Peel Inlet and Harvey Estuary System Management Strategy:

Progress and Compliance by the Proponents with the Environmental Conditions set by the Minister for the Environment in 1989, 1991 and 1993

Advice of the Environmental Protection Authority

(This is not an assessment of the Environmental Protection Authority under Part IV of the *Environmental Protection Act 1986*)

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- The Appendices to this EPA report are separated by red dividers.
- The Appendices to the report of the Expert Review Committee (Appendix 1 of the EPA report) are separated by orange dividers.
- The Appendices to the Specialists' reports (which are Appendices to the Expert Review Committee report) are separated by yellow dividers.

EPA Report includes:

Appendix 1: ERC report
- Appendix 1: Ministerial Statement
- Appendix 2: Specialist report – Legal & Admin
  - Appendix 1: EPA Recommendations 1988 & 1985
  - Appendix 2: Environmental Conditions 1989, 1991, 1993
  - Appendix 3: Peel-Harvey EPP 1992
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  - Appendix 5: Summary of EPP public submissions 1999
- Appendix 3: Specialist report – Water Quality
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Appendix 2: Ministerial Statement

Appendix 3: Towards a further draft EPP

EXECUTIVE SUMMARY

A Management Strategy for the Peel Inlet and Harvey Estuary System was approved for implementation by the Minister for the Environment on 4 January 1989. The Strategy was developed to address an environmental problem of massive algal growth in the Peel-Harvey System, caused by an increase in nutrients, especially phosphorus, from the estuaries' coastal catchment.

The Strategy has two major thrusts: the construction of the Dawesville Channel and the development and implementation of an integrated catchment management plan. The objective of the Strategy was to have the Peel-Harvey System become "visibly clean and healthy and ecologically healthy and resilient".

The Strategy was ambitious and far-sighted, and for the first time drew attention to the need for a whole-of-government integrated approach to solving environmental problems and, in particular, the problem of excessive nutrient flowing into our rivers and streams from an array of activities on land. To achieve this, the Minister for the Environment nominated three relevant Ministers as the proponents for implementation of the Strategy. The lessons learned in defining the problems and from developing and implementing management of the Peel-Harvey System are transferable to most of the other coastal plain lagoonal estuaries in Western Australia.

The documents in this Environmental Protection Authority (EPA) report provide a review of the effectiveness of the environmental management of the Peel-Harvey System during the past two decades. The review had two approaches: did the EPA of the day provide sound advice and recommendations, and did the proponents fulfil the requirements of the Environmental Conditions? The EPA, with advice from an Expert Review Committee established by the EPA, has responded to the Progress and Compliance Report required under Environmental Condition 17 of the Ministerial Statement to "help verify the environmental performance of the Peel Inlet-Harvey Estuary Management Strategy, Stage 2, in consultation with the Environmental Protection Authority".

The report includes a discussion of government as a proponent with a legal obligation to fulfil the requirements of the Environmental Conditions established by the Minister. The Environmental Protection Act binds the Crown, and adequate finance needs to be allocated to Government agencies in a manner which ensures that the legal requirements under the Environmental Protection Act are afforded a high priority and met in an environmentally acceptable manner.

In relation to the major thrusts of the Strategy, the Dawesville Channel was constructed, and the report of the Expert Review Committee, as an Appendix to this report, describes the environmental response to the construction of the Channel judged against predicted responses. The environmental changes predicted by the EPA in its 1988 assessment report have been shown to be valid.

The Catchment Management Plan required by the Environmental Conditions has yet to be developed. The time is now appropriate to commence this important task. There have

been a number of changes at both State and National levels which will provide an impetus for the development of catchment management plans, not only for the Peel-Harvey System, but also for other catchments. These changes include accreditation criteria being established for natural resource management plans as a requirement associated with the provision of funds under the Natural Heritage Trust and the National Action Plan for Salinity and Water Quality as well as a general acceptance of the proposition that all tiers of government, industry and the community need to work collectively to design and monitor action plans to implement the standards, processes and techniques for improved natural resource management of land and water ecosystems.

The purpose of the catchment management plan is to reduce the flow of nutrients into the estuaries. To date there is a cause for optimism, but the system is still in a fragile condition as evidenced by persistent blue-green algal blooms in the Serpentine River and potentially toxic dinoflagellates in the lower Murray. Reductions in nutrient loads from the catchment, as required by the Environmental Conditions set in 1989, are still needed.

Management of the Peel-Harvey System is the subject of a Ministerial Statement but it is also to be managed in accord with an Environmental Protection Policy approved by Parliament. This leads to the EPA having a particular responsibility in relation to environmental performance and compliance. A review of the Peel-Harvey Environmental Protection Policy should now result in the EPA having responsibility for ensuring that a catchment management plan to protect water quality is developed, as has been the case with the more recent Environmental Protection Policies for the Swan and Canning Rivers and for Cockburn Sound. The plan would be in the form of a Water Quality Improvement Plan and be implemented by relevant agencies.

A Peel-Harvey Catchment Council has been established to bring together government agencies and stakeholders in the area. This is supported by the EPA, and the EPA needs to develop an understanding with the Council in relation to the initiatives to be undertaken by the EPA, including the review of the Peel-Harvey Environmental Protection Policy and the development of a catchment management plan to protect water quality.

The EPA commends this report and the associated report of the Expert Review Committee to government, the public and those involved in catchment management as a description of the history of management of the Peel-Harvey System, the need for further reductions in nutrient load from this catchment, advice on improved governance of WA's natural resources, and a sound basis for action during the next decades.

1. INTRODUCTION AND BACKGROUND

This Report provides the advice of the Environmental Protection Authority (EPA) to the Minister for the Environment and Heritage on the Progress and Compliance Report in relation to the Peel Inlet and Harvey Estuary System Management Strategy Stage 2 (the Strategy).

The Strategy was approved for implementation by the Minister for the Environment on 4 January 1989. The Minister nominated three Ministers as co-proponents so as to ensure a whole-of-government approach to the implementation of the Strategy. The nominated proponents are the Ministers for Transport (now Planning and Infrastructure), Agriculture (now Primary Industries) and Waterways (now Environment and Heritage).

The Strategy was developed to manage the massive algal growth in the Peel-Harvey Estuarine System caused by an increase in nutrients, especially phosphorus, from the estuaries' coastal catchment. The Strategy had two major thrusts to address the environmental problems: the construction of the Dawesville Channel and the development and implementation of a Catchment Management Plan to limit (or "cap") the amount of phosphorus entering the estuaries from the river and drainage system. The objective of the Strategy was to have the Peel-Harvey System become "visibly clean and healthy and ecologically healthy and resilient" (EPA, 1985). This objective was based on the recognition that the Peel-Harvey System had important environmental, economic and social values involving a broad range of stakeholders, not necessarily only those people living within the coastal catchment area.

The combined approach involved the community as a whole paying for the Dawesville Channel in return for the catchment community changing its management practices to meet the phosphorus "cap", thus demonstrating its duty of care for the environment and social responsibility. The full management strategy consisted of:

- constructing the Dawesville Channel as soon as possible;
- implementing catchment management measures, to include:
  - fertiliser management
  - changes in land-use
  - control of point sources
  - continuation of the moratorium on clearing and drainage
  - preparation and implementation of an integrated catchment management plan to meet the target for phosphorus load reduction specified in the EPA assessment report;
- continue weed harvesting; and
- implement appropriate monitoring to measure the success of the strategy (EPA, 1988, p. 16).

An Environmental Protection Policy (EPP) was gazetted on 11 December 1992 for the purpose of setting environmental quality objectives for the Peel Inlet and Harvey Estuary (with a view to preventing excessive growth of algae) and outlining the means by which the objectives were to be achieved and maintained. The means of achieving the objectives are listed in section 8 of the EPP as being:

- Implementation of a Planning Policy;
- Appropriate land management by landholders and management authorities;
- Government extension services including the provision of advice to landholders; and
- Local authorities and the State ensuring that decisions and actions are compatible with the achievement and maintenance of the environmental quality objectives.

The Ministerial Statement that the Strategy may be implemented was issued on 4 January 1989 and contained a number of Environmental Conditions as well as Proponent Commitments. The Ministerial Statement was amended in 1991 and 1993 to add a small number of Conditions, including Condition 17 to require the proponents to prepare periodic Progress and Compliance Reports to "help verify the environmental performance of the Peel Inlet-Harvey Estuary Management Strategy, Stage 2, in consultation with the Environmental Protection Authority".

The Progress and Compliance Report was prepared by the Peel-Harvey Project Managers Group on behalf of the Senior Officers Group and the three proponent Ministers (PCR, 1998). On 28 January 1999, the EPA resolved that an Expert Review Committee (ERC) of key professionals be established to provide advice to the EPA on the Progress and Compliance Report. The members and approach taken by the Peel-Harvey Expert Review Committee are addressed in Section 3 of this report.

2. CONTEXT

Section 4 of the ERC report provides an excellent account of the definition and assessment phases of the Peel-Harvey Management Strategy which is briefly summarised here. The assessment followed over 10 years of scientific research, initiated and coordinated by the EPA, into the causes of the estuaries' eutrophication problems, accompanied by extensive community consultation and agricultural extension in the catchment.

Studies into the biological and physical aspects of the Peel-Harvey System commenced in 1977 and were initiated by the EPA. **Phase 1** of the studies concluded that:

- the Peel-Harvey System is eutrophic (i.e. severely nutrient enriched) in that there is an excess of the nutrients phosphorus and nitrogen available for plant growth in the estuaries;
- the excess of nutrient enters the system from activities in the catchment, in particular from the application of phosphorus-rich fertilisers; and
- proper management of the system can only be achieved by reducing the present input of nutrients from agricultural drainage, by preventing the increase of nutrients from other sources and by not further restricting the flushing of nutrients to the sea (EMAC, 1981).

Phase 2 studies began in 1981 and confirmed that the use of fertilisers and their transport to the estuary via the drainage system on the coastal plain catchment was the main cause of excessive phosphorus inputs to the estuary system.

Phase 3 examined all the possible management options to determine their effectiveness and feasibility against a set of constraints and objectives (Humphries and Croft, 1983; DCE, 1984).

The EPA carried out an assessment of the proposals in the Stage 1 Environmental Review and Management programme (ERMP) and recommended that a combined strategy of a new channel to the ocean and control of phosphorus inputs from the catchment was essential (EPA, 1985). In that assessment the EPA identified the management objectives as being, in simple terms:

"*to produce and maintain an estuary system that is visibly clean and healthy and is ecologically healthy and resilient*" (EPA, 1985).

This objective was based on the recognition that the Peel-Harvey System had important environmental, economic and social values involving a broad range of stakeholders, not necessarily only those people living within the coastal catchment area.

In 1985, the EPA defined the management area as being "the Estuary System" which included the Peel Inlet, the Harvey Estuary and the rivers and drains of the coastal part of the catchment, including the Serpentine, Murray and Harvey Rivers (see Figure 1). The EPA also stated in its conclusions that:

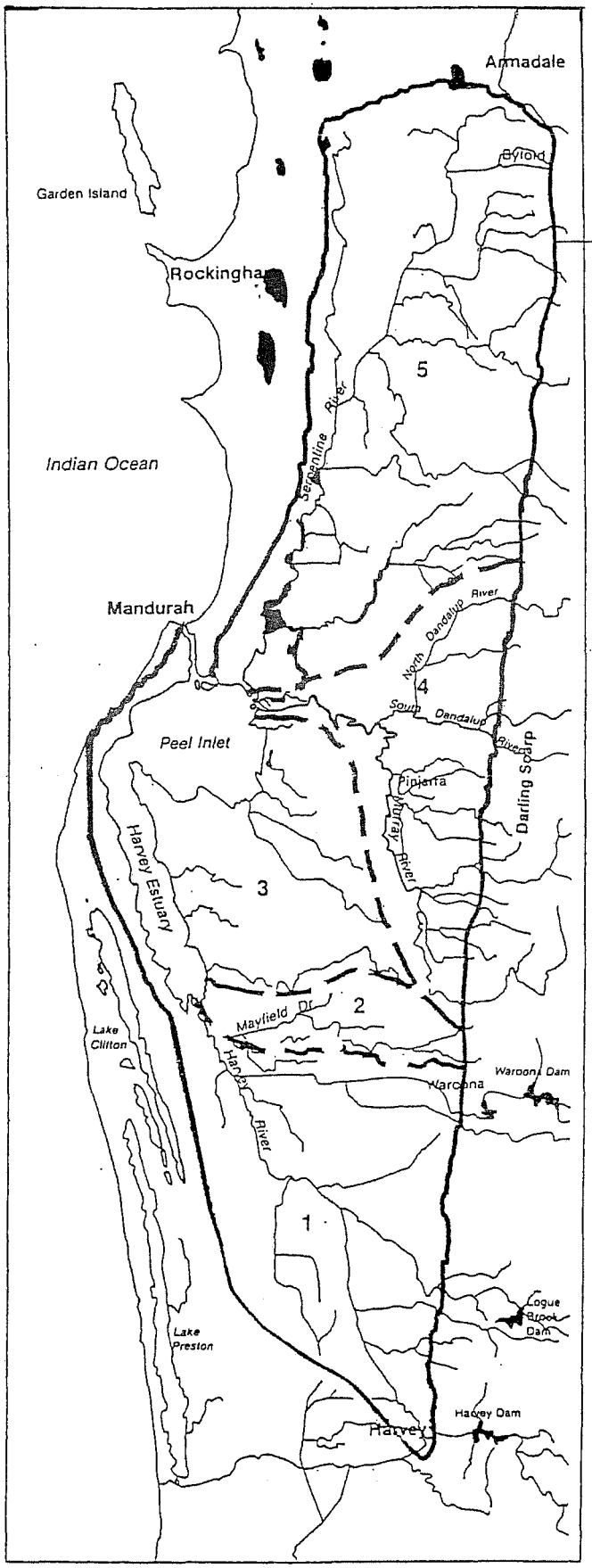
"*it will be necessary to develop a long-term land management plan for the Catchment Area and an appropriate enabling framework, to attain and secure for all time reductions in nutrient loading to the System;*" (EPA, 1988, (page 27 of the Part I Report)).

Phase 4 was the preparation of the Stage 2 ERMP (Kinhill Engineers, 1988) which examined the management package in detail, followed by the environmental impact assessment by the EPA (EPA, 1988). In preparing its assessment and recommendations to Government, the EPA provided advice on the legal and administrative framework that would be necessary to underpin successful management of the estuary system's environmental quality over the long term. This was embodied in the recommendations of the EPA in its assessment reports (EPA, 1985 and 1988) (reproduced in Appendix 1 in the Legal and Administrative Framework Specialist Report) and in the Environmental Conditions set by the then Minister for the Environment (see Appendix 2 of this EPA report).

The Management Target

The position taken by the EPA in its assessment of the ERMP in 1988 was:

" *..that the estuarine water quality is presently seriously degraded, and that this requires significant improvement to make it environmentally acceptable and to ensure that the*



Catchment	Area (ha)	Cleared area (ha)	% cleared
1	53,995	41,454	76.8
2	11,044	10,139	91.8
3	26,365	21,296	80.8
4	32,366	29,149	90.0
5	78,645	48,962	62.3
Total	202,415	151,000	74.6

Figure 1

Location map of Peel-Harvey Estuary System and boundaries of the Coastal Plain Catchment and Sub-catchments

beneficial uses of the system such as direct water contact recreation, fishing, fishery protection, and habitat protection can continue. To date, catchment land-uses have taken place without due regard for the downstream consequences and impacts on the end receiving water body. The environmental quality of the estuaries has been traded off for the benefit of catchment land-uses. This balance needs to be redressed to achieve conservation and sustainable development of the Peel-Harvey System. Adequate protection of the estuaries' beneficial uses will dictate changes to the amount and types of catchment activities that will be possible" (EPA, 1988, p.1).

By 1988, there were sufficient data and modelling results to enable the EPA assessment to express the management target in both descriptive and numerical terms. The latter was expressed in probabilistic terms to take account of the different nutrient loads that would result from wet and dry rainfall years and was important as it would enable the success of the management strategy to be measured and judged over time, including under differing environmental conditions.

The descriptive management objectives the EPA set at that time were:

i) *"At least an acceptable to good level of water quality, defined as moderately nutrient enriched (mesotrophic);*
ii) *A high level of resilience in the system to ensure that massive oxygen depletion does not occur;*
iii) *A large reduction in phosphorus input to the system from the catchment area;*
iv) *A solution, that will preferably show major improvement within five years, to ensure that irreversible damage to the system does not occur; and*
v) *A very high probability that the strategy will succeed both in the short and the long term.*

Although not environmental in nature, another important consideration is the overall cost - benefit that would result from the system being adequately managed and becoming healthy and resilient" (EPA, 1988, p.10).

The target organisms for management at that time were the in-estuary occurrences of a cyanobacterium (blue-green alga) called *Nodularia* which can "fix" atmospheric nitrogen, and macro-algae. This led to the focus for management being reducing availability of phosphorus as the means of limiting plant growth.

The full management strategy consisted of:

- constructing the Dawesville Channel as soon as possible;
- implementing catchment management measures, to include:
  - fertiliser management
  - changes in land-use
  - control of point sources
  - continuation of the moratorium on clearing and drainage
  - preparation and implementation of an integrated catchment management plan to meet the target for phosphorus load reduction specified in the EPA assessment report;
- continue weed harvesting; and

- implement appropriate monitoring to measure the success of the strategy (EPA, 1988, p. 16).

The parts to be played by the two main components of the management strategy were set out by the EPA in its 1988 assessment and are covered in Table 1 in the ERC report.

At the time of the assessment, there was a sense of urgency as it was the view of many scientists that the magnitude of the *Nodularia* problem threatened the ongoing health of the estuaries and that further significant decline with a move to an even more environmentally unstable and less predictable situation was quite likely. Scientists were concerned about the likely "collapse" of estuary health and concern that if such an extreme collapse occurred, it would become impossible to achieve restoration to a healthy estuary system.

It became clear that a management package was required that would foster a dynamic, adaptive environmental management approach and that it would need to be underpinned in the long term by a robust legal and administrative framework for management.

The lessons learned in defining the problems and from developing and implementing management of the Peel-Harvey are transferable to most of the other coastal plain lagoonal estuaries in WA, as well as to catchment management in general. However, Peel-Harvey is unique in the amount of money spent on research to define the problems (over $10 million) and to implement management solutions (over $60 million). It is most unlikely that in excess of $60 million will ever be spent again in Western Australia on a catchment scale solution to a nutrient-related environmental problem.

The predictions about the post-management performance of the estuary system made by the EPA in 1988 (and before) have now been tested and have proved to be correct (see Tables 2 and 7 of the Expert Review Committee Report).

3. THE PEEL-HARVEY EXPERT REVIEW COMMITTEE

The key specialists with direct experience in the research into, and development of, the Peel-Harvey Management Strategy in the late 1980's and early 1990's were invited to form the Expert Review Committee. The specialists are:

Ms Sally Robinson – legal and administrative framework for integrated catchment management; Deputy Chairman of EPA during the initial stages of the review; author of the EPA's 1985 and 1988 assessment reports;
Dr John Yeates – agricultural practices and catchment management;
Dr David Deeley – estuary water quality and in-estuary management targets;
Dr Robert Humphries – estuary systems ecology and water quality;
Mr Geoffrey Bott – estuary management and Environmental Protection Policies.

Administrative support was provided by Ms Alanna Fandry.

To enable it to develop its advice, the Expert Review Committee (ERC):

- Examined the claims made in the proponents' Progress and Compliance Report;
- Carried out aerial and ground site inspections;
- Consulted with agencies of the co-proponent Ministers;
- Consulted with key individuals and community members;
- Carried out a review of associated documents and file information;
- Carried out a review of submissions on the review of the Peel-Harvey Environmental Protection Policy; and
- Had many discussions to integrate the views of the members of the Expert Review Committee.

The Committee decided that the most appropriate approach to providing advice to the EPA was to prepare three specialist reports and an over-arching report of the Expert Review Committee as a whole. The full report of the Peel-Harvey Expert Review Committee to the EPA forms Appendix 1 to this EPA report. The three specialist reports form appendices to that Expert Review Committee report.

Members of the Committee accepted responsibility for preparing the various reports, as follows:

Specialist Report on the Legal and Administrative Framework for Environmental Management: Review of Success and Future Directions	Ms Sally Robinson
Specialist Report on Catchment Management	Dr John Yeates
Specialist Report on Water Quality and Management Targets	Dr David Deeley
Report to the EPA by the Peel-Harvey Expert Review Committee (the over-arching report).	Ms Sally Robinson

An informal review of the full Expert Review Committee report was carried out by Professor Neil Gunningham of the Australian National University and independent expert reviews of the specialist reports were carried out as follows:

Report	**Reviewer(s)**
Specialist Report on the Legal and Administrative Framework for Environmental Management: Review of Success and Future Directions	Formal reviews by Mr Barry Carbon and Dr Chris Whitaker Informal review by Prof Neil Gunningham
Specialist Report on Catchment Management	Dr Roy Green Key staff in the Department of Agriculture were consulted
Specialist Report on Water Quality and Management Targets	Dr Roy Green Key staff in the Water and Rivers Commission were consulted

The EPA records its appreciation to the Expert Review Committee members for undertaking the difficult task of reviewing the last decade of the operation of the Peel-Harvey System Management Strategy. The report of the Expert Review Committee provides an excellent review of progress made in implementing the management strategy via the Environmental Conditions set down in the Ministerial Statement on the Strategy. It also provides sound advice on the current state of aspects of the environment, especially in relation to water quality, as well as advice for the future of integrated natural resource management and catchment management in WA in general.

The report also discusses and provides general advice on the benefits of Progress and Compliance reports for both the proponents and the EPA with a view to continuous improvement in environmental protection and stewardship. Such reviews need to concentrate on the progress aspect to answer two questions: firstly, has the proponent implemented the Environmental Conditions in the spirit of environmental stewardship in accordance with the intent of the Conditions, and secondly, did the EPA "get it right" in terms of its assessment of the proposal and the environmental objectives, and the advice it provided. The whole purpose of the EPA's advice on a proposal, the Environmental Conditions and the associated proponent commitments is to ensure that the environment is protected, and, where the proposal being assessed involves environmental restoration, that the required degree of restoration is being achieved.

Ideally a Progress and Compliance review should be a positive experience for proponents with the emphasis being on achieving improvements into the future. This can best be done in association with the EPA, and its outside review specialists, working with the common aim of achieving continuous improvement in environmental outcomes.

The EPA commends the report of the Expert Review Committee to Government, the public and to those now involved in management of the Peel-Harvey System as being an accurate documentation of the history of management of the System. The report provides a sound basis for action during the next decades.

The EPA accepts and endorses all of the recommendations made to it by the Expert Review Committee, although not necessarily their precise wording, and many of these recommendations have been extended by the additional advice provided in this report by the EPA.

4. THE PROPONENTS, AND GOVERNMENT AS PROPONENT

Under the current Environmental Protection Act, Environmental Conditions cannot be applied to non-proponents even though they may be crucial to supporting decisions or management to ensure a successful outcome.

At times, and for very good reasons, a project cannot be made environmentally acceptable by the proponent's actions alone, and it is not uncommon for private industry proponents to find themselves in the position where their project can only be made "environmentally acceptable" if certain actions are taken by government agencies. In such instances, if agency management requirements are not funded, proponents can find

themselves in a difficult position even though they are themselves meeting the requirements of the Environmental Conditions placed upon them.

Peel-Harvey represented a particularly difficult project for the identification of appropriate proponents as the proposal was a "whole-of-government" project where successful implementation required actions across a range of State agencies as well as by local government, landholders and the community.

Recognising that management of Peel-Harvey required a seamless "whole-of-government" approach, the Minister of the day designated three Ministers as equal co-proponents for the whole management strategy (the Minister for Transport, the Minister for Agriculture and the Minister for Waterways). This was to ensure:

- that all aspects of the strategy were implemented;
- that each Minister would apply pressure to the others to achieve full implementation and a coordinated approach;
- adequate funding for full implementation would be secured; and
- to prevent division of the strategy along conventional agency lines and the potential for aspects remaining unmanaged.

The Senior Officers Group consisting of agency staff gave effect to the co-proponent responsibility by dividing the management strategy along conventional agency lines. This approach led to a lack of protection of some portions of the environment. In addition, the legal requirements of the Environmental Conditions have not been afforded adequate priority, the agencies citing "budget constraints" as a "reason" for lack of implementation of some Conditions.

The EPA is concerned that for the management strategy for Peel-Harvey, government agencies have not afforded a high enough priority to meeting the legal requirements of the Environmental Conditions. This would not be acceptable from private industry and, as the Environmental Protection Act binds the Crown, is not acceptable from government agencies as proponents. The EPA notes that while government is frequently very keen to foster development, including by its own agencies, the provision of adequate funding to meet legal environmental requirements is often inadequate or lacking. There are also instances where government expenditure is required to ensure that non-government developments meet environmental objectives, and that expenditure can become an issue (examples include the Port Geographe canal development; provision of basic infrastructure for the Maitland industrial site; Jervoise Bay boat harbour; and the Coral Coast development, if the project is approved for implementation).

The "whole-of-government" approach to the management of Peel-Harvey is still required to properly bring together the expertise of the Department of Planning and Infrastructure, the Department of Agriculture, the Department of Environmental Protection and the Water and Rivers Commission, with local government and the community. However, what is now required is a clear statement of operational outcomes within the context of the linkages between land and the water in achieving catchment management and natural resource management outcomes.

The ERC report advised that actions from non-proponent agencies that are essential to successful implementation of management to ensure proper environmental protection, can be identified and defined through the "Procedure" part of the Environmental Conditions. The report also advised that it would be useful, in amending some of the Environmental Conditions, for the EPA to provide advice to the Minister for the Environment on non-proponent management agencies and for a draft "Procedure" to be prepared for inclusion in the revised Statement.

The implementation of the whole strategy would be assisted by having a single person who is responsible for ensuring that the whole strategy is implemented. Such a position should be a very senior one and the role should be cooperative oversight and integration to ensure the following (at least):

- adequate budget is obtained, for implementation, via a multi-agency program budget;
- the whole strategy is implemented;
- there is a focus for coordination of agency activities as required;
- disputes between or among agencies are mediated;
- there is a strong conduit established for information flows with the catchment and general community in the catchment and generally;
- assistance is provided to enable land use changes to occur;
- links to Commonwealth funding are provided for co-ordinated implementation of on ground works;
- the necessary institutional changes expected by the Commonwealth to access Commonwealth funding occur; and
- proponent Ministers are informed of difficulties being encountered that require intervention with their departments.

EPA Advice/Comment - 1

The proponents for the continuing implementation of the Peel-Harvey Strategy should be the Ministers for Agriculture, Planning and Infrastructure, and Environment and Heritage with the Chief Executive Officers of the Department of Agriculture, Department of Planning and Infrastructure and a combination of the Department of Environmental Protection and the Water and Rivers Commission being required to fully implement the whole strategy in accordance with the legal requirements and prioritise the legal requirements within their agency budgets.

EPA Advice/Comment - 2

A senior position needs to be given responsibility for co-ordinating implementation of the management strategy as outlined above. This position should be very senior and influential and located with the EPA/EPA Service Unit. The EPA has the function of examining environmental performance of natural resource management, and publicly reporting on the achievement of environmental objectives.

5. KEY ISSUES FROM THE COMPLIANCE REVIEW PROCESS

Clearly a significant issue in carrying out a major progress and compliance review (PCR) is to ensure that the review team contains people who are familiar with and well informed about the history of the project, the EPA's assessment(s) and the intent behind the approach taken by the EPA in formulating its recommendations and draft conditions.

Two members of this Expert Review Committee have been involved in two major compliance reviews of projects where government agencies are the proponent (Forest Management plans and Peel-Harvey), and as a result the ERC provided advice to the EPA on improvements to the PCR Process.

The ERC report advises that:

"*As the EPA is independent as to the advice that it provides, it is appropriate for the EPA to carry out the audit of some projects, particularly those where government agencies (or Ministers) are the proponent, or projects considered to be sensitive either environmentally or politically.*"

The EPA supports the advice set out in section 10.2 of the ERC report that:

- the EPA sets down its requirements for preparation of a PCR to ensure that the contents are adequate for the purpose;
- progress and compliance report prepared by the proponents needs to contain sufficient information to enable a determination of compliance to be made, in accordance with the requirements of the EPA;
- proponents must consult with the EPA on the form and content of a PCR report and any such report must meet the EPA's requirements; and
- consultation between the proponents and the EPA occurs to establish a two-way communication and to establish an open and transparent approach.

The purpose of the compliance review should be to see whether the environment is being adequately protected, both from the point of view of the proponents implementing the Environmental Conditions, as well as assessing whether the EPA's environmental objectives and the Conditions set by the Minister are what are required to deliver the required level of environmental protection. The two key questions are:

- has the proponent implemented the Conditions as required and in accordance with the intent of the Condition? and

- did the EPA "get it right" in terms of the outcomes of the environmental objectives, plan and implementation - i.e. is significant environmental harm occurring even though the proponents have fully met their requirements, and if so, what feasible changes to implementation are required to address this?

Ideally, a compliance review should focus more on whether the intent of the Conditions has been met rather than strictly focusing on whether the minutiae of the legal aspects have been met. Any resultant changes to the management requirements of the project must recognise that the proposal is already being implemented, degrees of freedom have been reduced, and thus for some types of proposal achieving major changes may not be practicable or possible.

The ERC has identified the following problems in carrying out the PCR review for Peel-Harvey:

a) the PCR documentation was prepared in isolation with no input from the EPA. The Environmental Condition sets out that the PCR shall be prepared in consultation with the EPA;

b) the PCR documentation in many instances does not contain adequate information to enable the Expert Review Committee to be able to tell whether the Condition has been fully complied with, or for the EPA to be able to verify compliance. The onus is on a proponent to provide information to enable compliance to be determined, and in the absence of such information being provided it would be reasonable for the EPA to record potential non-compliance;

c) the PCR document expresses the personal opinions of senior staff from the proponent agencies in terms of claims of compliance rather than providing the information in a more objective form that would enable the EPA (and others) to form such judgements;

d) the PCR (and other documentation) was made public before it was approved for release by the EPA, and the proponents claims about their compliance was extensively publicised in the Peel-Harvey area, as well as provided to their Ministers. The proponents claim that they are in full compliance for some items when this is clearly not the case;

e) the way in which the Environmental Conditions were styled in the PCR made it very difficult to follow, focusing as it did on the many small "compliance elements" identified by the DEP audit group. Had the EPA been involved in the development of the PCR it would have advised the proponents to stay with the broad requirements of the Conditions and their intent as set out in the EPA's 1988 assessment report; and

f) there are numerous examples of difficulties arising from differences in perception of issues, requirements and the legal status of the Conditions and the EPP, including on matters of fact including on the nature of the environmental objective and legal requirements on proponents.

The Expert Review Committee suggests the following approach should be adopted to improve the PCR process and ensure that it is fair to proponents and the community. The EPA welcomes this advice and endorses the ERC recommendations PCR 1 to PCR 4 as a guide in relation to the PCR review process.

a) As the former Department of Environmental Protection has responsibilities for Licensing, it may not be appropriate for audits to be carried out by that department for projects where meeting environmental outcomes requires Licenses to be issued under Part V of the Environmental Protection Act, or under the water resources legislation.

b) With the increased separation of the EPA from the Departments which are responsible for administration of the Licensing functions under the Environmental Protection Act and the Water Resources legislation, it will be necessary to adequately resource the EPA to carry out future compliance reviews itself and enable it to cover the costs of using independent review teams.

c) EPA should clearly document the intent of its recommendations in its assessment reports, preferably by inserting recommendations throughout the report close to the rationale for that recommendation.

d) The intent should be stated adjacent to each Environmental Condition and included in the Statement issued by the Minister for the Environment. Although the intent behind both EPA recommendations and Environmental Conditions is clear from reading the assessment reports, it would be of more assistance to proponents (and to future PCR review teams) if the rationale was made explicit within the Minister's Statement.

e) Proponents should be required by the EPA to propose a strategy to enable evaluation of progress and compliance and EPA and proponents need to reach mutual agreement on this. Following issue of the Statement that a Proposal may be Implemented, the EPA should invite proponents to attend an EPA meeting to discuss and agree on the measures of success that will be used to verify compliance in the next review. The agreed measures of success would then lead to the development of a targeted monitoring program to ensure that the appropriate information to enable compliance to be verified is included.

f) The proponents should be requested to propose measures to the EPA for consideration and discussion and would be encouraged to consult with key stakeholders and groups. The agreement reached by the proponents and the EPA should form a "contract" that should remain regardless of staff changes either at the EPA or at the proponent organisation, and should be made public as a draft, to allow for other expert input, prior to being finalised.

6. STATEMENT ON COMPLIANCE

Ideally, a compliance review should focus more on whether the intent of the Conditions has been met rather than strictly focusing on whether the minutiae of the legal aspects have been met.

In previous reviews, the EPA has put more emphasis on the "Progress" aspect of the process, than on the "Compliance" aspect and has focused more on the actions of the proponent than assessing the appropriateness of its own environmental objectives. Ideally a compliance review as required by the Condition should be a positive experience for proponents with the emphasis being on achieving improvements in environmental performance into the future. However, when PCR documents are prepared in isolation from the EPA the opportunity for a beneficial experience by the proponent can be compromised and can lead to a more oppositional process.

A summary of the verification of compliance and advice on Environmental Conditions is provided in Table 1, with additional information being set out in Table 14 of the ERC report and (more fully) in Table A5 in Appendix 5 of the ERC report.

Although the Conditions may be regarded as not having been written strictly in a manner that could be legally enforceable, it is apparent that even the intent of some of the more important Conditions has not been followed by the proponents. The intent behind the Conditions is clear from the assessment report. The key elements of effective regulation (including of Environmental Conditions) based on current "state of the art" is covered in Section 13.2 of the ERC report.

Although the PCR recommends in many instances that the Environmental Conditions be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as part of the EPP, the ERC is of the view that it would be better to retain the Conditions, rather than try and add them into the scope of the EPP (see Table A5 in Appendix 5 of the ERC Report). However, it would be appropriate to amend the wording of several of the Conditions as well as add some new ones to the Minister's statement (see section 11 of this EPA report).

Table 1 - EPA Advice on Compliance with the Environmental Conditions

Condition No	Date Condition set	EPA Statement on Compliance
M1 (see also 1A and 1B below)	In original Statement signed 3 Jan 1989	Partially met (see 1A and 1B below). Original M1 reworded into new M1A and 1B.
M1A	16 April 1993	Partially met.
M1B	16 April 1993	Not met. Compliance not demonstrated.
M2	In original Statement signed 3 Jan 1989	Not met. Compliance not demonstrated.
M3	In original Statement signed 3 Jan 1989	Partially met. An EPP was developed but not until 1992 (Condition required it by 31 December 1989).

M4	In original Statement signed 3 Jan 1989	Not met.
M5	In original Statement signed 3 Jan 1989	Partially met. The co-proponents were made responsible on behalf of the whole of Government and should have been more vigorous in working with non-proponent agencies to meet the requirement of this Condition.
M6	In original Statement signed 3 Jan 1989	Not met. Compliance not demonstrated.
M7	In original Statement signed 3 Jan 1989	Met. Compliance verified.
M8	In original Statement signed 3 Jan 1989	Met. Compliance verified.
M9	In original Statement signed 3 Jan 1989	Not met. Compliance not demonstrated.
M10	In original Statement signed 3 Jan 1989	Not implemented. Condition contingent on timing being specified by the Minister for the Environment. Unable to verify if the Minister for the Environment ever issued a timetable for doing so.
M11	In original Statement signed 3 Jan 1989	Compliance not demonstrated.
M12	In original Statement signed 3 Jan 1989	Met. Compliance verified.
M13	In original Statement signed 3 Jan 1989	Compliance verified for parts (1) and (2) of this Condition. Part (3) is ongoing as it relates to long-term monitoring.
M14	2 October 1991	Not met. Compliance not verified. The co-proponents were made responsible on behalf of the whole of Government and should have been more vigorous in working with non-proponent agencies to meet the requirements of this Condition,
M15-1	16 April 1993	Met. Compliance verified.
M15-2	16 April 1993	Met. Compliance verified.

M16	16 April 1993	Met. Compliance verified.
M16-1	16 April 1993	Met. Compliance verified.
M17 and 17-1	16 April 1993	Partially met. A PCR was prepared but EPA was not consulted as required by the Condition.

7. THE LEGAL AND ADMINISTRATIVE FRAMEWORK FOR MANAGEMENT AND THE PEEL-HARVEY ENVIRONMENTAL PROTECTION POLICY

The Expert Review Committee report provides a very competent analysis of the legal and administrative framework for management by drawing on the work in the Specialist report which forms Appendix 2 to the ERC report. A tiered management framework was proposed in the EPA assessment consisting of:

- the management objectives for nutrients identified in the EPA assessment being set in the Environmental Conditions
- an Environmental Protection Policy which includes those nutrient objectives as the environmental objectives in the EPP; and
- development of a comprehensive integrated catchment management plan.

The EPA identified in its 1985 and 1988 assessments that the government would need to develop an implementation mechanism for implementation of a catchment management plan. The EPA notes that no such mechanism has yet been developed to enable implementation of catchment management plans and the approach used to date for some areas where diffuse source pollution is an issue (Peel-Harvey; Gnangara and Jandakot groundwater mounds) of an EPP with an associated Statement of Planning Policy (SPP) for land use control has largely not been successful.

The EPA notes that the lack of an appropriate mechanism to implement catchment management plans is of great concern, given that detailed salinity and natural resource management plans will increasingly be required to address the State's major multiple natural resource issues at a catchment scale. The EPA has recommended that such a mechanism is required on two prior occasions (EPA, 1985 and 1988) and in this report is also urging the government to address this issue.

The concept of the Environmental Protection Policy (EPP) for the Peel-Harvey coastal catchment, gazetted on 11 December 1992, remains the appropriate instrument for the EPA to set broad environmental quality objectives for the area as well as describing the mechanism for achieving these objectives. The mechanism includes appropriate land management by landholders and management authorities. The EPA supports the establishment of the Peel-Harvey Catchment Council (in August 2000), which currently is a sub-regional Council within the broader South West Catchment Council, but the EPA is of the view that the initiative for the development of environmental values and

environmental quality objectives as well as an integrated catchment management plan to protect water quality should be pursued by the EPA as part of the EPP process. This issue is addressed later in Section 10 of this EPA report.

Although some may be of the view that it may be desirable to amend the EPP to recognise the Peel-Harvey Catchment Council as having operational responsibility to achieve the objectives of the EPP, this requires careful consideration. This approach may appear to be in accord with that developed for the draft Cockburn Sound EPP which sets out that the Environmental Management Plan is to be prepared and implemented by the Cockburn Sound Management Council, reviewed, as necessary, with community consultation and approved by the EPA. However, there are significant differences in that it was the EPA which established the key water quality requirements and mechanisms for implementation for the protection of water quality. The Environmental Management Program developed by the Cockburn Sound Management Council is based upon the substantial documentation on water quality developed by the EPA and included in the EPP. The Peel-Harvey Catchment Council may not be appropriately constituted (in membership) to carry out the task of preparing the plan to protect water quality as the essential expertise and technical support are not guaranteed. Furthermore, it would be unreasonable to expect the Council to take on the responsibility given that there is no implementation mechanism and the members of that Council are not proponents and have no control over land use planning for the area. The Peel-Harvey area is a special case because its management is pursuant to both a Ministerial Statement that a Management Strategy may be implemented and an Environmental Protection Policy adopted by Parliament.

The ERC report proposes that the EPA re-commence the review of the Peel-Harvey EPP following completion of the Progress and Compliance review on the Peel-Harvey Management Strategy. The need to re-examine the overall management objectives for the estuary system except for those relating to nutrients has also been raised. The ERC has proposed that the EPA should run a public process to engage the community as a whole in determining the measures of ecosystem "health" that should be applied to the system at this time. These can be expected to cover a greater range of environmental indicators than for the original EPA assessment (for example condition of remnant native vegetation and wetlands).

In addition, the manner in which the water quality objectives for nutrients have been set should be revised to reflect the nested approach put forward in the ERC report (see section 6 and recommendations W1 to W3 in that report).

In accepting and endorsing the recommendations in the ERC report, the EPA will be reviewing the EPP drawing on the advice of the ERC and experience in developing EPPs in recent years. This review will especially relate to identifying the broader environmental values to be protected, measures of ecosystem health, and the means by which protection of the environment to meet the objectives will be given effect over the next 5 to 10 years (see Section 10 of this Report).

8. THE DAWESVILLE CHANNEL, CATCHMENT MANAGEMENT AND WATER QUALITY

The authors of the EPA Bulletin on the Peel-Harvey management strategy in 1988 were farsighted in their advice on the requirements for a catchment management plan as an integral part of the strategy for improving water quality. The management strategy developed by the EPA in 1988 was the first attempt in Australia (and probably in the world) at management of a diffuse source of pollution problem where catchment management needed to be tackled in association with a major engineering approach. The revised Environmental Protection Act was new in its application and the role of Environmental Conditions in achieving management objectives identified by the EPA was still being developed. Describing approaches and mechanisms for auditing compliance by the Department and for proponents had barely commenced, and environmental management systems were in their infancy. It was early days for catchment management anywhere in Australia, and indeed the world.

The Peel-Harvey system was, and remains, an icon of Western Australia, as well as being of international significance as a Ramsar wetland. The EPA 1988 assessment report stated:

"*Management of the problems of the Peel Inlet and Harvey Estuary waterways and their catchments will require the adoption of a long-term view and a holistic approach. Because some of the remedial measures proposed in this report will be on a scale and of a kind not previously undertaken, they will generate considerable world-wide interest. At the local level, the Dawesville Channel will be the largest coastal engineering project undertaken since C Y O'Connor built Fremantle harbour. The proposals to manage agricultural activities in the catchment would also be innovative in that the emphasis is on a co-operative approach rather than on a strict regulatory approach of the kind being adopted by a number of European countries to control similar problems* " (EPA 1988, p. 1-2).

The Dawesville Channel

The Dawesville Channel has now been constructed and has been successful in improving the water quality in the main body of the Peel Inlet and Harvey Estuary. However, water quality and environmental problems remain in the rivers, and in areas such as the Serpentine Lakes. The second part of the Strategy, that of catchment management to "cap" the phosphorus input to the waterways remains the aspect of the management package that still requires significant action.

The ERC report found that the predictions made by the EPA in regard to the channel's performance and likely environmental impacts were correctly predicted and no unpredicted impacts resulted (see Table 7 of the ERC report). However, the success of the Dawesville Channel in improving the water quality in the estuaries does not provide a basis for any relaxation in the requirements for catchment management. The Channel has an engineered, fixed maximum flushing capacity, and catchment management is essential to provide an adequate buffer to ensure maintenance of the estuary health and resilience

in the long term, particularly if there is a return to a regime of higher rainfall. Catchment management is also required to improve the quality of the river systems which enter the estuaries.

It is of concern to the ERC and the EPA that the whole period from commencement of investigation into the Peel-Harvey estuaries has coincided with a very significant reduction in rainfall and runoff in the South West of WA. If a return to more normal rainfall and runoff occurs then the loads of nutrients entering the system will become significantly greater.

A monitoring program should continue in relation to the Dawesville Channel and estuary system as a whole, to take account of high run-off years and other longer term environmental variations.

The ERC recommends (see recommendation DC1 of the ERC report) and the EPA endorses that the proponents maintain a monitoring programme in relation to the performance of the Dawesville Channel to include:

- nearshore bathymetry and beach profiles extending 1 km north and south of the channel;
- bathymetry of the Harvey Estuary in the vicinity of the channel;
- shoreline movements using aerial photography either side of the channel;
- inundation assessment;
- nearshore water quality and marine habitat;
- water quality within the Peel Inlet and Harvey Estuary; and
- sand bypassing operations.

Catchment Management

Some work towards a catchment plan was undertaken by the parties involved, but the comprehensive integrated catchment management plan envisaged by the EPA was not produced. In addition, the government has not yet developed an implementation mechanism for catchment management plans developed by catchment groups.

The importance of an effective catchment management plan and implementation strategy is emphasised in the Expert Review Report. It is the ERC's judgement that under the current catchment management arrangements there is an 80% likelihood of there being further deterioration in water quality of the catchment run-off.

The time is now right to properly commence the task of preparing a catchment management plan. This should be assisted by several recent initiatives, including:

- At both the National and State levels, accreditation criteria are being established for NRM Plans which will be required in relation to the provision of National Action Plan and Natural Heritage Trust funds;

- The EPA has a function in relation to the environmental performance of natural resource management agencies;
- The Department of Agriculture has indicated it is adopting a framework for Environmentally Responsible Agriculture which will lead to minimum acceptable management practices and ultimately development of "best management practices" to take proper regard for environmental protection during agricultural production;
- There is a growing acceptance of the proposition that all tiers of government, community, industry and agriculture, cooperatively need to design and monitor action plans to implement the standards, processes and techniques for improved natural resource management of land and water ecosystems;
- There is a growing acceptance of the need to incorporate an environmental "duty of care" for all land use and management (see Industry Commission 1998 report "A Full Repairing Lease");
- The Peel-Harvey Catchment Council has been formed, as a sub-region of the South West Catchment Council; and
- The State Government has appointed a Natural Resource Management Council.

Although none of the above will lead miraculously to the plan envisaged by the EPA, the points do suggest that change is occurring and that the social aspects of catchment management planning may have changed in the time since it was first proposed by the EPA in 1985. Thus the feasibility of achieving a competent catchment management plan and an implementation strategy may now be greater.

The EPA intends to use the Peel-Harvey coastal catchment as a model for the development of a catchment management plan and an implementation framework. This issue is addressed further in Section 10 of this EPA report.

The Peel-Harvey System is important to the people of Western Australia, and the EPA looks forward to significant progress within the next two years on both a catchment management plan and an implementation strategy.

EPA Advice/Comment - 3

A Catchment Management Plan and an Implementation Strategy need to be prepared as a matter of urgency with the objective of reducing the run-off of nutrients into the rivers pursuant to the Environmental Protection Policy.

EPA Advice/Comment - 4

The comprehensive integrated catchment management plan needs to include the development and introduction of Minimum Acceptable Management Practices (MAMP's) into rural and farming activities with high potential for risk to the environment as well as improving the condition of riparian vegetation.

The term "acceptable" relates to environmental acceptability and prevention of land degradation and environmental harm both on and off site.

EPA Advice/Comment - 5

The use of Minimum Acceptable Management Practices (MAMP's) should be required in farm plans and required in land use practices. MAMP's can be encouraged through positive interaction between government agencies and landholders, and their use audited as part of the process of the Implementation Strategy for the Catchment Management Plan.

EPA Advice/Comment - 6

Where Minimum Acceptable Management Practices (MAMP's) are not adopted through voluntary take-up within 3 years of the development of an integrated catchment management plan, regulations should be introduced through the Environmental Protection Act to enable coercive action to be taken to achieve the level of conformance in catchment behaviour that is required to protect the environment.

Water Quality

A prime objective of the Strategy was to improve water quality in the Peel Inlet and Harvey Estuary so as to reduce the incidence of nuisance levels of algal growth. However, this was accompanied by a need to reduce ("cap") phosphorus loads flowing from the Serpentine, Murray and Harvey Rivers as set out in the Peel-Harvey Environmental Protection Policy.

Accordingly, it is important to re-state the advice of the Expert Review Committee on this subject:

"Environmental monitoring shows that water quality in the Peel-Harvey estuary has improved significantly in terms of nutrient concentrations, chlorophyll a and Secchi depths (transparency) since completion of the Dawesville Channel. Nodularia blooms have not been observed in the estuary since the Channel was completed, even though there have been two years where streamflow and nutrient delivery to the estuary were above the threshold level that would have been expected to trigger a Nodularia bloom prior to the construction of the Dawesville Channel. However, it is still of concern that the management strategy was developed during an extended drier-than-average period and the recent below average rainfall conditions means that performance of the system under wetter conditions has not been measured. It is still not known whether the current pattern of reduced rainfall is a temporary phenomenon or represents a permanent reduction. If it is the latter, then the long-term average can be expected to remain lower which would be likely to benefit estuary management (as a result of reduced flows and nutrient loads). If there is a return to the previously wetter regime, then flows and nutrient loads would significantly increase, could possibly overwhelm the currently implemented level of management.

To date the improvement in water quality is cause for optimism. The success of the restorative measures in the estuary will only become apparent in future years as the

system continues to find a new equilibrium as a result of the altered flushing regime, and after there have been additional years of larger flows and nutrient delivery.

Of increasing concern to the local community are continuing blooms of Nodularia and other cyanophytes (blue-green algae) in the lower reaches of the Serpentine River. In recent years, there have also been localised accumulations of macro-algae in the southern portion of the Harvey Estuary. This means that although the system has improved, it is still in a fragile condition and reductions in nutrient loads from the catchment, as required by the Minister's Conditions set in 1989, are still needed.

Monitoring of the three main rivers has shown that there appears to have been small reductions in nutrient loads for the Serpentine and Harvey Rivers. Although these apparent reductions are encouraging, there is still considerable improvement required before the target nutrient loads are met. Based on monitoring since 1993, the average annual P load in the Serpentine River (measured at Dog Hill gauging station) still requires a 72% reduction and the average annual P load in the Harvey River (measured at Clifton Park gauging station) requires a 21% reduction to meet the total phosphorus (TP) targets.

The Murray River appears to be performing within its target for TP, although being unregulated this river is subject to extreme floods (like February 2000), and a different pattern may well emerge when these data are considered.

Statutory targets for TP runoff should be further divided to include scaled targets for the Serpentine River (at Dog Hill), the Murray River (at Pinjarra) and the Harvey River (at Clifton Park), thus providing a nested series of catchment targets for different scales of application which will better support compliance testing. It would be useful for the nested catchment targets to be incorporated into the EPP.

The community's growing expectation for continual improvement, and the continuing degraded condition of the lower Serpentine River, mean that current targets for estuarine water quality and catchment runoff should be maintained and reviewed again in 10 years. This would allow for a longer series of flow years on which to base a system-wide performance audit. Additionally it is recommended that other measures of system health for the estuary, rivers, streams, wetlands and the Peel-Harvey catchment be explored. Given the degree of community interest in the Peel-Harvey Estuary System, it is recommended that the EPA should commence extensive public consultation to obtain the community's views on the environmental quality it desires and meaningful measures of system health for the estuaries and the catchment".

9. WHERE TO FROM HERE?

The Expert Review Committee expressed the view, and this is endorsed by the EPA, that the EPA has an important, central and ongoing role to play in natural resource management across all areas of the State, in ensuring that the environment is fully taken into account and that proposed management actions will indeed be sufficient to deliver environmental protection and restoration outcomes.

The lack of action in Peel-Harvey, to date, in developing and implementing an effective catchment management plan in the Peel-Harvey has led the EPA to be concerned about any additional devolution of responsibility in natural resource management to catchment groups. Furthermore, successive governments have still not taken seriously the need to develop appropriate ICM or NRM legislation or a sound implementation mechanism for catchment management plans, which by their very nature require specific and timebound management actions to be undertaken on both urban and rural land. Although urban development is subject to various development controls and planning requirements, to date none has been applied to rural land, and an attitude of "this is my land and I can do what I like with it" by some landholders persists in rural areas.

The above two issues are important risk management issues which have not been adequately addressed in WA over the last 15 years, in spite of the need for urgent and comprehensive action in rural areas both for tackling salinity and other catchment-based environmental problems. They will remain significant risk management issues until such time as groups in WA can provide 'reasonable assurance' that the parties involved can form meaningful working partnerships, develop and implement a purposeful plan and roles and accountabilities can be satisfied. This is unlikely to be possible until there is recognition from those within a catchment that others outside also have an equal right to make input, and meaningful legislation is developed which assigns roles and responsibilities and addresses the issue of implementation of catchment plans on all land types and tenures. There is a responsibility to ensure that Commonwealth, State, local government, industry and landowner investments are not squandered (Australian National Audit Office, 1997). The resources available are few enough, and there is a clear need to be focussed.

The form of a Compliance Review has required that the Expert Review Committee largely confines itself to the review upon which it has reported. However, the Committee expressed the view that the EPA and government would benefit from broader and additional advice relating to the development and implementation of catchment management plans in WA in general. In particular the ERC identified that it will be important to ensure that the EPA continues to have an independent role in identifying the elements of the environment that are priorities for protection, as well as identifying and setting the environmental values and ecosystem 'endpoints' that are fundamental to the natural resource management and sustainability agendas.

The ERC report (section 13.2) goes on to say:

"The Peel-Harvey Management Strategy is the only catchment management proposal that has been fully assessed by the EPA in WA. Use of the EPA's process is currently the only statutory mechanism which provides for and encourages input from any member of the community regardless of whether or not they live in a particular catchment, and that can taken account of the very long term and matters such as inter-generational equity. The ERC notes with some concern the current trend whereby residents in a catchment regard that catchment as theirs to manage, irrespective of others located elsewhere who may also have a share in its intrinsic values and/or management."

"The ERC notes the recent formation of a Natural Resource Management Council to provide advice to the Minister for Environment and Heritage, on natural resource matters. A major reason for the formation of that Council is to dovetail into and secure funding under the Commonwealth Government's new National Action plan on Salinity and Water Quality (NAP) and Natural Heritage Trust (NHT) funding arrangements."

The ERC report recognises that the EPA has a direct and irrefutable interest in the environmental consequences of setting targets to achieve ecological outcomes and maintain key ecological processes in the long term as well as being responsible for providing "over-arching" environmental advice to government. The ERC report also recognises the central and over-arching role of the EPA by stating:

"The overview and scientific investigations coordination role taken by the EPA in defining the management solutions to the Peel-Harvey estuary problems has been the most successful approach to integrated catchment management planning in WA, to date, and ensured an open and transparent approach to setting the environmental objectives. It would be appropriate for the EPA to once again clearly take on the focus of coordination of integrated research and investigation for catchment-scale environmental problems and coordination of long-term monitoring requirements for measuring and demonstrating environmental change. The EPA is already recognised by the public as having the primary role in protection and maintenance of ecosystem processes and in long-term custodial responsibility for the environment." (ERC, point 15 in Section 5.2).

Shortly, to be able to access Commonwealth funding for implementation of NRM plans, WA will have to develop plans that meet accreditation requirements. NRM plans will have to be developed to satisfy the Commonwealth's requirements (as a minimum) but clearly will also need to take full account of the local environmental conditions and requirements. This is in accordance with the national Water Quality Management Strategy (NWQMS) approach of proposing guidelines but recognising that the way is open to argue for different guideline levels where appropriate to the local environmental conditions. The ERC Report states that the Commonwealth has set down the minimum requirements for NRM plans (see ERC report section 13.2) and these include:

- **the environmental values** (EVs) of the surface and aquifer receiving waters - the EVs of the plan may be considered 'interim', but must be consistent with the National Water Quality Management Strategy (NWQMS). The basis and criteria for setting EVs, including the level of protection for "aquatic ecosystems", should be set out - preferably in tabular form;

- **water quality issues and associated pollutants** that threaten those EVs - the pollutants may be in addition to those matters for which regional targets must be set, ie surface water salinity, suspended sediment/solids and nutrients (see NAP Standards and Targets Framework);

- **water quality targets**, based on the Environment Australia document *Water Quality Targets: A Handbook* and the Water Quality Guidelines (especially for additional matters), consistent with the NAP Standards and Targets Framework. Trade-offs

between environmental, social and economic objectives that underpin environmental values and/or targets should be documented and the rationale clearly explained;

- **management actions and their timing**, substantiated against the water quality targets - these actions should be part of a cost-effective and stepwise approach to achieving those targets; and

- **a monitoring program,** which should be used to identify the sources of pollution, evaluate the effectiveness of the management actions in meeting the proposed targets and should set out the role of community monitoring (eg Waterwatch) in that program.

In the above list, the EPA operating in accordance with its Act would have to assess whether NRM plans meet environmental requirements. In addition, as it does with any proponent, the EPA would wish to be fully assured that the management actions proposed are indeed adequate to deliver against the protection/restoration of the environment.

The ERC report says:

"Although application of the NWQMS guidelines is in general desirable, there may be instances where local environmental conditions would make it appropriate to use other guideline values. This will always be the case where the differences in climate and between natural environments is as great as it is in continental Australia. Clearly any deviation from the NWQMS guidelines would require expert judgement, and in WA it is the EPA that has been established as the expert environmental body to form such judgements on matters of environmental concern.

In addition to having a clear role in assessing NRM plans and in their accreditation, the EPA also would have a role in audit and evaluation of progress of NRM plans, comparable to the role it already has in auditing and evaluating progress for the WA State of the Environment and Salinity Strategies." (ERC Report, p.112).

The National Framework for Natural Resource Management Standards and Targets leads to a requirement that regional NRM plans properly address national natural resource outcomes, and national standards which define best practice management. The EPA has an obvious interest in most to all of the areas proposed as significant within that framework, and should be providing over-arching advice on whether the targets being put forward in NRM plans are environmentally acceptable. In addition, the EPA may well require the proponents of the plans to demonstrate that the management actions proposed are adequate and will deliver on the targets within a reasonable timeframe.

The EPA has an established role and it should be expected that the EPA will continue to provide over-arching environmental advice on natural resource management plans and in particular on whether the environmental management/improvement targets are adequate to achieve the required level of environmental protection/restoration over the long term. The Environmental Protection Act requires that any proposal which may have a significant effect on the environment must be referred to the EPA by proponents and

EPA can readily carry out such assessments by requiring referral to it of all catchment management plans or NRM plans prepared by catchment groups and regional councils. These bodies would be the "proponents" under the Environmental Protection Act.

The ERC report recommended that, as a matter of urgency, the EPA should develop a process by which it can continue to operate in accordance with its Act in regard to the development, assessment and accreditation of NRM plans, and the manner by which it will provide independent advice to the Minister on the environmental acceptability of NRM plans. This is important both in terms of protecting the environment but also in terms of having an impartial and independent body able to provide assurance about the potential gains from particular catchment plans. This latter point recognises some of the issues raised in the Australian National Audit Office report (1997) and addresses the situation where the 'independence' of resource managers (both agencies and catchment groups and landholders) may be called into question should such bodies be the recipients of, or otherwise gain financial benefit (directly or indirectly) from, the accreditation of plans and/or funding of management actions arising therefrom.

The intent of an NRM plan is to chart a course towards achieving future environmental outcomes, and it is appropriate and germane to the functions of the EPA that it should require referral of such plans as part of its routine business.

As the NHT relies heavily on the use of public funds, it is legitimate for any member of the community to make input to any plan, regardless of where they live. The EPA has an identified role as an advocate for the environment on behalf of the community as a whole, and as such it is appropriate for the EPA to use its public processes to ensure that the broader community has the opportunity to make input to any NRM plan, and in particular to the environmental quality being sought and the management targets being set.

Recommendation NRM1 of the ERC report stated:

"It is recommended that the EPA provide public advice, as a matter of urgency, on how it will continue to meet the requirements set down in the Environmental Protection Act which will require that the EPA is fully accommodated in the processes and requirements being developed for NRM in WA and Nationally."

The EPA accepts this advice (and the advice in recommendation NRM2 of the ERC report) and will be providing such public advice shortly. That advice will include the EPA seeking to retain the expertise of the members of the Peel-Harvey Expert Review Committee to continue to provide advice to the EPA on selected natural resource management and integrated catchment management matters generally. The EPA's advice will also include the need for natural resource management legislation to establish and provide legitimacy to catchment management groups and to enable the State to better meet the developing requirements of the Commonwealth NRM framework.

EPA Advice/Comment - 7

Effective Natural Resource Management legislation should be passed to:

- **enable proper coordination of NRM activities to occur at all levels;**
- **establish a biding "duty of care" on all land users;**
- **to facilitate the formation and use of government, community and industry partnerships for NRM; and**
- **establish mechanisms for assigning accountabilities for actions;**

with the goal of achieving environmentally acceptable development on rural land.

10. PROGRESSING THE REVIEW OF THE EPP, INCLUDING THE REQUIREMENTS FOR A CATCHMENT MANAGEMENT PLAN

A review document for the Peel Inlet – Harvey Estuary EPP was published in November 1999, but a review of the EPP was held over until the advice contained in the ERC report and this report was available.

The review document now needs to be amended and re-issued so as to re-commence the review process. As set out in Section 7 of this Report, the review will need to engage the community as a whole in determining the measures of ecosystem "health" that should be applied to the system at this time.

The review will be guided by the approach adopted in the more recent EPPs, such as the Revised Draft EPP for Cockburn Sound submitted to the Minister for the Environment in November 2002.

Appendix 3 of this Report sets out a working document towards the preparation of a further draft EPP. It includes the following essential elements.

Ecosystem health

The review of the EPP will need to consider whether the basis for protecting the Estuary should be expanded. The current basis is about nutrient enrichment of the Estuary and this will remain the core issue. However, additional text may now be required to encompass a wider understanding of ecosystem health.

An essential part of the review will be the examination, through the public process, of the environmental values in the Peel-Harvey area that are to be protected, and this will lead to a further definition of the environmental quality objectives.

Environmental quality criteria

A core criterion for judging the health of the ecosystem is the measure of the phosphorus load entering the Estuary from the Serpentine River, Murray River and Harvey River and drains. The ERC has provided extensive advice on water quality, and in its Recommendation M1 has established a table of scaled phosphorus targets for these three rivers. The Recommendation also provides advice on system-wide water balance, estuarine ecosystem health and managing public nuisance.

The advice provided in the ERC report will assist greatly the discussion with the public on environmental values and objectives.

Environmental management plan

Environmental Condition number 4 of the Ministerial Statement of 2 October 1991 that the Peel Inlet – Harvey Estuary Management Strategy may be implemented set out that the proponents shall develop an integrated catchment management plan to the satisfaction of the Environmental Protection Authority (EPA). The proponents undertook a number of actions during the 1990's, but this did not include the preparation of a catchment management plan. Perhaps more importantly, the target for a reduction in the annual phosphorus inputs into the river system set in Environmental Condition 2 has not been achieved.

The development of catchment management plans, under different names, has been given greater attention by the EPA in recent times in the preparation of EPPs. The 1998 EPP for the Swan and Canning Rivers required the EPA, in consultation with relevant parties, to prepare a Comprehensive Management Plan to achieve the environmental quality objectives that specifically referred to water quality of the watercourses within the policy area.

The draft Cockburn Sound EPP that has been submitted to the Minister for the Environment for consideration is also about water quality. The EPP sets out that one of the mechanisms for protecting the environmental values of Cockburn Sound will be an Environmental Management Plan prepared and implemented by a committee established under the EPP and approved by the EPA.

The Environmental Conditions set down in 1989 for the Peel-Harvey strategy required the proponents to develop an integrated catchment management plan. Following the lead given in more recent EPPs, the EPA needs now to take a more pro-active role in the development of a catchment management plan to protect the water quality in the Peel-Harvey system, and this should be written into the EPP.

Discussions are currently taking place between Environment Australia and the EPA with a view to Commonwealth funding being made available to assist in the preparation of a Water Quality Improvement Plan for the Peel Inlet and Harvey Estuary. The EPA is aware that community-based Natural Resource Management groups have been established to advance catchment management, and one of these is the South West Catchments Council as an NRM Region. A Peel-Harvey Catchment Council has also been formed and is under the umbrella of the South West Catchments Council.

The Peel-Harvey Catchment Council is a new entity in the broad approach to the development and implementation of a catchment management plan. The establishment of the Council is supported by the EPA. However, its area of interest falls within the policy area covered by the Peel-Harvey EPP. The EPA needs to develop an understanding with the Peel-Harvey Catchment Council in relation to the initiatives to be undertaken by the EPA in the review of the EPP and the development of a catchment

management plan to protect water quality (Water Quality Improvement Plan).

The EPA will be seeking to retain the expertise of the members of the Expert Review Committee as a source of expert advice in relation to the review of the EPP and the development of a catchment management plan.

11. REVIEW OF ENVIRONMENTAL CONDITIONS AND NEW MINISTERIAL STATEMENT FOR THE PROJECT

The Ministerial Statement that the Peel Inlet-Harvey Estuary Management Strategy – Stage 2, issued on 4 January 1989 included a set of 13 Environmental Conditions. The first Condition referred to commitments given by the proponents, and these commitments became part of the binding Environmental Conditions. A further condition was added on 2 December 1991 and three more were added on 16 April 1993.

The EPA advice in 1988 for a whole-of-government approach to integrated catchment management to give attention to water quality was innovative, and much of what was recommended is now being accepted as the responsible approach to the stewardship requirements for environmental protection. The Environmental Conditions and commitments were well thought out and they provided an opportunity to reduce the algal problem. The approach, and thus the Conditions and commitments, were two-fold: the construction of the Dawesville Channel and the preparation and implementation of an integrated Catchment Management Plan.

The time is now appropriate to revise the Environmental Conditions. The intent of most of the Conditions should remain, but those which specifically applied to the timing of the construction of the Dawesville Channel should be reviewed and cleared.

Appendix 5 of the Expert Review Committee report provides detailed guidance on how the Conditions should be modified and whether suggestions in relation to the Conditions contained in the Progress and Compliance report should be adopted. Section 14 of the ERC report tabulates the changes that are required (see Table 2 which follows).

EPA Advice/Comment - 8

The EPA will liaise with the proponents with a view to the proponents submitting a request under S46 of the Environmental Protection Act for the Environmental Conditions to be amended, and proposing the nature of those amendments.

EPA Advice/Comment - 9

In any review of the Environmental Conditions, consideration will need to be given to the procedures which may be required to set down the Minister's expectations of non-proponent management agencies.

Table 2 – EPA Advice on Proposed New Statement for Continued Implementation of the Peel-Harvey Estuary System Project Reflecting Changed Wording and Conditions Which Should be Deleted

Old Condition No	New Condition No	Text of Environmental Condition *Advice to the EPA from the Expert Review Committee*
1* (replaced by new 1A and 1B in April 1993	1A	**Proponent Commitments** In implementing the proposal, including the amendments reported on in Environmental Protection Authority Bulletins 543 and 640, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made and listed in Appendix 2 of Environmental Protection Authority Bulletin 363, as amended, and subsequently, including the Department of Marine and Harbours letter of 24 February 1992 on reclamation associated with the Dawesville Channel. (A copy of the commitments is attached). **Advice/comment** *Retain condition with above wording.*
	1B	**Implementation** Subject to the conditions in this amended statement, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected. **Advice/comment** *Retain condition with above wording.*
2	2	The proponents shall develop proposals for control of phosphorus through catchment management, to the satisfaction of the Environmental Protection Authority, and shall implement them as rapidly as possible so that, in conjunction with the Dawesville Channel, the following objective is met: • the Peel-Harvey System becomes clean, healthy and resilient. To achieve this objective, the following interim targets should be

		used: (1) annual phosphorus input to the system shall not exceed 85 tonnes in more than four years out of ten (on average) and shall not exceed 165 tonnes in more than one year out of ten (on average). (These are based on 60 and 90 percentile loads); and (2) average phosphorus concentration in estuary water shall not exceed 0.2 milligrams per litre in nine years out of ten (on average). These target figures shall be reviewed by the Environmental Protection Authority after 3 years or sooner if environmental conditions dictate, in the light of measured performance of the System and may subsequently be varied by the Environmental Protection Authority. **Advice/comment** *The principle of the condition should be retained. However as the EPA will be taking over the development of the catchment management plan, some amendments to the Condition will be required. However, it is probable that once the plan has been prepared the responsibility of the co-proponents should be restored to ensure full implementation occurs. EPA's role would then revert to one of auditing performance in implementing the plan and of the land use changes in achieving the desired P and N reductions.* *The requirement for review after 3 years in the final paragraph, should be replaced by a review "after 10 years or sooner if environmental conditions dictate..etc"*
3	3	The proponents shall jointly prepare an Environmental Protection Policy for the Peel-Harvey catchment in consultation with such persons and agencies as Government may specify, to the satisfaction of the Environmental Protection Authority, in accordance with the objective and targets specified in Condition 2 above. The target date for the draft policy (under Section 26 of the Environmental Protection Act 1986) is 31 December 1989. **Advice/comment** *Although EPPs are now prepared by the Environmental Protection Authority rather than by proponents, the historical value of this condition is significant as the requirement for an EPP forms an essential part of the legal and administrative framework for management.* *The review of the Peel-Harvey EPP should now be continued by the EPA in the context of this compliance review. However, as*

		the management target remains the same (as specified in the original conditions) it must be incorporated into the EPP unchanged.
4	**4**	The proponents shall develop in consultation with such persons and agencies as Government may specify, an integrated catchment management plan designed to meet the objective and targets specified in Condition 2 above, to the satisfaction of the Environmental Protection Authority, and which shall be in accordance with the principles to be developed in the Environmental Protection Policy for the area pursuant to Condition 3. The target date for the implementation of the integrated catchment management plan shall be 31 December 1990. **Advice/comment** *The thrust of the Condition is still required, however the wording needs to be modified in accordance with what follows:* *The proponents shall be responsible for the implementation of the comprehensive integrated catchment management plan to be developed by the EPA for the area covered by the Peel-Harvey Environmental Protection Policy to meet the management objectives and targets specified in Condition No 2 (as may be amended as a result of the advice in the ERC report). The plan shall be developed in consultation with such persons as the EPA may specify. The target date for approval of the plan by the Environmental Protection Authority shall be 30 June 2004.*
5	**5**	The proponents shall ensure that the moratorium on clearing and drainage in the Peel-Harvey coastal plain catchment proposed in the Stage 2 Environmental Review and Management Programme (commitment 3.6) continues until the Minister for Environment is satisfied that these activities would be environmentally acceptable. **Advice/comment** *The amendments to the Environmental Protection Act make continued clearing difficult to justify, and there is now effectively a legal ban on clearing. The moratorium on drainage related to the creation of additional new drains, as well as to cleaning of drains.* *The condition should be retained until the Minister is satisfied that these activities will not exacerbate loss of nutrients from the catchment into the estuaries. It is the responsibility of the proponents to put a case to the Minister which the EPA should assess.*

6	**6**	Relevant decision-making authorities shall ensure that all developments within 2 km of the Peel-Harvey Estuary System (as defined in the Estuarine and Marine Advisory Committee Report to the Environmental Protection Authority, Department of Conservation and Environment Bulletin 88, march 1981) include appropriate nutrient-attenuating waste disposal systems and management practices, to the satisfaction of the Environmental Protection Authority. **Advice/comment** *It is suggested that the original Conditions Nos 6 and 9 and later Condition No 14 be amalgamated into a reworded condition as follows:* *The proponents shall ensure that all proposed developments that produce nutrients (in particular significant amounts of phosphorus and/or nitrogen) are referred to the EPA for consideration under Parts IV and V of the Environmental Protection Act. Developments of particular concern include intensive horticultural and animal industries, and activities requiring application of large amounts of nutrients as organic wastes and/or as fertilisers, including recreational grassed areas and some residential developments.*
7	-	Condition 7 related to dredge spoil management. A note states that Conditions No 15 and 16 are to be audited in association with Condition No 7. **Advice/comment** *Cleared – no longer relevant*
8	7	The proponents shall ensure that weed harvesting and control is continued and increased as necessary to manage the expected initial increase in the occurrence of nuisance macro-algae. **Advice/comment** *Condition should be retained– weed harvesting may be required at some later time if catchment nutrient loads become excessive in wet years from the 14 year delay in implementing catchment management.*
9	-	Original condition No 9 related to developments that would add phosphorus to the estuaries. **Advice/comment** *Amalgamated into new Condition 6.*

10	**8**	The Peel-Harvey regional park concept, as originally proposed in the System 6 Redbook report (Conservation Reserves for Western Australia: The Darling System – System 6, Department of Conservation and Environment Report 13, Parts I and II, October 1983) shall be implemented within such timeframe as to be determined by the Minister for Environment. **Advice/comment** *Condition should be retained. It requires a timetable to be set by the Minister for Environment.*
11	**9**	If the Dawesville Channel is constructed, the proponents shall be responsible for ensuring that mosquito management is effective and is carried out in an environmentally acceptable manner, to the satisfaction of the Minister for Environment and the Minister for Health. **Advice/comment** *The advice of the Minister for Health should be sought to establish whether this condition is still required.*
12	**10**	The proponents shall be jointly responsible for the environmental aspects of: (1) the construction, operation, monitoring and maintenance of the Dawesville Channel and its impacts within the estuaries and within the immediate marine environment. (2) the management and required monitoring of the catchment, and collection of data necessary for the development of the integrated catchment management plan for the Peel-Harvey catchment; and (3) all in-estuary monitoring and management, including weed harvesting. **Advice/comment** *Retain.*
13	**11**	Prior to the construction of the Dawesville Channel, the proponents shall prepare in stages, a monitoring and management programme, to the satisfaction of the Environmental Protection Authority. This programme shall include: (1) essential additional baseline monitoring required to be in place as soon as possible and prior to construction commencing; (2) construction stage impacts and monitoring, prior to

		construction; and (3) operational and long-term monitoring, in stages, to be determined by the Environmental Protection Authority. **Advice/comment** *The Condition should be retained. However, parts (1) and (2) can be cleared.* *The EPA should now determine the operational and long-term monitoring and reporting programme it now requires and the condition should be reworded to reflect these requirements.*
14*	-	Proposals which may release nitrogen or phosphorus to the environment shall not be referred to the Environmental Protection Authority provided that they are consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment. Proposals not consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment shall be referred to the Environmental Protection Authority. This Condition will apply to the final Statement of Planning Policy for the Peel-Harvey Coastal Catchment when it is gazetted. **Advice/comment** *The Condition should be amended to the extent that all proposals likely to release nitrogen or phosphorus shall be in accordance with water sensitive design and management requirements in relation to export of nutrient requirements.*
15 **15-1 &15-2**	-	**Estuary Reclamation (Dawesville Channel)** These two conditions relate to estuary reclamation work associated with the construction of the Dawesville Channel. A note states that Conditions No 15 and 16 are to be audited in association with original Condition No 7. **Advice/comment** *As the construction of the Dawesville Channel is complete the conditions are no longer required and can be deleted.*
16 **16-1**	-	**Foreshore vegetation (Dawesville Channel)** This condition required retention of the foreshore vegetation in and near the area of construction of the Dawesville Channel, as well as on/along existing foreshore areas outside the alignment of the Dawesville Channel. A note states that Conditions No 15 and 16 are to be audited in association with original Condition No 7.

		Advice/comment *The condition was unnecessary and not effective as it could not protect the vegetation.* *The condition took no account of the inevitable death of shoreline vegetation that would result from the increased tidal range and more marine-like conditions. The vegetation was dependent upon a shallow freshwater lense which has migrated up the shore in stasis with the changed tidal conditions. Vegetation will progressively re-establish along the new shoreline over time.* *The condition should be deleted from the Statement.*
17	12	**Compliance Auditing** In order to ensure that environmental conditions and commitments are met, an audit system is required.
17-1	12-1	The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of the Peel-Inlet – Harvey Estuary Management Strategy Stage 2, in consultation with the Environmental Protection Authority.
17-2	12-2	**Procedure** The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency. If the Environmental protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment. **Advice/comment** *The Expert Review Committee believes it is important for the EPA to continue to carry out the compliance auditing for all projects where the proponent is a government agency (or agencies) to ensure that independent audit advice is provided. As the EPA is independent of government as to the advice that it provides, it has greater public credibility in auditing government agencies.*

*Notes:
Original Statement was for Conditions 1 – 13 approved in January 1989
Condition 14 was introduced in October 1991
Original Condition No 1 replaced by new 1A and 1B in April 1993
New Condition Nos 15, 16 and 17 introduced in April 1993

12. SUMMARY OF ADVICE/COMMENTS

12.1 Specific

EPA Advice/Comment - 1

The proponents for the continuing implementation of the Peel-Harvey Strategy should be the Ministers for Agriculture, Planning and Infrastructure, and Environment and Heritage with the Chief Executive Officers of the Department of Agriculture, Department of Planning and Infrastructure and a combination of the Department of Environmental Protection and the Water and Rivers Commission being required to fully implement the whole strategy in accordance with the legal requirements and prioritise the legal requirements within their agency budgets.

EPA Advice/Comment - 2

A senior position needs to be given responsibility for coordinating implementation of the management strategy as outlined above. This position should be very senior and influential and located with the EPA/EPA Service Unit. The EPA has the function of examining environmental performance of natural resource management, and publicly reporting on the achievement of environmental objectives.

EPA Advice/Comment - 3

A Catchment Management Plan and an Implementation Strategy need to be prepared as a matter of urgency with the objective of reducing the run-off of nutrients into the rivers pursuant to the Environmental Protection Policy.

EPA Advice/Comment - 4

The comprehensive integrated catchment management plan needs to include the development and introduction of Minimum Acceptable Management Practices (MAMP's) into rural and farming activities with high potential for risk to the environment as well as improving the condition of riparian vegetation.

The term "acceptable" relates to environmental acceptability and prevention of land degradation and environmental harm both on and off site.

EPA Advice/Comment - 5

The use of Minimum Acceptable Management Practices (MAMP's) should be required in farm plans and required in land use practices. MAMP's can be encouraged through positive interaction between government agencies and landholders, and their use audited as part of the process of the Implementation Strategy for the Catchment Management Plan.

EPA Advice/Comment - 6

Where Minimum Acceptable Management Practices (MAMP's) are not adopted through voluntary take-up within 3 years of the development of an integrated catchment management plan, regulations should be introduced through the Environmental Protection Act to enable coercive action to be taken to achieve the level of conformance in catchment behaviour that is required to protect the environment.

EPA Advice/Comment - 7

Effective Natural Resource Management legislation should be passed to:

- enable proper coordination of NRM activities to occur at all levels;
- establish a biding "duty of care" on all land users;
- to facilitate the formation and use of government, community and industry partnerships for NRM; and
- establish mechanisms for assigning accountabilities for actions;

with the goal of achieving environmentally acceptable development on rural land.

EPA Advice/Comment - 8

The EPA will liaise with the proponents with a view to the proponents submitting a request under S46 of the Environmental Protection Act for the Environmental Conditions to be amended, and proposing the nature of those amendments.

EPA Advice/Comment - 9

In any review of the Environmental Conditions, consideration will need to be given to the procedures which may be required to set down the Minister's expectations of non-proponent management agencies.

12.2 General

- The work of the Peel-Harvey Expert Review Committee has been carried out in a competent and thorough manner by people who are experts in management of environmental systems and natural resource and catchment management.

- The EPA accepts and endorses the advice and recommendations provided to it by the Peel-Harvey Expert Review Committee (although not necessarily their precise wording).

- The proponents for the Peel-Harvey System Management Strategy have not fully complied with the environmental conditions set on the project by the Minister for Environment.

- The EPA will have discussions with the proponents for the Peel-Harvey System Management Strategy to discuss and pursue compliance, and also to discuss amendments to Environmental Conditions.

- All government proponents should note that the Environmental Protection Act binds the Crown and that they are required by law to meet all the requirements of the environmental conditions set on their projects. Failure to do so can result in the offences and penalties set down in the Act being applied.

- All government proponents should note that compliance with legal requirements is a fundamental requirement of Chief Executive Officers and that legal compliance should be made the top priority for the procurement and allocation of budgets.

- The EPA will be requiring NRM plans prepared by catchment groups be referred to the EPA to ensure that environmental objectives will be met and the environment properly protected.

- The EPA will be maintaining its central role in the provision of independent, over-arching advice to government on the environment, including natural resources management and salinity as an environmental issue.

- The EPA will be seeking to maintain the group of experts that constituted the Expert Review Committee to continue to provide the EPA with advice on management of environmental systems and natural resource and catchment management generally.

12.3 List of recommendations provided by the Expert Review Committee Report and accepted and endorsed by the EPA (although not necessarily their precise wording)

The letters refer to the subject of the recommendation and the section(s) from which it results, as follows:
L = Legal and administrative framework
W = Water quality and targets
C = Catchment management
DC = Dawesville Channel
PCR = PCR process
P = Proponents
M = Monitoring
Co = Conditions

ERC Recommendation L1

It is recommended that the concept of the EPP in the management framework remain a key to fully successful implementation of the management strategy for the Peel- Harvey

and that it should be made to work in the manner envisaged. To do so will necessitate priority development of the comprehensive catchment management plan (proposed in 1988) and the implementation mechanism (proposed by the EPA in 1985 and 1988).

ERC Recommendation L2

It is recommended that the concept of "co-proponents" who are severally and jointly responsible for implementation of the whole management strategy be strengthened, recognising that this is a "whole of government" project and requires strong co-operation by all proponents, other decision-maker, management agencies and the community.

ERC Recommendation L3

It is recommended that a single point of responsibility be established to ensure that the whole management strategy is implemented. This would provide a responsible person to act as the key contact with the various agencies involved in decision-making, management and meeting the Environmental Conditions.

ERC Recommendation L4

It is recommended that the Environmental Protection Authority take a more pro-active approach in ensuring that the proponents and other parts of government collectively deliver on the total management required. For example, the EPA can (with input from key agencies) develop a work plan and require regular reporting on progress against the plan.

ERC Recommendation L5

It is recommended that an appropriate implementation mechanism for the EPP, including a mechanism for implementation of catchment management, be identified, or a new tool be developed, if using an SPP as the main means of implementation is no longer valid.

ERC Recommendation L6

It is recommended that the EPA provides leadership on the issue of control and regulation (if required) of diffuse sources of pollution to establish equity in the management of diffuse and point sources of pollution. In taking such an approach, the EPA should take account of the magnitude of environmental effect on the receiving environment from the various contributing sources and adopt a catchment level, risk-based approach to requiring operators to reduce their nutrient losses to the environment.

ERC Recommendation L7

It is recommended that a comprehensive integrated catchment management plan be developed and implemented as a matter of urgency. At the same time a review should be carried out to recommend a mix of incentives and regulatory measures to lead to full

implementation of the catchment management plan.

ERC Recommendation L8

It is recommended that the government addresses the attitudinal and institutional barriers to effective implementation of holistic approaches to environmental management and secures bipartisan political support to ensure that effective natural resource management occurs in a consistent manner over the long-term.

ERC Recommendation L9

It is recommended that the EPA should review current responsibilities for implementation of the EPP, SPP and Environmental Conditions to ensure that all relevant decision-making authorities are clear about and held accountable for their respective responsibilities in implementing the strategy, regardless of whether they are currently identified as proponents and bound by Environmental Conditions.

ERC Recommendation L10

It is recommended that the EPP review which was commenced in November 1999 should be resumed and take account of the findings of this Report and submissions already received. As part of the review a public process should be initiated to develop a clear statement about the environmental quality now being sought for the Peel-Harvey Estuary System as a whole.

ERC Recommendation L11

It is recommended that the planning system take steps to ensure that the required environmental standards are met by adopting a combination of a precautionary/preventative approach with adaptive environmental assessment and management to facilitate mutual protection for the environment, residential development and industry.

ERC Recommendation L12

It is recommended that the Peel-Harvey Regional Park be implemented as a matter of priority.

ERC Recommendation L13

It is recommended that the EPA develops and heads up a management structure to "drive" implementation of the whole strategy (see also Recommendations L3 and L4).

ERC Recommendation L14

The ERC recommends that the DEP be required to develop and commence implementation of a load-based licensing system for the Peel-Harvey coastal plain catchment by June 2004, to give affect to target pollutant loads identified under the

Environmental Protection (Peel-Harvey Estuary) Policy 1992 (as revised from time to time).

ERC Recommendation W1

It is recommended that scaled phosphorus targets for Serpentine River at Dog Hill, the Murray River at Pinjarra, and Harvey River at Clifton Park be used to complement the system-wide targets contained in the Ministerial Conditions. This will provide a nested series of catchment targets for different scales of application to support compliance testing.

ERC Recommendation W2

It is recommended that the current system targets for estuarine water quality and catchment runoff should be maintained and reviewed again in 10 years. This would allow for a longer series of flow years on which to base a system-wide performance audit.

ERC Recommendation W3

It is recommended that other measures of system health for the estuary, rivers, streams, wetlands and the Peel-Harvey catchment be explored. Given the degree of community interest in the Peel-Harvey Estuary System, it is recommended that the EPA should commence extensive public consultation to obtain the community's views on the environmental quality it desires and meaningful measures of system health for the estuaries and the catchment

ERC Recommendation W4

It is recommended that the current phosphorus target for estuarine water quality and catchment runoff should be maintained until at least the year 2008 and reviewed in the light of valid monitoring data.

ERC Recommendation W5

It is recommended that bottom-end target loads for nitrogen should be developed in accordance with the targets set in the EPP.

ERC Recommendation W6

It is recommended that a nutrient inventory be prepared to facilitate the identification of nutrient hotspots and the cumulative impacts of more diffuse ones, and to enable a risk-based approach to nutrient reduction to be implemented.

ERC Recommendation W7

It is recommended that an independent system-wide audit of the environmental condition of the estuaries, rivers, streams, wetlands and the Peel-Harvey catchment (including

nutrient budget) should be carried out by the EPA prior to any review of the nutrient management targets.

ERC Recommendation C1

Key proponent and management agencies should be required to meet at least the minimum legal requirements of catchment management. This should be made a high organisational priority and reflected in performance agreements with Ministers, in agency Business Plans and in Key Performance Indicators (KPI's).

ERC Recommendation C2

It is recommended that the proponents ensure that sufficient offsite monitoring is carried out to enable the proponents to be able to estimate cumulative discharges from known point sources.

ERC Recommendation C3

It is recommended that the effects of clearing and drainage on biodiversity and salinisation of land be addressed as well as the effects of nutrients. The relationships between the various legislative instruments in regard to clearing and drainage, nutrients, biodiversity and salinity should be clarified.

ERC Recommendation C4

It is recommended that the following maps be prepared and submitted to the Environmental Protection Authority by 30 November 2003:

- *a basemap of land use in the coastal catchment in 1989 be compiled from Landsat and other remote sensed and historic data;*
- *maps of land use in the coastal catchment in 1994 and 1999 be compiled from Landsat and other remote sensed and historic data; and*
- *maps showing land use change from the date of the EPA's 1988 report on Peel-Harvey.*

ERC Recommendation C5

It is recommended that EPA runs a process to develop clear indicators of catchment health for assessing the success of catchment management measures and appropriate associated monitoring be implemented (see section 11 of the ERC Report).

ERC Recommendation C6

It is recommended that a pragmatic mix of voluntary co-operation, regulation and enforcement be explored to ensure environmentally acceptable management options are used in the catchment. This should include a much more pro-active approach from the

proponent agencies, to more strongly encourage adoption of changed land management practices, backed by appropriate incentives/disincentives to achieve outcomes acceptable to all stakeholders, not just those within the Peel-Harvey coastal catchment (see Section 12 and Appendix 2 of this Report (the ERC report)).

ERC Recommendation C7

It is recommended that The EPA endorses the advice on Catchment Management in 1 - 7 above.

ERC Recommendation DC 1

It is recommended that monitoring should continue long enough to take account of high runoff years and other longer term environmental variations. This monitoring should include the following:

- *nearshore bathymetry and beach profiles extending 1 km north and south of the channel*
- *bathymetry of the Harvey Estuary in the vicinity of the channel*
- *shoreline movements using aerial photography either side of the channel*
- *inundation assessment*
- *nearshore water quality and marine habitat*
- *water quality within the Peel Inlet and Harvey Estuary*
- *sand bypassing operations.*

ERC Recommendation PCR 1

The EPA should promote compliance reviews as a potentially positive experience for proponents with the emphasis being on providing an opportunity to progress or improve environmental protection and management into the future, and an opportunity for the EPA to review its environmental objectives alongside verifying compliance.

It is recommended that compliance reviews run by the EPA should focus on examining three areas:

a) verification of implementation of the Environmental Conditions as set out in the Minister's Statement, in the context of the intent of the Conditions as set out in the EPA's assessment report and recommendations;

b) an examination of whether the assessment of the project carried out by the EPA was accurate in its predictions including identification of the environmental objectives and environmental management goals; and

c) whether the proponent's commitments and the Environmental Conditions, and any associated legal and administrative framework to underpin management have been successful in achieving the goals for which they were originally designed.

ERC Recommendation PCR 2

It is recommended that for major PCR reviews, the EPA use Expert Review teams consisting of people who are familiar with and well informed in relation to the project performance to be reviewed, including the history of the project, the EPA's assessment(s) and the intent behind the approach taken by the EPA in formulating its recommendations and draft conditions.

ERC Recommendation PCR 3

It is recommended that the EPA obtains adequate resources to enable it to form and resource the independent expert review teams required to carry out future compliance reviews, and in particular reviews of projects where government agencies are the proponents.

ERC Recommendation PCR 4

It is recommended that the EPA adopts the following approach to improve the PCR process to ensure that it is open and transparent, fair to proponents and the community, and to assist in PCR reviews:

a) EPA should clearly document the intent of its recommendations in its assessment report by inserting recommendations throughout the report close to the rationale for that recommendation;

b) the rationale for and intent of a recommendation/Condition should be stated beneath each Environmental Condition and included in the Statement issued by the Minister for the Environment;

c) soon after completion of an assessment, proponents should be required to consult with key stakeholders and groups and propose measures to the EPA to enable evaluation of progress and compliance and to attend an EPA meeting to discuss and agree on the measures of success that will be used to verify compliance in the next review;

d) at the meeting in (c), the EPA should propose for discussion the approach that will be taken in the PCR review process;

e) the agreement reached by the proponents and the EPA on the compliance measures and the PCR process should form a "contract" and should be made public as a draft, to allow for other expert input, prior to being finalised; and

f) the final agreed measures of success should be used as the basis of development of a targeted monitoring program to ensure that the appropriate information to enable compliance against agreed compliance measures to be verified.

ERC Recommendation P1

It is recommended that the current three Ministers nominated as co-proponents be retained but be required (through "Procedure") to operate as being equally responsible for implementation of the whole management strategy, with carriage of the whole project on behalf of Government as a whole.

ERC Recommendation P2

It would be useful in amending some of the Environmental Conditions, for the EPA to provide advice to the Minister for the Environment on non-proponent management agencies and for a draft "Procedure" to be prepared for inclusion in the revised Statement.

ERC Recommendation P3

It is recommended that the EPA should ensure that the provisions for preparation of a catchment management plan from the Swan-Canning EPP are included in the revised Peel-Harvey EPP, and the EPA should take on the responsibility for driving catchment management.

ERC Recommendation P4

It is recommended that the EPA give consideration to delegating preparation of the above catchment management plan to an appropriately resourced group to ensure that the EPA's and Minister's requirements are met.

ERC Recommendation M1

It is recommended that the EPA requires the proponents to prepare a monitoring program to the satisfaction of the EPA, through an open and public process, to demonstrate that the requirements of the Environmental Conditions are being met. Monitoring should cover, inter alia:

a) System-wide water balance
b) System-wide nutrient balance
c) Estuarine ecosystem health
d) Managing organisms that have the potential to cause nuisance to the public.

Specific monitoring for (a) to (d) should include:

a) System-wide water balance

i) Surface water flux to the estuary measured continuously as stream flow at the Serpentine River at Dog Hill, the Harvey River at Clifton Park and the Murray River at Pinjarra using techniques to provide results with at least ±1% accuracy on annual totals.

ii) Estimates of surface runoff to the estuary from urban areas and other areas downsteam of the three gauging stations nominated at (i) above using techniques to provide results with at least ±15% accuracy on annual totals.

iii) Estimates of direct groundwater accession and loss from the estuary using techniques to provide results within ±15% accuracy on annual totals.

iv) Estimates of marine exchange through the Dawesville Channel and the Mandurah Channel using techniques to provide results within ±20% accuracy on annual totals.

v) An annual water balance for the estuarine system should be derived using techniques to provide results within ±20% accuracy on annual totals.

Elements of the water balance should be reported every five years.

b) System-wide nutrient balance

i) Nutrient concentrations from samples collected from the Serpentine River at Dog Hill, the Harvey River at Clifton Park and the Murray River at Pinjarra using sampling techniques appropriate to reliably determine trends over time and to allow for mass load calculations as specified in ii) below.

ii) Nutrient mass loads for the Serpentine River at Dog Hill, the Harvey River at Clifton Park and the Murray River at Pinjarra using techniques to provide results within ±15% accuracy on annual totals. Results should be reported annually against the scaled targets below (see Appendix 3 this report for the derivation of the scaled targets.)

Table of scaled phosphorus targets for the three main rivers

Application	TP-Target for average conditions	TP-Target for extreme conditions
Serpentine River - Dog Hill S614030	14 t (50 percentile)	44 t (90 percentile)
Murray River at Pinjarra S614065	15 t (50 percentile)	36 t (90 percentile)
Harvey River at Clifton park S613052	27 t (50 percentile)	57 t (90 percentile)

iii) Nutrient concentrations in surface runoff to the estuary from representative urban areas and other areas downstream of the three gauging stations nominated at (i) above using spatial and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).

iv) Nutrient mass loads in surface runoff to the estuary from representative urban areas and other areas downstream of the three gauging stations nominated at (i) above using techniques to provide results within ±50% accuracy on annual totals.

v) Nutrient concentrations in groundwater from representative areas having direct

groundwater accession to the estuary using spatial and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).

vi) *Nutrient mass flux in groundwater from representative areas having direct groundwater accession to the estuary using techniques appropriate to provide results within ±50% accuracy on annual totals.*

vii) *Nutrient concentrations of estuarine waters using spatial and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).*

viii) *Nutrient concentrations of estuarine sediments using spatial and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).*

ix) *Nutrient mass flux associated with estuarine sediments using techniques to provide results within ±50% accuracy on annual totals.*

x) *Estimates of nutrient content associated with estuarine waters and marine exchange through the Dawesville Channel and the Mandurah Channel using techniques to provide estimates of mass flux within ±50% accuracy on annual totals.*

xi) *An annual nutrient mass balance for the estuarine system should be derived using techniques to provide results within ±50% accuracy on annual totals.*

Performance (mass loads) for the three main rivers should be reported against the scaled targets annually (bii).

Elements of the nutrient mass balance should be reported every five years.

c) Estuarine ecosystem health

i) *Dissolved oxygen concentrations should be determined in estuarine waters using spatial, temporal and vertical sampling strategies appropriate to determining trends over time and an assessment of any localised short-term periods of hypoxia or anoxia.*

ii) *Chlorophyll a should be determined in estuarine waters using spatial, temporal and vertical sampling strategies appropriate to determining trends over time. Assessment of any localised short-term periods of algal bloom is covered in di) below.*

iii) *The condition and extent of riparian communities fringing the estuary should be determined using techniques appropriate to determining trends over time (5 yearly trends).*

iv) *The nature of any commercial or recreational fisheries should be determined using techniques appropriate to determining trends over time (5 yearly trends).*

v) *The nature of any avifaunal communities inhabiting or visiting estuarine waters should be determined using techniques appropriate to determining trends over time (5 yearly trends).*

Elements of estuarine ecosystem health should be reported every five years.

d) Managing potential public nuisance

i) *Chlorophyll a and phytoplankton cell densities should be determined (if bloom conditions occur) in estuarine waters using spatial, temporal and vertical sampling*

strategies appropriate to determining the magnitude and nature of any localised short-term periods of algal bloom.

ii) *Macroalgal species composition and densities should be determined around the estuary (if present at nuisance levels) using spatial, temporal and vertical sampling strategies appropriate to determining trends over time. These data should be reported annually and will form the basis of any macroalgal harvesting or other management strategies.*

iii) *Mosquito nuisance should be assessed regularly during the year using methods appropriate to providing reports on trends particularly around areas of significant human habitation.*

Elements of programmes to manage organisms that can cause public nuisance should be reported annually.

The monitoring program should be designed to measure performance against the measures of estuary system health to be developed by the EPA as outlined in Section 11.1 of this Report. The recommendations from that section and the section on targets are relevant here.

ERC Recommendation NRM1

It is recommended that the EPA provide public advice, as a matter of urgency, on how it will continue to meet the requirements set down in the Environmental Protection Act which will require that the EPA is fully accommodated in the processes and requirements being developed for NRM in WA and Nationally.

ERC Recommendation NRM2

It is recommended that the EPA ensures that it formally assesses all NRM plans to be prepared by local and regional catchment groups, to ensure that the environmental effects of such proposals are environmentally acceptable, that environmental objectives meet the EPA's requirements, that management actions to deliver on protection/restoration of the environment will indeed do so, and to facilitate input from any member of the public who wishes to make input to the targets for any catchment area.

ERC Recommendation Co1

It is recommended that the agencies required to bring about full implementation of the management strategy be designated as joint proponents for all of the management strategy, and retained until catchment management has been fully implemented. The proponent agencies should be jointly responsible for obtaining the funding necessary to ensure full implementation of the strategy and full compliance with the Environmental Conditions.

ERC Recommendation Co2

It is recommended that the Changes to the Conditions proposed in this Report be adopted and retained until all of the management strategy, including catchment management has been fully implemented.

ERC Recommendation Co3

It is recommended that a new Statement that the Proposal may be Implemented which reflects the current agencies with implementation responsibilities as Proponents, and the amended Conditions is issued by the Minister for Environment and Heritage.

ERC Recommendation Co4

It is recommended that the Proponents obtain 3-year program funding for implementation and compliance.

ERC Recommendation Co5

It is recommended that the EPA carry out independent reviews of compliance for all projects where a government agency (or agencies) are the designated proponents. The matter of provision of resources to the EPA for such reviews needs to be addressed (see also Recommendations PCR 2 and PCR 3).

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APPENDIX 1

Report of the Expert Review Committee to the EPA

Report of the Peel-Harvey Expert Review Committee to the Environmental Protection Authority

Peel Inlet and Harvey Estuary System Management Strategy: Progress and Compliance by the Proponents with the Environmental Conditions set by the Minister for the Environment in 1989, 1991 and 1993

December 2002

Report prepared by Ms Sally Robinson for the Peel-Harvey Expert Review Committee

This Report represents the collective views of the Expert Review Committee and may differ from advice provided in the Specialist Technical Reports

The following Expert Technical Reports are attached as Appendices:

Specialist Report on Legal & Administrative Framework for Management by Ms Sally J Robinson (as Appendix 2)

Specialist Report on Water Quality and Management Targets by Dr David Deeley (as Appendix 3)

Specialist Report on Catchment Management by Dr John Yeates (as Appendix 4)

Acknowledgments

Thanks go to the following people for reviewing various documents:

Professor Neil Gunningham of the Australian National University for an informal review of the Peel-Harvey Expert Review Committee report.

Mr Barry Carbon* and Dr Chris Whitaker* for formally reviewing the Specialist Report on the Legal and Administrative Framework for Management.

Dr Roy Green for reviewing the Specialist Reports on Water Quality and Management Targets and Catchment Management.

In addition, the Specialist Report on Catchment Management was reviewed by officers in the Department of Agriculture, and the Specialist Report on Water Quality and Management Targets was reviewed by staff from the Water and Rivers Commission.

*Mr Barry Carbon was Chairman of the Environmental Protection Authority when the management strategy was developed and EPA carried out its Stage 2 assessment.

*Dr Chris Whitaker was the manager in charge of assessments when the management strategy was developed and EPA carried out its assessment.

ENVIRONMENTAL PROTECTION AUTHORITY
PEEL-HARVEY EXPERT REVIEW COMMITTEE

Environmental Protection Authority
8th Floor
Westralia Square
141 St George's Terrace
PERTH WA 6000

Report on Environmental Performance and Compliance with Environmental Conditions set by the Minister for the Environment on the Peel Inlet and Harvey Estuary System Management Strategy 1989 onwards.

We submit to the Authority, our final Report on the environmental performance and compliance with the Ministerial Conditions of 1989 onwards, for the above project.

The Committee wishes to express its appreciation to the EPA for the opportunity to provide assistance with this very important and significant area of environmental management and hopes that the Report provides a positive contribution to achieving improved environmental outcomes for management of catchments and waterbodies in Western Australia.

The Committee also expresses its appreciation to Ms Sally Robinson who undertook the major part of the writing of this Report in consultation with the other members.

Yours faithfully

Mr Bernard Bowen
(Chairman)

Ms Sally Robinson

Dr David Deeley

Dr Robert Humphries

Dr John Yeates

Mr Geoffrey Bott

The Value of Scientific Knowledge:

"...we have seen that weak knowledge must lead to more stringent standards on precautionary grounds. The value of science is to allow us, where appropriate, to relax the standards."

(*Setting Environmental Standards: The Statistical Approach to Handling Uncertainty and Variation.*
Barnett, V and O'Hagan, A (1997))

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APPENDIX 2 - Specialist Report on the Legal and Administrative Framework for Management

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APPENDIX 5 - Table of Summary Advice of the Expert Review Committee on the PCR Recommendations (Table A5)

Executive Summary and Recommendations

1. The Dawesville Channel has been constructed and has been successful in increasing flushing between the estuaries and the ocean. This has led to:

   - increased oxygenation of the sediments within the estuaries with consequent reduction in phosphorus release from the sediments into the water column;
   - a change in salinity to more marine-like conditions for most of the year. The narrowing of the period when lower salinities occur has limited the germination of *Nodularia*, and
   - increased flushing enhancing loss of nutrients from the estuaries.

2. Although the Dawesville Channel has been successful in improving the water quality in the main body of the Peel Inlet and Harvey Estuary, severe water quality and environmental problems remain in the Serpentine Lakes. These water quality problems may not be solvable if conventional agricultural practices continue to prevail in the coastal catchment. In essence, the solution to preventing water quality problems in estuaries and rivers requires fundamental changes in land use practices throughout the State.

3. There is a perception among some of the rural community and their advisers, that now that the Dawesville Channel has improved the water quality some controls in the catchment can now be relaxed. This demonstrates a continuing lack of recognition and acceptance of the causal factors and of the ecological risks posed by existing management practices in the catchment. The view is of concern because the Dawesville Channel has a fixed maximum flushing capacity and catchment management is necessary to provide an adequate buffer to ensure maintenance of estuary health and resilience in the long term.

4. Catchment management has not "worked". However, this was not because catchment management was tried and failed but because a comprehensive integrated catchment management plan has not been developed or implemented.

5. The focus of implementation now needs to be on:

   - developing a comprehensive integrated catchment management plan;
   - developing an implementation mechanism to underpin application of the catchment management plan. In addition, a range of incentives and regulatory tools should be applied.

6. Institutional failures have been a key reason for the failure to develop and implement the catchment management plan and implementation of the whole management package. According to Graham Harris of CSIRO Land and Water, institutional failure is probably the most significant barrier to implementing catchment management approaches in all States. It is institutional failure and not the science that most consistently explains the failure of catchment management (Harris *in* Robinson, 2001). Successful integrated catchment management requires change in attitudes and power sharing among all players, including government agencies, and a need to operate outside the familiar comfort zone. Examples of failures in Peel-Harvey include:

   a) the lack of development and implementation of the comprehensive integrated catchment management plan;
   b) critical information to measure real progress in the catchment not being collected;
   c) lack of provision of a base map showing land use distribution in 1989;
   d) records of fertiliser use not being kept;

e) failure to fully apply the EPP across all decision-makers.

Institutional problems have also been identified by the Auditor-General (1998) as having a negative effect in the multi-agency environmental management. The Auditor-General (1998) concluded, "Given these complexities and the need for greater coordination, a lead role by the Government is essential." (p. 38)

7. The Environmental Protection Policy (EPP) was developed and has been partially successful. Where it has not been fully successful relates to the lack of preparation and implementation of a comprehensive catchment management plan and lack of full application by agencies (institutional failure). The EPP does not contain a clause which explicitly makes it an offence not to follow its requirements, and it may be timely to introduce this during the review of the EPP.

8. The Minister's Environmental Conditions remain largely relevant with a few requiring minor amendment.

9. The technical synthesis developed during the assessments by the EPA in 1985 and 1988 remains relevant.

10. The on-the-ground actions necessary to implement nutrient reduction from broadacre agriculture in the catchment largely failed because of:

a) systemic institutional failure across government agencies; and/or

b) a perception by some sectors, of lack of community ownership of the management strategy, specifically the requirements for substantial reduction in nutrients from the catchment and the need for a comprehensive integrated catchment management plan. This has occurred in spite of the many years of community consultation in the Peel-Harvey catchment area during development of the management measures.

11. There is now an expectation in the community and regulators for continual improvement in environmental management. This provides a current context to review the 1988 management strategy and the EPP. The focus of management in the future needs to be on the ecological sustainability of the estuaries and catchments, in particular protection of remnant native vegetation and rebuilding of biodiversity as well as improvement in overall environmental quality in the catchment and estuaries.

12. The community in general needs to accept that decisions to establish land-uses on greenfield sites (for example urban, agricultural) will inevitably lead to some degree of change to soil and water quality as well as some degree of loss of natural diversity. However, changing existing rural land uses to urban may provide opportunities to improve water quality and restore biodiversity.

13. The community needs to accept that once a system such as the Peel-Harvey has been altered to the extent that it had, prior to management, it will be impossible to restore it to its original environmental condition. At best what can be realistically achieved is a new, resilient system which will differ from the original in terms of its ecology.

1. Regulatory equity in relation to the extent, magnitude and risks from the impacts of agriculture on the environment, when compared with those of industry and mining, is an ongoing issue.

15. The custodial responsibilities within the Soil and Land Conservation Act should be actively applied to maximise prevention of land clearing and environmental degradation. Although the basics of the Act are sound, custodial aspects in relation to basic protection of land, soil and water are too narrowly defined and are interpreted in favour of short-term interests of farmers rather than considering the long-term interests of the community and future generations

16. The over-arching custodial responsibilities for Soil and Land (and water) conservation should more appropriately reside with the EPA. Amendment to the Soil and Land Conservation Act will be required.

17. Government agencies as proponents for projects are bound by the same rules as private non-government proponents. Compliance with the legal instruments of environmental approvals, including Environmental Conditions set by the Minister for the Environment is mandatory for all proponents, and EPPs bind everyone, including government agencies and the community as they undertake their activities.

18. Although economic constraints are commonly raised as an excuse for why farmers do not meet even basic environmental protection requirements or duty of care obligations, this is still not an acceptable excuse for inaction, either by the farming community or by agricultural departments. The fact that the current economic and political support for farming also supports lack of environmentally appropriate land management is also not acceptable. Currently the real economics of farming is not costed, as the full cost of environmental protection is not factored in. However, the current economics of farming is not good, even before environmental costs are included.

19. If farmers are to operate in accordance with the State Sustainability Strategy, then activities that are not sustainable when properly costed to fully include environmental protection costs, should be encouraged either to change significantly, or to cease.

20. It is clear that both the community as well as agencies require assistance with understanding and delivering on compliance in regard to the EPA requirements, the Environmental Conditions associated with the project and the requirements of the Environmental Protection Policy for Peel-Harvey. Compliance is not an optional activity, but one that is legally required, leading to penalties such as fines for non-compliance.

LIST OF RECOMMENDATIONS TO THE EPA

The letters refer to the subject of the recommendation and the section(s) from which it results, as follows:
L = Legal and administrative framework
W = Water quality and targets
C = Catchment management
DC = Dawesville Channel
PCR = PCR process
P = Proponents
M = Monitoring
Co = Conditions

Recommendation L1

It is recommended that the concept of the EPP in the management framework remain a key to fully successful implementation of the management strategy for the Peel- Harvey and that it should be made to work in the manner envisaged. To do so will necessitate priority development of the comprehensive catchment management plan (proposed in 1988) and the implementation mechanism (proposed by the EPA in 1985 and 1988).

Recommendation L2

It is recommended that the concept of "co-proponents" who are severally and jointly responsible for implementation of the whole management strategy be strengthened, recognising that this is a "whole of government" project and requires strong co-operation by all proponents, other decision-makers, management agencies and the community.

Recommendation L3

It is recommended that a single point of responsibility be established to ensure that the whole management strategy is implemented. This would provide a responsible person to act as the key contact with the various agencies involved in decision-making, management and meeting the Environmental Conditions.

Recommendation L4

It is recommended that the Environmental Protection Authority take a more pro-active approach in ensuring that the proponents and other parts of government collectively deliver on the total management required. For example, the EPA can (with input from key agencies) develop a work plan and require regular reporting on progress against the plan.

Recommendation L5

It is recommended that an appropriate implementation mechanism for the EPP, including a mechanism for implementation of catchment management, be identified, or a new tool be developed, if using an SPP as the main means of implementation is no longer valid.

Recommendation L6

It is recommended that the EPA provides leadership on the issue of control and regulation (if required) of diffuse sources of pollution to establish equity in the management of diffuse and point sources of pollution. In taking such an approach, the EPA should take account of the magnitude of environmental effect on the receiving environment from the various contributing sources and adopt a catchment level, risk-based approach to requiring operators to reduce their nutrient losses to the environment.

Recommendation L7

It is recommended that a comprehensive integrated catchment management plan be developed and implemented as a matter of urgency. At the same time a review should be carried out to recommend a mix of incentives and regulatory measures to lead to full implementation of the catchment management plan.

Recommendation L8

It is recommended that the government addresses the attitudinal and institutional barriers to effective implementation of holistic approaches to environmental management and secures bipartisan political support to ensure that effective natural resource management occurs in a consistent manner over the long-term.

Recommendation L9

It is recommended that the EPA should review current responsibilities for implementation of the EPP, SPP and Environmental Conditions to ensure that all relevant decision-making authorities are clear about and held accountable for their respective responsibilities in implementing the strategy, regardless of whether they are currently identified as proponents and bound by Environmental Conditions.

Recommendation L10

It is recommended that the EPP review which was commenced in November 1999 should be resumed and take account of the findings of this Report and submissions already received. As part of the review a public process should be initiated to develop a clear statement about the environmental quality now being sought for the Peel-Harvey Estuary System as a whole.

Recommendation L11

It is recommended that the planning system take steps to ensure that the required environmental standards are met by adopting a combination of a precautionary/preventative approach with adaptive environmental assessment and management to facilitate mutual protection for the environment, residential development and industry.

Recommendation L12

It is recommended that the Peel-Harvey Regional Park be implemented as a matter of priority.

Recommendation L13

It is recommended that the EPA develops and heads up a management structure to "drive" implementation of the whole strategy (see also Recommendations L3 and L4).

Recommendation L14

The ERC recommends that the DEP be required to develop and commence implementation of a load-based licensing system for the Peel-Harvey coastal plain catchment by June 2004, to give affect to target pollutant loads identified under the Environmental Protection (Peel-Harvey Estuary) Policy 1992 (as revised from time to time).

Recommendation W1
It is recommended that scaled phosphorus targets for Serpentine River at Dog Hill, the Murray River at Pinjarra, and Harvey River at Clifton Park be used to complement the system-wide targets contained in the Ministerial Condition. This will provide a nested series of catchment targets for different scales of application to support compliance testing.

Recommendation W2

It is recommended that the current system targets for estuarine water quality and catchment runoff should be maintained and reviewed again in 10 years. This would allow for a longer series of flow years on which to base a system-wide performance audit.

Recommendation W3

It is recommended that other measures of system health for the estuary, rivers, streams, wetlands and the Peel-Harvey catchment be explored. Given the degree of community interest in the Peel-Harvey Estuary System, it is recommended that the EPA should commence extensive public consultation to obtain the community's views on the environmental quality it desires and meaningful measures of system health for the estuaries and the catchment

Recommendation W4

It is recommended that the current phosphorus target for estuarine water quality and catchment runoff should be maintained until at least the year 2008 and reviewed in the light of valid monitoring data.

Recommendation W5

It is recommended that bottom-end target loads for nitrogen should be developed in accordance with the targets set in the EPP.

Recommendation W6

It is recommended that a nutrient inventory be prepared to facilitate the identification of nutrient hotspots and the cumulative impacts of more diffuse ones, and to enable a risk-based approach to nutrient reduction to be implemented.

Recommendation W7

It is recommended that an independent system-wide audit of the environmental condition of the estuaries, rivers, streams, wetlands and the Peel-Harvey catchment (including nutrient budget) should be carried out by the EPA prior to any review of the nutrient management targets.

Recommendation C1

Key proponent and management agencies should be required to meet at least the minimum legal requirements of catchment management. This should be made a high organisational priority and reflected in performance agreements with Ministers, in agency Business Plans and in Key Performance Indicators (KPI's).

Recommendation C2

It is recommended that the proponents ensure that sufficient offsite monitoring is carried out to enable the proponents to be able to estimate cumulative discharges from known point sources.

Recommendation C3

It is recommended that the effects of clearing and drainage on biodiversity and salinisation of land be addressed as well as the effects of nutrients. The relationships between the various legislative instruments in regard to clearing and drainage, nutrients, biodiversity and salinity should be clarified.

Recommendation C4

It is recommended that the following maps be prepared and submitted to the Environmental Protection Authority by 30 November 2003:

- *a basemap of land use in the coastal catchment in 1989 be compiled from Landsat and other remote sensed and historic data;*
- *maps of land use in the coastal catchment in 1994 and 1999 be compiled from Landsat and other remote sensed and historic data; and*
- *maps showing land use change from the date of the EPA's 1988 report on Peel-Harvey.*

Recommendation C5

It is recommended that EPA runs a process to develop clear indicators of catchment health for assessing the success of catchment management measures and appropriate associated monitoring be implemented (see section 11).

Recommendation C6

It is recommended that a pragmatic mix of voluntary co-operation, regulation and enforcement be explored to ensure that environmentally acceptable management options are used in the catchment. This should include a much more pro-active approach from the proponent agencies, to more strongly encourage adoption of changed land management practices, backed by appropriate incentives/disincentives to achieve outcomes acceptable to all stakeholders, not just those within the Peel-Harvey coastal catchment (see Section 12 and Appendix 2 of this Report).

Recommendation C7

It is recommended that The EPA endorses the advice on Catchment Management in 1 - 7 above.

Recommendation DC 1

It is recommended that monitoring should continue long enough to take account of high runoff years and other longer term environmental variations. This monitoring should include the following:

- *nearshore bathymetry and beach profiles extending 1 km north and south of the channel*
- *bathymetry of the Harvey Estuary in the vicinity of the channel*
- *shoreline movements using aerial photography either side of the channel*
- *inundation assessment*
- *nearshore water quality and marine habitat*
- *water quality within the Peel Inlet and Harvey Estuary*
- *sand bypassing operations.*

Recommendation PCR 1

The EPA should promote compliance reviews as a potentially positive experience for proponents with the emphasis being on providing an opportunity to progress or improve environmental protection and management into the future, and an opportunity for the EPA to review its environmental objectives alongside verifying compliance.

It is recommended that compliance reviews run by the EPA should focus on examining three areas:

a) verification of implementation of the Environmental Conditions as set out in the Minister's Statement, in the context of the intent of the Conditions as set out in the EPA's assessment report and recommendations;

b) an examination of whether the assessment of the project carried out by the EPA was accurate in its predictions including identification of the environmental objectives and environmental management goals; and

c) whether the proponent's commitments and the Environmental Conditions, and any associated legal and administrative framework to underpin management have been successful in achieving the goals for which they were originally designed.

Recommendation PCR 2

It is recommended that for major PCR reviews, the EPA use Expert Review teams consisting of people who are familiar with and well informed in relation to the project performance to be reviewed, including the history of the project, the EPA's assessment(s) and the intent behind the approach taken by the EPA in formulating its recommendations and draft conditions.

Recommendation PCR 3

It is recommended that the EPA obtains adequate resources to enable it to form and resource the independent expert review teams required to carry out future compliance reviews, and in particular reviews of projects where government agencies are the proponents.

Recommendation PCR 4

It is recommended that the EPA adopts the following approach to improve the PCR process to ensure that it is open and transparent, fair to proponents and the community, and to assist in PCR reviews:

a) EPA should clearly document the intent of its recommendations in its assessment report by inserting recommendations throughout the report close to the rationale for that recommendation;

b) the rationale for and intent of a recommendation/Condition should be stated beneath each Environmental Condition and included in the Statement issued by the Minister for the Environment;

c) soon after completion of an assessment, proponents should be required to consult with key stakeholders and groups and propose measures to the EPA to enable evaluation of progress and compliance and to attend an EPA meeting to discuss and agree on the measures of success that will be used to verify compliance in the next review;

d) at the meeting in (c), the EPA should propose for discussion the approach that will be taken in the PCR review process;

e) the agreement reached by the proponents and the EPA on the compliance measures and the PCR process should form a "contract" and should be made public as a draft, to allow for other expert input, prior to being finalised; and

f) the final agreed measures of success should be used as the basis of development of a targeted monitoring program to ensure that the appropriate information to enable compliance against agreed compliance measures to be verified.

Recommendation P1

It is recommended that the current three Ministers nominated as co-proponents be retained but be required (through "Procedure") to operate as being equally responsible for implementation of the whole management strategy, with carriage of the project on behalf of Government as a whole..

Recommendation P2

It would be useful in amending some of the Environmental Conditions, for the EPA to provide advice to the Minister for the Environment on non-proponent management agencies and for a draft "Procedure" to be prepared for inclusion in the revised Statement.

Recommendation P3

It is recommended that the EPA should ensure that the provisions for preparation of a catchment management plan from the Swan-Canning EPP are included in the revised Peel-Harvey EPP, and the EPA should take on the responsibility for driving catchment management.

Recommendation P4

It is recommended that the EPA give consideration to delegating preparation of the above catchment management plan to an appropriately resourced group to ensure that the EPA's and Minister's requirements are met.

Recommendation M1

It is recommended that the EPA requires the proponents to prepare a monitoring program to the satisfaction of the EPA, through an open and public process, to demonstrate that the requirements of the Environmental Conditions are being met. Monitoring should cover, inter alia:

a) System-wide water balance
b) System-wide nutrient balance
c) Estuarine ecosystem health
d) Managing organisms that have the potential to cause nuisance to the public.

Specific monitoring for (a) to (d) should include:

*a) **System-wide water balance***

i) Surface water flux to the estuary measured continuously as stream flow at the Serpentine River at Dog Hill, the Harvey River at Clifton Park and the Murray River at Pinjarra using techniques to provide results with at least ±1% accuracy on annual totals.

ii) Estimates of surface runoff to the estuary from urban areas and other areas downsteam of the three gauging stations nominated at (i) above using techniques to provide results with at least ±15% accuracy on annual totals.

iii) Estimates of direct groundwater accession and loss from the estuary using techniques to provide results within ±15% accuracy on annual totals.

iv) Estimates of marine exchange through the Dawesville Channel and the Mandurah Channel using techniques to provide results within ±20% accuracy on annual totals.

v) An annual water balance for the estuarine system should be derived using techniques to provide results within ±20% accuracy on annual totals.

Elements of the water balance should be reported every five years.

*b) **System-wide nutrient balance***

i) Nutrient concentrations from samples collected from the Serpentine River at Dog Hill, the Harvey River at Clifton Park and the Murray River at Pinjarra using sampling techniques appropriate to reliably determine trends over time and to allow for mass load calculations as specified in ii) below.

ii) Nutrient mass loads for the Serpentine River at Dog Hill, the Harvey River at Clifton Park and the Murray River at Pinjarra using techniques to provide results within ±15% accuracy on annual totals. Results should be reported annually against the scaled targets below (see Appendix 3 this report for the derivation of the scaled targets.)

Table of scaled total phosphorus targets for the three main rivers

Application	TP - Target for average conditions	TP - Target for extreme conditions
Serpentine River - Dog Hill S614030	14 t (50 percentile)	44 t (90 percentile)
Murray River at Pinjarra S614065	15 t (50 percentile)	36 t (90 percentile)
Harvey River at Clifton Park S613052	27 t (50 percentile)	57 t (90 percentile)

iii) Nutrient concentrations in surface runoff to the estuary from representative urban areas and other areas downstream of the three gauging stations nominated at (i) above using spatial

and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).

iv) Nutrient mass loads in surface runoff to the estuary from representative urban areas and other areas downstream of the three gauging stations nominated at (i) above using techniques to provide results within ±50% accuracy on annual totals.

v) Nutrient concentrations in groundwater from representative areas having direct groundwater accession to the estuary using spatial and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).

vi) Nutrient mass flux in groundwater from representative areas having direct groundwater accession to the estuary using techniques appropriate to provide results within ±50% accuracy on annual totals.

vii) Nutrient concentrations of estuarine waters using spatial and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).

viii) Nutrient concentrations of estuarine sediments using spatial and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).

ix) Nutrient mass flux associated with estuarine sediments using techniques to provide results within ±50% accuracy on annual totals.

x) Estimates of nutrient content associated with estuarine waters and marine exchange through the Dawesville Channel and the Mandurah Channel using techniques to provide estimates of mass flux within ±50% accuracy on annual totals.

xi) An annual nutrient mass balance for the estuarine system should be derived using techniques to provide results within ±50% accuracy on annual totals.

Performance (mass loads) for the three main rivers should be reported against the scaled targets annually (bii).

Elements of the nutrient mass balance should be reported every five years.

c) Estuarine ecosystem health

i) Dissolved oxygen concentrations should be determined in estuarine waters using spatial, temporal and vertical sampling strategies appropriate to determining trends over time and an assessment of any localised short-term periods of hypoxia or anoxia.

ii) Chlorophylla should be determined in estuarine waters using spatial, temporal and vertical sampling strategies appropriate to determining trends over time. Assessment of any localised short-term periods of algal bloom is covered in di) below.

iii) The condition and extent of riparian communities fringing the estuary should be determined using techniques appropriate to determining trends over time (5 yearly trends).

iv) The nature of any commercial or recreational fisheries should be determined using techniques appropriate to determining trends over time (5 yearly trends).

v) The nature of any avifaunal communities inhabiting or visiting estuarine waters should be determined using techniques appropriate to determining trends over time (5 yearly trends).

Elements of estuarine ecosystem health should be reported every five years.

d) Managing potential public nuisance

i) Chlorophylla and phytoplankton cell densities should be determined (if bloom conditions occur) in estuarine waters using spatial, temporal and vertical sampling strategies appropriate to determining the magnitude and nature of any localised short-term periods of algal bloom.

ii) Macroalgal species composition and densities should be determined around the estuary (if present at nuisance levels) using spatial, temporal and vertical sampling strategies appropriate to determining trends over time. These data should be reported annually and will form the basis of any macroalgal harvesting or other management strategies.

iii) Mosquito nuisance should be assessed regularly during the year using methods appropriate to providing reports on trends particularly around areas of significant human habitation.

Elements of programmes to manage organisms that can cause public nuisance should be reported annually.

The monitoring program should be designed to measure performance against the measures of estuary system health to be developed by the EPA as outlined in Section 11.1 of this Report. The recommendations from that section and the section on targets are relevant here.

Recommendation NRM1

It is recommended that the EPA provide public advice, as a matter of urgency, on how it will continue to meet the requirements set down in the Environmental Protection Act which will require that the EPA is fully accommodated in the processes and requirements being developed for NRM in WA and Nationally.

Recommendation NRM2

It is recommended that the EPA ensures that it formally assesses all NRM plans to be prepared by local and regional catchment groups, to ensure that the environmental effects of such proposals are environmentally acceptable, that environmental objectives meet the EPA's requirements, that management actions to deliver on protection/restoration of the environment will indeed do so, and to facilitate input from any member of the public who wishes to make input to the targets for any catchment area.

Recommendation Co1

It is recommended that the agencies required to bring about full implementation of the management strategy be designated as joint proponents for all of the management strategy, and retained until catchment management has been fully implemented. The proponent agencies should be jointly responsible for obtaining the funding necessary to ensure full implementation of the strategy and full compliance with the Environmental Conditions.

Recommendation Co2

It is recommended that the Changes to the Conditions proposed in this Report be adopted and retained until all of the management strategy, including catchment management has been fully implemented.

Recommendation Co3

It is recommended that a new Statement that the Proposal may be Implemented which reflects the current agencies with implementation responsibilities as Proponents, and the amended Conditions is issued by the Minister for Environment and Heritage.

Recommendation Co4

It is recommended that the Proponents obtain 3-year program funding for implementation and compliance.

Recommendation Co5

It is recommended that the EPA carry out independent reviews of compliance for all projects where a government agency (or agencies) are the designated proponents. The matter of provision of resources to the EPA for such reviews needs to be addressed (see also recommendations PCR 2 and PCR 3).

1. INTRODUCTION

This Report documents the work and advice of an Expert Review Committee (ERC) convened by the Environmental Protection Authority (EPA) under Section 25 of the Environmental Protection Act, 1986. The overall purpose of this Committee was to consult with the proponents of the "project" known as the Peel Inlet and Harvey Estuary Management Strategy Stage 2, to provide advice to the EPA with respect to a Performance and Compliance Report (PCR) compiled for the Proponent Ministers by the Peel-Harvey Senior Officers Group and Project Managers Group, and to provide advice on the environmental performance of the project and the related Environmental Conditions set on the project under Part IV of the Environmental Protection Act, 1986. These Conditions are set out in the Ministerial Statement of 4 January 1989 and subsequent statements dated 2 October, 1991 and 19 April 1993 (reproduced in full in Appendix 1).

This Report also provides advice to the EPA on whether the management approach and targets for management of phosphorus (P) that were set by the Authority in 1988 were "correct", the management that is required now, and a process for engaging the community in arriving at consensus on the environmental quality now desired for the Peel-Harvey Estuary System as a whole. The term "System" is used here in accordance with its use in the EPA's 1988 assessment report as shown in Figure 1.

This review arises from the requirements of the Minister for the Environment of the Environmental Protection Authority in the amendments to the Statement issued on 4 January 1989 allowing the Peel Inlet and Harvey Estuary Management Strategy - Stage 2 to be implemented. Condition 17 is reproduced in full below:

*"17 **Compliance Auditing***
In order to ensure that environmental conditions and commitments are met, an audit system is required.

17-1 The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of the Peel Inlet - Harvey Estuary Management Strategy, Stage 2, in consultation with the Environmental Protection Authority.

Procedure

The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.

If the Environmental Protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment."

The Expert Review Committee understands that these statements mean that for the purposes of verifying the "environmental performance of the Peel Inlet - Harvey Estuary Management Strategy, Stage 2" and "compliance with conditions" the role of the EPA is to consider the proponents' Progress and Compliance Report (PCR) and any other matters which enable it to verify whether in its opinion, satisfactory environmental performance and compliance with the Environmental Conditions has been achieved. The Authority is then to convey its view and any related recommendations to the Minister for the Environment.

2. THE REVIEW PROCESS

A Progress and Compliance Report (PCR) was prepared by the Peel-Harvey Project Managers Group on behalf of the Senior Officers Group and the three proponent Ministers - the Minister for Transport; Minister for Agriculture (now Primary Industries); and Minister for Waterways (now MInister for the Environment and Heritage). The PCR was referred to the Environmental Protection Authority in October 1998. A Technical Report on the monitoring program was also prepared which was released to the public (Lord, et al, 1998).

Following the EPA's Review of Proponent's Compliance with the Forest Management Plans in 1998, it decided that a comparable, independent review should be undertaken for Peel-Harvey as it is a significant government project involving considerable investment of public funds and in which the community is interested. The approach followed was to establish an Expert Advisory Committee to review the PCR, Technical Report and other documentation, as well as hold whatever discussions and site inspections were required to enable the group to provide its advice to the EPA on Progress and Compliance.

The EPA Minutes of 28 January 1999 record:

"*After discussion, the EPA resolved to:*

Delegate to the Chairman the establishment of a small expert Advisory Group to provide advice to the EPA on compliance with the Environmental Conditions as outlined in the Progress and Compliance Report prepared by the Peel-Harvey Project Managers Group.

Action: *Establish a small expert Advisory group with membership to be determined by the Chairman to provide advice to the EPA on compliance with the Peel-Harvey PCR."*

With the exception of the Chairman EPA, all members of the Expert Review Committee were selected as independent experts because of their personal knowledge and experience of the Peel-Harvey system and its assessment by the EPA in 1988, and not because of any current professional affiliations.

The Chairman and authors of the Specialist Reports (denoted *) formed a core group with the other two members attending meetings whenever possible. However, all draft and final reports prepared were reviewed thoroughly by all members of the Expert Review Committee. The Specialist Reports were also subjected to external review by independent experts.

2.1 MEMBERSHIP OF PEEL-HARVEY EXPERT REVIEW COMMITTEE

The full Peel-Harvey Expert Review Committee consisted of the following members:

Mr Bernard Bowen	Chairman of Expert Review Committee Chairman of the EPA Former Chairman of EPA's Estuarine and Marine Advisory Committee
Ms Sally Robinson*	Specialist Consultant on legal and administrative framework for environmental management of the system; manager and author of the 1985 and 1988 assessments for the EPA. Deputy Chairman of the EPA (1998-2000) EPA assessment officer for Peel-Harvey from 1981-1989

Dr John Yeates*	Specialist Consultant - agricultural practices and catchment management Formerly WA Department of Agriculture prior to and during the EPA's assessment in 1988
Mr David Deeley*	Specialist Consultant - estuary water quality and in-estuary management targets Expert on WA estuarine systems Formerly Estuarine Impacts Branch, EPA
Dr Robert Humphries	Expert adviser on estuary systems ecology and water quality Formerly Manager Estuarine Impacts for the EPA during the assessment Former Manager Policy Development for the EPA during development of the EPP Co-author of review of all options for management (Humphries and Croft, 1983)
Mr Geoff Bott	Adviser on estuary management and EPP (formerly in DEP) Formerly Estuarine Impacts Branch, EPA during the assessment in 1988

* indicates that these people are the authors of the Specialist Technical Reports (see Appendices)

3. EXPERT REVIEW COMMITTEE'S APPROACH TO PROVIDING ADVICE, AND OUTLINE OF THE STRUCTURE OF THE REPORT

The Expert Review Committee formed the view that there were two important aspects requiring advice to the EPA. These were the review of performance by the proponents (as outlined above in Section 1), and also a review of the appropriateness (adequacy and effectiveness) of the management strategy and targets proposed by the EPA in 1985 and 1988.

The approach taken by the Expert Review committee included the following:

i) Examination of the proponents' PCR report.

ii) Aerial and ground site inspections.

iii) Seeking specialist advice in three areas:

- a specialist review of the legal and administrative framework for management;
- a specialist review of water quality and management targets; and
- a specialist review of catchment management.

iv) Consultations with the agencies whose Ministers are co-proponents for the management strategy.

v) Consultations with key individuals and community members.

vi) Review of documentation and file information.

vii) Review of submissions on the review of the Peel-Harvey Environmental Protection Policy.

viii) Meetings of members of the Expert Committee and discussions.

ix) Independent, expert peer review of the Specialist Reports.

The primary objective of this advice to the EPA is to be positive and helpful in providing information to enable it to determine compliance with the Conditions and also to provide advice on a way forward to further reduce nutrient losses from the catchment to the estuary and improve environmental quality.

This Report is structured as follows:

Introduction, Background and Context, including historical context of the management strategy (Sections 1 to 4).

Advice from the Specialist Reports (Sections 5, 6 and 7), The Specialist Reports are reproduced in full as Appendices (2, 3 and 4).

Advice on other components of the management strategy (Sections 8 and 9).

An overall statement on verification of compliance, and advice to the EPA on the Environmental Conditions (Section 10).

Advice on monitoring (Section 11).

Background on regulatory approaches to catchment management (Section 12).

Section 13 covers conclusions and recommendations to the EPA in a number of areas, including the need to engage the public in determining measures of "health" and "wellbeing" of the estuary system (water bodies and catchment).

The Appendices include the Environmental Conditions which have been reproduced in full. Other key documents have been included as Appendices to the Specialist Reports.

4. CONTEXT AND BACKGROUND TO THE PEEL-HARVEY MANAGEMENT STRATEGY AND THE COMPLIANCE REVIEW

The assessment of the Peel-Harvey Management Strategy followed over 10 years of scientific research, coordinated by the EPA, into the causes of the estuaries' eutrophication problems, accompanied by extensive community consultation and agricultural extension in the catchment.

4.1. THE PATH TO MANAGEMENT IN 1987-88

Large green algae, particularly of the genera *Cladophora* and *Chaetomorpha*, became noticeably more abundant in Peel Inlet from the mid to late 1960's, By the 1970's, large algal accumulations were fouling estuary beaches and causing odour and other problems. Increasing public concern stimulated the EPA to investigate the problems in the late 1970's.

Studies into the biological and physical aspects of the Peel-Harvey System commenced in 1977 and were initiated by the EPA through its the Estuarine and Marine Advisory Committee (EMAC). The task of EMAC was "to determine the causes of the excessive growth and accumulation of green algae in Peel Inlet and if possible propose methods for its control" (EMAC, 1981, p.6). This constituted **Phase 1** of the studies. The principal conclusions presented in the EMAC report of 1981, were:

- the Peel-Harvey System is eutrophic (i.e. severely nutrient enriched) in that there is an excess of the nutrients phosphorus and nitrogen available for plant growth in the estuaries;
- the excess of nutrient enters the system from activities in the catchment, in particular from the application of phosphorus-rich fertilisers; and
- proper management of the system can only be achieved by reducing the present input of nutrients from agricultural drainage, by preventing the increase of nutrients from other sources and by not further restricting the flushing of nutrients to the sea.

Phase 2 studies began in 1981 and confirmed that the use of fertilisers and their transport to the estuary via the drainage system on the coastal plain catchment were the main cause of excessive phosphorus inputs to the estuary system.

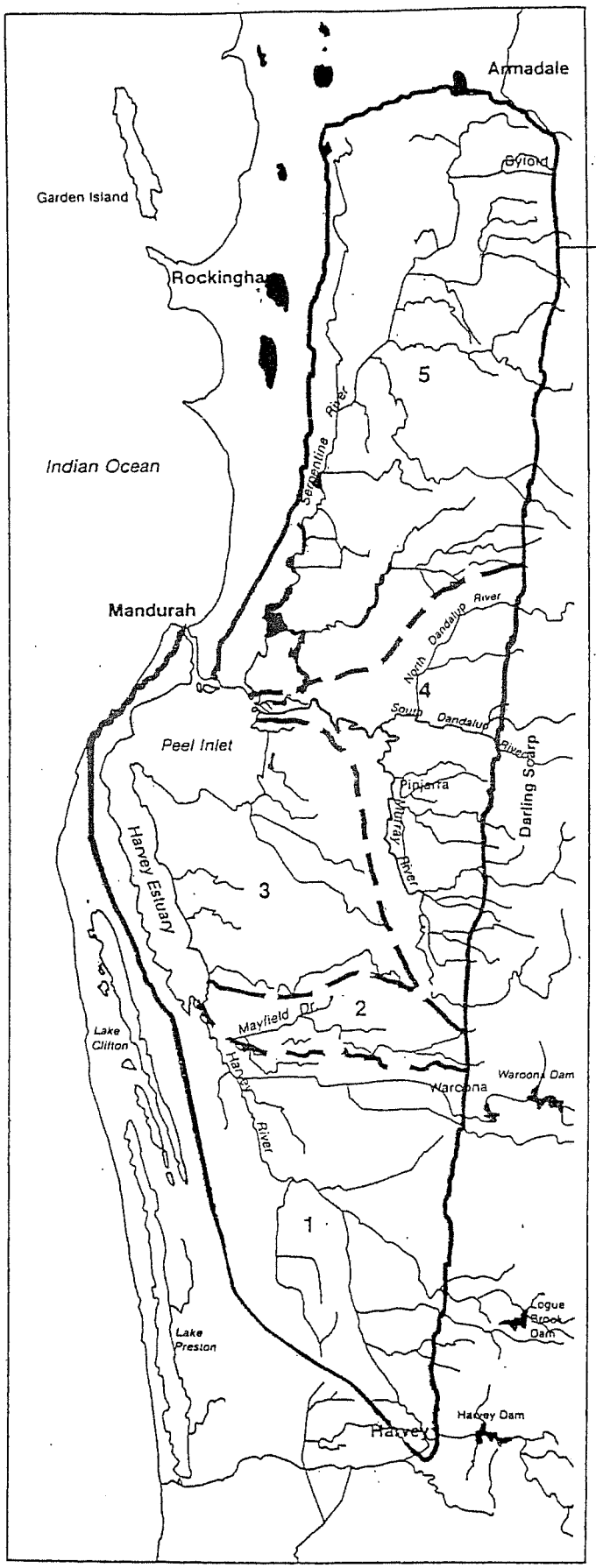
Phase 3 examined all the possible management options to determine their effectiveness and feasibility against a set of constraints and objectives (Humphries and Croft, 1983; DCE, 1984). The aim was to keep eutrophication of the estuaries within "acceptable" limits. The study proposed management strategies that would be cost-effective, as well as options that would benefit from further investigation, such as application of bauxite residue ("red mud") to the catchment soils.

EPA carried out an assessment of the proposals in 1985 in the Stage 1 Environmental Review and Management programme (ERMP) and recommended that a combined strategy of a new channel to the ocean and control of phosphorus inputs from the catchment was essential (EPA, 1985). In the assessment the EPA identified the management objectives as being, in simple terms:

"*to produce and maintain an estuary system that is visibly clean and healthy and is ecologically healthy and resilient*" (EPA, 1985).

This objective was based on the recognition that the Peel-Harvey System had important environmental, economic and social values involving a broad range of stakeholders, not necessarily only those people living within the coastal catchment area.

In 1985, the EPA defined the management area as "the Estuary System" which included the Peel Inlet, the Harvey Estuary and the rivers and drains of the coastal part of the catchment, including the Serpentine, Murray and Harvey Rivers (see Figure 1). The EPA also stated in its conclusions that:



Catchment	Area (ha)	Cleared area (ha)	% cleared
1	53,995	41,454	76.8
2	11,044	10,139	91.8
3	26,365	21,296	80.8
4	32,366	29,149	90.0
5	78,645	48,962	62.3
Total	202,415	151,000	74.6

Figure 1

Location map of Peel-Harvey Estuary System and boundaries of the Coastal Plain Catchment and Sub-catchments

"it will be necessary to develop a long-term land management plan for the Catchment Area and an appropriate enabling framework, to attain and secure for all time reductions in nutrient loading to the System;" (EPA, 1988, (page 27 of the Part I Report)).

Phase 4 was the preparation of the Stage 2 ERMP (Kinhill Engineers, 1988) which examined the management package in detail, followed by the environmental impact assessment by the EPA (EPA, 1988). In preparing its assessment and recommendations to Government, the EPA provided advice on the legal and administrative framework that would be necessary to underpin successful management of the estuary system's environmental quality over the long term. This was embodied in the recommendations of the EPA in its assessment report (EPA, 1988) (reproduced as Appendix 1 in the Legal and Administrative Framework Specialist report (Appendix 2 to this report)) and in the Environmental Conditions set by the then Minister for the Environment (reproduced in Appendix 1).

The position taken by the EPA in its assessment of the ERMP in 1988 was:

" *..that the estuarine water quality is presently seriously degraded, and that this requires significant improvement to make it environmentally acceptable and to ensure that the beneficial uses of the system such as direct water contact recreation, fishing, fishery protection, and habitat protection can continue. To date, catchment land-uses have taken place without due regard for the downstream consequences and impacts on the end receiving water body. The environmental quality of the estuaries has been traded off for the benefit of catchment land-uses. This balance needs to be redressed to achieve conservation and sustainable development of the Peel - Harvey System. Adequate protection of the estuaries' beneficial uses will dictate changes to the amount and types of catchment activities that will be possible.*" (EPA, 1988, p.1).

By 1988, there were sufficient data and modelling results to enable the EPA assessment to express the management target in both descriptive and numerical terms. The latter was important as it would enable the success of the management strategy to be measured and judged over time including under differing environmental conditions.

The descriptive management objectives the EPA set at that time were:

i) *"At least an acceptable to good level of water quality, defined as moderately nutrient enriched (mesotrophic);*

ii) *A high level of resilience in the system to ensure that massive oxygen depletion does not occur;*

iii) *A large reduction in phosphorus input to the system from the catchment area;*

iv) *A solution, that will preferably show major improvement within five years, to ensure that irreversible damage to the system does not occur; and*

v) *A very high probability that the strategy will succeed both in the short and the long term.*

Although not environmental in nature, another important consideration is the overall cost - benefit that would result from the system being adequately managed and becoming healthy and resilient" (EPA, 1988, p.10)

The target organisms for management at that time were the in-estuary occurrences of a cyanobacterium (blue-green alga) called *Nodularia* as well as large (macro) algae. As *Nodularia* was capable of fixing nitrogen from the air it effectively had unlimited access to nitrogen as an essential nutrient. This led to the focus for management being reducing availability of phosphorus as the means of limiting plant growth.

The full management strategy consisted of:

- constructing the Dawesville Channel as soon as possible;
- implementing catchment management measures, to include:
  - fertiliser management
  - changes in land-use
  - control of point sources
  - continuation of the moratorium on clearing and drainage
  - preparation and implementation of an integrated catchment management plan to meet the target for phosphorus load reduction specified in the EPA assessment report;
- continue weed harvesting; and
- implement appropriate monitoring to measure the success of the strategy. (EPA, 1988, p. 16)

The parts to be played by the two main components of the management strategy were set out by the EPA in its 1988 assessment (see Table 1):

Table 1 - Relative contributions of Dawesville Channel and catchment Management to achieving the general management criteria (after EPA, 1988, p.66)

Management Criteria	Dawesville Channel	Catchment Management
At least an acceptable to good water quality	Essential	Essential
Marine or near-marine conditions, for control of *Nodularia*	Essential	-
High resilience in the system to ensure it does not "go over the edge"	Essential	Essential
A large reduction in phosphorus input to the system	-	Essential
Increased removal of phosphorus from the system	Essential	-
Very high chance of success of the strategy and ongoing long-term success	Essential	Essential

At the time of the assessment, the magnitude of the *Nodularia* problem was considerable and in the view of many scientists threatened the ongoing health of the estuary, in particular the development of *Nodularia* in the Harvey was an indicator of further significant decline in the health of the estuaries and the move to an even more environmentally unstable and less predictable situation. Scientists at the time frequently expressed concern about the likely "collapse" of the estuary health and what this would mean for its ecosystems as well as impacts on residents nearby. There was also concern among some scientists that if such an extreme collapse occurred, it would become impossible to restore the health of the estuary. This provided a sense of urgency in implementing effective, long-term management, as well as introducing the importance of building resilience, and an adequate safety margin to cover the long-term, back into the system.

It became clear that only a management package consisting of both a new channel and effective catchment management measures would be likely to succeed in protecting the estuary system in the long term, and that there would also be a need to underpin management with an effective legal and administrative framework that would foster a dynamic, adaptive environmental management approach.

It is worth remembering that the Peel-Harvey system is but one of a number of similar estuarine systems in the southwest of Western Australia which are susceptible to eutrophication resulting from excessively high rates of nutrient loss from their catchments. All catchments export nutrients naturally to waterways. Nutrient enrichment problems arise when nutrient losses exceed background (the original state) and exceed the capacity of the receiving waterbodies to be able to accept and process them without changes to the ecosystem occurring.

The lessons learned in defining the problems and in developing and implementing management of the Peel-Harvey are transferable to most of the other coastal plain lagoonal estuaries in WA. However, Peel-Harvey is unique in the amount of money spent on research to define the problems (over $10 million) and to implement management solutions (over $60 million). It is most unlikely that in excess of $60 million would ever be spent again in Western Australia primarily on management of a nutrient-related environmental problem.

The predictions about the post-management performance of the estuary system made by the EPA in 1988 (and before) have now been tested (see Table 2 in Section 5.2 of this Report) and have been found to be correct.

5. THE LEGAL AND ADMINISTRATIVE FRAMEWORK FOR MANAGEMENT

5.1 INTRODUCTION

The following terms of reference were applied to the review:

- Review the establishment and effectiveness of the legal and administrative framework for implementation of management of the Peel-Harvey as proposed by the EPA's recommendations and reflected in the Minister's Statement;
- Address necessary linking sections to build on or provide linkage between the work and findings of the "Catchment Management" and "Water Quality and Targets" Specialist reviews;
- Propose any improvements to the legal and administrative framework for the management of the Peel-Harvey Estuary System; and
- Prepare a report on the findings of the Legal and Administrative Framework Specialist Review for inclusion as an appendix to the report of the Peel-Harvey Expert Review Committee to the EPA.

The Legal and Administrative Framework review was able to access relevant reports and files and had access to the submissions on the review of the Peel-Harvey Environmental Protection Policy carried out in November 1999. Other experts were consulted as necessary.

The Specialist Report on the Legal and Administrative Framework for Management is included as Appendix 2 to this Report.

The EPA carried out the assessment of the Peel-Harvey Management Strategy in 1988, now over 14 years ago, using the scientific knowledge, statutes and management instruments available at the time. The management strategy was the first attempt in Western Australia at management of a diffuse source pollution problem where catchment management needed to be tackled in association with a major engineering approach. It was early days for catchment management anywhere in Australia and indeed elsewhere in the world. The revised Environmental Protection Act, 1986, was new in its application and the role of Environmental Conditions in achieving management objectives identified by the EPA was still being developed. Developing approaches and mechanisms for auditing

compliance by the EPA Department and for proponents had barely commenced, and environmental management systems were in their infancy.

All the above has a bearing on the approach taken at the time of the assessment and also on where it may be appropriate to go now, as a community. Other important contextual considerations include:

a) The costs of the Dawesville Channel were very substantial, in particular for addressing an environmental problem, and it was reasonable for a Government to wish to protect its investment in the Dawesville Channel through the application of adequate catchment management measures to reduce nutrient inputs to the estuaries.

b) The Peel-Harvey Environmental Protection Policy (EPP) was one of the first EPP's approved by the Government and was the first formulated to address diffuse source pollution.

c) The Peel-Harvey Estuary System is recognised as a West Australian icon as well as being of international significance as a Ramsar wetland.

d) The new channel to the ocean (the Dawesville Channel) has a design limit which dictated the maximum flushing capacity of the channel. Thus it was very important to carry out the research and modelling to clearly define the problem to be solved, to enable the flushing capacity of the channel to be properly scaled.

e) At the time of the assessment, the scientific data on the management strategy for Peel-Harvey indicated that the Dawesville Channel alone would not be adequate to reverse, or maintain in the long term, the improvements to water quality that were required, unless agriculture was to all intents and purposes removed from the catchment and no further nutrient-exporting development (including residential) was to occur around the estuary. It was considered impractical to remove agriculture and "hold" development in this manner. This led to the development of a combined approach of the Dawesville Channel and catchment management measures which would provide the best chance of achieving significant reductions in phosphorus inputs and would also provide additional buffering to ensure the long-term health of the estuaries and performance of the Dawesville Channel.

The assessment report stated:

> "*Management of the problems of the Peel Inlet and Harvey Estuary waterways and their catchments will require the adoption of a long-term view and a holistic approach. Because some of the remedial measures proposed in this report will be on a scale and of a kind not previously undertaken, they will generate considerable world-wide interest. At the local level, the Dawesville Channel will be the largest coastal engineering project undertaken since C Y O'Connor built Fremantle harbour. The proposals to manage agricultural activities in the catchment would also be innovative in that the emphasis is on a co-operative approach rather than on a strict regulatory approach of the kind being adopted by a number of European countries to control similar problems.*" (EPA, 1988, p. 1-2).

This statement recognised the local icon status of the Peel-Harvey as well as being a wetland of International importance, and recognised the significance of the management proposals at a world level.

In effect, the combined strategy required mutual responsibility – a balance between community input to build the channel, and local responsibility (duty of care) in modifying catchment activities.

5.2 KEY FINDINGS OF THE SPECIALIST REPORT ON THE LEGAL AND ADMINISTRATIVE FRAMEWORK FOR MANAGEMENT

The 1988 assessment established that only a management package consisting of both a new channel and effective catchment management measures would be likely to succeed in protecting the estuary system in the long term, and that, as first proposed by the EPA in 1985, there would also be a need to underpin management with an effective legal and administrative framework that would foster a dynamic, adaptive environmental management approach (EPA, 1985; EPA, 1988)

The phosphorus reduction management target for the catchment was a technically defensible, robust figure arrived at using predictions from empirical modelling and observed behaviour of the estuaries and catchments over some 10 years of data collection and involving several government agencies whose Ministers became the proponents for the ERMP. The target was set via several legal means including:

- the management target identified in the EPA's recommendations being specified in an Environmental Condition by the Minister; and
- the management target being re-stated in an Environmental Protection Policy as what needed to be achieved (the figure set by the Minister in the Environmental Condition ensured that the targets in the EPP could not be less than what was required by the Environmental Conditions (ie could not specify that a higher amount of phosphorus would be acceptable, although the EPP could specify a lower amount than the Conditions).

Furthermore development of a catchment management plan was required as the on-the-ground means of giving effect to the reduction in phosphorus required from the catchment to meet the management target and maintain it over the long term.

The key elements of the catchment management strategy were defined as being:

- fertiliser management;
- changes in land use;
- control of point sources of phosphorus (and other) pollution;
- preparation of an integrated catchment management plan; and
- continuation of the moratorium on clearing and drainage.

Along with all other elements of the management strategy, these all required consideration in some manner in the legal and administrative framework for management.

The EPA proposed a tiered legal and administrative framework to underpin management (see Figure 2). This consisted of:

a) the EPA's recommendations in the assessment report (EPA, 1985);
b) the proponents' commitments as included in the assessment report;
c) the Minister's Environmental Conditions on the proposal (which included requiring all the proponent commitments to be carried out);
d) the development of the EPP; and
e) use of other complementary government statutory instruments and regulations under various Acts, not just the Environmental Protection Act.

Recognising that a mechanism to enable implementation of catchment-wide management had not been developed as recommended in the EPA's 1985 assessment (EPA, 1985), an attempt was made to address this through the EPP itself. The Peel-Harvey Environmental Protection Policy (EPP) was one

of the first EPP's approved by the Government and was the first which attempted to address diffuse source pollution. At the time it was developed there were no other mechanisms available that would send a clear signal to all stakeholders that the Government was serious about having the environmental problem fixed and the importance of catchment management in doing so

The EPP provided a legal statement of intent by government as a whole by setting out the uses to be protected, the management objectives, and the program for protecting the environment. It provided a vision of what needed to happen in the long term and a headpower for doing so. The EPP was envisaged as providing an over-arching requirement for all with management responsibilities and would provide a statement of vision and direction that could work in concert with the planning approvals process in Western Australia to deliver sound planning decisions that reflected a catchment-wide environmental management constraint.

The management targets were to be given effect on the ground through the development of a comprehensive catchment management plan which would allow for a broad range of approaches to meeting the reduction in phosphorus input required from the catchment. Further definition and implementation of the range of measures to reduce nutrient losses from existing land-uses to the drainage system (for example "appropriate" land management) were to be included in the catchment management plan.

To date, a comprehensive integrated catchment management plan has not been prepared or implemented, although a draft "guidebook" was proposed. This means that the mechanisms envisaged by the EPA for implementing the management strategy in the catchment at the property level and for meeting the requirements set down in the EPP have still not been developed or put in place. The moratorium on clearing and drainage has also not been fully enforced by the proponents or reviewed, through either the PCR or the EPP, as originally envisaged by the EPA (see Section 5 of Appendix 2).

In addition to the technical reasons for needing catchment management it was also considered to be part of an implied social contract between the broader community of Western Australia which paid for construction of the Dawesville Channel, and the coastal plain catchment community where continuation of farming in the catchment required land use changes and catchment management to reduce P losses to the environment, and specifically to the estuaries.

As the catchment management plan was an essential component of the framework for management, its lack of development and implementation has significantly eroded the ability of the EPP, and the legal and administrative framework as a whole, to be completely successful in underpinning the management approach.

Furthermore, although the EPP requires governments and decision-makers at all levels to ensure decisions and actions are compatible with the achievement and maintenance of the environmental requirements of the EPP, there is no evidence that this requirement has been implemented or met (including by the Department of Environmental Protection) or that agencies have been sufficiently active in advising property holders in the Coastal Catchment of the legal obligations flowing from the EPP that apply to everyone.

The EPP is a legal instrument (in effect it becomes part of the EP Act) and requires all parties, not just proponents, to carry out the actions set down in section 8 of the EPP. This is not discretionary, and is particularly relevant. Any apparent failure of the EPP is the result of lack of appropriate implementation of their specific roles by the various parties, specifically landholders, land-users, state and local government agencies and the "State" in general.

The objectives of using an EPP as a key aspect of the management framework are set out in, together with specialist comment on the success of the legal and administrative framework for management. This is discussed more fully in Section 7 of Appendix 2.

Figure 2 - Diagram of Legal and Administrative Framework to Achieve Nutrient (especially Phosphorus) Control (as envisaged by the EPA in 1988)

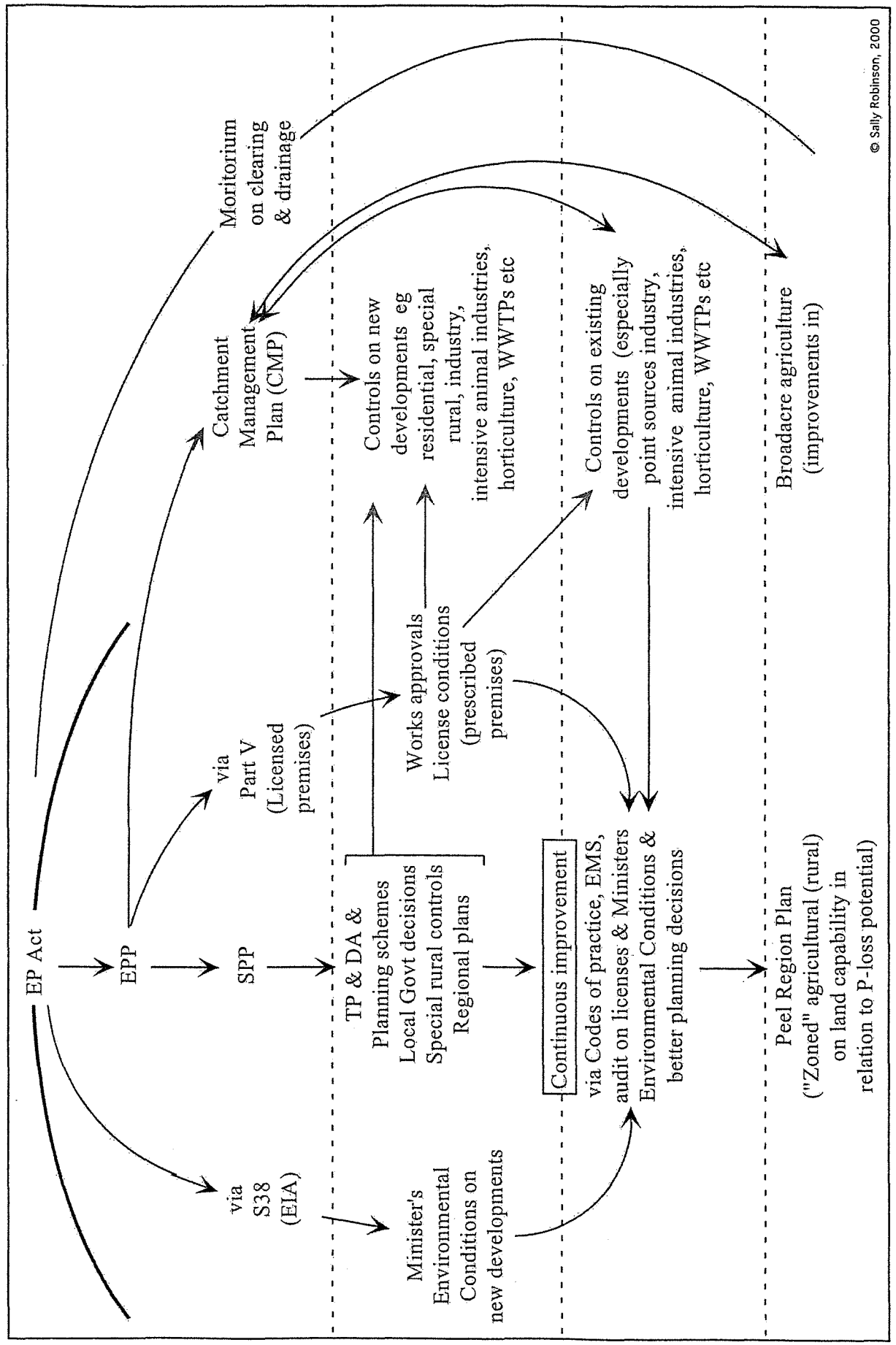


Table 2 - Summary of success of the Legal and Administrative Framework for Management (see also Section 7 in Appendix 2)

Objective behind having the EPP	Objective met/not met	Specialist Comment
to provide a long-term vision for management of the estuary system	Met	
to establish the management targets for phosphorus within a legal instrument	Met	
to lead to changes in land use (mostly via the EPP)	Met to some extent	The lack of a comprehensive catchment management plan has limited the ability of the EPP to deliver on this objective.
to discourage some land uses (in particular intensification of agriculture where increased phosphorus losses would result) (see SPP)	Met to some extent	The EPP contributed to reducing the expansion of irrigated intensive horticulture in the catchment. The lack of a comprehensive catchment management plan has limited the ability of the EPP to deliver fully on this objective.
to provide an over-arching, legal instrument that would establish the environmental constraints on the area	Met	Met
and be useful to decision-makers to guide planning, planning decisions, and land uses in the area	Met to some extent.	The existence of the EPP meant that planning schemes and development approvals should have been occurring within the environmental constraint. It was useful in providing guidance at the broad scale strategic level but proved difficult to implement at the level of individual developments (other than those assessed through section 38 of the EP Act).

to provide an over-arching, legal instrument that would establish the environmental constraints on the area	Met	Met
and be useful to land holders and users	Met to some extent.	Comments as above. In addition problems occurred because many landholders and users were not aware of the EPP early enough to avoid buying land that could not be developed in accordance with their expectations. The catchment management plan should have assisted in providing a pro-active tool useful at the property development level.
to provide a means of focusing all stakeholders into a common direction for management of Peel- Harvey	Partially met.	As an EPP is an instrument that applies to everyone, this should have been fully met. However there appears to have been both lack of knowledge of and resistance to the EPP among rural landholders in the catchment.
to provide a mechanism that in combination with the catchment management plan, would allow for flexibility in selection of land uses and land use practices, whilst at the same time ensuring that the environmental management objectives were met	Met	The mechanisms within the EPP, in concert with the catchment management plan, were adequate to guide decision-making to achieve the management objectives within the EPP.
to send a clear signal about Government's commitment to the successful management of the system.	Partially met.	The fact that Government supported the EPP sent a clear signal about commitment to management. However, this may not have been adequately supported in terms of budget and resource requirements. It appears there may have been greater commitment from the political level of government than at the departmental level. The view has been expressed that the Government gave out mixed signals about management of the system. However, the EPP could have and should have been taken as a clear, legal statement of intent by Government.

The Specialist review found that the concept of the EPP in the management framework, and the objectives above, remain a key to fully successful implementation of the management strategy for the Peel- Harvey and that it should be made to work in the manner envisaged. To do so will necessitate priority development of the comprehensive catchment management plan (proposed in 1988) and the implementation mechanisms (proposed by the EPA in 1985 and 1988).

Recommendation L1

It is recommended that the concept of the EPP in the management framework remain a key to fully successful implementation of the management strategy for the Peel- Harvey and that it should be made to work in the manner envisaged. To do so will necessitate priority development of the comprehensive catchment management plan (proposed in 1988) and the implementation mechanism (proposed by the EPA in 1985 and 1988).

The review concluded that there were a number of barriers (real or perceived) that may have contributed to the lack of full implementation of the legal and administrative framework and the total management strategy. These include:

- lack of a comprehensive catchment management plan;
- limited understanding of the co-proponent approach;
- conflicting management objectives;
- ignorance of the management framework, in particular the role of the EPP (resulting from lack of promotion);
- ongoing challenge to the management target for P management defined through a long research and public consultative process;
- misperception of the need for the whole management strategy;
- perceptions of equity issues;
- weak institutional commitment and reliance on "volunteerism"; and
- resistance to change from current approaches (the need for people to change and move out of their "comfort zones").

The review identified some perceived equity issues and found that there are some real equity issues relating to:

- new developments that are required to be assessed under Part IV of the Environmental Protection Act compared with the lack of similar requirements on most existing rural land uses;

- the different degree of regulation being applied to point sources compared with minimal requirements on diffuse nutrient sources; and

- the increased amount of regulation being applied to some point sources compared with other point sources, regardless of the relative contribution made by each type of development to the nutrient problems (for example, stricter license requirements on waste water treatment plants than on dairies).

To ensure that all aspects of the proposal would receive the proper level of management, and recognising the "whole of government" aspect of the strategy, the EPA recommended in 1988 that the three proponent Ministers be made co-proponents for implementation of the whole management strategy, on behalf of government. This was a deliberate strategy proposed to promote integration of responsibilities and to ensure that all issues would be managed and recognised the role of the proponents on behalf of government as a whole.

Although the Minister for the Environment designated the three Ministers as equally responsible for all aspects of the management strategy, it appears that at some point management responsibility has become devolved to the conventional approach of dividing responsibility along agency lines. This division of responsibility has been a key factor in the lack of development of the catchment

management plan, and in other integrating and environmental issues not being managed. The issue of proponents and responsibility for implementing the management strategy on behalf of government is addressed in Appendix 2 and Section 11.3 of this report.

The fact that there is no single person within government who has been given the responsibility of ensuring that all aspects of the advice and Minister's requirements are met is a contributing factor to the partial success of the legal and administrative framework for management. Furthermore, the lack of a single point of contact has made it more difficult for local government authorities, developers, landowners and industries and users to obtain the advice they need.

Recommendation L2

It is recommended that the concept of "co-proponents" who are severally and jointly responsible for implementation of the whole management strategy be strengthened, recognising that this is a "whole of government" project and requires strong co-operation by all proponents, other decision-makers, management agencies and the community.

Recommendation L3

It is recommended that a single point of responsibility be established to ensure that the whole management strategy is implemented. This would provide a responsible person to act as the key contact with the various agencies involved in decision-making, management and meeting the Environmental Conditions.

Recommendation L4

It is recommended that the Environmental Protection Authority take a more pro-active approach in ensuring that the proponents and other parts of government collectively deliver on the total management required. For example, the EPA can (with input from key agencies) develop a work plan and require regular reporting on progress against the plan.

It appears that several of the Conditions and commitments have not been met and in some instances it is suggested that the Conditions or commitments were inappropriate. A formal public process exists whereby Conditions can be modified where they are no longer required, or removed (cleared) when they have been fully met, and this could have been pursued by the proponents at any time for any Conditions considered by them to be inappropriate.

Recent advice suggests that the co-operative approach of linking development and use of an EPP and Statement of Planning Policy (SPP) to address land use controls to meet environmental objectives may not be possible legally. If this is the case, then an alternative means of implementing management of the Peel-Harvey catchment will have to be developed. This is likely to involve broadening the scope of the EPP with possibly greater control over land uses being specified within the EPP itself.

Recommendation L5

It is recommended that an appropriate implementation mechanism for the EPP, including a mechanism for implementation of catchment management, be identified, or a new tool be developed, if using an SPP as the main means of implementation is no longer valid.

The failure to develop a comprehensive integrated catchment management plan to protect the environmental quality of the Peel-Harvey Estuary System (and the public's investment in the Dawesville Channel) is an indicator of the broader problems in both the agricultural and pastoral areas of Western Australia, where short-term economic returns are given a higher priority than long-term agricultural and environmental sustainability.

There is increasing public and industry concern with the ongoing poor environmental performance of the agricultural sector, and with the regulatory inequity whereby most industries and the mining sector

are tightly regulated while farming is not. This is despite the clear understanding by the community and Government at all levels that broadacre agriculture is the source of Australia's worst environmental problems including salinity, soil acidification, erosion and sedimentation, loss of biodiversity from land clearing and rising water tables and degradation of waterways. Eutrophication originating from agricultural fertilisers is occurring in inland lakes, rivers and waterways, in estuaries (such as Peel-Harvey) and in some cases has affected near-shore marine embayments (Commonwealth of Australia, 1996).

Although the EPA's intention in its 1988 assessment was that the catchment management plan should be developed in a co-operative and voluntary manner, the fact that an adequate plan has not been developed suggests that it may now be necessary to adopt a more regulatory approach.

The Specialist review stated:

"In Western Australia current legislative and institutional arrangements are clearly inadequate to deal with multi-faceted management problems at the catchment scale where a combination of "top down" vision and leadership at the government level combined with "ground up" voluntary management is required." (P.9)

In carrying out a Performance Examination on Monitoring and Reporting the Environment, as part of the 1998 Report on Public Sector Performance, the WA Auditor-General in 1998 stated (p.38):

"Coordination is essential to minimise overlap where responsibility for managing issues such as water quality ... is shared between agencies." .....

"While some agencies feel confident that their legislation provides them with a clear leadership role for an issue, some stakeholders have suggested that timely and effective management has been constrained by overlapping or unclear delineation of responsibilities. Overlapping or unclear leadership makes it difficult to coordinate clear and effective monitoring and reporting."

"....Poor coordination can lead to duplication and gaps in data collection."

"The need for better coordination has been recognised...."
"Nevertheless, one agency expressed the view that....the outputs as required by existing legislation must remain the primary objective of monitoring and reporting."

The Auditor-General concluded:

"Given these complexities and the need for greater coordination, a lead role by the Government is essential." (p. 38)

The report of the Industry Commission (1998) observed that most States have a plethora of agencies with overlapping and contradictory responsibilities and this often leads to ineffective policing of the regulatory regimes that do exist, and stated that:

"There are two aspects to the institutional weaknesses of existing arrangements. One is the limited devolution and capacity of local and regional institutions to deal with environmental problems, given the importance of local dimensions to most of them. The other, is the coordination of responsibilities among agencies with responsibility for natural resources and the environment." (p. 119)

It is the experience of the Legal and Administrative Framework Specialist Review, that it is not catchment management plans *per se* that are the problem but the expectation that the magnitude of what must be achieved in terms of nutrient reductions and other environmental improvements can be delivered by volunteerism. Put simply, it is estimated that more than 70% of the excessive nutrient loads to waterways in south west WA is derived from agricultural sources, yet the severity of the problem is not reflected in management requirements on the agricultural industry.

The Specialist review says:

"The lack of will of Governments and regulatory agencies around Australia to develop, let alone apply to diffuse sources of pollution, the degree of regulation applied to point sources is a major contribution to the lack of achievement of successful catchment management in Australia. It is unlikely that any significant improvement will occur until this institutional attitude, and ultimately barrier to change, is itself changed. In WA there has been an lack of leadership on this issue, particularly at the government agency and political levels.

"These views are supported by others and show that regional and catchment planning generally lacks resources and expertise (at the Government level), States have inappropriate institutional arrangements and as a consequence little coordinating capacity, lines of responsibility have become increasingly blurred and States have become more reliant on Commonwealth resources. Most States have a plethora of agencies with overlapping and contradictory responsibilities and this often leads to ineffective policing of the regulatory regimes that do exist (Industry Commission, 1997)." (p.10).

Recommendation L6

It is recommended that the EPA provides leadership on the issue of control and regulation (if required) of diffuse sources of pollution to establish equity in the management of diffuse and point sources of pollution. In taking such an approach, the EPA should take account of the magnitude of environmental effect on the receiving environment from the various contributing sources and adopt a catchment level, risk-based approach to requiring operators to reduce their nutrient losses to the environment.

Recommendation L7

It is recommended that a comprehensive integrated catchment management plan be developed and implemented as a matter of urgency. At the same time a review should be carried out to recommend a mix of incentives and regulatory measures to lead to full implementation of the catchment management plan.

Recommendation L8

It is recommended that the government addresses the attitudinal and institutional barriers to effective implementation of holistic approaches to environmental management and secures bipartisanpolitical support to ensure that effective natural resource management occurs in a consistent manner over the long-term.

Young and Evans (1997) state the view that there is no doubt that institutional change and introduction of appropriate incentives does make a difference in bringing about land-use changes for better environmental management.

The Industry Commission (1997) outlined a reform package to move towards ecologically sustainable land management. This consisted of three pillars (p. xxii):

a) to recast the regulatory regime to ensure that resource owners and managers take into account the environmental impacts of their decisions. To impose on natural resource owners, managers and users a duty of care for the environment.

b) to create or improve the markets for key natural resources, for example tradeable rights to use resources through mechanisms such as tradeable water entitlements, separating the ownership of trees from the land upon which they are grown, and creating new permit systems for agricultural discharges (including for diffuse source discharges). Such measures would result in a reducing the bias in the financial incentives to clear deep-rooted vegetation and over-use water that currently face farmers.

c) to encourage nature conservation on private land, in particular the protection of biological diversity and natural heritage.

All the above would be accompanied by complementary steps to strengthen the dissemination of environmental knowledge and know-how, and the ground-level institutions concerned with natural resource management. The Industry Commission recognises the need to impose a duty of care for the environment. Institutional reform will also be necessary with an increasing need to separate resource management and regulatory functions in government agencies to promote transparency and accountability.

The Legal and Administrative Framework Specialist Report concluded that:

1. The legal and administrative framework proposed by the EPA sets minimum requirements and remains essential to successful and full implementation of the management strategy. It has no "fatal flaws" and should be made to work.

2. The EPP has been partially successful in meeting its objectives, both environmental and institutional as per the intent of the EPA's recommendations in 1988.

3. The comprehensive integrated catchment management plan as envisaged by the EPA has not been prepared and implemented and this has detrimentally affected the effectiveness of the Peel-Harvey and the success of the EPP and the legal and administrative framework for management as a whole.

4. The Environmental Conditions relating to the EPP and catchment management plan have not been fully met.

5. The legal and administrative framework proposed by the EPA has been partially successful. The concept of the EPP in the management framework, and the objectives above, remain a key to fully successful implementation of the management strategy for the Peel-Harvey and that it should be made to work in the manner envisaged. To do so will necessitate development of the comprehensive catchment management plan (proposed in 1988) and implementation mechanisms (proposed in 1985 and 1988) as a very high priority.

6. The review concluded that there were a number of barriers (real or perceived) that may have contributed to the lack of full implementation of the legal and administrative framework and the total management strategy. The perceived barriers include:

    - lack of a comprehensive catchment management plan;
    - limited understanding of shared co-proponent approach;
    - conflicting management objectives;
    - ignorance of the management framework, in particular the role of the EPP;
    - ongoing challenge to the management target identified by the EPA;
    - misperception of the need for the whole management strategy;
    - perceptions of equity issues;
    - institutional commitment and reliance on "volunteerism"; and
    - resistance to change from current approaches.

7. The review has found that there are some real equity issues relating to:

    - new developments that are required to be assessed under Part IV of the Environmental Protection Act compared with the lack of similar requirements on most rural land uses;

    - the different degree of regulation being applied to point sources compared with minimal requirements on diffuse nutrient sources; and

- the increased amount of regulation being applied to some point sources compared with other point sources, regardless of the relative contribution made by each type of development to the nutrient problems (for example, stricter license requirements on waste water treatment plants than on dairies).

8. Although the EPA's intention in its 1988 assessment was that the catchment management plan should be developed in a co-operative and voluntary manner, the fact that an adequate plan has still not been developed (let alone successfully implemented) suggests that it may now be necessary to adopt a more regulatory approach.

9. The fact that there is no single person or body within government who has been given the responsibility of ensuring that all aspects of the EPA's and Minister's requirements are met is a contributing factor to the incomplete success of the legal and administrative framework for management. Furthermore, the lack of a single point of contact has made it more difficult for all land developers and users to obtain the advice they need on minimum acceptable emnvironmental practices.

10. The failure to develop a comprehensive catchment management plan to protect the environmental quality of the Peel-Harvey Estuary System and the public's investment in the Dawesville Channel is an indicator of the broader problems in both the agricultural and pastoral areas of Western Australia, where short-term agricultural survival is given a higher priority than long-term agricultural and environmental sustainability. There is increasing public and industry concern with the ongoing poor environmental performance of the agricultural sector, and the regulatory inequity in which most industries and the mining sector are tightly regulated while farming is not. This is despite the clear understanding by the community and Government at all levels that broadacre agriculture is the source of Australia's worst environmental problems including salinity, soil acidification, erosion and sedimentation, loss of biodiversity from land clearing and rising water tables and degradation of waterways. Eutrophication originating from agricultural fertilisers is occurring in inland lakes, rivers and waterways, in estuaries (such as Peel-Harvey) and in some cases has affected near-shore marine embayments (Commonwealth of Australia, 1996).

11. In Western Australia the legislation and institutional arrangements are inadequate to deal with multi-faceted management problems at the catchment scale where a combination of "top down" vision and leadership at the government level combined with "ground up" voluntary management is required.

12. There is no evidence that those with decision-making responsibilities have carried out their actions sufficiently to ensure that the environmental objectives of the EPP have been met. This includes the Department of Environmental Protection which has assessment and licensing responsibilities under the Environmental Protection Act.

13. The Environmental Conditions relating to the EPP and catchment management plan should be retained although some amendment to the wording may be appropriate, particularly relating to responsibilities (see 18 below).

14. The EPP should be publicly reviewed immediately following completion of the Compliance Review by the EPA. In particular the EPA should seek input from the community at least on the following:

- the area the EPP should cover (the Peel-Harvey "system");
- the environmental objectives for the system
- indicators of health, sustainability and vigour for various parts of the system.

15. The overview and scientific investigation coordination role taken by the EPA in defining the management solutions to the Peel-Harvey estuary problems has been the most successful approach to integrated catchment management in WA, to date, and ensured an open and

transparent approach to setting the environmental objectives. It would be appropriate for the EPA to once again clearly take on the focus of coordination of integrated research and investigation for catchment scale environmental problems and coordination of long-term monitoring requirements for measuring and demonstrating environmental change. The EPA is already recognised by the public as having the primary role in protection and maintenance of ecosystem processes and in long-term custodial responsibility for the environment.

16. Although the legal and institutional framework for integrated catchment management in Western Australia is the best that could be built using the existing statutory framework, it will continue to be inadequate in the absence of a proper ICM statute. The adopted approach of "change by evolution not revolution" and resistance by some sectors to the development of effective catchment management and natural resource management legislation, has not delivered catchment management over the last 14 years and it is now time for more radical reform, including an effective and progressive catchment management/NRM statute. In addition to other matters, the new statute should establish catchment management authorities and provide them with the power to prepare plans and to raise catchment management rates for development and implementation of the plans. Notwithstanding the minor institutional changes made recent years (eg to Conservation and Land Management, Department of Environmental Protection and the Water and Rivers Commission) associated comprehensive institutional change to the functions and responsibilities of the natural resource management sector in WA will be required. This should involve changes to many of the natural resource agencies, including (*inter alia*) Agriculture WA, the Water and Rivers Commission, the Department of Conservation and Land Management, the Department of Environmental Protection, Ministry for Planning and the associated representative member statutory boards. (Note the Ministry for Planning has now been joined with other agencies to form the Ministry for Planning and Infrastructure. However the term "Ministry for Planning" has been used through this report to identify the Planning Acts part of that Ministry).

17. The management of the Peel-Harvey system has been afforded the greatest degree of legitimacy of any integrated catchment management project in WA to date (see Section 9 of this Report) and some $60 million of taxpayer money has been invested in improving the environmental quality of the estuaries. Such a high investment of public money in an environmental issue requires adequate protection and ongoing investment in the long-term. The Specialist Review of the Legal and Administrative Framework is of the view that if the Government is not willing to address the issues of proper catchment management legislation and agency re-structuring as part of this protection, it does not auger well for salinity mitigation, catchment management and environmental protection in general in WA.

18. To ensure that all elements of the management strategy are implemented, the EPA should be more pro-active and drive the key decision-makers to have implementation occur in accordance with the Conditions and intent of the strategy. Although some of the decision-making rests with parties which are not currently proponents for implementation of the strategy, the framework of the EPP requires that all decision-making for the area occurs in accordance with the environmental objectives of the EPP. Review and education of decision-makers is required to correct the misperception that only parties bound by the Environmental Conditions are responsible for implementing management. A compliance assistance program would be a positive way of achieving this.

The Expert Review Committee is of the view that further education of government agencies as proponents is required so they fully understand that they are obliged to operate according to the same rules as private, non-government proponents.

5.3 EXPERT REVIEW COMMITTEE'S ADVICE ON THE LEGAL AND ADMINISTRATIVE FRAMEWORK FOR MANAGEMENT

The Expert Review Committee endorses the findings of the Specialist Review on Legal and Administrative Framework for management and accepts the advice of that report as well as providing the following advice:

1. The EPA should review current responsibilities for implementation of the EPP, SPP and Environmental Conditions to ensure that all relevant decision-making authorities are clear about their respective responsibilities in implementing the strategy, regardless of whether they are currently identified as proponents and bound by Environmental Conditions. This would address the misperception that decision-makers who are not proponents are somehow not required to implement their decision in accordance with the management strategy including the EPP and SPP.

Recommendation L9

It is recommended that the EPA should review current responsibilities for implementation of the EPP, SPP and Environmental Conditions to ensure that all relevant decision-making authorities are clear about and held accountable for their respective responsibilities in implementing the strategy, regardless of whether they are currently identified as proponents and bound by Environmental Conditions.

2. The EPP review which was commenced in November 1999 should be resumed by the EPA and take account of the findings of this Report and submissions already received. As part of the review the EPA should initiate a public process to develop a clear statement about the environmental quality now being sought for the Peel-Harvey Estuary System as a whole. An approach to this is outlined in Section 13 of this Report.

Recommendation L10

It is recommended that the EPP review which was commenced in November 1999 should be resumed and take account of the findings of this Report and submissions already received. As part of the review a public process should be initiated to develop a clear statement about the environmental quality now being sought for the Peel-Harvey Estuary System as a whole.

3. The management framework proposed and developed from 1985 to gazettal of the EPP in 1992 was innovative at that time and still is the only example in WA where a whole of catchment approach was taken to defining a technical management target involving both local and Statewide communities.

4. The combination of "Top Down" identification of the technical requirements for the environmental quality sought by the public at large, with "Ground Up" development of a catchment management plan to meet the catchment phosphorus reductions required was groundbreaking. This is seen as the key to the success of the strategy as a whole. It is appropriate for experts to identify the environmental constraints of systems and the measures needed to reverse severe environmental degradation. Similarly it is appropriate for the landowner public within catchments to be free to choose from a range of appropriate management options designed to meet minimum acceptable environmental requirements to ensure the overall target is met. This is seen as the most appropriate means of achieving a melding of "Top Down" with "Ground Up" in integrated catchment management and natural resource management in general (This approach is supported by Harris, pers. comm. December 2000).

5. It is important for the planning system to ensure that environmental standards are met. This applies to meeting the phosphorus target for Peel-Harvey as well as to provision and protection of adequate buffers between industries and residential developments to ensure that residents are not subjected to unreasonable odour or noise and amenity is not adversely affected. It is important to protect existing residential areas from the introduction of such developments as well as protecting

existing industries from encroachment by residential development. Preventing development where it will result in a social or environmental problem is the best way where it is too expensive to retro-fit. A combination of precautionary/preventative approach with adaptive environmental assessment and management should facilitate mutual protection for the environment, residences and industry.

Recommendation L11

It is recommended that the planning system take steps to ensure that the required environmental standards are met by adopting a combination of a precautionary/preventative approach with adaptive environmental assessment and management to facilitate mutual protection for the environment, residential development and industry.

6. The Environmental Conditions required that new development and expansions that may increase phosphorus loss to the waterbodies should be referred to the EPA, and also required that decision-making be conservative until such time as the Minister for Environment is satisfied that the management strategy is working adequately to protect the Estuary System. The EPA should revisit this requirement and develop clear guidelines for referral of all changes in land use that have the potential to increase phosphorus and nitrogen inputs from the catchment. This should not apply only to new developments. (see Recommendation L6)

7. The Peel-Harvey Regional Park has not been fully implemented. This was (and still is) the responsibility of the Minister for the Environment.

Recommendation L12

It is recommended that the Peel-Harvey Regional Park be implemented as a matter of priority.

8. Given that some issues have not been managed and that part of the management package has not been implemented, the EPA should put in place a management structure to drive implementation in accordance with the full requirements of the strategy. In discussions the EPA has indicated its intention to retain the members of the Expert Review Committee to assist it by providing ongoing expert advice on catchment management and NRM in general. Clearly, an option is for the EPA to be at the centre of this, supported by the expertise of the Expert Review Committee members.

The implementation of the Peel-Harvey management strategy should be properly "project managed" as happens routinely in the planning and delivery of complex infrastructure projects.

Recommendation L13

It is recommended that the EPA develops and heads up a management structure to "drive" implementation of the whole strategy (see also Recommendations L3 and L4).

9. The approach to planning and land use change in the Peel-Harvey area should be driven by the requirement to have to meet the required environmental performance standards. It is too expensive to retrofit this if decisions are made that are not in accordance with the management strategy. A preferred approach is to aim to get it right at the beginning and from then on then apply minor corrective actions via an adaptive environmental assessment and management approach. (see Recommendation L11)

10. There is a need to provide guidance on the preparation of catchment management plans generally, as well as on authorisation processes. Other than through the EPA's assessment processes (under s16 or s38) there is currently no means of differentiating an acceptable plan from an inadequate plan, be it for the Peel-Harvey or elsewhere. The EPA process also provides the only fully open and transparent public process allowing anyone from within WA and even beyond, to provide input on the environmental management targets of any proposal. This issue is discussed at length in Section 13.2 of this Report.

5.3.1 Introduction of Load-based Licensing to Control Water Pollution from Point Sources

Load-based licensing uses economic incentives and penalties to encourage point-source polluters to reduce their discharges of pollutants and nutrients into the environment.

Although the level of treatment at a wastewater plant (i.e. primary, secondary, tertiary) can be important, the relevant issue is the actual load to the receiving waters and how these are managed within the capacity of those waters to sustain the declared environmental values to be protected. A high level of treatment itself does not guarantee protection of the receiving environment, nor does it necessarily guard against adverse cumulative impacts arising from a proliferation of discharges from a range of sources including agricultural activities.

Ideally load-based licensing schemes:

- provide economic incentives for reducing pollutant emissions;
- are based on the quantity and toxicity of the pollutants emitted;
- are reflective of the costs to the environment and society;
- consider the sensitivity and assimilative capacity of the environment being affected; and
- have some flexibility to allow the trading of discharge permits (licences) across and between sectors and premises.

Most states and territories in Australia have pollution licensing schemes that do not currently meet the model presented above. For example in WA, Part V of the Environmental Protection Act 1986 is applied to impose licence fees for discharges to water based on a flat fee or, in some circumstances, a load-based fee. The load-based fee largely does not reflect the toxicity of the pollutant and the sensitivity or assimilative capacity of the affected environment, and provides a minimal incentive to reduce emissions. Other states' and territories' water pollution control legislation have similar deficiencies.

Importantly, licensing activities undertaken under Part V of the EP Act are required to be consistent with approved policies (Environmental Protection Policies). It is unclear how, or whether, the existing licensing system implemented by the Department of Environmental Protection is consistent with statutory water quality targets identified under the Environmental Protection (Peel-Harvey Estuary) Policy 1992.

A new Load-Based Licensing Scheme is required and should be introduced for the Peel-Harvey system to give effect to the prescribed target nutrient loads to protect the environmental values of the waterway. The new system would need to progressively introduce emission load limits and link licence fees to the total pollutant loads emitted from each licensed premises. The total amount of emissions permitted from all licensed activities should, in time, reflect the prescribed target loads minus emissions from 'uncontrolled' (unregulated) activities.

The purpose of load-based fees is to provide rewards and incentives to polluters to reduce their emissions—the smaller the load, the lower the fee and the benefit of improved performance returns to the emitter, as well as protecting the environment. The fee varies to reflect the quantity and types of pollutants discharged and the sensitivity of the receiving environment.

The tradeability of pollutant discharge credits and debits would be enhanced through the establishment and operation of complementary market-based systems.

Recommendation L14

The ERC recommends that the DEP be required to develop and commence implementation of a load-based licensing system for the Peel-Harvey coastal plain catchment by June 2004, to give effect to target pollutant loads identified under the Environmental Protection (Peel-Harvey Estuary) Policy 1992 (as revised from time to time).

6. WATER QUALITY AND MANAGEMENT TARGETS

6.1 INTRODUCTION

The Specialist Report on Water Quality and Review of Management Targets was asked to examine the following:

a) Catchment

- Evaluate the past sampling strategy as to its suitability to report on nutrient loading targets for the catchment;
- Reallocate the existing targets to the Serpentine River at Dog Hill, the Murray River at Pinjarra and the Harvey River at Clifton Park;
- Report on nutrient loadings from the Serpentine River at Dog Hill, the Murray River at Pinjarra and the Harvey River at Clifton park in the context of the split targets with an assessment of variance; and
- Recommend on future monitoring to audit nutrient loss from catchments including the possibility of very large episodic events from inland catchments.

b) Estuary

- Review median total phosphorus (TP) concentrations in the estuary pre- and post- Dawesville Channel;
- Review *Nodularia* bloom frequency pre and post Dawesville Channel;
- Review estuary and catchment nutrient targets in the context of better-than-expected flushing from the Dawesville Channel using Vollenweider modelling and the Parslow model if possible;
- Explore measures of ecosystem health (vigour, organisation and resilience) for the estuary and streams; and
- Prepare a Specialist report on the findings of the review of Water Quality and Management Targets for inclusion as an appendix to the report of the Peel-Harvey Expert Review Committee to the EPA.

The existing total phosphorus targets for the Peel-Harvey system are shown in Table 3.

Table 3 - Existing targets for annual phosphorus loads (tonnes per year) for the Peel-Harvey system including new scaled targets for gauging stations on the three main rivers.

Application	Target for average conditions (tonnes/yr)	Target for extreme conditions (tonnes/yr)	Source of Target
• *Entire catchment* Peel-Harvey catchment	85 (60 percentile)	165 (90 percentile)	Minister's Environmental Conditions
• *Catchments down to the estuary* Serpentine plus drains	21 (50 percentile)	-	Peel-Harvey EPP
Murray River plus Dandalups	16 (50 percentile)	-	Peel-Harvey EPP
Harvey River plus drains	38 (50 percentile)	-	Peel-Harvey EPP
• *Rivers at gauging stations* Serpentine River - Dog Hill S614030	14 (50 percentile)	44 (90 percentile)	Areal scaling
Murray River at Pinjarra S614065	15 (50 percentile)	36 (90 percentile)	Areal scaling
Harvey River at Clifton Park S613052	27 (50 percentile)	57 (90 percentile)	Birch-Forbes scaling

Source: Appendix 3 of this Report.

6.2 KEY FINDINGS OF THE SPECIALIST REPORT ON WATER QUALITY AND REVIEW OF MANAGEMENT TARGETS

The Specialist report on Water Quality and Review of Management Targets is given in Appendix 3.

In summary, the report's findings are as follows.

Changes in water quality from the Peel-Harvey catchment have been identified as the main measure of performance of improved catchment management efforts and these can be assessed using concentration data and statistical trend analysis, or by assessing streamflow and estimating mass loadings of nutrients.

Streamflow, nutrient concentrations and nutrient mass loadings are all core indicators for streams in the Peel-Harvey system.

Assessment of streamflow is an important part of defining changes in water quality from a catchment because there is a significant increase in the volume and velocity of runoff following clearing. Conversely, there is usually a decrease in flow volume when catchment restoration measures, such as the establishment of filter strips, riparian buffers, catchment revegetation, and constructed wetlands, are established.

Assessing concentrations is important because they can be used statistically to accurately define changes in water quality over time. At the same time, assessing mass loadings is important for bio-stimulants (for example nutrients such as phosphorus) because nutrients are retained and made available in estuaries through a range of biological and physico-chemical processes. The estimation of mass loadings must be based on an appropriate sampling regime. The most reliable estimation of mass loadings results from fixed interval sampling where the cell width is small and matches the event

response of the stream, or flow proportional sampling. Indicators based on nutrient concentrations alone may not detect subtle increases or decreases in mass loading resulting from changes in flow volume.

Nutrient mass loads were established as statutory compliance indicators for the streams of the Peel-Harvey coastal catchment, and the target loadings were based on a probabilistic assessment of inter-annual variability in runoff and mass loadings (Kinhill, 1988; EPA, 1988; Humphries and Robinson, 1995; Deeley et al, 1995).

Environmental monitoring shows that water quality in the Peel-Harvey estuary has improved significantly in terms of nutrient concentrations, chlorophylla and Secchi depths (transparency) since completion of the Dawesville Channel. *Nodularia* blooms have not been observed in the estuary since the Channel was completed, even though there have been two years where streamflow and nutrient delivery to the estuary were above the threshold level that would have been expected to trigger a *Nodularia* bloom prior to the construction of the Dawesville Channel. However, it is still of concern that the management strategy was developed during an extended drier-than-average period and the recent below average rainfall conditions means that performance of the system under wetter conditions has not been measured. It is still not known whether the current pattern of reduced rainfall is a temporary phenomenon or represents a permanent reduction. If it is the latter, then the long-term average can be expected to remain lower which would be likely to benefit estuary management (as a result of reduced flows and nutrient loads). If there is a return to the previously wetter regime, then flows and nutrient loads would significantly increase, and could possibly overwhelm the currently implemented level of management.

To date the improvement in water quality is cause for optimism. The success of the restorative measures in the estuary will only become apparent in future years as the system continues to find a new equilibrium as a result of the altered flushing regime, and after there have been additional years of larger flows and associated delivery of nutrients.

Of increasing concern to the local community are continuing blooms of *Nodularia* and other cyanophytes (blue-green algae) in the lower reaches of the Serpentine River. In recent years, there have also been localised accumulations of macro-algae in the southern portion of the Harvey Estuary. This means that although the system has improved, it is still in a fragile condition and reductions in nutrient loads from the catchment, as required by the Minister's Conditions set in 1989, are still needed.

Monitoring of the three main rivers has shown that there appearsto have been small reductions in nutrient loads for the Serpentine and Harvey Rivers. Although these apparent reductions are encouraging, there is still considerable improvement required before the target nutrient loads are met. Based on monitoring since 1993, the average annual P load in the Serpentine River (measured at Dog Hill gauging station) still requires a 72% reduction and the average annual P load in the Harvey River (measured at Clifton Park gauging station) requires a 21% reduction to meet the total phosphorus (TP) targets.

The Murray River appears to be performing within its target for TP, although being unregulated this river is subject to extreme floods (like February 2000), and a different pattern may well emerge when these data are considered.

Statutory targets for TP runoff should be further divided to include scaled targets for the Serpentine River (at Dog Hill), the Murray River (at Pinjarra) and the Harvey River (at Clifton Park), thus providing a nested series of catchment targets for different scales of application which will better support compliance testing. It would be useful for the nested catchment targets to be incorporated into the Environmental Protection Policy.

Recommendation W1

It is recommended that scaled phosphorus targets for Serpentine River at Dog Hill, the Murray River at Pinjarra, and Harvey River at Clifton Park be used to complement the system-wide targets contained in the Ministerial Conditions. This will provide a nested series of catchment targets for different scales of application to support compliance testing.

The community's growing expectation for continual improvement, and the continuing degraded condition of the lower Serpentine River, mean that current targets for estuarine water quality and catchment runoff should be maintained and reviewed again in 10 years. This would allow for a longer series of flow years on which to base a system-wide performance audit. Additionally it is recommended that other measures of system health for the estuary, rivers, streams, wetlands and the Peel-Harvey catchment be explored. Given the degree of community interest in the Peel-Harvey Estuary System, it is recommended that the EPA should commence extensive public consultation to obtain the community's views on the environmental quality it desires and meaningful measures of system health for the estuaries and the catchment.

Recommendation W2

It is recommended that the current system targets for estuarine water quality and catchment runoff should be maintained and reviewed again in 10 years. This would allow for a longer series of flow years on which to base a system-wide performance audit.

Recommendation W3

It is recommended that other measures of system health for the estuary, rivers, streams, wetlands and the Peel-Harvey catchment be explored. Given the degree of community interest in the Peel-Harvey Estuary System, it is recommended that the EPA should commence extensive public consultation to obtain the community's views on the environmental quality it desires and meaningful measures of system health for the estuaries and the catchment

6.3 EXPERT REVIEW COMMITTEE'S ADVICE ON WATER QUALITY AND MANAGEMENT TARGETS

The Expert Review Committee endorses the findings of the Specialist Review on Water Quality and Management Targets and accepts the advice of that report as well as providing the following advice.

Two key questions asked by estuary experts are "will the new water quality in the estuaries remain?" and "is the management currently in place sufficient to maintain an adequate level of improved water quality over the long-term (perhaps 50 to 100 years)?".

The estuary system appears to be performing at a new level but it is the overall judgement of the ERC that this represents a temporary and unstable condition and that there are considerable risks to the ability of the system (estuaries and catchment) to maintain over the long-term the improvements already seen. There are increasing development and use pressures on the estuary system as a whole. Many kinds of development are still not assessed by the EPA for their environmental effects and do not necessarily receive adequate environmental management. There is disparity and inequity among the environmental management requirements placed on different types of developments.

A more stable condition with a greater degree of resilience (the ability of a system to recover or to bounce back after disturbance) is desirable, as sought by the EPA in its 1988 assessment. The more phosphorus that can be removed from the system, and in particular the more that can be prevented from entering the rivers and drainage system in the catchment, the more management leverage there is to manage the nutrient status of the system overall under differing climatic conditions. The observed behaviour of the system since 1988 covers a drier than average period and we have not yet seen how the management strategy (Dawesville Channel part) behaves in a sequence of average to wet years.

However, we do know that extreme events would still put the system at risk with the current level of management in the catchment. In dry years, streamlines (rivers, streams, drains, wetlands), Lake Goegrup and the estuary all play a significant part in capturing the phosphorus that enters the system at the farm gate. It is predicted that in a sequence of average to wet years, streamlines and Lake Goegrup may well become sources of additional phosphorus in their own right. Table 4 shows estimates of phosphorus export from the catchment in dry, normal and extreme wet years.

Table 4 - Estimates of P export in dry, normal and extreme wet years

Location	Dry Year (t)	% Error	Normal Year (t)	% Error	Extreme (wet) Year (t)	% Error
P Loss at farm gate	500	± 50	1000	± 50	1500	± 80
Streamlines (- or +)	-430	± 50	-830	± 50	+1500	± 80
Lake Goegrup (- or +)	70	± 25	-170	± 30	3000	± 50
Estuary (- or +)	-35	± 25	-70	± 30	-100	± 50
To Ocean	35	± 25	100	± 30	2900	± 50

Note: A minus in the above table indicates phosphorus is stored (sequestered as a P sink)
A plus in the above table indicates that phosphorus is being released (a P source)
Streamlines act as a P sink in normal and dry years but may act as a significant P source in higher flow years

To continue to fail to develop and implement the required level of catchment management now, in effect amounts to accepting that nutrient inputs to the system (in particular phosphorus) will remain high, or increase which will make the system unmanageable in the longer term.

The ERC's judgement is that the probability of occurrence of each of the 3 scenarios below is as follows:

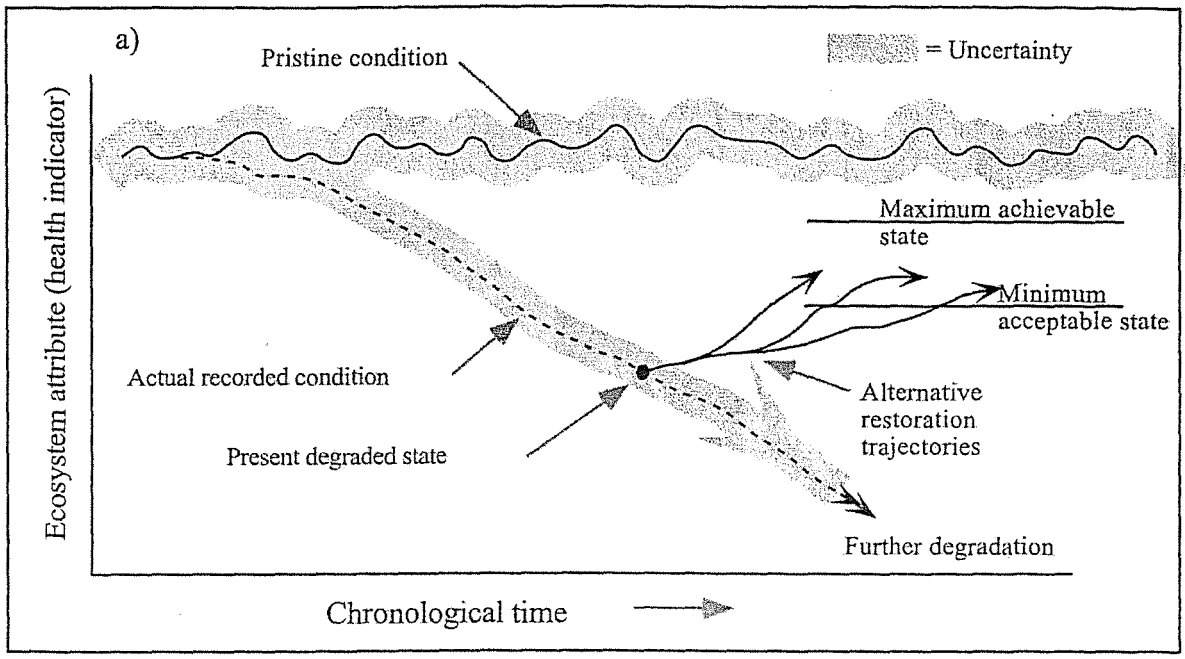
Scenario #1 a 5% likelihood of an improvement in catchment runoff water quality (eg significantly reduced N and P losses)

Scenario #2 a 15% likelihood of maintenance of current runoff water quality (no significant change in N and P losses)

Scenario #3 an 80% likelihood of further deterioration in runoff water quality (significantly increased amounts of nutrients in runoff)

Figure 3 is a conceptual model of trends in ecosystem health (a) a general model for a degraded and restoring ecosystem, and (b) with predicted future trends for the Peel-Harvey system assuming ongoing intensification of agricultural activities and without comprehensive catchment management measures. Table 5 summarises the key characteristics of the 3 management scenarios.

Figure 3 - Conceptual model of trends in ecosystem health (a) a general model for a degraded and restoring ecosystem, and (b) with predicted future trends for the Peel-Harvey system assuming ongoing intensification of agricultural activities and without comprehensive catchment management measures.



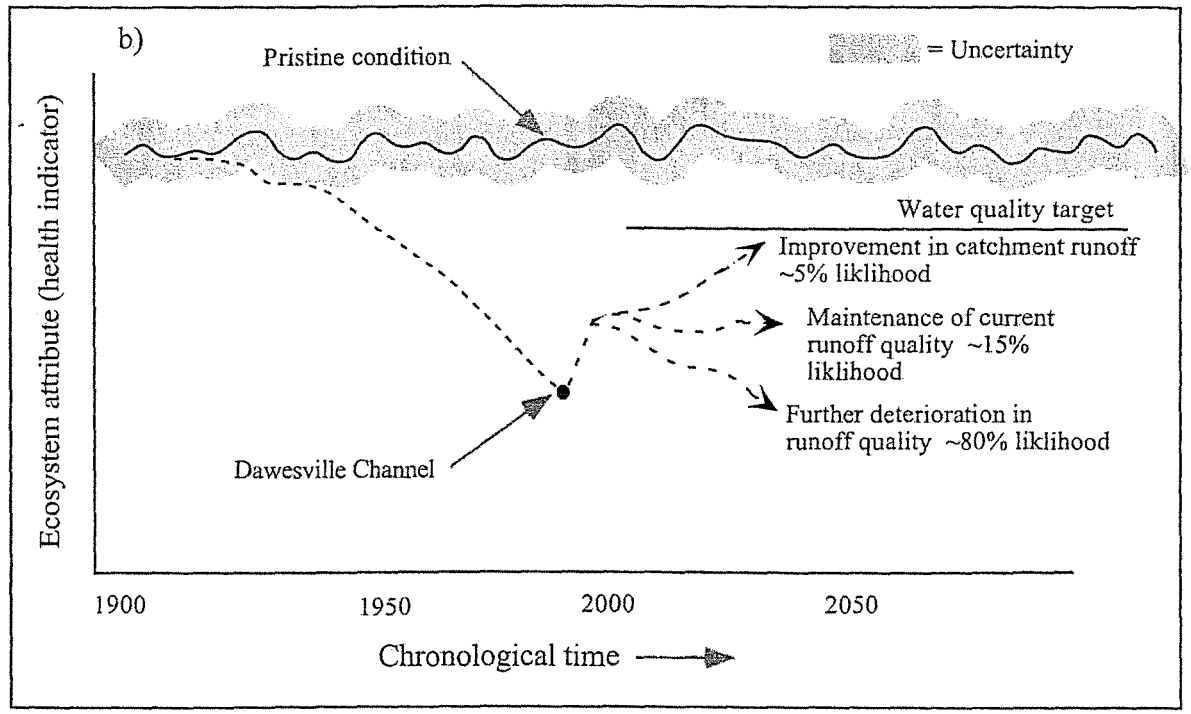


Table 5 - Key characteristics and likelihood of occurrence of the 3 management scenarios.

Key Characteristic	Scenario #1	Scenario #2	Scenario #3
Catchment runoff water quality (nutrients)	Significant improvement (ie significant reduction in nutrients)	Maintenance (ie no significant change in nutrients)	Further deterioration (Significantly increased nutrients)
Likelihood of occurrence	5%	15%	80%
Condition of Peel-Harvey estuaries	Very healthy	Reasonably healthy	Unhealthy
Resilience of the estuaries	High	Little	None
Condition of Serpentine & Lake Goegrup	A little improvement	Severely degraded	Severely degraded

The above table includes the condition of Serpentine River and Lake Goegrup because of the high level of public expectation that the management strategy would deliver improved water quality in the Lower Serpentine River between Peel Inlet and Lake Goegrup as well as within the lake itself. Although this was never the aim of the adopted management approach, the water quality in these areas has declined further, yet public expectation remains. For there to be any arrest in the rate of decline or chance of improvement in the Lower Serpentine, effective catchment management would have to be implemented as a matter of urgency. To be effective, catchment management would need to achieve the levels of phosphorus reduction indicated by the assessment in 1988, or better. Even with fully successful catchment management, Lake Goegrup will remain in poor condition (because of nutrients already stored in it), blooms of *Nodularia* will continue, and the Lake will continue to be at risk of becoming a source of nutrients from release in extreme wet years. A major component of the P problems in Lake Goegrup is from the recycling of P stored within the lake sediments. Lake Goegrup would only be significantly improved by major engineering work to remove P enriched sediments (such as by-passing the Serpentine River around the lake). However, this would increase the risk to the estuary, as at present the Lake acts (mainly) as a sink and removes phosphorus from the system and stores it, thus preventing it from reaching the estuary in drier years.

An engineering option to divert Serpentine River water away from the lake to the ocean was considered in 1988, during the EPA's assessment, as an alternative to the Dawesville Channel, but the cost of this was comparable to that of the Dawseville Channel and it would not have led to any improvements in Harvey Estuary water quality. Furthermore, Lake Goegrup is subject to the JAMBA treaty.

Causal relationships between any water quality change (positive or negative) from any activities in the catchment have not been demonstrated by the proponents. Therefore, in the absence of appropriate monitoring, the causes of water quality decline or improvement from catchment land use changes remain speculative at best.

Catchment management (with adequate monitoring) needs to be tackled now as a matter of priority because:

a) there is a very real risk that the improvements seen so far will be lost and the system will revert to poorer water quality in average to wet years.

b) the new state of the system is judged to be temporary and potentially unstable. There is not yet adequate resilience within the system to guarantee the gains from the Dawesville Channel

and greater resilience would be desirable. This can be achieved if the original catchment reductions required by the EPA are achieved.

c) the public has higher expectations now than in 1988 about what represents a "clean, healthy system". In addition there is now a National Strategy for the Conservation of Australia's Biological Diversity, an agreed National Strategy for Ecologically Sustainable Development, and expectations about continuous improvement in environmental use and management. Implementing the recommended catchment management will be essential if the qualitative target is now for a higher and improved environmental quality, in accordance with these national initiatives.

d) maintenance of biodiversity (i.e. number of species and stable composition of ecosystems over long-term timeframes of 100 - 500 years) is seen as the key performance measure of ecological sustainability and therefore of ecologically sustainable development (ESD) (Lovejoy, 2000; 2001).

6.4 NUTRIENT MANAGEMENT TARGETS (PHOSPHORUS AND NITROGEN)

Although the phosphorus management target proposed by the EPA and reflected in the Environmental Conditions and the Environmental Protection Policy has frequently been under challenge by those with responsibilities for changing land uses in the catchment, this review has found that the community's growing expectation for continual improvement and the continuing degraded condition of the Lower Serpentine River means that current targets for system level (bottom end) estuarine water quality and catchment runoff should be maintained and reviewed in about 10 years. This will allow for a longer series of flow years on which to base an system-wide performance audit. Other measures of system health for the estuaries, rivers, streams, wetlands and the Peel-Harvey catchment should also be explored and developed through a public process. The starting point for identifying or developing these measures should be ecologically sustainable development.

In relation to the nutrient targets, the Review has found that:

1. No review is necessary for bottom-end phosphorus loads for at least 10 years.

2. It may be useful to develop concentration targets for short-term local application to better support estuary and catchment repair. This approach is being used for the Swan-Canning system.

3. Bottom-end target loads for nitrogen should be developed in accordance with the targets set in the EPP.

4. The scope of the EPP should be to set broad requirements with detail to be provided later.

The Expert Review Committee makes the following recommendations in relation to the nutrient targets. Details of the specific monitoring required to enable water quality to be estimated are provided in Recommendation M1 in Section 11 of this Report.

Recommendation W4

It is recommended that the current phosphorus target for estuarine water quality and catchment runoff should be maintained until at least the year 2008 and reviewed in the light of valid monitoring data.

Recommendation W5

It is recommended that bottom-end target loads for nitrogen should be developed in accordance with the targets set in the EPP.

Recommendation W6

It is recommended that a nutrient inventory be prepared to facilitate the identification of nutrient hotspots and the cumulative impacts of more diffuse ones, and to enable a risk-based approach to nutrient reduction to be implemented.

Recommendation W7

It is recommended that an independent system-wide audit of the environmental condition of the estuaries, rivers, streams, wetlands and the Peel-Harvey catchment (including nutrient budget) should be carried out by the EPA prior to any review of the nutrient management targets.

7. CATCHMENT MANAGEMENT

7.1 INTRODUCTION

The Specialist review of Catchment Management was asked to:

1. Verify the statements made in the Progress and Compliance Report (PCR) in relation to the development and implementation of the integrated catchment management plans and to determine what changes have occurred in the catchment since 1989 and what these have achieved in terms of nutrient reduction to the estuary from the catchment;

2. Examine what the proponents have done in terms of developing and implementing the ICM plan to meet the requirements of the Environmental Conditions - specifically that the plan had to be produced to the satisfaction of the EPA and implemented by December 1990; and

3. Prepare a Specialist Report on Catchment Management for inclusion as an appendix to the report of the Peel-Harvey Expert Review Committee to the EPA.

7.2 KEY FINDINGS OF THE SPECIALIST REPORT ON CATCHMENT MANAGEMENT

The Specialist Report on Catchment Management is provided in Appendix 4.

The conclusions of the report are as follows.

"*...the PCR, while providing valuable information on the current status of implementation of measures related to compliance with the Peel-Harvey Stage II ERMP Environmental Conditions (ECs), contains some conclusions which are not supported by available evidence, and that the PCR is rather simplistic in its treatment of a number of issues related to compliance.*

It is considered that the interpretation by the authors of the PCR of a number of the ECs is open to question, as are the actions apparently considered by the proponents to be necessary or sufficient to comply with some of the ECs. The PCR asserts that some ECs have been met because progress has been made towards compliance, or some actions have been taken in relation to those ECs. However, this Specialist Report concludes that, of the ECs considered by the PCR to have been met, many have only partially been met, and it is open to question whether partial compliance meets the intent of the ECs.

This Specialist Report identifies a number of issues which are believed to have negatively impacted on both compliance with the ECs, and the meeting of catchment targets. These include difficulties encountered in accurately measuring catchment parameters relevant to catchment management ECs, such as the level of implementation or adoption of management programs or success of the programs in terms of reduction in water and nutrient loss to the catchment. This complicates the assessment of compliance with ECs.

Another issue identified as impacting compliance with the ECs was dissatisfaction by catchment landholders and managers (including staff of proponent Ministers' Departments) with the process by which the Peel-Harvey Stage II ECs were developed and implemented, which is considered to have lead to lack of commitment to meet the ECs. Lack of funding to or by authorities (including the Stage II Peel-Harvey Ministerial proponents' Departments) for components of the catchment management strategy for the Peel-Harvey also appears to have severely restricted the implementation of programs related to compliance with ECs.

This Specialist Report also concluded that failures occurred within the proponent Ministers' Departments, and within the EPA/DEP (and likely others), including a lack of leadership on compliance with the ECs, consistency in developing and implementing policies, absence and/or diversion of funds for programs and catchment management measures, lack of management commitment to the catchment management strategy, and lack of timely development, implementation and review of policies and plans. These have negatively impacted on compliance with the ECs.

The ECs sought, via legally binding commitments on three Government Ministers, to achieve catchment management objectives mostly through voluntary changes by landholders to landuse practices. However, poor adoption of these changes of practice, and other contributory factors have resulted in poor compliance with the ECs related to catchment management, and have caused catchment nutrient loss targets to not be met. Currently, the proponent Ministers' agencies appear to lack the mechanisms required to achieve adoption of these changes, although there would appear to be no reason why this deficiency could not be corrected, if the will existed.

This Specialist Report also concludes that top-down regulation is likely to be less effective in achieving the overall objectives of the ECs and outcomes acceptable to all stakeholders in the Peel-Harvey catchment than a pragmatic, proponent agency-driven consistent and pro-active mix of regulation, enforcement and voluntary co-operation, backed by financial incentives."

The PCR frequently concludes that because progress has been made towards or some actions have been taken in relation to some of the Conditions, the Conditions have been met and they are no longer required.

Many of the Conditions and commitments which are regarded by the proponents as having been met, are regarded as having been only partly met and even for these it is questionable as to whether the apparent progress towards compliance meets the intent and the requirements of the Conditions.

A number of matters have contributed to the proponents not fully meeting the requirements of the Environmental Conditions and the catchment management targets specified by the EPA and in the Conditions, in particular the required reduction in phosphorus input to the estuary system. These include:

- difficulties in relation to measurement of catchment factors such as the level of implementation or adoption of management programs;
- the effectiveness of the programs in terms of reducing water and nutrient losses from the catchment;
- dissatisfaction with the process by which the Peel-Harvey Stage 2 Conditions were developed and implemented, leading to some lack of co-operation by landholders and managers (including staff of proponent Ministers' Departments);
- lack of funding of or by authorities (including by the proponent Ministers' Departments) of components of the catchment management strategy which has severely restricted the implementation of programs related to compliance with the Conditions;

- a variety of failures within the proponent Ministers' Departments and within the Department of Environmental Protection (and former Environmental Protection Authorities) (and likely others), including a lack of consistency in implementing policies, issues of funding for programs and catchment management measures, lack of appropriate management commitment to the catchment management strategy, and lack of timely development, implementation and reviews of key policies and plans;

- the loss of any champions of and focus for the execution of the management strategy proposed by the EPA, leading to poor setting of priorities, lack of co-ordination and no overall drive or responsibility; and

- the failure over a period in excess of 15 years of multiple parties, including Government, to develop appropriate instruments to underpin implementation of catchment management (see Section 8 of this Report). The need to develop an appropriate mechanism was first identified in the EPA assessment of Peel-Harvey Stage 1 ERMP in 1985 (EPA, 1985) and there is no reason why this deficiency could not be corrected, if the will existed.

The Condition relating to catchment management was a critical aspect of the legal and administrative framework for management, the others being the numerical management targets for phosphorus set in the Conditions (to be brought forward into the Environmental Protection Policy) the Environmental Protection Policy itself, and the use of regulation, under the Environmental Protection Act, Soil and Land Conservation Act, Planning legislation and other Acts to achieve a range of catchment outcomes in both urban and rural areas (see Appendix 2).

It is noted that initiatives such as the MoU on land clearing developed in 1997, have been used as reasons for the lack of progress in Peel-Harvey, and yet they are unrelated initiatives and not relevant to any lack of progress from 1989. The MoU on land clearing was developed in 1997/98 specifically for the agricultural area known as "the wheatbelt" (areas that are vulnerable to salinisation, already severely over-cleared and where the remaining native vegetation is under threat) and was not intended to cover the Peel-Harvey coastal plain catchment. This also applies to the recent approach on deep drainage which is aimed at the salinising areas of the wheatbelt.

In regard to the catchment management planning process, it is agreed that a considerable amount of monitoring data has been collected. However the data are fragmented and it cannot be agreed that these data meet the requirement for being "necessary for the development of an ICM plan for the Peel-Harvey catchment". A catchment plan that meets the requirements of the EPA has not been prepared, and it is apparent that there is still no consensus on many aspects of the technical data relating to catchment management, even after the 13 years that have elapsed since the management strategy first required the ICM plan. Examples include:

- the loss rates of P from various soil types;
- the measures required to achieve target P loss rates;
- actual fertiliser use and changes in use in response to management initiatives;
- P losses from subcatchments;
- revegetation statistics; and
- the impact of vegetation on P losses (including through "streamlining").

Although lack of or reduction in funding for this work was cited as a major reason for limitations on data acquisition, this relates to allocation of priorities within agencies and by Government. Whilst acknowledging the competing demands on governments and agencies for funds, clearly meeting minimum legal requirements should be a high priority in any organisation and should be reflected in agency Business Plans and Key Performance Indicators (KPI's).

Recommendation C1

Key proponent and management agencies should be required to meet at least the minimum legal requirements of catchment management. This should be made a high organisational priority and

reflected in performance agreements with Ministers, in agency Business Plans and in Key Performance Indicators (KPI's).

In addition, the proponents did not regard monitoring effluent from point sources as being their responsibility (the Condition required monitoring off-site to enable estimation of cumulative discharges from known point sources).

Recommendation C2

It is recommended that the proponents ensure that sufficient offsite monitoring is carried out to enable the proponents to be able to estimate cumulative discharges from known point sources.

The Condition on the moratorium on clearing and drainage has been contentious, with perceptions of inequity issues between urban and rural drainage and clearing. The impact of clearing and drainage on biodiversity and salinity in the Peel-Harvey catchment also needs to be addressed alongside the nutrient aspects. There appear to be some ambiguity relating to the ability to use the Soil and Land Conservation Act versus planning legislation to control clearing in urban areas. This needs to be clarified.

Recommendation C3

It is recommended that the effects of clearing and drainage on biodiversity and salinisation of land be addressed as well as the effects of nutrients. The relationships between the various legislative instruments in regard to clearing and drainage, nutrients, biodiversity and salinity should be clarified.

The PCR provides no conclusive evidence that land use change is currently being accurately recorded, and some 12 years after the Conditions were set, base land use data maps are only now under development. Thus any changes in land use, and the impacts or benefits of such changes that might have occurred cannot be quantified. This is unfortunate as land use change critically underpins a number of aspects of the catchment management requirements.

Recommendation C4

It is recommended that the following maps be prepared and submitted to the Environmental Protection Authority by 30 November 2003:

- *a basemap of land use in the coastal catchment in 1989 be compiled from Landsat and other remote sensed and historic data;*
- *maps of land use in the coastal catchment in 1994 and 1999 be compiled from Landsat and other remote sensed and historic data; and*
- *maps showing land use change from the date of the EPA's 1988 report on Peel-Harvey.*

An important aspect of catchment management is determining measures of catchment health and assessing success of strategies implemented. Although some indicators have been established, clear indicators have not been developed for assessing the success of catchment management measures and appropriate associated monitoring has not occurred.

Recommendation C5

It is recommended that EPA runs a process to develop clear indicators of catchment health for assessing the success of catchment management measures and appropriate associated monitoring be implemented (see section 11).

It is apparent that concerns over social equity and issues relating to management of the Peel-Harvey were present at the time the 1994 section 46 request was made and are still being expressed. However,

no objective evidence was obtained during this review to support the concerns raised and there is no evidence that all (or a majority of) stakeholders support the views expressed.

Although the PCR implies that the catchment program, in its present form, is meeting the targets, and that the Environmental Conditions have in large part been met, this for the most part cannot be verified by the information made available.

While the task of developing a catchment management plan was difficult enough, it was made more difficult by the ongoing challenge to the management targets specified by the EPA and accepted by Government. The targets were developed following over 10 years of research and the proponent agencies and the community were involved throughout. The EPA targets were technically robust at the time and this has been further verified during this review by the findings of the Specialist Report on Water Quality and Review of Management Targets. The targets were set in Environmental Conditions which were agreed to by the proponents and once set can only be changed through an open, transparent, public process using s46 of the EP Act.

What was required was for the key agencies, including proponent agencies, to provide leadership to the rural community, by supporting the management targets accepted by the Government and to foster a more precautionary and responsible approach to environmental protection.

Practical experience in Australia and elsewhere has pointed to the many difficulties of top down regulation in addressing complex landuse problems in farming communities, because of various social, economic, educational, political and other issues. In the Peel-Harvey catchment, it would therefore seem prudent to explore a pragmatic mix of voluntary co-operation, regulation and enforcement in terms of take up of management options. This should include a much more pro-active approach from the proponent agencies, to more strongly encourage adoption of changed land management practices, backed by financial incentives to achieve outcomes acceptable to all stakeholders, not just those within the Peel-Harvey coastal catchment.

Recommendation C6

It is recommended that a pragmatic mix of voluntary co-operation, regulation and enforcement be explored to ensure that environmentally acceptable management options are used in the catchment. This should include a much more pro-active approach from the proponent agencies, to more strongly encourage adoption of changed land management practices, backed by appropriate incentives/disincentives to achieve outcomes acceptable to all stakeholders, not just those within the Peel-Harvey coastal catchment (see Section 12 and Appendix 2 of this Report).

7.2.1 Recommendations of the Specialist Report on Catchment Management to the Expert Review Committee

The Specialist Report on Catchment management made the following recommendations to the Expert Review Committee. These recommendations are all fully endorsed by the Expert Review Committee.

a) General Recommendations

1. *"The desired environmental outcomes and targets of the Peel-Harvey catchment strategy should be re-endorsed by the EPA, and involve extensive community consultation.*

2. *The current catchment ECs should be reviewed and/or redefined to ensure that all commitments are practicable, achievable and are likely to deliver the desired outcome.*

3. *The catchment ECs should be audited against the mix of enforcement mechanisms currently available to the proponent agencies, and, if necessary, either the ECs should be modified, or appropriate mechanisms should be created or strengthened within the agencies.*

4. *The roles and mix of landuse regulatory and voluntary measures currently in place in the catchment should be re-assessed and redefined with a view to developing or reconfirming a mix which will achieve compliance with the ECs, and the desired environmental outcomes.*

5. *Government agency funding for Peel-Harvey catchment management should be reassessed and re-prioritized."*

Specific Recommendations

1. *"A full, integrated and practicable catchment management plan (Integrated Catchment Management Plan, ICMP) should be developed and implemented, incorporating all measures and mechanisms required to achieve the specified catchment nutrient loss and other targets, and the desired environmental outcomes of the Peel Harvey Strategy.*

2. *A single point of leadership, authority and coordination should be established within one agency and charged with the development and implementation of measures incorporated into the ICMP, which will, as best as currently can be determined, achieve the desired environmental outcomes of the Peel Harvey Strategy.*

3. *Minimum acceptable Management practices (MAMP's) for all catchment land uses and an effective catchment education program related to the MAMP's should be developed, endorsed by the EPA, and implemented by the Peel Harvey strategy proponents and other relevant agencies.*

4. *An effective and enforceable system should be developed within the catchment for identification and regulation (via assessment and licensing) of land uses which have been demonstrated to have high nutrient loss potential (such as intensive horticulture and point source emissions).*

5. *Mandatory farm and other land use planning requirements, involving use of BMPs, should be introduced catchment wide. Plans should be developed by each landholder or manager, and approved and audited annually by relevant agencies. The approvals process for these plans would not specify allowable land uses (with the exception of those with high demonstrated nutrient loss potential) but would nominate nutrient loss and other environmental targets which must be achieved.*

6. *Specific catchment and sub-catchment nutrient export targets should be defined, and effective monitoring systems should be developed for these catchments to enable the success of catchment management to be measured.*

7. *A nutrient emissions/discharge trading system should be developed, such that allowable land uses (with the exception of those with high, demonstrated nutrient loss potential) would not be specified if sub-catchment and catchment targets could be shown to be met.*

8. *A strict system should be developed to effectively deal with enforcement of and non-compliance with planning requirements, approvals, farm plans and BMP measures.*

9. *A suitable sub-catchment within the Peel-Harvey catchment should be identified and used as a demonstration of environmentally acceptable and economically viable and sustainable land use. This pilot catchment would be used to demonstrate and build landholder confidence in and understanding of appropriate fertilizer use, alternative land uses, soil amendment technology, zero discharge intensive animal industries, drainage retention basins and landcare initiatives such as streamlining and re-vegetation. Biological and economic yields would need to be measured, in conjunction with nutrient losses."*

7.3 EXPERT REVIEW COMMITTEE'S ADVICE ON CATCHMENT MANAGEMENT

The Conditions imposed a legally binding requirement on the proponents to develop and implement a comprehensive integrated catchment management plan to bring about changes in land use practices in the catchment. This plan has not yet been developed or implemented and the Condition has not been met.

Although the contents and approach to doing so were not specified in detail by the EPA, the requirement that an effective plan be developed and implemented (by 31 December 1990) was binding on the proponents and reflected a Government decision. The interpretation that this had to occur through voluntary land use practice changes was an interpretation made by the proponents. In terms of the degree of environmental protection required, both in terms of phosphorus reduction for management and to protect Government's (the community's) investment in the Dawesville Channel, any approach ranging from fully voluntary to fully regulatory that would lead to the required reductions would have been a reasonable expectation and acceptable to the EPA.

Although economic constraints are commonly raised as an excuse for why farmers do not meet even basic environmental protection requirements or duty of care obligations, this is still not an acceptable excuse for inaction, either by the farming community or by agricultural departments. The fact that the current economic and political support for farming also supports lack of environmentally appropriate land management is also not acceptable. Currently the real economics of farming is not costed, as the full cost of environmental protection is not factored in. However, the current economics of farming is not good, even before environmental costs are included.

If farmers are to operate in accordance with the State Sustainability Strategy, then activities that are not sustainable when properly costed to fully include environmental protection costs, should be encouraged either to change significantly, or to cease.

The view of the Specialist report on Catchment Management was that top down regulation is likely to be less effective in achieving the overall objectives of the Environmental Condition than a proponent agency-driven pragmatic, consistent and pro-active mix of regulation, enforcement and voluntary co-operation, by landholders, backed by financial incentives, to achieve outcomes acceptable to all stakeholders in the Peel-Harvey. The emphasis on "agency-driven" is important, as that has been lacking to date. However, it should be remembered that the actual reduction in phosphorus required is a technically defensible, robust figure. This is a "top down" fact. It should also be remembered that "all stakeholders in the Peel-Harvey" does not only mean people living in rural areas of the coastal catchment, but includes urban areas and anyone in Perth or elsewhere in WA (or indeed in Australia) who has an interest in the Peel-Harvey system. As the estuaries are recognised internationally as a Ramsar wetland, it is also legitimate for international interests to receive some consideration.

The Environmental Conditions made the three proponent Ministers equally responsible for ensuring that the requirements of all the Environmental Conditions are implemented. Proponents are consulted during the Condition setting process and also have the right to appeal against the proposed Conditions. Thus it is curious that having agreed with and accepted the Conditions, the Conditions themselves have frequently been used as the reason for non-compliance - the reason being given is that it was not within the power of the proponents to deliver on the Condition, because the responsibility rests with another Government agency. Given that the Government made the three Ministers co-proponents on behalf of the whole of Government, it was incumbent on the proponent agencies to use their best endeavours, including resorting to Cabinet, to ensure that their legal obligations were fulfilled. Alternatively, the proponents could at any time have used the section 46 process under the Environmental Protection Act, and pursued it to completion, to achieve appropriate amendments to the Environmental Conditions that would not compromise sound management of the Peel-Harvey System. A whole of government approach to implementation is needed.

It is recognised that any catchment management plan would be unlikely to be a "plan" in the conventional sense but needs to be flexible and dynamic. An earlier attempt at preparing a plan in 1994, as well as being late, was not completed (the Condition required the plan to be prepared and implemented by 31 december 1990, thus allowing two years from when the Conditions were set). In addition, the EPA of the day released a public discussion paper to seek public comment on a request by the proponents to review some of the Peel-Harvey Environmental Conditions (EPA, 1994) but this process was not pursued to completion. As a result, closure between the proponents and the EPA on what constituted an appropriate plan to meet the catchment management Condition was never obtained. This is unfortunate, as the lack of closure on this matter appears to have been used as an ongoing point of contention between agencies, and has been deemed by some proponent agency officers as demonstrating Government's lack of commitment and consistency in regard to the Peel-Harvey catchment management aspect of the overall management strategy.

Although this may be regarded as a failure of the government "system", it is nonetheless the responsibility of all proponents to be pro-active in regard to requirements placed on proposals that have undergone environmental impact assessment, particularly where legal Environmental Conditions have been set. Notwithstanding the apparent systemic failure, the legal requirement for the proponents to meet the Environmental Conditions in accordance with the guidance laid out by the EPA in its assessment report remained (EPA, 1988).

The fact that the rural community was not directly involved during the Condition setting process has resulted in perceptions of lack of community ownership of the need for catchment management. Although this perception among some is apparent, it is surprising, given the extensive community consultation that was carried out over the 10 years of research into management of the estuaries and the soil testing and fertiliser management program.

Furthermore, it demonstrates a lack of understanding of the Condition setting process. Condition setting does not include input from the community beyond that required by public review during the environmental impact assessment process itself. Consultation on the Conditions is a matter only for the proponents and the Minister for the Environment, who consults with other Ministers and Decision-making Authorities as appropriate. In the case of Peel-Harvey, the Conditions reflected commitments already made by the proponent Departments which were already in the public domain in the Stage 2 ERMP. In the case of the catchment, two key commitments put forward by the Department of Agriculture included:

"*The Department of Agriculture will coordinate the preparation and implementation of a detailed catchment management plan aimed at reducing phosphorus losses to the estuary to less than 85 t/a in a 60 percentile year with minimal economic or social disruption to the catchment community.*" (EPA, 1988, p.94) and

"*The Department of Agriculture will implement a moratorium on further clearing and drainage in the catchment, pending determination of the success of the catchment management plan in reducing phosphorus losses from existing cleared land.*" (EPA, 1988, p. 94).

In regard to the management commitments made by the proponents, the EPA assessment report states:

"*The following list has been amended by the EPA and accepted by the proponents to reflect the "whole of government" approach which is essential for management of this proposal.*" (EPA, 1988, p.93).

All the Environmental Conditions were discussed with and accepted by the relevant Ministers and their agencies in the normal Condition-setting process. The EPA's process is open and transparent and the EPA's recommendations, upon which the Environmental Conditions are formulated, appear in the assessment report, any aspect of which can be appealed by any person. It should be noted that no member of the public appealed on any of the recommendations made in the EPA's report.

The ERC notes that an earlier proposal for a s46 change to conditions (not completed) stated:

"*Many aspects of the current catchment program go beyond the intent of the Conditions. While phosphate load reduction remains the core of the program, its operations have broadened significantly and are now directed towards the attainment of sustainable land-use throughout the catchment.*" (Proponent's document)

Although this more general focus on sustainable agriculture is laudable, it cannot be supported as a substitute for the requirement to significantly reduce phosphate loss to the estuary system.

The Expert Review Committee's advice on catchment management is as follows:

1. The Expert Review Committee endorses all of the recommendations made in the Specialist Report on Catchment Management.

2. Management emphasis for the "System" and the catchment management plan should still be on the coastal catchment rather than the whole catchment, although a duty of care to prevent on-site and off-site pollution should apply everywhere.

3. The EPA should develop generic catchment management guidelines which should be applied to all catchment management and rural activities in Western Australia. The EPA in discussions has indicated that it will be driving development of the catchment management plan in Peel-Harvey to provide a model that can be used for other catchments.

4. In addition to the generic requirements of catchment management, the Peel-Harvey and Coastal Plain catchment require particular attention - Peel-Harvey catchment management requires that particular care be given to the minimisation of "emissions" (any losses from land that can harm the environment). The emphasis should be on a rational risk-based approach and on the nature of the impacts on the receiving environment. In the case of Peel-Harvey Coastal catchment, the target P requirements have been set and must be met.

5. The environmental costs associated with farming in the catchment should be fully costed as part of the value of the commodities being produced from the area.

6. It is acknowledged that urban development will probably become dominant in this catchment over time and as such it would be wise to carry out some modelling of what the implications of this would be for estuary water quality. We know from the Perth metropolitan area that loss of nutrients from "best practice" urban development is about half what they are from conventional agriculture (when normalised per unit area). Key issues requiring consideration from increasing urbanisation are:

    - water balance (increased flows off urban areas);
    - site selection (land suitability);

- much of the remaining land in the Peel-Harvey catchment includes palus plains which readily becomes waterlogged in winter, thus storing water in the catchment and leading to rapid losses of nutrients to downstream waterbodies and estuaries;
- the palus plain problem is worse south of Perth because of lower relief, heavier soils and waterlogging; and
- "best practice" urban development (Water Sensitive Urban Design).

A mechanism for dealing with urbanisation and the attendant hydrological changes and management of the new "urban" hydrological regime with consideration of hydrological buffering may need to be incorporated into the revised EPP.

7. It is important for all agencies (including planning) to be bound into the Peel-Harvey management system. The Environmental Conditions and the EPP provide the essential framework to prevent anyone from carrying out any activity in the catchment that would not meet the P reduction objectives. This issue is covered in Sections 5 and 7.4 of this Report.

8. It is clear that both the community as well as agencies require assistance with understanding and delivering on compliance in regard the EPA requirements, the Environmental Conditions associated with the project and the requirements of the Environmental Protection Policy for Peel-Harvey. Compliance is not an optional activity, but one that is legally required, leading to penalties such as fines for non-compliance. It would be useful to develop a "Compliance Package" similar to the Tax Pack, to assist proponents in meeting the legal requirements and obligations upon them.

The Expert Review Committee makes the following additional recommendation in regard to Catchment Management:

Recommendation C7

It is recommended that The EPA endorses the advice on Catchment Management in 1 -8 above.

8. THE DAWESVILLE CHANNEL - CONSTRUCTION, OPERATION AND ENVIRONMENTAL EFFECTS

8.1 INTRODUCTION

The Channel was opened in April 1994 and was constructed to achieve three outcomes (EPA, 1988), namely:

a) to increase tidal flushing thereby enhancing nutrient transport from the estuary system in winter and improving marine exchange in the summer;

b) to alter the salinity regime within the estuary system to prevent (or reduce) the germination of *Nodularia* spores which occurs at salinities less than 15 parts per thousand (ppt) (marine water is 35 ppt). *Nodularia* growth is poor at salinities greater than 30 ppt, so increasing salinity would reduce growth even if germination was to occur; and

c) to improve the oxygenation of the sediment surface, and thus prevent de-oxygenation and its consequent re-release of phosphorus from the sediments into the water column.

Attempting to reverse the problems in the estuaries amounts to a field scale trial. This could be justified in terms of the expected improvements, but in such instances the trial always constitutes a very good opportunity to monitor what occurs, both positive and negative. It is also useful if field scale trials of this magnitude lead to results that are transferable to other similar areas (ASTEC, 1997-98).

The ERMP and EPA assessment predicted that there would be profound changes to the physical, chemical and biological aspects of the system over the short and long term and also that some negative impacts would result (for example, increased mosquito nuisance). A 5-year monitoring program was approved by the State government, aimed at being able to assess the overall success of the management strategy, to determine how well the Dawesville Channel was performing in meeting the purpose for which it was designed, and to ensure that positive and negative impacts associated with the Dawesville Channel were properly understood and managed. The monitoring program was not fully comprehensive but was targeted specifically to be able to determine whether the strategy was working or not.

A Technical Review Report on the monitoring program and performance of the Dawesville Channel has been prepared by DA Lord & Associates (Lord et al, 1998). This report addresses the predicted effects of the Dawesville Channel and also looks at the effects that have resulted from the opening of the Channel. The Technical Review Report approach involved analysing the results from the 32 monitoring projects associated with the Dawesville Channel Monitoring program and carrying out an interpretation and summary of the results. Particular emphasis was given to trend analysis (comparisons with pre-Channel conditions) and the health of the Channel was also assessed in terms of the environmental health of the Peel-Harvey Estuary System (Lord et al, 1998). The review drew on 2 years of data but made reference to later years where this was possible and appropriate.

The following sections summarise the findings of Lord et al (1998) and the limitations of the Technical Review carried out by Lord et al (1998) are shown in Table 6.

Table 6 - Limitations of the technical review of Dawesville Channel performance (Lord et al, 1998)

Element of monitoring	Comment
Data from post-channel monitoring	covers two years of below-average rainfall (1994 and 1995) and 1 year of average rainfall (1996)
Performance of channel	not yet measured in an above average rainfall year
Influence of channel on fringing vegetation	Assessment compromised as a result of lack of baseline data. Effects may take many years to develop
Influence of channel on riverine phytoplankton	Assessment compromised as a result of lack of baseline data
Influence of channel on water birds	Assessment compromised as a result of lack of baseline data
Influence of channel on fisheries	Assessment affected to some extent as a result of inadequate baseline data
Influence of channel on mosquitoes and arbo-virus ecology	Assessment affected to some extent as a result of inadequate baseline data
Impacts of channel on estuarine sediments	Impacts could not be determined because of lack of post-Dawesville Channel data
Impacts of channel on benthic invertebrates	Impacts could not be determined because of lack of post-Dawesville Channel data

Table 7 provides a full summary of the changes predicted by the EPA in its assessment (EPA, 1988) and pre- and post Dawesville Channel condition. This analysis amounts to additional, independent, expert verification of the validity of the management strategy and the accuracy of the EPA predictions. Section 11 of this Report discusses the revised monitoring requirements arising from this review.

The predicted effects of the Channel were:

a) increased astronomic tidal fluctuations (from 15% to 50% of oceanic tide);

b) a less variable and more marine salinity regime (salinities of around 35 ppt except during periods of river flow in winter) which would reduce or prevent the germination of *Nodularia*;

c) shorter and less frequent periods of low oxygen levels in estuarine waters;

d) increased water clarity and lower concentrations of nutrients, particularly in Harvey Estuary;

e) short-term increase in macro-algae, but less macro-algal growth in the long-term;

f) a more favourable environment for estuarine biota - because of reduced variability in the condition of the estuaries;

g) less favourable conditions for occurrence of and use by some waterbirds; and

h) increased mosquito populations resulting from an increased frequency of inundation of mosquito breeding areas.

Impacts on the human community were expected to be largely positive but the probability of increased mosquito nuisance and attendant risk of Ross River Virus was predicted. This has been exacerbated further by the increased human settlement and population growth in the Mandurah region during the period since 1988.

Table 7 - Summary of Changes Predicted by the EPA in its 1988 Assessment with Pre- and Post-Dawesville Channel Condition (Adapted from Table 6 of EPA, 1988) (source Lord et al, 1998)

FACTOR	PRIOR TO OPENING THE DAWESVILLE CHANNEL	PREDICTED EFFECTS OF THE DAWESVILLE CHANNEL	CONDITIONS OBSERVED AFTER THE OPENING THE DAWESVILLE CHANNEL
Tides			
Daily tidal range	Peel Inlet 17% of ocean tide Harvey Estuary 15% of ocean tide	Peel Inlet 45–50% of ocean tide Harvey Estuary 60–70% of ocean tide	Peel Inlet 48% of ocean tide; Harvey Estuary 55% of ocean tide.
Duration of tidal inundation/exposure		Decreased	As predicted
Frequency of tidal inundation/exposure		Increased	As predicted
Flooding			
Flood levels	Predominantly driven by river inflow	Small increase in area flooded by daily or storm surge tides on the east side of the estuary. Other estuarine shorelines too steep.	As predicted
Decrease in flood levels	Average water level decrease of 0.4 m in 10 days	Average water level decrease of 0.4 in 3 days.	As predicted
Hydraulic Characteristics			
Average residence time	Peel Inlet: 30 days Harvey Estuary: 50 days	Peel Inlet: 10 days Harvey Estuary: 17 days	As predicted
Water exchange per tidal cycle	Mandurah Channel: 5.5 x 10^6 m^3 Grey Channel: 3.5 x 10^6 m^3	Mandurah Channel: 6.3 x 10^6 m^3 Grey Channel: 6.4 x 10^6 m^3 Dawesville Channel: 16.5 x 10^6 m^3	As predicted
Stratification	Stratified conditions prevailed in most of winter and early spring	Period of stratified conditions reduced by about 2 months. However, stratification expected to be more intense.	As predicted.
Sediment Characteristics			
Estuarine sediments	Total phosphorus in surface sediments more than doubled in the last 100 years. A high proportion of total phosphorus was non-apatite phosphorus, and readily released for plant growth under anoxic conditions	Gradual depletion of non-apatite phosphorus stores in sediment. Reduced periods of anoxia and therefore less release of phosphorus from sediments to the water column	No post-Channel data available as yet.
Riverine sediment	Phosphorus concentrations quite variable	No predictions made.	Draft report completed
Nearshore Marine Areas			
Nearshore sediment transport	Longshore sediment transport from south to north of about 60,000 cubic metres per year.	Disruption of sediment transport processes by Channel breakwaters. Sand bypassing needed.	Significant realignment of shoreline south of Channel. Sand bypassing undertaken as required..
Channel stability	Not applicable	Channel configuration unstable. Formation of flood tide shoal in Harvey Estuary expected.	Minor sediment level changes within the Channel. Flood tide shoal formed in Harvey Estuary

FACTOR	PRIOR TO OPENING THE DAWESVILLE CHANNEL	PREDICTED EFFECTS OF THE DAWESVILLE CHANNEL	CONDITIONS OBSERVED AFTER THE OPENING THE DAWESVILLE CHANNEL
Nearshore water quality	Low nutrient levels, and high turbidity	Jet plume from Channel up to 1 km offshore during ebb tides in winter (when rivers are flowing): estuary waters should be rapidly dispersed and diluted.	Plume moved north in winter, was confined to less than 2 km offshore and 3 km north of Channel. Rapid dispersion of plume occurred.
Nearshore benthic habitats	Patches of reef, interspersed with bare sand. Diverse macroalgal communities on reef in spring summer and autumn, but communities 'scoured' off reef surfaces during winter storms	Little change expected due to rapid dispersion of plume during winter, and fact that macroalgal communities are 'scoured' off reef surfaces during winter storms	As predicted. Freshwater discharge had almost ceased by time of algal recruitment to reefs in spring.
Water Quality			
Salinity	Extreme salinity regime, especially in Harvey Estuary, from essentially freshwater in winter to hypersaline by late summer.	Marine salinities to prevail for most of the year, but strong stratification expected during months of river runoff. Hypersalinity to end. Stratification in lower reaches of Murray and Serpentine Rivers	As predicted, except hypersaline conditions (although less extreme) still occurred.
Dissolved oxygen	Frequent periods of deoxygenation in spring and sometimes summer, especially in Harvey Estuary	Reduced frequency and duration of periods of deoxygenation in estuary. Deoxygenation still likely in lower reaches of Murray and Serpentine Rivers.	As predicted.
Turbidity	Turbidity high in winter due to runoff, and high in spring/early summer due to *Nodularia* blooms, particularly in Harvey Estuary. Higher levels of wind stirring of fine sediments in Harvey Estuary.	Reduction in turbidity due to absence of *Nodularia* blooms and more rapid loss of river runoff. Progressive improvement in Harvey Estuary due to loss of suspended fine sediments to ocean.	Reduced turbidity in spring due to absence of *Nodularia* blooms and more rapid loss of river runoff. Turbidity in Harvey Inlet still high in summer due to resuspension of sediments.
Nutrients	High nutrient levels associated with winter runoff, and with nutrient release from sediments during periods of anoxia. Overall nutrient levels in Harvey Estuary higher than in Peel Inlet.	Little impact on high nutrient levels associated with winter runoff, but a more rapid return to low nutrient levels due to increased oceanic exchange and less sediment nutrient release.	As predicted. Little difference in nutrient levels between Harvey Estuary and Peel Inlet.
Groundwater in vicinity of Channel	Thin lenses of fresh water overlying brackish groundwater.	Decrease in groundwater levels and increase in groundwater salinity accompanying dewatering during Channel construction	Groundwater levels recovered rapidly following dewatering; however, groundwater salinities remained elevated. Groundwater monitoring ceased in May 1995
Chlorophyll a	Minor peaks associated with winter diatom blooms, and extremely high levels associated with *Nodularia* blooms in late spring/early summer, especially in Harvey Estuary.	Decrease in size of winter diatom blooms, and absence of *Nodularia* blooms. *Nodularia* blooms to continue in lower reaches of rivers.	As predicted. Harvey Estuary and Peel Inlet virtually indistinguishable. High chlorophyll a levels in lower reaches of Murray and Serpentine Rivers due to both *Nodularia* and dinoflagellate blooms.
Estuarine Flora			
Phytoplankton	Community dominated by a few euryhaline species, and *Nodularia*. See also chlorophyll a levels above.	Increased species diversity, and more marine species prevalent. See also chlorophyll a levels above.	As predicted.
Macroalgae	Large accumulations of macroalgae in Peel Inlet, dominated by a few species of opportunistic green algae.	Increased growth of macroalgae in the short term, and the occurrence of macroalgae in deeper waters and in southern Harvey Estuary, due to better water clarity. Declining levels of macroalgae in	Macroalgal levels in Peel Inlet appeared to decline, but some accumulation occurred in southern Harvey Estuary (although of far lesser magnitude than in Peel Inlet).

FACTOR	PRIOR TO OPENING THE DAWESVILLE CHANNEL	PREDICTED EFFECTS OF THE DAWESVILLE CHANNEL	CONDITIONS OBSERVED AFTER THE OPENING THE DAWESVILLE CHANNEL
		the long term, with red and brown algae more dominant.	The dominance of green algae over red and brown algae was less.
Seagrasses	Ephemeral patches of seagrass in Peel Inlet. The main species (*Halophila ovalis*) has a relatively high tolerance to low salinities and high turbidity.	The more marine salinities and improved water clarity should result in the growth and expansion of areas of *Halophila*, and less tolerant species may establish near the Channel entrance	*Halophila* extended into deeper waters in Peel Inlet and further into Harvey Estuary. Small patches of less tolerant species established near the Channel entrance.
Fringing vegetation	Large expanses of fringing saltmarsh, dominated by *Sarcocornia* species in the lower marsh, and *Halosarcia* species or *Juncus* in the higher marsh	Altered tidal regime will result in the expanse of areas of *Sarcocornia* marsh to higher ground, the retreat of *Halosarcia* species, and an increase in extent of *Juncus*. Less extreme salinity regime will cause changes in community composition.	Too early to discern changes: fringing communities will take several years to respond
Estuarine Fauna			
Zooplankton	Community dominated by a few euryhaline species	Increased species diversity, and more marine species prevalent.	No data available
Benthic invertebrates	Classic symptoms of eutrophication. Community dominated by high numbers of a few euryhaline species that are short lived, fast growing, and extremely fecund.	Increased species diversity, and more marine species present. Greater numbers of larger, longer-lived species (due to less eutrophic conditions).	Data still being processed, but numbers of some short-lived species appeared to decline, and a few larger, longer-lived species were found.
Fish communities	Most important commercial estuarine fishery in Western Australia. High numbers of fish, prawns and crabs, linked to high levels of macroalgae and food (benthic invertebrates). Most species utilised PHES when marine salinities prevailed, and were recruited to the system as juveniles.	More species present which mature or only occur at marine salinities. Fish populations not expected to decline if macrophyte cover (whether macroalgae or seagrass) remained extensive. Species preferring low salinities may be adversely affected.	Numbers of the main commercial species were either little affected or increased in abundance. More marine species were present. Prawns and crabs were recruited to Harvey Estuary far earlier and stayed longer.
Waterbirds	The most important waterbird habitat in south-western Australia. Over 80 species recorded, attracted to sheltered conditions, large expanses of shallow waters and abundant food supply (benthic invertebrates) Large numbers of migratory waders. Also large numbers of resident waders (usually found in inland waters) due to lack of tidal variation.	Main food sources likely to remain abundant. However, altered tidal regime may affect the feeding habits of resident waders, and the availability of roosting sites in the intertidal zone. Some low-lying breeding sites may be lost to due to tidal inundation.	Loss of one summer breeding site for pelicans, but pelican numbers maintained. A possible decline in numbers of black swans. Other data not fully processed.
Social and Economic Uses			
Residents	Considerable use of estuary for passive recreation, fishing, crabbing and boating.	Improved recreational amenity	Little change in recreational use of estuary.
Fishing	Highly productive commercial fishery. Presence of *Nodularia* affected fishing methods, and was believed to adversely affect fish populations.	Concerns that some commercial species might be affected, but absence of *Nodularia* blooms considered beneficial.	Abundances of commercial species increased or unchanged. Lower commercial catches of western king prawns as prawns leaving via the Dawesville Channel can't be caught with current fishing methods.
Tourism	Considerable use of estuary for passive recreation, fishing,	Improved recreational amenity	Little change in recreational use of estuary.

FACTOR	PRIOR TO OPENING THE DAWESVILLE CHANNEL	PREDICTED EFFECTS OF THE DAWESVILLE CHANNEL	CONDITIONS OBSERVED AFTER THE OPENING THE DAWESVILLE CHANNEL
	crabbing and boating.		
Property development	Concern by business community that *Nodularia* blooms and macroalgal accumulations adversely affected property values	Improved development opportunities	Not fully realised as yet.
Public Health			
Mosquitoes	Major saltmarsh mosquito problem in Peel Region, and known area for Ross River virus (RRV)	Increased breeding areas for saltmarsh mosquitoes, particularly in summer, due to increased frequency of tidal inundation of saltmarsh	Increased numbers of mosquitoes in summer despite massive increase in aerial larvicide use, particularly the vicious biter *Aedes vigilax*. High levels of RRV activity.
Odours from decomposing algae	Frequent complaints by residents to authorities, particularly during summer months	Potential increase in level of complaints. Increased level of weed (macroalgae) harvesting required	Fewer complaints, and less weed harvesting needed.

8.2 EFFECTS OF THE DAWESVILLE CHANNEL

a) Hydrodynamics

The main hydrodynamic changes are shown in Table 8.

Table 8 - Main hydrodynamic changes resulting from the Dawesville Channel

Aspect of hydrodynamics	Pre-Dawesville Channel value/range	Post-Dawesville Channel value/range
Mean tidal range	17% of ocean (Peel Inlet) 15% of ocean (Harvey Estuary)	48% of ocean (Peel) 55% of ocean (Harvey)
High tide time lag	3 hrs difference between Peel Inlet and Harvey Estuary (Harvey later)	Harvey Estuary high tide 43 minutes before Peel high tide
Sediment erosion/accretion (in DC)		minor. A small floodtide delta has developed at channel entrance to Harvey
Intertidal area from increased tidal range		upper intertidal areas submerged more frequently but for reduced periods. Lower intertidal areas exposed more frequently but for reduced periods
Salinity gradient along Harvey Estuary	marked stratification in Harvey Estuary was common	a significant gradient was observed during summer with salinities of 35ppt by the channel entrance and up to 48ppt towards the southern end. This suggests the level of water exchange from the estuary to the ocean was close to the minimum required for adequate mixing
Salinity gradient in Peel Inlet		very little variance in water density structure was observed suggesting that the water exchange is satisfactory

b) Sediment Nutrient Concentrations

Phosphorus stored in sediments used to play an important part in the development of cycles of diatom, cyano-bacterial and macro-algal blooms in the estuaries. Phosphorus stores trapped in sediments (eg from when diatoms died and settled on the sediment surface) was released into the water column under low oxygen conditions in the water. This internal cycling sustained the supply of phosphorus in a biologically available form, enabling algae to develop to nuisance proportions even when there was no direct input of phosphorus occurring. The Dawesville Channel was expected to reduce the amount of phosphorus added to the sediments each year (by flushing it out to the ocean making less available to sustain diatoms) as well as to provide enhanced oxygenation, thus preventing the release of phosphorus already stored.

Prior to the Channel, sediment total phosphorus concentrations in Harvey Estuary was 2 to 4 times greater than in the Peel, with a greater proportion being biologically available. This probably explains why *Nodularia* blooms affected the Harvey Estuary so severely.

Initial monitoring results indicate that the sediment stores of nitrogen and phosphorus are similar to those occurring in the period from 1982-89.

c) Nearshore Marine Environment

Environmental impacts on the nearshore marine environment were expected to be minimal because winter storm conditions would ensure rapid dispersion and dilution of the water discharged from the estuaries through the Dawesville Channel. Lord et al (1998) concludes that "available water quality data appeared to confirm this" (p.vii). Furthermore, the impact on nearshore macroalgal communities was minimised because the greatest outflow of estuarine water occurred when the algae were effectively scoured off reef surfaces by storms (p. vii).

The greatest improvement in near-shore marine water quality is attributable to the absence of the effect of *Nodularia* blooms fixing and transporting nitrogen to the ocean.

d) Water Quality

Lord et al (1998) states that "the predicted effects of the Channel on estuarine water quality were largely confirmed" (p.vii). The effects are shown in Table 9 and show considerable improvements in water quality in the Peel and Harvey estuaries. At the same time (although not caused by the Dawesville Channel) water quality in the lower reaches of the Serpentine and Murray Rivers has declined. No data were available for the Harvey River water quality post-Dawesville Channel.

Table 9 - Summary table of changes in water quality post-Dawesville Channel

Observed change in water quality	Location within the Peel-Harvey system
Periods of deoxygenation	Rare in waters close to the DC. Less frequent than pre-channel time in mid Peel Inlet and Harvey Estuary. Relatively unchanged in southern Harvey and eastern Peel.
Phytoplankton biomass (expressed as chlorolphylla levels	Winter blooms of diatoms smaller (less than 50 micrograms/L) and of shorter duration. Chlorophylla levels remained below 10 micrograms/L for most of year) except winter blooms)
Levels of organic nitrogen (N) and organic phosphorus (P) in estuarine waters	Corresponding decreases. Reduced phytoplankton mass means less N and P present in phytoplankton (ie organic).
Levels of total N and total P	Reduced phytoplankton mass means less total N and P present in estuarine waters.
Occurrence of *Nodularia* blooms in Peel and Harvey	No *Nodularia* blooms occurred in Peel or Harvey.
Nodularia in rivers	*Nodularia* blooms occurred in Serpentine R from late Spring to end of summer.

Dinoflagellate blooms in rivers	Occurred during summer and autumn in Serpentine and (to a lesser extent) in the Murray.
Harvey River	no data

e) Macroalgae

Large accumulations of macroalgae were a common feature of (mainly) the Peel Inlet prior to opening of the Dawesville Channel. Three types of alga were common - *Ulva* (sea lettuce), *Chaetomorpha* , and *Enteromorpha* . The algae *Ulva* and *Enteromorpha* were more abundant when nutrient levels were higher, and *Chaetomorpha* was more abundant when nutrient conditions were lower. The amount of algal biomass was commonly in the range of 5 000 to 20 000 tonnes per year but it reached a high of 60 000 tonnes in 1979.

Macroalgal growth related strongly to nutrient levels and water clarity with increased amounts occurring when water clarity and nutrient levels were higher.

The EPA assessment warned that macroalgal blooms may increase in the short term as a result of increased water clarity from the opening of the Dawesville Channel but would decrease in the longer term as nutrient levels were reduced. It was to be countered by increased weed harvesting (to remove the weed) if it occurred (EPA, 1988). The EPA also anticipated that weed levels in the Harvey Estuary may increase as a result of the expected clearer water conditions.

The following table shows the changes that occurred following the opening of the Dawesville Channel (Table 10).

Table 10 - Estimates of macroalgal biomass in Peel Inlet and Harvey Estuary pre- and post Dawesville Channel

Location	Annual biomass of macroalgae Pre-Dawesville Channel tonnes (t)	Annual biomass of macroalgae Post-Dawesville Channel tonnes (t)
Peel Inlet	range 5000 - 20 000t with a high of 60 000t in 1979	15 000t (Spring 1994 & Summer 1994/5) approx 5000t until Autumn 1996 then declining to 3000t (Spring 1996) and 2000t Summer 1996/7 greater proportion of red and brown algae in biomass (an indicator of low nutrient conditions) (in 1996/7)
Harvey Estuary	lower than in Peel	increased biomass but levels still an order of magnitude less than those in the Peel

1994 and 1995 were years of low rainfall and low nutrient input and macroalgal levels in these years were not significantly different from low rainfall years pre-Dawesville Channel. 1996 was an average rainfall year and macroalgal biomass was the lowest on record. Up to 1998 the predicted increase in macroalgae had not occurred but a high rainfall year had also not been experienced. Data showed that the amount of nutrients available for algal growth in Peel Inlet had reduced and the nutrient status of the Peel-Harvey Estuary System was declining as planned.

f) Seagrasses

Seagrasses differ from the large algae (macroalgae) in being aquatic flowering plants with roots and leaves. They are intolerant to significant light reduction and sensitive to salinities falling to below about three quarters that of sea water and their occurrence in Peel-Harvey pre-Dawesville Channel was always sporadic and sparse, depending on the amount of winter runoff (which reduced salinity) and the level of algal growth (which restricted light to the plants). Eutrophic conditions leads to growth of algae (epiphytes) on the seagrass fronds and to seagrass being shaded out by macroalgae and phytoplankton blooms which reduce light to the plants.

The proliferation of algae in the system in the 1970s and 1980s caused the widespread loss of seagrasses but effects on associated fauna were mitigated because the ecological functions of the macroalgae were similar to those of the seagrasses.

The EPA predicted that the opening of the Dawesville Channel should be beneficial to seagrasses, resulting from a more stable salinity regime, a salinity regime more like that of marine waters for longer periods, and improved water clarity (EPA, 1988).

Table 11 summarises the changes to seagrass occurrence pre- and post-Dawesville Channel.

Table 11 - Summary of changes to seagrass occurrence pre and post Dawesville Channel

Pre-Dawesville Channel	Post-Dawesville Channel
Halophila ovalis (paddle weed) most common species (more tolerant of low salinities, low light and turbid waters than other seagrasses)	*Halophila* stands consistently maintained high biomass in summer and autumn & in deeper water Stands of *Halophila* expanded in northern half of Harvey Estuary *Halophila* recorded for the first time in deeper waters of Harvey Estuary
Small beds of less tolerant species in or near Mandurah Channel (more marine)	Patches of seagrass species requiring marine salinities occurred near the Harvey Estuary end of the Dawesville Channel
Ruppia megacarpa (duck weed) common in shallows of SE Peel Inlet (broad range of salinity tolerance)	Distribution of *Ruppia* in Peel Inlet on tidally exposed areas not known - not monitored

g) Fringing Vegetation

Fringing vegetation (including salt marsh) occupies the upper part of the tidal zone from about mean water level to just above extreme high-water mark. It is important in estuary systems as it plays an important role in food webs, acts as a biological filter for waters discharging to the estuaries and provides habitats for waterbirds.

Assessment of historical changes in fringing vegetation (aerial photography) have shown that it was extremely dynamic and variable with losses occurring in different areas in many cases from degradation caused by human use and expansion.

Table 12 shows the changes observed at the monitoring sites post Dawesville Channel. Although overall the monitoring results showed that the dynamic and variable nature of fringing vegetation continued with no effects being clearly attributed to the Dawesville Channel, clear trends may take several more years to become apparent.

Table 12 - Changes observed at the monitoring sites post Dawesville Channel.

Monitoring Location	Changes post-Dawesville Channel
Saltmarsh sites	no consistent patterns of change of species cover from 1994-95
Austin Bay Nature Reserve	no changes other than those consistent with year-to-year variations in environmental conditions No evidence of salt water intrusion
Riverine Transects	No immediate effect of influence of increased salinity (although any change would be expected to be more gradual)

Very little on-the-ground monitoring of fringing vegetation was carried out before the Dawesville Channel was opened. Post channel monitoring has included:

- monitoring of salt marshes (species change from tidal inundation, frequency of inundation and salinity);
- monitoring of seasonal freshwater wetlands in Austin Bay Nature Reserve (these wetlands contain a rare freshwater aquatic plant that might be susceptible to ingress of salt water);
- monitoring of riverine vegetation, river bank tree health and *Typha* patch dynamics along the lower 4km of the Harvey River (to detect changes from expected increase in penetration of salt water upstream with the tidal change and more marines salinities).

Although not part of the monitoring program, another change observed is the loss of fringing freshwater melaleucas (*M. rhaphiophylla*) along Harvey Estuary. A new line of fringing vegetation can be expected to establish over time at a height that suits the modified tidal/freshwater lense interface.

h) Fisheries

The Peel-Inlet and Harvey Estuary System is the most important commercial estuarine fishery (by weight of catch) in Western Australia. It is also heavily used for recreational fishing. The status of fisheries pre- and post-Dawesville Channel is shown in Table 13.

Table 13 - The status of fisheries pre- and post Dawesville Channel

Item	Pre-Dawesville Channel	Post-Dawesville Channel
Fish	Fish kills from *Nodularia* blooms	No fish kills (absence of *Nodularia* blooms & reduced periods of low oxygen levels)
Fish food species	Kills of benthic invertebrates from reduced oxygen conditions	Reduced impacts on favoured food (worms, crustaceans and molluscs) from improved oxygen status
Crustaceans (Western King Prawns & Crabs)		Much earlier recruitment of juveniles into Harvey Estuary with longer retention there Maximum densities far higher than in pre-channel years
	Prawns larger on leaving estuary (only exit via Mandurah Channel)	Left estuary at smaller size (Presumably Dawesville Channel allows more rapid return to the ocean of Harvey Estuary animals?)
	Prawns and crabs migrate to sea via Mandurah Channel only	Prawns and crabs can migrate to sea through Mandurah (Peel) and Dawesville (Harvey) Channels
Marine species such as gobbleguts & six lined trumpeter	More abundant	Less abundant (generally associated with macroalgae, so decline in macroalgae may have led to decline in these fish species) Marine species penetrated further south into Harvey Estuary with higher fish densities
Commercial species	Good catches of Western King prawns exiting to ocean through Mandurah Channel	Prawn migration through both Mandurah and Dawesville Channels has resulted in dramatic reduction in Western King prawn catches although still abundant (two channel exits not one, strong currents in Dawesville Channel make use of beamtide trawls very difficult, plus animals smaller (reduced time to exit through Dawesville Channel over Mandurah Channel to north)
	Cobbler, sea garfish, Australian herring, western sand whiting, sea mullet, yellow-eye mullet, tailor and King George Whiting and other species	Higher abundance of cobbler, sea garfish, Australian herring and western sand whiting Little change in abundance of sea mullet, yellow-eye mullet, tailor and King George Whiting

i) Waterbirds

The Peel-Harvey Estuary System is an internationally significant habitat for waterbirds. Tens of thousands of waterbirds gather each year with over 80 species recorded, of which 27 are listed on the Japan Australia Migratory Birds Agreement (JAMBA) and China Australia Migratory Birds Agreement (CAMBA). The area is listed as a wetland of international importance under the Ramsar Convention.

Waterbirds vary throughout the year. Resident species are present all year round while migratory species occur mainly in spring and summer.

Monitoring of waterbirds focused on specific concerns about channel possible effects including:

- pelican nesting activity and success;
- numbers of black swans;
- salinity changes and waterbird use in the upper Harvey Estuary, Harvey River Delta and lower Harvey River;
- numbers of banded stilts; and
- the effect of increased inundation on three major roosting sites at Herron Point Ford, Point Birch and Nirimba Cay.

Data show that apparent changes post-Dawesville Channel include:

- little egrets are more numerous and widespread (reflects a general trend in WA);
- no decline in numbers of eastern curlew;
- curlew sandpipers far less abundant (uncertain whether this is an effect of the Dawesville Channel or variations in numbers migrating to Australia);
- previously successful breeding sites for Pelicans failed (Nirimba Cay was inundated; Creery and Boodalan Islands from human disturbance and foxes), but Pelican breeding on Boundary Island over the three year period was sufficient to maintain total pelican numbers; and
- decline in numbers of black swans (may be from variations in abundance and distribution of *Ruppia*).

j) Public Health Issues

The region is known to have a severe salt marsh mosquito problem (identified as early as 1985) and is known to be a major focus of Ross River Virus (RRV) and Barmah Forest Virus (BFV). The EPA report predicted that the changed tidal regime could be expected to lead to increased numbers of mosquitoes and corresponding mosquito nuisance (EPA, 1988). Increased numbers of people in areas where mosquitoes are already abundant also leads to increased mosquito nuisance, regardless of whether the mosquito numbers themselves increase.

The increased tidal amplitude exacerbated the mosquito problem as predicted. Larger numbers of adult *Aedes camptorhyncus* (the main carrier of RRV) were detected in summer 1995/6 and a major outbreak of RRV also occurred. Numbers of adult saltmarsh mosquitoes especially *Aedes vigilax* increased significantly, particularly in summer, in spite of a threefold increase in the number of aerial larvicide applications. This species can fly long distances and is a vicious biter as well as being a vector for RRV.

8.3 EXPERT REVIEW COMMITTEE'S ADVICE RELATING TO CONDITIONS ON DAWESVILLE CHANNEL CONSTRUCTION, OPERATION AND ENVIRONMENTAL EFFECTS

The Environmental Conditions set by the Minister in relation to construction of the Channel appear to have been fulfilled. Further longer-term monitoring is required and this is discussed in Section 11 of this Report.

Monitoring as set out in Lord et al (1998) demonstrates that the channel is performing as predicted by the numerical modelling and that the predictions of environmental change associated with the channel made by the EPA in the assessment (EPA, 1988) were shown to be valid (Lord et al, 1998).

The Environmental Conditions relating to the Dawesville Channel covered the following areas.

a) Baseline monitoring

Baseline data were collected for the following:

- nearshore bathymetry and beach profiles extending 1km north and south of the channel
- bathymetry of the Harvey Estuary in the vicinity of the channel
- shoreline movements using aerial photography either side of the channel
- water exchange between the Harvey Estuary and the Peel Inlet and between the Peel Inlet and the ocean
- tidal regime within the Peel Inlet and Harvey Estuary
- groundwater levels and quality within a 3km radius of the channel
- nearshore water quality and marine habitat
- water quality within the Peel Inlet and Harvey Estuary.

b) Aboriginal sites and heritage survey.

This was carried out.

c) Construction stage impacts and monitoring including groundwater

The PCR indicated that a construction impact monitoring program was put in place to cover the following:

- groundwater levels and quality within a 3km radius
- blasting measurements of groundwater vibration and air blast pressures
- dust control of excavations and spoil disposal areas
- nearshore water quality estuary water quality associated with dredging washwater
- association with dewatering turbidity plume
- foreshore protection and sand by-passing
- construction video

A Dawesville Channel Spoil Disposal and Management Plan was prepared in five parts. Spoil placement occurred as required by parts 1, 2 and 3, and tree and foreshore vegetation protection occurred in accordance with the plans. Contour of significant landscape elements was protected wherever possible and spoil was used to facilitate possible future development where practicable. The impact on the foreshores was controlled in accordance with the Dredging and Spoil Disposal Management Plan (Parts 1 and 3) and sand bypassing occurred at regular intervals. A photographic record of construction was made as well as a video of construction and progress reports. Much of this material has now been made into a documentary on the Dawesville Channel Project.

Dust and noise were controlled in accordance with requirements and public access and utilities were maintained during construction.

A Landscape plan was required and this was prepared and implemented.

d) Operational and long-term monitoring

The proponents were required to prepare a monitoring and management programme prior to construction of the Channel. A plan was developed and implemented covering the following elements:

- bathymetry and beach profiles extending 1 km north and south of the channel
- bathymetry of the Harvey Estuary in the vicinity of the channel
- shoreline movements using aerial photography either side of the channel
- tidal regime within the Peel Inlet and Harvey Estuary
- water exchange characteristics within the Peel Inlet and Harvey Estuary
- tidal velocity
- inundation assessment
- groundwater levels and quality within a 3km radius of the channel
- nearshore water quality and marine habitat
- water quality within the Peel Inlet and Harvey Estuary
- sand bypassing operations.

In the PCR the proponents state that they have met the requirements of the condition and that the condition should be cleared. However, the ERC is of the view that approximately 5 years of monitoring post Dawesville Channel does not constitute long-term monitoring. In particular it is considered important to continue to monitor long enough at least to take account of high runoff years and other longer term environmental variations.

Recommendation DC 1

It is recommended that monitoring should continue long enough to take account of high runoff years and other longer term environmental variations. This monitoring should include the following:

- *nearshore bathymetry and beach profiles extending 1 km north and south of the channel*
- *bathymetry of the Harvey Estuary in the vicinity of the channel*
- *shoreline movements using aerial photography either side of the channel*
- *inundation assessment*
- *nearshore water quality and marine habitat*
- *water quality within the Peel Inlet and Harvey Estuary*
- *sand bypassing operations*

e) Sand Bypassing

Mechanical sand bypassing of up to 85 000 cubic metres of sediment per year (average of 60 000 cubic metres) is required to maintain beach profiles and minimise erosion of the coastline to the north of the Channel. Although a fixed bypass system had been planned initially, this was later rejected in favour of a land based dredge that could pick up sand from the beach.

The construction of the channel initially caused accretion to the south and erosion to the north even though some 110 000 cubic metres of sand was placed to the north of the channel to prevent deficiencies in sediment supply. Natural processes of long-term erosion and the very severe winter storms of 1995 and 1996 contributed to this outcome.

The PCR states that survey data for only 3 years was available and this is insufficient to accurately determine long-term changes or trends. The PCR says that ongoing monitoring is essential for the management of the channel and will be continued by Department of Transport as part of its core activities in coastal and facilities management. They anticipate that for an area as complex as this, post-construction data containing 5 - 10 annual surveys will be required before trends can be determined with any degree of reliability.

f) Maintain Dawesville Channel as Navigable

The PCR states that regular sand bypassing should maintain a navigable Channel, and from monitoring to date there is no evidence to suggest excessive silting or erosion of the Channel occurs.

The navigability (or otherwise) is not regarded by the ERC as a key issue of environmental concern as long as flushing through the channel is not allowed to be compromised (for example by failure to maintain adequate sand bypassing). This is regarded more as an operational matter for the Department of Transport (within its core activities) rather than an environmental issue per se.

9. NON-PROPONENT DECISION-MAKERS, REGULATORY AGENCIES AND RESPONSIBILITIES OF THE PUBLIC IN RELATION TO THE EPP REQUIREMENTS

An Environmental Protection Policy is a statute of government like any other, and all agents of government and the community should be able to demonstrate that they have carried out all decision-making and activities in accordance with the requirements of an EPP.

Non-proponent decision-makers, regulators and members of the public all have a responsibility to act in accordance with the legal and moral requirements of an Environmental Protection Policy.

The key responsibilities of some of the various sectors and agencies are set down below.

a) Department of Environmental Protection

The DEP has the responsibility to license various polluting industries under Part V of the Environmental Protection Act, as well as to provide advice on behalf of the EPA for small developments that may have an effect on the environment, but which are not being formally assessed by the EPA. This advice is often provided to other decision-making authorities including agencies such as local government and the Ministry for Planning. Where the DEP or EPA provides advice which is consistent with meeting the requirements of the EPP, the decision-makers to whom that advice is provided should impose the advice on developers through their own approvals processes.

b) Ministry for Planning (now incorporated into Ministry for Planning and Infrastructure), and Local Government

Although planning often approaches environmental advice as being an area to which they should "have regard" rather than as a constraint, it should be recognised that for an area covered by an EPP, the need to carry out decision-making actions and implement developments in a manner which meets the requirements of the EPP is not discretionary. In the Peel-Harvey catchment, it makes no sense to construct a Dawesville Channel at high cost to the community, without also limiting the establishment and operation of certain types of development, in particular those that add nutrients to the estuary system. The EPP provides a framework which allows for some flexibility of development as long as the environmental objectives are being met.

c) Health Department

In the Peel-Harvey area one of the major responsibilities of the Health Department and local government is control of mosquitoes. The EPA predicted that mosquito numbers would rise if the Dawesville Channel was implemented. The degree of nuisance occurring from the presence of mosquitoes correlates with the size of the population within the area of exposure. Increasing urbanisation in the Mandurah area has led to increased mosquito nuisance being experienced. The EPA recommended that mosquito control programs should be funded by the government, and resources provided to the Health Department to do so. However, the full amount was not forthcoming and control measures have not been fully implemented. Some work has been carried out in an attempt

to develop more environmentally appropriate methods of controlling mosquitoes (eg runnelling to reduce breeding areas; use of fish to reduce numbers of larvae) but the potential impacts on other parts of the ecosystem also have to be taken into account, particularly as the estuaries are important to waterbirds and are listed as Ramsar wetlands.

d) Department of Conservation and Land Management

CALM has responsibilities for protection of flora and fauna, and also carries out management planning and management of National Parks, nature reserves and marine parks on behalf of the Conservation Commission.

e) Local Government

Local Government has responsibilities through development of planning schemes to incorporate the requirements of regional plans and implementation of development controls, for example in Special Rural Zones. Local Government also has some responsibilities in regard to provision of drainage and disposal of drainage water in all the urban and some of the rural area.

f) Water Corporation

The Water Corporation has responsibilities for provision of water supplies (domestic and some bulk water for irrigation) and treatment of wastewater where it is collected via sewerage systems, as well as for maintenance of the main drainage system of the area. The Water Corporation has significantly reduced nutrient content of wastewater discharged to river systems within the coastal catchment.

g) General Public

The general public is also covered by an EPP in the same manner as by any other Government statute, and should ensure that existing and proposed land uses and actions they carry out within the EPP area meet the objectives of the EPP.

10. OVERALL STATEMENT ON VERIFICATION OF COMPLIANCE AND ADVICE ON ENVIRONMENTAL CONDITIONS, THE PCR AND PROPONENTS

10.1 ADVICE TO THE EPA ON COMPLIANCE

A summary of the verification of compliance and advice on Environmental Conditions is provided in Table 14 below, and (more fully) in Table A5 in Appendix 5.

Although the conditions may be regarded as not having been written strictly in a manner that could be legally enforced, it is apparent that even the intent of most of them has not been followed by the proponents. The intent behind the Conditions is clear from the assessment report. The key elements of effective regulation (including of Environmental Conditions), based on current 'state of the art' is covered in Section 13.2 of this Report.

Although the PCR recommends in many instances that the Environmental Conditions be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as part of the EPP, the ERC is of the view that it would be better to retain the Conditions, rather than try and add them into the scope of the EPP (see Table A5 in Appendix 5). However, it would be appropriate to amend the wording of several of the Conditions as well as add several new ones to the Minister's statement.

Table 14- Summary of Expert Review Committee's advice on verification of compliance and advice on Environmental Conditions

Condition No	Date Condition set	Expert Review Group Advice on Verification of Compliance	Expert Review Group Advice on Environmental Condition
M1 (see also 1A and 1B below)	In original Statement signed 3 Jan 1989	Partially met (see 1A and 1B below). Original M1 reworded into new M1A and 1B.	Condition should be retained
M1A	16 April 1993	Partially met.	Condition should be retained.
M1B	16 April 1993	Cannot be verified.	Condition should be retained.
M2	In original Statement signed 3 Jan 1989	Cannot be verified. Compliance not demonstrated.	Condition should be retained
M3	In original Statement signed 3 Jan 1989	Partially met. An EPP was developed but not until 1992 (Condition required it by 31 December 1989).	Condition should be retained
M4	In original Statement signed 3 Jan 1989	No comprehensive integrated catchment management plan was in place by 31 December 1990 as required by the Condition. There has been some progress towards developing an ICM plan of reduced scope. Compliance not demonstrated.	Condition should be retained
M5	In original Statement signed 3 Jan 1989	Partially met. The co-proponents were made responsible on behalf of the whole of Government and should have been more vigorous in working with non-proponent agencies to meet the requirement of this Condition, particularly as it was offered by the Department of Agriculture as a commitment.	Condition should be retained
M6	In original Statement signed 3 Jan 1989	Compliance not demonstrated. The co-proponents PCR states that not all decision-making authorities have followed the management strategy particularly in regard to decisions and advice affecting phosphorus reduction and attenuation.	Condition should be retained
M7	In original Statement signed 3 Jan 1989	Compliance verified.	Condition related to construction impacts of the Dawesville Channel and is no longer required, subject to any new proposals for dredging having to be referred to the EPA.
M8	In original Statement signed 3 Jan 1989	Compliance verified.	Condition should be retained in case algal problems return.

M9	In original Statement signed 3 Jan 1989	Compliance not demonstrated. The co-proponents admit that not all decision-making authorities have followed the management strategy particularly in regard to decisions and advice affecting phosphorus reduction and attenuation. The co-proponents were made responsible on behalf of the whole of Government and should have been more vigorous in working with non-proponent agencies to meet the requirement of this Condition	Condition should be retained
M10	In original Statement signed 3 Jan 1989	Not implemented. Condition contingent on timing being specified by the Minister for the Environment. Unable to verify if the Minister for the Environment ever issued a timetable for doing so.	Condition required until implementation has occurred. The co-proponents were made responsible on behalf of the whole of Government and should have been more vigorous in requesting a timeframe from the Minister and in working with non-proponent agencies to meet the requirement of this Condition
M11	In original Statement signed 3 Jan 1989	Mosquito numbers have increased as predicted by the EPA. The co-proponents were made responsible on behalf of the whole of Government and should have been more vigorous in working with non-proponent agencies to meet the requirements of this Condition. Compliance not demonstrated.	Condition should be retained.
M12	In original Statement signed 3 Jan 1989	Compliance verified.	Long-term monitoring should continue. Condition should be combined with a modified M13 to focus on key long-term monitoring for performance and the immediate marine environment.
M13	In original Statement signed 3 Jan 1989	Compliance verified for parts (1) and (2) of this Condition. Part (3) is ongoing as it relates to long-term monitoring.	M12 and M13 should be combined and modified to focus on long-term monitoring and the near-shore marine environment.
M14	2 October 1991	Compliance not verified. The co-proponents were made responsible on behalf of the whole of Government and should have been more vigorous in working with non-proponent agencies to meet the requirements of this Condition,	Condition should be retained and modified to: a) remove the term "draft" b) include a date of gazettal of the SPP. This Condition should be reviewed on each occasion that the SPP is reviewed, to ensure that the contents of the SPP is adequate to cover the intent of the Condition.
M15-1	16 April 1993	Compliance verified.	Condition related to construction impacts of the Dawesville Channel and is no longer required.

M15-2	16 April 1993	Compliance verified.	Condition related to construction impacts of the Dawesville Channel and is no longer required.
M16	16 April 1993	Compliance verified.	Condition related to construction impacts of the Dawesville Channel and is no longer required.
M16-1	16 April 1993	Compliance verified.	Condition related to construction impacts of the Dawesville Channel and is no longer required.
M17 and 17-1	16 April 1993	A PCR was prepared although EPA was not consulted as required by the Condition.	Condition should be retained.

10.2 ADVICE TO THE EPA ON THE PCR PROCESS AND ON THE NEED FOR FULLY INDEPENDENT AUDIT BY THE EPA OF SOME PROPOSALS

Two members of this Expert Review Group have now been involved in two major compliance reviews of projects where government agencies are the proponent, and as a result have some advice for the EPA to improve the PCR Process.

Condition 17 states that an audit system is required. Condition 17-1 (Procedure) requires the Environmental Protection Authority to verify compliance with the conditions in the statement. As the EPA is independent as to the advice that it provides, it is appropriate for the EPA to carry out the audit of some projects, particularly those where government agencies (or Ministers) are the proponent, or projects considered to be sensitive either environmentally or politically.

To enable the EPA to verify compliance, the Progress and Compliance Report prepared by the proponents needs to contain sufficient information to enable a determination of compliance to be made. This is why Condition 17 requires the proponents to consult with the EPA. Such consultation enables the establishment of two-way communication between the proponents and the EPA and establishes an open and transparent approach. It also enables the EPA to set down its requirements for preparation of the PCR to ensure that the contents is adequate for the purpose.

The purpose of the compliance review should be to see whether the environment is being adequately protected, both from the point of view of the proponents implementing the Environmental Conditions, as well as assessing whether the EPA's environmental objectives and the Conditions set by the Minister are what is required to deliver the required level of environmental protection. Thus there are two questions, namely

1. "Has the proponent implemented the Conditions as required and in accordance with the intent of the Condition?" and

2. "Did the EPA "get it right" in terms of the environmental objectives used - i.e. is significant environmental harm occurring even though the proponents have fully met their requirements, and if so, what feasible changes to implementation are required to address this?"

Any resultant changes to the management requirements of the project must recognise that the proposal is already being implemented, degrees of freedom have been reduced, and thus for some types of proposal achieving major changes may not be practicable or possible.

Ideally, a compliance review should focus more on whether the intent of the Conditions has been met rather than strictly focusing on whether the minutiae of the legal aspects have. This is not to meant to imply that legal compliance is not important, rather it reflects the reality which is that non-compliance with a Condition is not in itself an offence, and only becomes so if a proponent fails to provide

information to the Minister when requested to do so, or fails to take corrective action when required by the Minister to do so.

In previous reviews, the EPA has put more emphasis on the "Progress" aspect of the process, than on the "Compliance" aspect and has focused more on the actions of the proponent than assessing the appropriateness of its own environmental objectives. Ideally a compliance review as required by the Condition should be a positive experience for proponents with the emphasis being on achieving improvements in environmental performance into the future. When PCR documents are prepared in isolation from the EPA the opportunity for a beneficial experience by the proponent can be compromised as it can lead to a more oppositional process.

For this PCR review, the following problems have been experienced:

a) the PCR documentation was prepared in isolation from input from the EPA.

b) the PCR documentation in many instances does not contain adequate information to enable the Expert Review Group to be able to tell whether the Condition has been fully complied with, or for the EPA to carry out its verification of compliance.

c) the PCR document expresses the personal opinions of the proponent agencies in terms of compliance rather than providing the information in a form that would enable those responsible to make such judgements.

d) the PCR (and other documentation) was made public before it was approved for release by the EPA, and the proponents views about their compliance was extensively publicised in the Peel-Harvey area.

e) the way in which the Environmental Conditions were styled in the PCR made it very difficult to follow, focusing as it did on many small "compliance elements" identified by the DEP audit group. For an EPA review of compliance it may be preferable to stay with the broad requirements of the Conditions and intent as set out in the EPA's assessment report.

f) there are numerous examples of difficulties arising from differences in perception of issues, requirements and the legal status of the Conditions and the EPP.

Clearly a significant issue in carrying out a major PCR review is to ensure that the review team contains people who are familiar with and well informed about the history of the project, the EPA's assessment(s) and the intent behind the approach taken by the EPA in formulating its recommendations and draft conditions.

The Expert Review Group suggests the following approach should be adopted to improve the PCR process and ensure that it is fair to proponents and the community. As the former Department of Environmental Protection has responsibilities for Licensing, it may not be appropriate for audits to be carried out by that department for projects where a License has been issued under Part V of the Environmental Protection Act, or under the Water Resource legislation.

With the increased separation of the EPA from the Departments which are responsible for administration of the Licensing function under the Environmental Protection Act and the Water Resources legislation, it will be necessary to adequately resource the EPA to carry out future compliance reviews to enable it to cover the costs of using independent review teams.

EPA should clearly document the intent of its recommendations in its assessment report, preferably by inserting recommendations throughout the report close to the rationale for that recommendation. Similarly, the intent should be stated adjacent to each Environmental Condition and included in the Statement issued by the Minister for the Environment. Although the intent behind both EPA recommendations and Environmental Conditions is clear from reading the assessment reports, it would

be of more assistance to proponents (and to future PCR review teams) if the rationale was made explicit within the Statement.

Proponents should be required by the EPA to propose a strategy to enable evaluation of progress and compliance and EPA and proponents need to reach mutual agreement on this. Following issue of the Statement that a Proposal may be Implemented, the EPA should invite proponents to attend an EPA meeting to discuss and agree on the measures of success that will be used to verify compliance in the next review. The agreed measures of success would then lead to the development of a targeted monitoring program to ensure that the appropriate information to enable compliance to be verified is included.

The proponents should be requested to propose measures to the EPA for consideration and discussion and would be encouraged to consult with key stakeholders and groups. The agreement reached by the proponents and the EPA should form a "contract" that should remain regardless of staff changes either at the EPA or at the proponent organisation, and should be made public as a draft, to allow for other expert input, prior to being finalised.

Recommendation PCR 1

The EPA should promote compliance reviews as a potentially positive experience for proponents with the emphasis being on providing an opportunity to progress or improve environmental protection and management into the future, and an opportunity for the EPA to review its environmental objectives alongside verifying compliance.

It is recommended that compliance reviews run by the EPA should focus on examining three areas:

a) verification of implementation of the Environmental Conditions as set out in the Minister's Statement, in the context of the intent of the Conditions as set out in the EPA's assessment report and recommendations;

b) an examination of whether the assessment of the project carried out by the EPA was accurate in its predictions including identification of the environmental objectives and environmental management goals; and

c) whether the proponent's commitments and the Environmental Conditions, and any associated legal and administrative framework to underpin management have been successful in achieving the goals for which they were originally designed.

Recommendation PCR 2

It is recommended that for major PCR reviews, the EPA use Expert Review teams consisting of people who are familiar with and well informed in relation to the project performance to be reviewed, including the history of the project, the EPA's assessment(s) and the intent behind the approach taken by the EPA in formulating its recommendations and draft conditions. The EPA should be resourced to enable such experts to be used and paid.

Recommendation PCR 3

It is recommended that the EPA obtains adequate resources to enable it to form and resource the independent expert review teams required to carry out future compliance reviews, and in particular reviews of projects where government agencies are the proponents.

Recommendation PCR 4

It is recommended that the EPA adopts the following approach to improve the PCR process to ensure that it is open and transparent, fair to proponents and the community, and to assist in PCR reviews:

a) *EPA should clearly document the intent of its recommendations in its assessment report by inserting recommendations throughout the report close to the rationale for that recommendation;*

b) *the rationale for and intent of a recommendation/Condition should be stated beneath each Environmental Condition and included in the Statement issued by the Minister for the Environment;*

c) *soon after completion of an assessment, proponents should be required to consult with key stakeholders and groups and propose measures to the EPA to enable evaluation of progress and compliance and to attend an EPA meeting to discuss and agree on the measures of success that will be used to verify compliance in the next review;*

d) *at the meeting in (c), the EPA should propose for discussion the approach that will be taken in the PCR review process;*

e) *the agreement reached by the proponents and the EPA on the compliance measures and the PCR process should form a "contract" and should be made public as a draft, to allow for other expert input, prior to being finalised; and*

f) *the final agreed measures of success should be used as the basis of development of a targeted monitoring program to ensure that the appropriate information to enable compliance against agreed compliance measures to be verified.*

10.3 ADVICE TO THE EPA ON PROPONENTS

The Specialist Report on Legal and Administrative Framework for Management examined the issue of proponents and management agencies in some depth (see Section 11 of Appendix 2). The essential points are summarised here.

The Environmental Protection Act requires the designation of a "proponent" for a proposal. This is not always a straightforward case of identifying who is referring the proposal but also requires consideration of the Environmental Conditions that will be required for full implementation of the development. The Conditions can only be applied to those identified as the "proponent" and cannot be applied to those that are not proponents, even though the latter may be even more important in achieving successful implementation of the project.

At times, and for very good reasons, a project cannot be made environmentally acceptable by the proponent's actions alone, and it is not uncommon for private industry proponents to find themselves in the position where their project can only be made "environmentally acceptable" if certain actions are taken by government agencies. Examples include the Port Geographe development, Jervoise Bay boat harbour and the Coral Coast development at Ningaloo However, if agency management requirements are not funded a proponent can find themselves in a difficult position even though they are meeting the requirements of Environmental Conditions placed upon them.

Under the current Environmental Protection Act Environmental Conditions cannot be applied to non-proponents even though they may be significant in providing supporting decisions or management to ensure a successful outcome.

Peel-Harvey represented a particularly difficult project for designation of appropriate proponents as the proposal was a "whole of government" project requiring actions across a range of State agencies as well as by local government, landholders and the local community for successful implementation.

The Minister for the Environment designated three Ministers as co-proponents with the intention that those Ministers would carry full implementation of the strategy on behalf of government as a whole. A critical intention of this approach was to make each Minister equally responsible for all of the strategy, reflecting a collegiate approach to ensure that all parts of the strategy were covered. Where an action was required that was outside a Minister's direct responsibilities, it was expected that the

Minister would take on responsibility at least to the extent of influencing his Cabinet colleagues to take the required actions, and, if necessary take the matter to cabinet for decision.

Peel-Harvey has both "proponent management" agencies (through the Ministers as designated) as well as other "management" agencies whose Ministers were not designated as proponents.

Through the "Procedure" part of the Environmental Conditions, actions from non-proponent agencies that are essential to successful implementation of management to ensure proper environmental protection can be defined. It would be useful in amending some of the Environmental Conditions, for the EPA to provide advice to the Minister for the Environment on non-proponent management agencies and for a draft "Procedure" to be prepared for inclusion in the revised Statement.

Recommendation P1

It is recommended that the current three Ministers nominated as co-proponents be retained but be required (through "Procedure") to operate as being equally responsible for implementation of the whole management strategy, with carriage of the project on behalf of Government as a whole.

Recommendation P2

It would be useful in amending some of the Environmental Conditions, for the EPA to provide advice to the Minister for the Environment on non-proponent management agencies and for a draft "Procedure" to be prepared for inclusion in the revised Statement.

With Peel-Harvey being a "whole of government" project and to address the institutional failures, in particular the diffuse responsibility for implementation of the full strategy, it would now be useful to allocate the responsibility for "driving" implementation. The interest in ensuring that the EPA's recommendations and the Minister's Environmental Conditions are implemented in full lies with the EPA (on behalf of the community as a whole) and the Minister for the Environment (for government and the community) respectively.

Since Peel-Harvey was assessed, the EPA has developed an EPP for protection of the Swan-Canning river and catchment system and more recently for Cockburn Sound. This EPP makes the EPA responsible for the preparation of a catchment management plan for the Swan-Canning, to meet the environmental objectives stated in the EPP. The EPA can develop the plan itself or can delegate responsibility for its preparation, to the satisfaction of the EPA, to another body. For Swan-Canning, the EPA requested the Swan River trust to prepare a draft plan for the EPA to consider.

This approach would be useful to adopt for the Peel-Harvey at this juncture. The revision of the EPP should reflect the relevant clauses from the Swan-Canning EPP or Cockburn Sound EPP. The EPA can then ensure that the comprehensive integrated catchment management plan originally envisaged by the EPA can be prepared and implemented, either by carrying this out itself, or by delegating preparation of the plan (to meet the environmental objectives stated in the EP) to another suitable body. Now that a Peel-Harvey Catchment Council has recently been established, this may be a group that could assist in preparing a draft plan for the EPA's consideration, showing how actions required will be implemented to meet the environmental requirements.

Recommendation P3

It is recommended that the EPA should ensure that the provisions for preparation of a catchment management plan from the Swan-Canning EPP are included in the revised Peel-Harvey EPP, and the EPA should take on the responsibility for driving catchment management.

Recommendation P4

It is recommended that the EPA give consideration to delegating preparation of the above catchment management plan to an appropriately resourced group to ensure that the EPA's and Minister's requirements are met.

11. MONITORING

11.1 MEASURES OF "HEALTH" OR "WELLBEING" OF THE SYSTEM

11.1.1 Ecosystem Health

The following is a summary of information provided in Appendix 3 of this Report, on Water Quality and Management Targets (Deeley, 2001).

Ecosystem health has been defined by Costanza *et al* (1998a) as having the following characteristics. All of these are related to ecosystem health, but none of them in isolation fully describes the multi-dimensional concept of ecosystem wellbeing.

- homeostasis;
- an absence of ecosystem distress syndrome;
- diversity or complexity;
- stability or resilience;
- vigour or scope for growth; and
- a balance between ecosystem components.

Measuring ecosystem health has been described by Constanza *et al* (1998a) as a comprehensive, multiscale, dynamic, hierarchical measure of ecosystem resilience, organisation and vigour.

These definitions imply that a system can maintain its structure (organisation or inventory) and function (vigour or processes) over time in the face of external stressors. The system's ability to do so is a measure of its resilience.

In simple terms ecosystem health is a measure of the overall performance of a complex system that is constructed from the behaviour of its parts.

An ecosystem is considered to be healthy:

- if it is stable and sustainable;
- if it is active and maintains its organisation and autonomy over time; and
- if it is resilient to stress.

This can be further simplified into three components which together encapsulate the characteristics of healthy and unhealthy ecosystems.

- Vigour, which refers to a system's activity, metabolism or primary productivity. Biomass of particular trophic groups may be considered a measure of vigour;

- Organisation, which refers to the number and diversity of interactions between system components. This is not as easily measured as activity or vigour (Constanza *et al*, 1998b), but traditional measures of species richness and diversity provides some indication of system organisation; and

- Resilience, defined as the ability of the system to maintain its structure and normal patterns of behaviour in the presence of stress. Because of the dynamic nature of estuarine systems and the interplay of seasonal cycles, response to a particular level of external stress may not be

predictable or repeatable. Although it became possible to predict with a high degree of certainty the behaviour of the Peel-Harvey estuaries under a range of conditions in the pre-Dawesville Channel condition, there has not yet been a full range of seasonal cycles to enable this to be carried out with equivalent certainty in the post-Dawesville Channel situation.

Estuarine systems in the southwest of Western Australia are resistant to natural disturbances brought about by variable patterns of runoff and they are able to recover rapidly after large episodic floods. Estuarine organisms are generally well-adapted to periods of low dissolved oxygen and salinity variations through patterns of migration, physiological adaptations or effective reproductive strategies. However, the natural structural organisation of benthic communities is simplified, because of regular disturbances which "reset" these communities to immature states following each bout of disturbance (Appendix 3).

Because of their evolutionary history of oligotrophic conditions, estuaries of the southwest of Western Australia are not particularly resistant to nutrient enrichment, and the biological communities found in undisturbed estuaries are easily modified and replaced by opportunists, following addition of nutrients. This means that biological communities in southwest estuaries can rapidly recover from natural disturbances that have been part of their evolutionary history, but they are easily modified through disturbance brought about by cultural nutrient enrichment that has not been part of their recent evolutionary experience.

11.1.2 Measuring Ecosystem Health

An ecological indicator is a characteristic of the environment that, when measured, quantifies the magnitude of stress, habitat characteristics, degree of exposure to the stressor, or degree of ecological response to the exposure, and which provides information toward a measurement endpoint.

Factors contributing to the ill-health of ecosystems include (though not all are relevant for Peel-Harvey):

- Changes in natural capital;
- Change in primary productivity;
- Simplification of food webs, loss of mutualism;
- Reduction in species diversity;
- Community redundancy declines;
- Increased dominance by opportunists;
- Reduced size distribution of biota;
- Increased amplitude of species populations;
- Increased prevalence of disease, abnormalities; and
- Circulation of contaminants in biota and media.

Measurement endpoints must be related to desired management outcomes, which will embody current interpretations of social and environmental values. The spatial and temporal scales of monitoring will be dictated by the management goals. The relationship between indicators, endpoints and system values are shown in Figure 4.

Although numerous indicators which have the potential to define estuarine health have been proposed, few have been tested to date. Testing should ensure that the indicator behaves predictably, is repeatable and has precision and accuracy. Environmental parameters or indicators must be selected that are measurable, meaningful and useful in judging the degree to which specified environmental conditions have been achieved or are being maintained.

Biological indicators should be:

- Simple and measurable;
- Able to quantify the rate of degradation or recovery in water quality;
- Applicable over a large geographic region;

- Furnish data on background or reference conditions and natural variability;
- Be present throughout the length of a wetland, river, estuary;
- Should grow in a specific well-defined habitat;
- Should be easily sampled and present in abundance;
- Should be unaffected by lifecycle stages;
- Should react to changes in water quality so that specific groups can be used as markers; and
- Presence rather than absence in response to environmental stimulus is a preferred characteristic for indicator organisms.

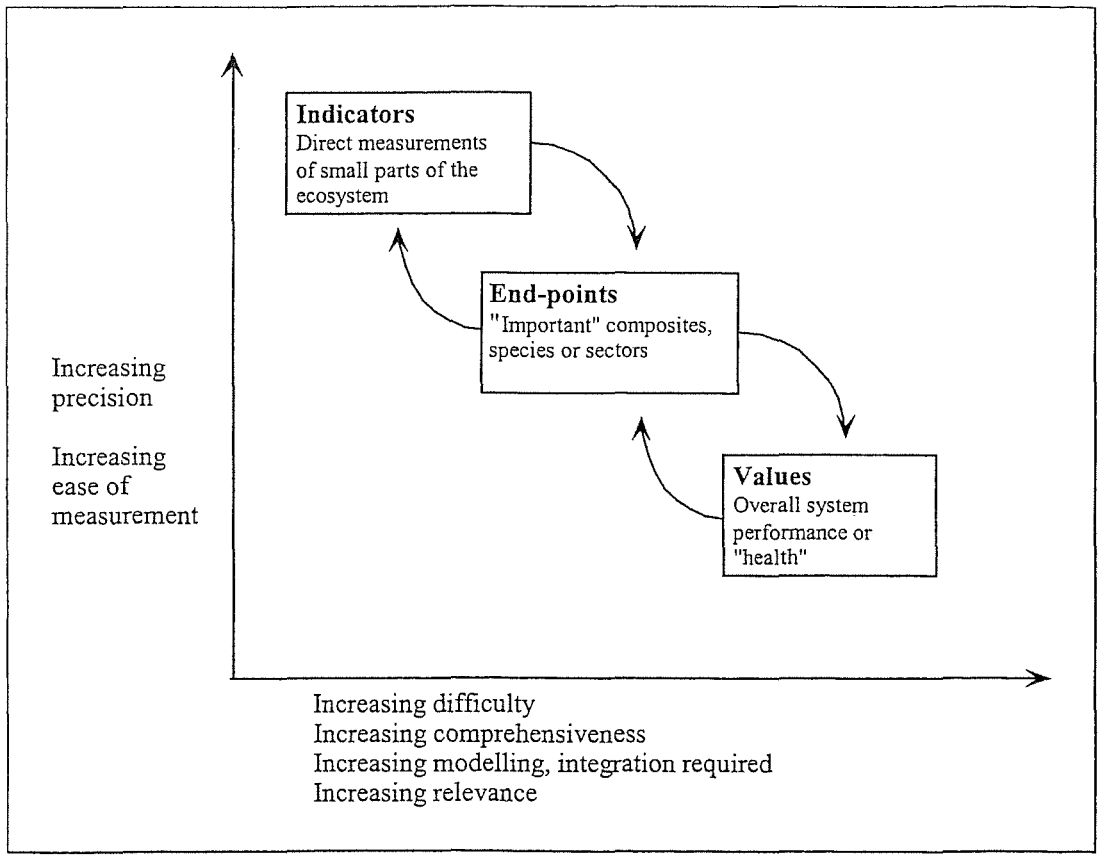
There are three types of indicators that should be included in a suite to assess the health of estuaries:

1. Core indicators - form the basis of assessment programs. Within this set are:
   - compliance indicators (used to judge the achievement of particular environmental objectives)
   - diagnostic indicators (used to determine the causes of impacts)
   - early warning indicators (especially sensitive to a particular ecosystem stressor and can detect potential deleterious impacts before significant impact has occurred)

2. Developmental indicators - those where research is advanced but their applicability to a particular management situation requires additional work; and

3. Research indicators - these need considerable additional research to be of use.

Figure 4 - The relationship between indicators, endpoints and system values



11.2 GENERAL ADVICE ON LONG-TERM MONITORING

According to Kendall (*in* Shenk and Franklin, 2001) a well-designed monitoring programme serves three crucial roles in the decision-making process, as follows:

1. It should provide information about the current state of the system and allow for an informed management decision based on predictions, including from modelling, both conceptual and mathematical;

2. It should provide information about the new state of the system after the decision is implemented. This allows for comparison between various models and hypotheses and can increase knowledge about which are more correct; and

3. Initial models may be based on historical monitoring information which may not have been collected with objective measurement in mind. To compile mathematical models, variables measured in the monitoring programme must be relevant to the objective function and appear as components of the models in the modelled set.

Monitoring the system's reaction to management and comparing the results against predictions is the essence of Adaptive Resource Management (Walters, 1986). Furthermore, there is a need to agree on management objectives and to state them clearly, otherwise there is no basis for optimising management decisions. The smaller the measurement error in the monitoring program and the more exact our knowledge of the current system state, the less uncertainty has to be faced in the decision-making process, and the faster the learning rate. (Kendall, *in* Shenk and Franklin, 2001).

Figure 5 shows a matrix of approaches to making management decisions dependent on agreement/disagreement over objectives and knowledge about ecosystems (after Lee, 1993)

Figure 5 - Matrix of approaches to making management decisions dependent on agreement/disagreement over objectives and knowledge about ecosystems

	MANAGEMENT OBJECTIVES	
KNOWLEDGE OF ECOSYSTEM	***AGREE***	***DISAGREE***
AGREE	Routine	Negotiations/Compromise
DISAGREE	Adaptive Resource Management	Conflict

When an environmental problem is identified, there is a range of approaches available to use to set management targets, and the one selected then leads into defining the kind and extent of monitoring required. Broadly the focus of management can be on an identified "protection level" or may be based on "permissible change from background". Both can be expressed in either (or both) qualitative (descriptive) or quantitative (numerical) measures.

The approaches to setting management targets for pollutants include:

i) setting a safe level for the pollutant, or at least a level that is deemed to be "safe". This might be a level considered "safe" from the perspective of protecting the environment, of may in the case of many pollutants, be set to protect human health.

ii) a second approach is that of prudent reduction. This entails setting the required management level at some "worthwhile" reduction from present. This approach may be utilised because the "safe" level cannot be determined. This may be as a result of imperfect scientific understanding or because it would be too costly to implement.

iii) a level can be set using through a precautionary approach using the Precautionary Principle. Put simply this states that lack of scientific evidence of an impact is no reason to assume that there is no impact occurring.

iv) an approach of using "best available technology not entailing excessive cost" (also known as BATNEEC). This approach recognises that if safe level exists (ie the safe level is known) it is probably too costly to achieve, and generally is applied in point source industrial situations.

v) an approach of using "as low as reasonably achievable" (also known as ALARA). This approach sets the target at a safe/prudent level, but recognising that anything more stringent would be unrealistic. Again, this is generally applied in point source industrial situations (adapted from Fox, D *in* Robinson, 2001):

In setting the original nutrient targets the EPA adopted a practical, pragmatic approach based on (i), (ii) and (iii) above, where the precautionary aspect related mainly to the need for strict catchment management to provide a safety buffer for the Dawesville Channel over time. The EPA recognised that "permissible change from background" in the Peel-Harvey system had already been well exceeded (as measured in the water quality and in the nuisance species occurring in the estuaries and rivers) and that having identified the critical threshold level required to be able to significantly improve the system, the management target needed to be set at an appropriate as "protection level".

In progressing from this review, it will be useful to ensure that critical terminology is used in a consistent manner to ensure common understanding across key stakeholders (Fox, D *in* Robinson, 2001). The concepts and terms that need to be defined include:

- environmental harm
- environmental effect and environmental impact
- background (is this the same as pristine in this context?)
- detectable change
- measurable change
- acceptable risk
- ecologically significant
- spatial scales (specifically what is meant by the terms small, medium, and large when applied to areas)
- temporal scales (specifically what is meant by short-term, medium-term, and long-term when used to describe timeframes)

At the same time, monitoring effort needs to be commensurate with risk. It is not worth intensively sampling those attributes which are not at risk or for which an adverse outcome is nearly impossible to detect beyond natural variation. It is very easy to fall into a trap of measuring (monitoring) attributes because they are easy to measure, even though they may not convey much if any useful information.

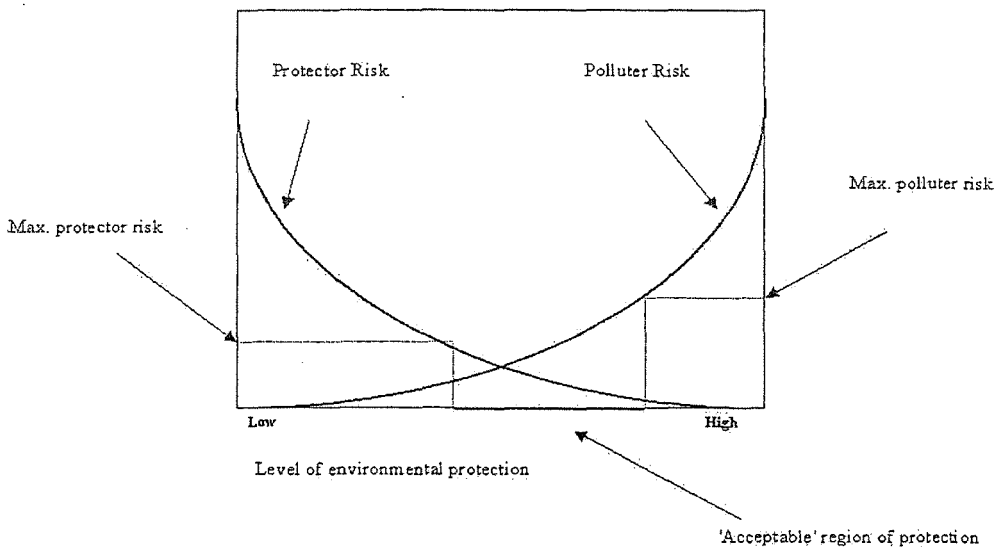
A key issue is balancing effort with certainty - less upfront effort leads to more false triggers and followups whereas more upfront effort leads to less false triggers and followups. The issue of who is carrying the risk if a problem is not detected or fixed is also an issue, as well as who is paying for fixing the problem. This issue of risks and trade-offs is very relevant (see Figure 6). In Peel-Harvey, the community at large has already made a significant financial contribution to fixing the problems, through the basic investigation, construction of the channel and monitoring ("Protector Risk"). The

community at large also carries the cost if the water quality in the estuaries deteriorates ("Protector Risk"). On the other hand, costs of implementing catchment management and changes in land use are borne largely by the catchment landholders. At present there are no costs incurred by this sector in not implementing additional management. This needs to be addressed in designing an appropriate incentive/penalty scheme as at present there is no "Polluter Risk".

The thrust of monitoring is that it should be able to detect environmental change (improvement or deterioration) over "appropriate" spatial and temporal scales, such that focus on inter-annual comparisons can be reduced or eliminated.

Figure 6 - Risks and Trade-offs in Environmental Protection
(Source: Fox, D *in* Robinson, 2001)

Protector Risk - is that a probable ecologically important impact goes undetected or not acted on
Polluter Risk - is that a probable unimportant impact triggers further action/cost



It is important to be clear why you are actually monitoring what you are monitoring. This requires clarity of purpose, for example testing a hypothesis, estimating parameters, describing existing condition etc. It is also important to recognise that implementing management of the Peel-Harvey to reverse deterioration of water quality in the estuaries and environmental quality of the system in general is, in effect, a field-scale environmental experiment. Monitoring of the receiving environment (the estuaries' water quality and biota) needs to be linked to nutrient loss characteristics from the catchment. Key endpoints such as extent of eutrophication, extent of improvement, changes from background (pre-channel background; post-channel background etc) need to be defined. A trigger level in catchment management improvements needs to be set which, if it is not achieved, will inevitably lead to action being taken to enforce the catchment management strategy.

Estuary and catchment monitoring should be synchronised with more general environmental monitoring to enable identification of possible cause and effect relationships (eg rainfall - wet and dry years).

11.3 SPECIFIC ADVICE ON MONITORING OF THE PEEL-HARVEY MANAGEMENT STRATEGY

The EPA in its 1988 assessment identified factors to be measured that would be indicators of fundamental measures of performance, specifically to determine:

a) whether the target water quality is being met;

b) whether the Dawesville Channel is working and to what extent; and

c) how well the overall package is working.

Environmental indicators recommended by the EPA for the Peel-Harvey System were listed along with the objective behind measuring that item, and included:

Catchment
- Streamflow;
- Phosphorus and nitrogen analyses of soils;
- Phosphorus and nitrogen analyses of streams;
- Areal water yields to the estuaries;

The EPA stated that the catchment portion of the management strategy would be considered to be working if there was a reduction in total phosphorus load entering the system, and with appropriate changes in land use a drop in water yield to the system (EPA, 1988).

Dawesville Channel
- Salt distribution and balance throughout the estuaries;
- Transparency of estuarine waters;
- Oxygen status of sediments;

Estuary Water Quality
- Seasonal nutrient levels;
- Light penetration through the water column;
- Tissue nutrient status of estuarine flora;

The EPA stated that success of the strategy would be demonstrated by reductions in summer nutrients, improved light penetration and reduction in total plant biomass.

Whole System
- System nutrient budget.

Key changes that would indicate improvements in the nutrient status of the system include reduction in nutrients entering the estuaries, increase in loss of nutrients permanently from the system (by flushing out to the ocean), prevention of phosphorus loss from the sediments into the estuaries' water column, or increased flushing from the system of any sediment phosphorus, and changes in biota.

The EPA also considered that because of the scale of the project the following should be regarded as essential monitoring, even though they were not necessarily required to demonstrate the fundamental performance of the key elements of the strategy.

- Tidal amplitude and tidal velocities;
- Sedimentation at the Dawesville Channel entrance and Harvey estuary entrance;
- Surface and groundwater balance;
- Groundwater contamination;
- Clearing and drainage;

- Land use and land use change;
- Cumulative discharge from known point sources;

- Measurement of Murray catchment east of the scarp;
- Fringing vegetation and foreshore inundation;
- Mosquito nuisance;
- Fish populations;
- Bird numbers.

This more general approach to monitoring whenever a large, field-scale environmental "trial" is carried out has later been supported by the" Guidelines for Carrying out Research or Field-scale trials in World Heritage or Environmentally Sensitive Areas" developed by the Australian Science and Technology Council (ASTEC,1997-98). Two important points made by ASTEC are the portability of the results in terms of potential relevance to other areas, and the importance, when carrying out any major environmental perturbation, of carrying out extensive monitoring to define "background" conditions and to show the resultant changes post disturbance. Not to do so is a wasted opportunity, such has occurred with most of the design of the National Landcare and Natural Heritage Trust Programs, where baseline conditions and post disturbance changes were mostly not measured, and very significant opportunities to gain knowledge and learn have been lost (Australian National Audit Office, 1997).

Additional indicators which could be considered for Peel-Harvey include:

Catchment
- Extent of development and adoption of "Minimum Acceptable Management Practices MAMPs";
- Proportion of farmers regularly using tissue and soil testing;
- Status of riparian vegetation along streams and drains;
- Biodiversity of wetlands (lakes, streams) in the catchment.

Estuary
- Occurrence of *Nodularia* blooms in lower riverine reaches;
- Presence of macroalgal biomass in the lower Harvey Estuary;

System
- Biodiversity of system (remnant vegetation, riparian areas, rivers, estuary).

Other indicators which can be used to indicate the overall health of the system should also be identified as a matter of urgency. The state of the system today forms the basis of a new "baseline" against which to measure change over the next 10 years.

Recommendation M1

It is recommended that the EPA requires the proponents to prepare a monitoring program to the satisfaction of the EPA, through an open and public process, to demonstrate that the requirements of the Environmental Conditions are being met. Monitoring should cover, inter alia:

a) System-wide water balance
b) System-wide nutrient balance
c) Estuarine ecosystem health
d) Managing organisms that have the potential to cause nuisance to the public.

Specific monitoring for (a) to (d) should include:

a) System-wide water balance

i) Surface water flux to the estuary measured continuously as stream flow at the Serpentine River at Dog Hill, the Harvey River at Clifton Park and the Murray River at Pinjarra using techniques to provide results with at least ±1% accuracy on annual totals.

ii) Estimates of surface runoff to the estuary from urban areas and other areas downsteam of the three gauging stations nominated at (i) above using techniques to provide results with at least ±15% accuracy on annual totals.

iii) Estimates of direct groundwater accession and loss from the estuary using techniques to provide results within ±15% accuracy on annual totals.

iv) Estimates of marine exchange through the Dawesville Channel and the Mandurah Channel using techniques to provide results within ±20% accuracy on annual totals.

vi) An annual water balance for the estuarine system should be derived using techniques to provide results within ±20% accuracy on annual totals.

Elements of the water balance should be reported every five years.

b) System-wide nutrient balance

i) Nutrient concentrations from samples collected from the Serpentine River at Dog Hill, the Harvey River at Clifton Park and the Murray River at Pinjarra using sampling techniques appropriate to reliably determine trends over time and to allow for mass load calculations as specified in ii) below.

ii) Nutrient mass loads for the Serpentine River at Dog Hill, the Harvey River at Clifton Park and the Murray River at Pinjarra using techniques to provide results within ±15% accuracy on annual totals. Results should be reported annually against the scaled targets below (see Appendix 3 this report for the derivation of the scaled targets.)

Table of scaled total phosphorus targets for the three main rivers

Application	TP - Target for average conditions	TP - Target for extreme conditions
Serpentine River - Dog Hill S614030	14 t (50 percentile)	44 t (90 percentile)
Murray River at Pinjarra S614065	15 t (50 percentile)	36 t (90 percentile)
Harvey River at Clifton Park S613052	27 t (50 percentile)	57 t (90 percentile)

iii) Nutrient concentrations in surface runoff to the estuary from representative urban areas and other areas downstream of the three gauging stations nominated at (i) above using spatial and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).

iv) Nutrient mass loads in surface runoff to the estuary from representative urban areas and other areas downstream of the three gauging stations nominated at (i) above using techniques to provide results within ±50% accuracy on annual totals.

v) Nutrient concentrations in groundwater from representative areas having direct groundwater accession to the estuary using spatial and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).

vi) Nutrient mass flux in groundwater from representative areas having direct groundwater accession to the estuary using techniques appropriate to provide results within ±50% accuracy on annual totals.

vii) Nutrient concentrations of estuarine waters using spatial and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).

viii) Nutrient concentrations of estuarine sediments using spatial and temporal sampling strategies appropriate to determining trends over time (5 yearly trends).

ix) Nutrient mass flux associated with estuarine sediments using techniques to provide results within ±50% accuracy on annual totals.

x) *Estimates of nutrient content associated with estuarine waters and marine exchange through the Dawesville Channel and the Mandurah Channel using techniques to provide estimates of mass flux within ±50% accuracy on annual totals.*

xi) *An annual nutrient mass balance for the estuarine system should be derived using techniques to provide results within ±50% accuracy on annual totals.*

Performance (mass loads) for the three main rivers should be reported against the scaled targets annually (bii).

Elements of the nutrient mass balance should be reported every five years.

c) ***Estuarine ecosystem health***

i) *Dissolved oxygen concentrations should be determined in estuarine waters using spatial, temporal and vertical sampling strategies appropriate to determining trends over time and an assessment of any localised short-term periods of hypoxia or anoxia.*

ii) *Chlorophylla should be determined in estuarine waters using spatial, temporal and vertical sampling strategies appropriate to determining trends over time. Assessment of any localised short-term periods of algal bloom is covered in di) below.*

iii) *The condition and extent of riparian communities fringing the estuary should be determined using techniques appropriate to determining trends over time (5 yearly trends).*

iv) *The nature of any commercial or recreational fisheries should be determined using techniques appropriate to determining trends over time (5 yearly trends).*

vi) *The nature of any avifaunal communities inhabiting or visiting estuarine waters should be determined using techniques appropriate to determining trends over time (5 yearly trends).*

Elements of estuarine ecosystem health should be reported every five years.

d) ***Managing potential public nuisance***

i) *Chlorophylla and phytoplankton cell densities should be determined (if bloom conditions occur) in estuarine waters using spatial, temporal and vertical sampling strategies appropriate to determining the magnitude and nature of any localised short-term periods of algal bloom.*

ii) *Macroalgal species composition and densities should be determined around the estuary (if present at nuisance levels) using spatial, temporal and vertical sampling strategies appropriate to determining trends over time. These data should be reported annually will form the basis of any macroalgal harvesting or other management strategies.*

iii) *Mosquito nuisance should be assessed regularly during the year using methods appropriate to providing reports on trends particularly around areas of significant human habitation.*

Elements of programmes to manage organisms that can cause public nuisance should be reported annually.

The monitoring program should be designed to measure performance against the measures of estuary system health to be developed by the EPA as outlined in Section 11.1 of this Report. The recommendations from that section and the section on targets are relevant here.

12. REGULATORY APPROACHES TO CATCHMENT MANAGEMENT

12.1 KEY ELEMENTS OF EFFECTIVE ENVIRONMENTAL REGULATION

The Environmental Protection Act requires the designation of a "proponent" for a proposal. This is not always a straightforward case of identifying who is referring the proposal but also requires consideration of the Environmental Conditions that will be required to implement the development. The Conditions can only be applied to those identified as the "proponent" and cannot be applied to those that are not proponents, even though the latter may be even more important in achieving successful implementation of the project . This has been discussed in more detail in Section 10.3 of this Report.

Assuming that the proponents and/or licensees have been accurately identified, there are several key elements to consider if effective regulatory environmental control is to be achieved (after A Baker, pers. comm.):

i) There is an environmental issue to be controlled/managed. This should be based on reasonable precautionary or real indications of an emerging problem (for example diffuse source pollution such as salinisation, eutrophication from excessive nutrients), or actual experience in comparable circumstances.

ii) The control measure should have a basis at law and the regulator should not be acting beyond head powers (*ultra vires*).

iii) The control envisaged should be attainable by the proponent. Setting unattainable goals that put the proponent into non-compliance are not fair or reasonable.

iv) The control measure should be reasonable and practicable - the golden thread that puts rational balance into demands and takes into account cost, on the basis of cost to do something versus cost for failing to have done so, and effectiveness of the cost compared with unit environmental benefit gained (biggest bang for the buck approach).

v) The control approach should be enforceable. If there are no tests at law from which the regulated entity can clearly demonstrate his responsibility, the control measure should not be written.

vi) There should be a willingness to carry out the enforcement (see Section 12.2).

vii) The compliance/non-compliance itself should be measurable. There must be a means of determining performance clearly stated as requirements, for example, send in a report on (contents) to a specified person by a specified time demonstrating that specified requirements have been met (or not met).

If a strict legal approach is to be taken, failure on any of the above suggests that the regulatory instrument whether a Regulation, License, Environmental Condition, or Environmental Protection Policy cannot be enforced and perhaps should not be proceeded with.

However, the achievement of good environmental protection often depends on good will, rather than statutory control per se. This is particularly the case for broadacre rather than "end-of-pipe" type projects where the intent behind environmental requirements is usually at least as important as the strict legal requirements. Even with "end-of-pipe type projects a high degree of trust and goodwill, supported by an appropriate level of regulation tends to lead to a greater degree of environmental

protection overall being volunteered by a proponent than might be achievable through regulation alone.

For Peel-Harvey, even though the Conditions may be regarded as not having been written in a manner that is strictly legally enforceable, the intent of most has also not been followed by the proponents and others responsible for the success of the management package.

12.2 "SMART" REGULATION - A TOOL FOR CATCHMENT MANAGEMENT

The relative advantages and disadvantages of using regulatory versus incentive approaches to achieving environmentally appropriate land management is discussed in some detail in Appendix 2.

Bradsen (1992) observed that the terms "regulation" and "compulsion" seem to generate a negative reaction and closed minds in people, even though most areas of our lives are subject to both, and in reality they may not be very different, as the withholding of an incentive, or imposition of a tax can operate much like a fine.

Although incentives have their place they have considerable shortcomings in areas such as land and water management where short-term individual interest and long-term societal interests are not seen to coincide naturally.

Environmental problems can be addressed via regulation in three main ways.

a) Regulation through planning. This can be regarded as a positive facilitatory approach, a "Yes, if" approach.

   This approach involves using criteria to identify the areas in which specified activities should or should not take place, or may take place according to certain conditions. This is the approach taken in the Peel Region Plan (DPUD, 1990) and was the intended approach for the Peel-Harvey catchment management plan.

b) Regulation through licensing of a person or firm. This can be regarded as a negative facilitatory approach, a "No, unless".

   Typically this prohibits an activity unless a license is obtained which is generally issued with conditions.

c) Direct regulation of activities. This prohibits activities, or enables them through adherence to minimum acceptable management practices or best management practices.

   This approach focuses directly on the activity and applies to persons. It "catches" anyone who engages in the activity and would often lead to criminal penalties.

Unfortunately there appears to be an assumption that (c) is the only mode of regulation that should be applied in the land conservation context, when clearly all of (a) to (c) could be used beneficially.

For landholders, licensing is probably not an appropriate way in which to deal with land degradation; direct regulation has a role but not as part of criminal law; and planning is essential both at regional and property levels.

12.2.1 An Environmental Duty of Care

The Industry Commission (1998) proposed a statutory "duty of care" for the environment "which would require everyone who influences the management of the risks to the environment to take all "reasonable and practical" steps to prevent harm to the environment that could have been reasonably foreseen" (p. 134). The extension of the common law duty of care for the environment would make it explicit that the duty not only applies to harm that might be caused to those living today, but also to those who are yet to be born. This would also emphasise that land holders are "stewards of the land" and that land is held in trust for subsequent generations (p. 135).

As foreseen by the Industry Commission, the duty should cover - private, Crown and Aboriginal land, air; surface and ground water; flora and fauna; biological diversity and ecological integrity; terrestrial, coastal and marine environments; and cultural and aesthetic values (Industry Commission, 1998, p.148) as well as a range of subordinate duties.

On the concept of 'duty of care" in natural resource management, Agriculture Western Australia said in a submission to the Inquiry:

"*This concept which already applies in common law is a useful philosophical underpinning for natural resource management.*" (Industry Commission, 1998, p.143).

12.2.2 Varieties of Regulatory Instruments

Gunningham and Grabosky (1998) carried out a detailed examination of the varieties of regulatory instruments as well as concluding that an approach of "Smart Regulation" was an effective way forward (see later). They list the main kinds of regulatory instruments as being:

a) Command and control regulation;
b) Self-regulation;
c) Volunteerism;
d) Education and information instruments, including
   - Education and training
   - Corporate environmental reports
   - Community right to know and pollution inventories
   - Product certification
   - Award schemes
e) Economic instruments
   - Property-rights
   - Market creation
   - Fiscal instruments and charge systems
   - Financial instruments
   - Liability instruments
   - Performance bonds
   - Deposit refund systems
   - Removing perverse incentives
f) Free market environmentalism.

12.2.3 Voluntary Standards

It is envisaged that operating to meet the duty of care requirement would be mandatory, but the means employed by a landholder to meet it would be voluntary, by the landholder making a selection from a range of options.

The Industry Commission (1998) states:

"*While voluntary standards should be the principal means by which landowners meet the proposed duty of care, that duty and its related principles should be mandatory. In addition, a range of mandatory "safety net" standards would remain in areas where the likelihood, and the potential cost, of environmental damage is particularly high.*" (p. 159)

It is a matter of judgement whether the multiple values of the Peel-Harvey estuaries and their catchments constitute a situation where mandatory "safety net" standards (minimum acceptable management practices (MAMP's)) should now be applied. The fact that governments were prepared to make the investment in the Dawesville Channel suggests that taking more certain steps to safeguard the estuaries from harmful activities in the catchment (and protect the government's investment in the channel) could be reasonably expected to follow. In doing so it should be remembered that strong

mandatory standards that cannot be enforced will simply serve to undermine the regulatory system and public confidence in it (Industry Commission, 1998, p.159)

The comprehensive integrated catchment management plan as envisaged by the EPA provided a sound means of improving land management in the catchment whilst at the same time still providing the flexibility for landholders to be able to select from a range of environmentally "acceptable" land uses and management measures. The aim was to have a dynamic plan that could take account of new methods and accommodate additional environmental risks as they were identified. The combination of "top down" and "ground up" in ICM is exemplified in recommendation 9.7 of the Industry Commission:

"*The administering agency should publish lists of voluntary standards that it considers conform to the requirements of the proposed unifying statute. The demonstrated application of such standards should be* prima facie *evidence of compliance with the legislation.*" (Industry Commission, 1998, p.167).

In effect, adoption of MAMP's by landholders would be accepted as demonstrating compliance with requirements.

12.2.4 Mandated Standards

Mandated standards are most likely to be necessary where the community considers that the risks or the damage to the environment are unacceptably high, or they lack confidence in the alternative means of managing the risks. Such mandated standards may take one of three forms:

- general environmental standards (eg a requirement to notify of risk of or occurrence of environmental damage)
- particularly risky universal hazards (eg maximum level of a hazardous agricultural chemical)
- for a particular industry (eg a piggery), or for an area under particular threat (eg an estuary)

Mandated standards should only be used when they have been adequately assessed to ensure that they are likely to yield a net benefit to the community and be the best of practical alternatives. COAG has endorsed a set of principles and guidelines for the development of national standards and regulations (see Appendix 2).

12.2.5 Enforcement

There are generally two approaches to regulatory enforcement;

- *deterrence* - where compliance is driven by the probability and severity of punishment (the expected penalty); and

- *persuasion* - where those who favour this approach believe that cooperation is more likely to be successful as compliance depends upon non-economic values.

Current thinking is that a mix of deterrence and persuasion is likely to be more effective than either one on its own. Deterrence is essential to effective enforcement, as on its own persuasion cannot ensure a commitment to compliance where compliance may not be in the immediate economic interests of those concerned, or where the benefit is perceived as accruing to society rather than to the individual.

Governments are forced to regulate in the areas of environmental and natural resource management because the natural incentives on people to voluntarily reduce risks are inadequate in many cases. While some people will voluntarily comply, others will only do so if there is an incentive, or an

expected penalty for not doing so. Setting the line between voluntary and mandated standards is a fine balancing act, as an over-reliance on deterrence can become counter-productive and produce a culture of regulatory resistance. However, research has also shown that compliance even by the majority

depends on deterring the recalcitrant minority. It has been found that about 20 per cent of all firms will comply unconditionally with any rule, about 5 per cent are always going to disobey, and about 75 per cent are likely to comply, but only if the threat of punishing the incorrigible 5 per cent is convincing.

Enforcement involves a hierarchy of responses and this is discussed in more detail in Appendix 2.

Effective regulation and enforcement can only occur when the institutional issue of agency conflict of interest is resolved. Conflicts can arise from the combination within one government agency of the requirement to discharge regulatory functions as well as management and/or service provision functions, such as occurs with controls over land clearing (now being addressed through the Environmental Protection Act amendments) and soil and land conservation in Western Australia.

12.2.6 "Smart" Regulation

Gunningham and Sinclair *(in* Gunningham and Grabosky, 1998) identify the key aspects of regulatory design processes and regulatory design principles.

These are summarised below:

Regulatory Design Processes

Process 1 - Identify the desired policy goal(s) and the trade-offs necessary to achieve it (them).

Process 2 - Identify the unique characteristics of the environmental problem being addressed.

Process 3 - Identify the range of potential regulatory participants and policy instruments.

Process 4 - Identify opportunities for consultation and public participation.

The above processes fit well into the model for ICM (philosophy, process and product) proposed for Western Australia and implemented from around 1988 to 1994.

Regulatory Design Principles

Principle 1 - Prefer policy mixes incorporating a broader range of instruments and institutions.

Principle 2 - Prefer less interventionist measures.

Principle 3 - Ascend a dynamic instrument pyramid to the extent necessary to achieve policy goals (including - building in regulatory responsiveness; instrument sequencing to increase dependability; triggers and buffer zones; circuit breakers)

Principle 4 - Empower participants who are in the best position to act as surrogate regulators.

Principle 5 - Maximise opportunities for win-win outcomes (including - will firms voluntarily go beyond compliance; moving the goal posts from win-lose to win-win).

The approach of developing an EPP and comprehensive integrated catchment management plan for the Peel-Harvey catchment already meets the above principles, by

a) identifying the environmental goals;

b) relying on a broad range of instruments to achieve the environmental goals (eg planning policies and statutes, development of codes of practice, implementation of a community-derived catchment management plan (CMP), regulation and volunteerism);

c) was designed to be a low interventionist approach (once the CMP was developed and implemented);

d) provided a means of developing a pyramid of regulatory approaches, which could respond in a dynamic manner to an adaptive environmental assessment and management approach implemented over an extended period;

e) would empower participants (through the implementation and monitoring of the CMP); and

f) provided a flexible framework to maximise win-win outcomes.

13. CONCLUDING ADVICE TO THE EPA

This section of the Report provides concluding advice on the central issues of nutrient targets, integrated catchment management and the legal and administrative requirements to ensure that environmentally appropriate management plans are developed and implemented, both for Peel-Harvey and for natural resource management and catchment management in general in WA.

13.1 CONCLUDING ADVICE ON THE MANAGEMENT APPROACH FOR PEEL-HARVEY

Overall, in terms of the management strategy and its success, the Expert Review Committee's judgement is that:

1. The management objectives set by the EPA have been reviewed and found to be appropriate for addressing the nutrient enrichment problems in the estuaries.

2. The technical synthesis developed during the assessments by the EPA in 1985 and 1988 was correct and remains relevant.

3. The management package of the Dawesville Channel and catchment management was found to be the correct management approach. However , only part of the package has been implemented by the proponents, to date.

4. The implementation of only part of the management package required by the Minister's Environmental Conditions means that full compliance by the proponents has not yet been achieved.

5. The Minister's Environmental Conditions remain largely relevant with a few requiring mostly only minor amendment. The Conditions should be continued into the next phase of management.

6. The Dawesville Channel has been constructed and has been successful in increasing flushing between the estuaries and the ocean. This has led to:

    - increased oxygenation of the sediments within the estuaries with consequent reduction in phosphorus release from the sediments into the water column;

    - a change in salinity to more marine-like conditions for most of the year. The narrowing of the period when lower salinities occur has limited the germination of *Nodularia*.; and

    - increased flushing enhancing loss of nutrients from the estuaries.

7. Although the targets for phosphorus reduction from the catchment have not yet been met, the phosphorus target for water quality improvement and phosphorus load reduction targets from the three main river catchments remain appropriate

8. Although the Dawesville Channel has been successful in improving the water quality in the main body of the Peel Inlet and Harvey Estuary, severe water quality and environmental problems remain in the Serpentine Lakes. These water quality problems in the lower reaches of the rivers will persist as long as agriculture, as currently practised, remains the dominant land use in the coastal plain catchment.

9. The immediate, pressing problem of algal blooms has been reduced but to a degree this can be regarded as having resulted from a succession of drier-than-average years. The estuary could still be at risk of algal blooms in an average-to-wet year and there may well be insufficient resilience in the system to cope with this.

10. Current public concern seems to relate more to water quality in the Lower Murray, Lower Serpentine and Lake Goegrup as well as the consequences of management already put in place, including increased mosquitoes and the death of freshwater-dependent fringing vegetation around the estuary from the changed salinity and tidal regime (predicted by EPA in its 1988 assessment).

11. Catchment management has not "worked". However, this was not because catchment management was tried and failed but because the on-the-ground actions necessary to implement nutrient reduction from broadacre agriculture in the catchment have not been implemented to an effective level. A contributing factor to this is that the comprehensive integrated catchment management plan envisaged by the EPA has not been developed or implemented and the mechanisms for implementing such a plan have not been developed, even though recommendations on this were first made by the EPA in 1985.

12. The control of point sources of phosphorus has largely been implemented through development of codes of practice and licensing of prescribed premises. However, it will still take some time for run-down of phosphorus to occur and for P stores in various parts of the drainage system to reduce.

13. Institutional failures have been a key reason for the failure to implement the whole management package and in particular to develop and implement the catchment management plan. Successful integrated catchment management requires change in attitudes and power sharing among all players, including government agencies, and a need to operate outside familiar comfort zones.

14. Nowadays the community and regulators expect continuous improvement in environmental management which provides the context for review of the 1988 management strategy. The focus for management in the future needs to be on the ecological sustainability of the estuaries and catchments, in particular protection of remnant native vegetation and rebuilding of biodiversity as well as improvement in overall environmental quality in the catchment and estuaries.

15. Further implementation of the management strategy now needs to focus on:

- developing and implementing the comprehensive integrated catchment management plan;
- developing a mechanism to underpin implementation of the catchment management plan. In addition a range of incentives and regulatory tools should be applied.

16. The management strategy that was developed was cutting edge at that time and is still innovative. The Legal and Administrative Framework for Management was the best that could be achieved using the statutes available. It has no "fatal flaws" and can be made to work.

17. The Environmental Protection Policy (EPP) was developed and has been partially successful. It has not been fully successful because of the shortcomings relating to catchment management and institutional problems and attitudinal barriers to achieving successful natural resources management in WA, including between agencies.

18. It needs to be accepted that once a system such as the Peel-Harvey has been altered to the extent that it had, prior to management, it is impossible to restore it to its original environmental condition. At best what can be realistically achieved is a new, resilient system which will differ from the original in terms of its ecology. Furthermore, decisions to establish land-uses on greenfield sites (for example urban, agricultural) will inevitably lead to some degree of change to soil and water quality as well as some degree of loss of natural diversity. However, changing existing rural land uses to urban may provide opportunities to improve water quality and restore biodiversity if handled well.

19. Regulatory equity in relation to the extent, magnitude and risks from the impacts of agriculture on the environment, is an issue that increasingly needs to be addressed both in the context of WA and national environmental quality and protection as well as international commodity pricing.

20. The custodial responsibilities within the Soil and Land Conservation Act should be actively applied to maximise wise use of land to prevent environmental degradation. Although the basics of the Act are sound, custodial aspects in relation to basic protection of land, soil and water are too narrowly defined and are interpreted in favour of short-term interests of farmers rather than considering the long-term interests of the community and future generations. The over-arching custodial responsibilities for Soil and Land (and water) conservation should more appropriately reside with the EPA, which would require amendment to the Soil and Land Conservation Act.

21. Government agencies as proponents for projects need to recognise that they are obliged to operate according to the same rules as private non-government proponents. The EPA may wish to consider additional education in this area. The advice to the EPA on the PCR process and Proponents should assist in moving government agencies to a more professional approach, noting that compliance with the legal instruments of environmental approvals, including Environmental Conditions set by the Minister for the Environment is mandatory for all proponents, and EPPs bind everyone, including government agencies and the community as they undertake their activities.

13.2 IMPLICATIONS FOR CATCHMENT MANAGEMENT AND SUSTAINABILITY IN WA

The form of a Compliance Review has required that the Expert Review Committee largely confine itself to the review in this report. However, the Committee is of the view that the EPA and government may substantially benefit from broader and additional advice relating to the development and implementation of catchment management plans in WA. In particular it will be important to ensure that EPA continues to have an independent role in identifying the elements of the environment that are priorities for protection, as well as identifying and setting the environmental values and ecosystem 'endpoints' that are fundamental to the natural resource management and sustainability agendas.

The Peel-Harvey Management Strategy is the only catchment management proposal that has been fully assessed by the EPA in WA. Use of the EPA's process is currently the only statutory mechanism which provides for and encourages input from any member of the community regardless of whether or not they live in a particular catchment, and that can taken account of the very long term and matters such as inter-generational equity. The ERC notes with some concern the current trend whereby residents in a catchment regard that catchment as theirs to manage, irrespective of others located elsewhere who may also have a share in its intrinsic values and/or management.

The ERC notes the recent formation of a Natural Resource Management Council to provide advice to the Minister for Environment and Heritage, on natural resource matters. The ERC notes that a major reason for the formation of that Council is to dovetail into and secure funding under the Commonwealth Government's new National Action plan on Salinity and Water Quality (NAP) and Natural Heritage Trust (NHT) funding arrangements. The ERC also notes that the terms of reference for the NRM Council are not yet finalised and that several of the potential terms being put forward would be inappropriate for this body as they are already functions of the EPA under the Environmental Protection Act. Furthermore, the membership of the NRM Council is not appropriate to carry out many of the terms of reference put forward.

Although, Commonwealth funding arrangements and the bilateral agreements that underpin them may not necessarily explicitly recognise the very significant and independent role of the EPA, (because of the requirement for EPA to operate independently of government) nevertheless the EPA will continue to perform its statutory functions and continue to provide unfettered, objective and independent environmental advice on natural resource management plans and their effectiveness. In particular, the EPA has a direct and irrefutable interest in the environmental consequences of setting targets to achieve ecological outcomes and maintain key ecological processes in the long term as well as being responsible for providing "over-arching" environmental advice to government.

The EPA has indicated its intention to retain the expertise of the Expert Review Committee to continue to provide it with expert advice on catchment management and NRM generally.

It is noted that the Natural Resource Management Ministerial Council has recently agreed to a framework for the accreditation of NRM Plans and which will be used as the basis for guiding investments under the National Action Plan for Salinity and Water Quality (NAP) and extension of the Natural Heritage Trust (NHT). The NRM plans have to be developed to satisfy the Commonwealth's requirements (as a minimum) but clearly will also need to take full account of the local environmental condition and requirements. This is in accordance with the National Water Quality Management Strategy (NWQMS) approach which proposed guidelines but recognises that it is open to argue for different levels where appropriate to take account of particular environmental differences.

Clearly this is a rapidly evolving area, however, Regional NRM plans should, as a minimum, be consistent with the NWQMS, to which Western Australia is party, and seek to identify (or set out the process for identifying) the following:

a) **community consultation** for determining the environmental values (or beneficial uses) of water in a planning region – aquatic ecosystems, primary industries, recreational and aesthetics and drinking water;

b) **the surface water catchment/s and receiving waters** - all land within the planning region should be accorded to a catchment (whether or not it flows to the coast), and receiving waters should include rivers, lakes, wetlands, estuaries, coastal and marine waters;

c) **aquifers** (including superficial aquifers) in the planning region that are identified as existing or future sources of water for human or agricultural use or for environmental purposes. The extent of these aquifers should be shown;

d) **existing information** on matters such as water quality and quantity for surface and groundwater, climatic variability and land use. From this identify **all point and diffuse sources of pollution** and where possible, prioritise the relative discharges from those sources. In particular, identify any "critical source areas" that may generate large amounts of pollutants;

e) **the environmental values** (EVs) of the surface and aquifer receiving waters -. the EVs of the plan may be considered 'interim', but must be consistent with the National Water Quality Management Strategy (NWQMS). The basis and criteria for setting EVs, including the level of protection for "aquatic ecosystems", should be set out - preferably in tabular form;

f) **water quality issues and associated pollutants** that threaten those EVs - the pollutants may be in addition to those matters for which regional targets must be set, ie surface water salinity, suspended sediment/solids and nutrients (see NAP Standards and Targets Framework);

g) **water quality targets**, based on the Environment Australia document *Water Quality Targets: A Handbook* (due for release at http://www.ea.gov.au/water/quality/targets by 30 June 2002) and the Water Quality Guidelines (especially for additional matters), consistent with the NAP Standards and Targets Framework. Trade-offs between environmental, social and economic objectives that underpin environmental values and/or targets should be documented and the rationale clearly explained. The target setting should take account of the agreed NAP Monitoring and Evaluation Framework (expected to be available online by 30 June 2002) and monitoring data will be essential in setting targets;

h) **management actions and their timing**, substantiated against the water quality targets - these actions should be part of a cost-effective and stepwise approach to achieving those targets; and

i) **a monitoring program,** which should be used to identify the sources of pollution, evaluate the effectiveness of the management actions in meeting the proposed targets and should set out the role of community monitoring (eg Waterwatch) in that program.

In the above list, it can be reasonably expected that the EPA operating in accordance with its Act and would have to assess whether NRM plans meet environmental requirements, particularly in relation to (a) to (h). In addition, as it does with any proponent, the EPA may wish to be fully assured that the management actions proposed are indeed adequate to deliver against the protection/restoration of the environment and that a competent monitoring programme will be provided.

Although application of the NWQMS guidelines is in general desirable, there may be instances where local environmental conditions would make it appropriate to use other guideline values. This will always be the case where the differences in climate and between natural environments is as great as it is in continental Australia. Clearly any deviation from the NWQMS guidelines would require expert judgement, and in WA it is the EPA that has been established as the expert environmental body to form such judgements on matters of environmental concern.

In addition to having a clear role in assessing NRM plans and in their accreditation, the EPA also would have a role in audit and evaluation of progress of NRM plans, comparable to the role it already has in auditing and evaluating progress for the WA State of the Environment and Salinity Strategies.

It is the view of the Expert Review Committee that the EPA has an important, central and ongoing role to play in natural resource management across all areas of the State, in ensuring that the environmental is fully taken into account and in ensuring that proposed management actions will indeed be sufficient to deliver environmental protection. The demonstrated lack of acceptance of responsibility by the catchment community and the various government departments, to date, in developing and implementing an effective catchment management plan in the Peel-Harvey (or indeed for any other area of Western Australia) leads to the ERC being greatly concerned about any additional devolution of responsibility in natural resource management (unsupervised) to catchment groups. Furthermore, the government has still not taken seriously the need to develop a sound implementation mechanism for catchment management plans, which by their very nature require specific and timebound management actions to be undertaken on both rural urban and rural land. Although urban development is subject to various development controls and planning requirements, to date none has been applied to rural land, and an attitude of "this is my land and I can do what I like with it" persists in rural areas.

The above two issues are important risk management issues which have not been adequately addressed in WA over the last 15+ years, in spite of the need for extensive action in rural areas both for tackling salinity and other catchment-based environmental problems. They will remain significant risk management issues until such time as groups in WA can provide 'reasonable assurance' that the parties can form meaningful working partnerships, develop and implement a purposeful plan and roles

and accountabilities can be satisfied. This is unlikely to be possible until there is recognition from those within a catchment that others outside also have an equal right to make input, and meaningful legislation is developed which assigns roles and responsibilities and addresses the issue of implementation of catchment plans on all land types and tenures. There is a responsibility to ensure that Commonwealth, State, local government, industry and landowner investments are not squandered (Australian National Audit Office, 1997). The resources available are few enough, and there is a clear need to be focussed.

The National Framework for Natural Resource Management Standards and Targets leads to a requirement that regional NRM plans properly address national natural resource outcomes, and national standards which define best practice management. The minimum set of matters for which all catchments/regions must consider setting regional targets are provided by the Commonwealth and are provided here (Table 15). The EPA has an obvious interest in most to all of the areas proposed, and should be providing over-arching advice on whether the targets being put forward in NRM plans are environmentally acceptable to the EPA. In addition, the EPA may well require the proponents of the plans to demonstrate that the management actions proposed are adequate and will deliver on the targets within a reasonable timeframe.

The EPA has an established role and it should be expected that the EPA will continue to provide over-arching environmental advice on all natural resource management plans and in particular on whether the environmental management/improvement targets are adequate to achieve the required level of environmental protection/restoration over the long term. The Environmental Protection Act requires that any proposal which may have a significant effect on the environment must be referred to the EPA by proponents and EPA can readily carry out such assessments by requiring referral to it of all catchment management plans or NRM plans prepared by catchment groups and regional councils. These bodies would be the "proponents" under the Environmental Protection Act.

The ERC considers that, as a matter of urgency, the EPA should develop a process by which it can continue to operate in accordance with its Act in regard to the development, assessment and accreditation of NRM plans, and the manner by which it will provide independent advice to the Minister on the environmental acceptability of NRM plans. This is important both in terms of protecting the environment but also in terms of having a neutral and independent body able to provide assurances to the public about the potential gains from particular catchment plans. This latter point recognises some of the issues raised in the Australian National Audit Office report (1997) and addresses the situation where the 'independence' of resource managers (both agencies and catchment groups and landholders) may be called into question should such bodies be the recipients of, or otherwise gain financial benefit (directly or indirectly) from, the accreditation of plans and/or funding of management actions arising therefrom.

Recommendation NRM1

It is recommended that the EPA provide public advice, as a matter of urgency, on how it will continue to meet the requirements set down in the Environmental Protection Act which will require that the EPA is fully accommodated in the processes and requirements being developed for NRM in WA and Nationally.

Table 15 – National Outcomes and Minimum Set of Regional Targets for NRM Framework

National Outcomes The national outcomes are aspirational statements about desired national natural resource outcomes	**Matters for Targets** **Resource Condition Matters for Targets (if relevant)**
1. The impact of salinity on land and water resources is minimised, avoided or reduced. 2. Biodiversity and the extent, diversity and condition of native ecosystems are maintained or rehabilitated 3. *Populations of significant species and ecological communities are maintained or rehabilitated.* 4. Ecosystem services and functions are maintained or rehabilitated. 5. Surface and groundwater quality is maintained or enhanced. 6. The impact of threatening processes on locations and systems which are critical for conservation of biodiversity, agricultural production, towns, infrastructure and cultural and social values, is avoided or minimised. 7. Surface water and groundwater is securely allocated for sustainable production purposes and to support human uses and the environment, within the sustainable capacity of the water resource. 8. Sustainable production systems are developed and management practices are in place, which maintain or rehabilitate biodiversity and ecosystem services, maintain or enhance resource quality, maintain productive capacity and prevent and manage degradation.	1. Land salinity. 2. Soil condition. 3. Native vegetation communities' integrity. 4. Inland aquatic ecosystems integrity (rivers and other wetlands). 5. Estuarine, coastal and marine habitats integrity. 6. Nutrients in aquatic environments. 7. Turbidity / suspended particulate matter in aquatic environments. 8. Surface water salinity in freshwater aquatic environments. 9. Significant native species and ecological communities. 10. Ecologically significant invasive species. **Management Action Matters for Targets** 1. Critical assets identified and protected. 2. Water allocation plans developed and implemented. 3. Improved land and water management practices adopted.

Extract from National Framework for Natural Resource Management (NRM) Standards and Targets Annex A. This table should also be read in conjunction with the National NRM Monitoring and Evaluation Framework and the document on Implementing the National Water Quality Management Strategy Through NAP/NHT Natural Resource Management Plans

The NAP/NHT program acknowledges that it is legitimate to use public funds to support actions carried out on private land where doing so would lead to community benefit. Such benefits include biodiversity, water quality, protection of rivers, wetlands and other receiving water bodies such as estuaries, and even work carried out today for the benefit of future generations.

As NHT relies heavily on the use of public funds, it is also legitimate for any member of the community to make input to any plan, regardless of where they may live. The EPA has an identified role as an advocate for the environment on behalf of the community, and thus it is appropriate for the EPA to use its public processes to ensure that the broad community has the opportunity to make input to any NRM plan, and in particular to the management targets being set.

The intent of an NRM plan is to chart a course towards achieving future environmental outcomes, and it seems appropriate and germane to the functions of the EPA that it should seek referral of such plans as part of its routine business.

Recommendation NRM2

It is recommended that the EPA ensures that it formally assesses all NRM plans to be prepared by local and regional catchment groups, to ensure that the environmental effects of such proposals are environmentally acceptable, that environmental objectives meet the EPA's requirements, that management actions to deliver on protection/restoration of the environment will indeed do so, and to facilitate input from any member of the public who wishes to make input to the targets for any catchment area.

14. PROPOSED PROPONENTS AND ENVIRONMENTAL CONDITIONS

The Expert Review Group considers that although some of the Conditions which specifically apply to the Dawesville Channel have been fully met and can now be cleared, there is benefit in retaining most of the Conditions in a revised form that reflects the current Ministerial arrangements and the change to the proponents required to fully implement the project.

It is recognised that revision of the Conditions will require a formal s46 process by the EPA and the Minister for Environment and Heritage.

Appendix 5 to this Report provides detailed summary advice on each Condition and audit element as set out in the PCR document. That Appendix provides the rationale for the new draft Environmental Conditions provided in Table 16.

The review has found that there are a number of issues which are pertinent to further review of the Peel-Harvey EPP and which the EPA should consider in re-commencing that review process. These include:

a) the need for the EPA to develop through a public process, measures of ecosystem health for the estuary system including key rivers and wetlands;

b) the need to develop a more comprehensive set of environmental objectives for the whole system, including for remnant native vegetation and fringing vegetation, for inclusion as objectives in the EPP. These can be developed as part of the above process;

c) the EPP should be modified so it is comparable to the Swan-Canning and Cockburn Sound EPPs. Specifically in regard to the need for the EPA to develop (or have developed via appropriate delegation) a comprehensive integrated catchment management plan for the Peel-Harvey coastal catchment as per the boundary in the current EPP;

d) the EPP should put the EPA firmly in the driving seat in terms of requiring the actions necessary to meet the requirements of the management strategy; and

e) the review of the EPP should consider in some detail the earlier approach of using an EPP in conjunction with an SPP to achieve controls on nutrient losing enterprises and activities in the catchment. If that approach can no longer be used, then the EPP will need to contain the implementation mechanism for the catchment management plan, including statements about acceptable and unacceptable land-uses.

Recommendation Co1

It is recommended that the agencies required to bring about full implementation of the management strategy be designated as joint proponents for all of the management strategy, and retained until catchment management has been fully implemented. The proponent agencies should be jointly responsible for obtaining the funding necessary to ensure full implementation of the strategy and full compliance with the Environmental Conditions.

Recommendation Co2

It is recommended that the Changes to the Conditions proposed in this Report be adopted and retained until all of the management strategy, including catchment management has been fully implemented.

Recommendation Co3

It is recommended that a new Statement that the Proposal may be Implemented which reflects the current agencies with implementation responsibilities as Proponents, and the amended Conditions is issued by the Minister for Environment and Heritage.

Recommendation Co4

It is recommended that the Proponents obtain 3-year program funding for implementation and compliance.

Recommendation Co5

It is recommended that the EPA carry out independent reviews of compliance for all projects where a government agency (or agencies) are the designated proponents. The matter of provision of resources to the EPA for such reviews needs to be addressed (see also recommendations PCR 2 and PCR 3).

Table 16 – Proposed New Statement for Continued Implementation of the Peel-Harvey Estuary System Project Reflecting Changed Wording and Conditions Which Should be Deleted

Old Condition No	New Condition No	Text of Environmental Condition *Advice to the EPA from the Expert Review Committee*
1* (replaced by new 1A and 1B in April 1993	1A	**Proponent Commitments** In implementing the proposal, including the amendments reported on in Environmental Protection Authority Bulletins 543 and 640, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made and listed in Appendix 2 of Environmental Protection Authority Bulletin 363, as amended, and subsequently, including the Department of Marine and Harbours letter of 24 February 1992 on reclamation associated with the Dawesville Channel. (A copy of the commitments is attached). **Advice/comment:** *Retain condition with above wording.*
	1B	**Implementation** Subject to the conditions in this amended statement, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected. **Advice/comment:** *Retain condition with above wording.*
2	2	The proponents shall develop proposals for control of phosphorus through catchment management, to the satisfaction of the Environmental Protection Authority, and shall implement them as rapidly as possible so that, in conjunction with the Dawesville Channel, the following objective is met: • the Peel-Harvey System becomes clean, healthy and resilient. To achieve this objective, the following interim targets should be used: (1) annual phosphorus input to the system shall not exceed 85 tonnes in more than four years out of ten (on average) and shall not exceed 165 tonnes in more than one year out of ten (on average). (These are based on 60 and 90 percentile loads); and (2) average phosphorus concentration in estuary water shall not exceed 0.2 milligrams per litre in nine years out of ten (on average). These target figures shall be reviewed by the Environmental Protection Authority after 3 years or sooner if environmental conditions dictate, in the light of measured performance of the System and may subsequently be varied by the Environmental Protection Authority. **Advice/comment:** *The principle of the condition should be retained. However as the EPA will be taking over the development of the catchment management plan, some amendments to the Condition will be required. However, it is probable that once the plan has been prepared the responsibility of the co-proponents should be restored to ensure full implementation occurs. EPA's role would then revert to one of auditing performance in implementing the plan and of the land use changes in achieving the desired P and N reductions.*

		The requirement for review after 3 years in the final paragraph, should be replaced by a review "after 10 years or sooner if environmental conditions dictate..etc"
3	3	The proponents shall jointly prepare an Environmental Protection Policy for the Peel-Harvey catchment in consultation with such persons and agencies as Government may specify, to the satisfaction of the Environmental Protection Authority, in accordance with the objective and targets specified in Condition 2 above. The target date for the draft policy (under Section 26 of the Environmental Protection Act 1986) is 31 December 1989. **Advice/comment:** *Although EPPs are now prepared by the Environmental Protection Authority rather than by proponents, the historical value of this condition is significant as the requirement for an EPP forms an essential part of the legal and administrative framework for management.* *The review of the Peel-Harvey EPP should now be continued by the EPA in the context of this compliance review. However, as the management target remains the same (as specified in the original conditions) it must be incorporated into the EPP unchanged.*
4	4	The proponents shall develop in consultation with such persons and agencies as Government may specify, an integrated catchment management plan designed to meet the objective and targets specified in Condition 2 above, to the satisfaction of the Environmental Protection Authority, and which shall be in accordance with the principles to be developed in the Environmental Protection Policy for the area pursuant to Condition 3. The target date for the implementation of the integrated catchment management plan shall be 31 December 1990. **Advice/comments:** *The thrust of the Condition is still required, however the wording needs to be modified in accordance with what follows:* *The principle of the condition should be retained. However as the EPA will be taking over the development of the catchment management plan, some amendments to the Condition will be required. However, it is probable that once the plan has been prepared the responsibility of the co-proponents should be restored to ensure full implementation occurs. EPA's role would then revert to one of auditing performance in implementing the plan and of the land use changes in achieving the desired P and N reductions.* *The plan shall be developed in consultation with such persons as the EPA may specify. The target date for approval of the plan by the Environmental Protection Authority shall be 30 June 2004.*
5	5	The proponents shall ensure that the moratorium on clearing and drainage in the Peel-Harvey coastal plain catchment proposed in the Stage 2 Environmental Review and Management Programme (commitment 3.6) continues until the Minister for Environment is satisfied that these activities would be environmentally acceptable. **Advice/comments:** *The amendments to the Environmental Protection Act make continued clearing difficult to justify, and there is now effectively a legal ban on clearing. The moratorium on drainage related to the creation of additional new drains, as well as to cleaning of drains.* *The condition should be retained until the Minister is satisfied that these activities will not exacerbate loss of nutrients from the catchment into the estuaries. It is the responsibility of the proponents to put a case to the Minister which the EPA should assess.*

6	6	Relevant decision-making authorities shall ensure that all developments within 2 km of the Peel-Harvey Estuary System (as defined in the Estuarine and Marine Advisory Committee Report to the Environmental Protection Authority, Department of Conservation and Environment Bulletin 88, march 1981) include appropriate nutrient-attenuating waste disposal systems and management practices, to the satisfaction of the Environmental Protection Authority. **Advice/comments:** *It is suggested that the original Conditions Nos 6 and 9 and later Condition No 14 be amalgamated into a reworded condition as follows:* *The proponents shall ensure that all proposed developments that produce nutrients (in particular significant amounts of phosphorus and/or nitrogen) are referred to the EPA for consideration under Parts IV and V of the Environmental Protection Act. Developments of particular concern include intensive horticultural and animal industries, and activities requiring application of large amounts of nutrients as organic wastes and/or as fertilisers, including recreational grassed areas and some residential developments.*
7	-	Condition 7 related to dredge spoil management. A note states that Conditions No 15 and 16 are to be audited in association with Condition No 7. **Advice/comments:** *Cleared – no longer relevant*
8	7	The proponents shall ensure that weed harvesting and control is continued and increased as necessary to manage the expected initial increase in the occurrence of nuisance macro-algae. **Advice/comments:** *Condition should be retained– weed harvesting may be required at some later time if catchment nutrient loads become excessive in wet years from the 14 year delay in implementing catchment management.*
9	-	Original condition No 9 related to developments that would add phosphorus to the estuaries. **Advice/comments:** *Amalgamated into new Condition 6.*
10	8	The Peel-Harvey regional park concept, as originally proposed in the System 6 Redbook report (Conservation Reserves for Western Australia: The Darling System – System 6, Department of Conservation and Environment Report 13, Parts I and II, October 1983) shall be implemented within such timeframe as to be determined by the Minister for Environment. **Advice/comments:** *Condition should be retained. It requires a timetable to be set by the Minister for Environment.*
11	9	If the Dawesville Channel is constructed, the proponents shall be responsible for ensuring that mosquito management is effective and is carried out in an environmentally acceptable manner, to the satisfaction of the Minister for Environment and the Minister for Health. **Advice/comments:** *The advice of the Minister for Health should be sought to establish whether this condition is still required.*

12	10	The proponents shall be jointly responsible for the environmental aspects of: (1) the construction, operation, monitoring and maintenance of the Dawesville Channel and its impacts within the estuaries and within the immediate marine environment. (2) the management and required monitoring of the catchment, and collection of data necessary for the development of the integrated catchment management plan for the Peel-Harvey catchment; and (3) all in-estuary monitoring and management, including weed harvesting. **Advice/comments:** *Retain.*
13	11	Prior to the construction of the Dawesville Channel, the proponents shall prepare in stages, a monitoring and management programme, to the satisfaction of the Environmental Protection Authority. This programme shall include: (1) essential additional baseline monitoring required to be in place as soon as possible and prior to construction commencing; (2) construction stage impacts and monitoring, prior to construction; and (3) operational and long-term monitoring, in stages, to be determined by the Environmental Protection Authority. **Advice/comments:** *The Condition should be retained. However, parts (1) and (2) can be cleared.* *The EPA should now determine the operational and long-term monitoring and reporting programme it now requires and the condition should be reworded to reflect these requirements.*
14*	-	Proposals which may release nitrogen or phosphorus to the environment shall not be referred to the Environmental Protection Authority provided that they are consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment. Proposals not consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment shall be referred to the Environmental Protection Authority. This Condition will apply to the final Statement of Planning Policy for the Peel-Harvey Coastal Catchment when it is gazetted. **Advice/comments:** *The Condition is regarded as being inappropriate and should be deleted from the Statement. All development in the Peel-Harvey coastal catchment should meet the requirements of the EPP and SPP. This is a legal requirement in its own right, and a condition on the proponents is not required to achieve this.*
15 15-1 &15-2	-	**Estuary Reclamation (Dawesville Channel)** These two conditions relate to estuary reclamation work associated with the construction of the Dawesville Channel. A note states that Conditions No 15 and 16 are to be audited in association with original Condition No 7. **Advice/comments:** *As the construction of the Dawesville Channel is complete the conditions are no longer required and can be deleted.*
16 16-1	-	**Foreshore vegetation (Dawesville Channel)** This condition required retention of the foreshore vegetation in and near the area of construction of the Dawesville Channel, as well as on/along existing foreshore areas outside the alignment of the Dawesville Channel.

		A note states that Conditions No 15 and 16 are to be audited in association with original Condition No 7. **Advice/comments:** *The condition was unnecessary and not effective as it could not protect the vegetation.* *The condition took no account of the inevitable death of shoreline vegetation that would result from the increased tidal range and more marine-like conditions. The vegetation was dependent upon a shallow freshwater lense which has migrated up the shore in stasis with the changed tidal conditions. Vegetation will progressively re-establish along the new shoreline over time. The condition should be deleted from the Statement.*
17	12	**Compliance Auditing** In order to ensure that environmental conditions and commitments are met, an audit system is required.
17-1	12-1	The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of the Peel-Inlet – Harvey Estuary Management Strategy Stage 2, in consultation with the Environmental Protection Authority.
17-2	12-2	**Procedure** The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency. If the Environmental protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment. **Advice/comments:** *The Expert Review Committee believes it is important for the EPA to continue to carry out the compliance auditing for all projects where the proponent is a government agency (or agencies) to ensure that independent audit advice is provided. As the EPA is independent of government as to the advice that it provides, it has greater public credibility in auditing government agencies.*

*Notes:
Original Statement was for Conditions 1 – 13 approved in January 1989
Condition 14 was introduced in October 1991
Original Condition No 1 replaced by new 1A and 1B in April 1993
New Condition Nos 15, 16 and 17 introduced in April 1993

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APPENDIX 1

Copies of:
"Statement That a Proposal May Be Implemented"
(4 Jan 1989)
and subsequent amendments dated
2 October 1991 and 19 April 1993

MINISTER FOR ENVIRONMENT

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PEEL INLET-HARVEY ESTUARY MANAGEMENT STRATEGY - STAGE 2

MINISTER FOR TRANSPORT
MINISTER FOR AGRICULTURE
MINISTER FOR WATERWAYS

This proposal may be implemented subject to the following conditions:

1. The proponents shall adhere to the proposal as assessed by the Environmental Protection Authority and shall fulfil the commitments made and listed in Appendix 2 of Environmental Protection Authority Bulletin 363, as amended (copy of commitments attached).

2. The proponents shall develop proposals for control of phosphorus through catchment management, to the satisfaction of the Environmental Protection Authority, and shall implement them as rapidly as possible so that, in conjunction with the Dawesville Channel, the following objective is met:

   . the Peel-Harvey System becomes clean, healthy and resilient.

   To achieve this objective, the following interim targets should be used:

   (1) annual phosphorus input to the system shall not exceed 85 tonnes in more than four years out of ten (on average) and shall not exceed 165 tonnes in more than one year out of ten (on average). [These are based on 60 and 90 percentile loads]; and

   (2) average phosphorus concentration in estuary water shall not exceed 0.2 milligrams per litre in nine years out of ten (on average).

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-4 JAN 1988

7th Floor, May Holman Centre,
Phone (09) 325 4133

These target figures shall be reviewed by the Environmental Protection Authority after 3 years or sooner if environmental conditions dictate, in the light of measured performance of the System and may subsequently be varied by the Environmental Protection Authority.

3. The proponents shall jointly prepare an Environmental Protection Policy for the Peel-Harvey catchment in consultation with such persons and agencies as Government may specify, to the satisfaction of the Environmental Protection Authority, in accordance with the objective and targets specified in Condition 2 above. The target date for the Draft Policy (under Section 26 of the Environmental Protection Act 1986) is 31 December 1989.

4. The proponents shall develop in consultation with such persons and agencies as Government may specify, an integrated catchment management plan designed to meet the objective and targets specified in Condition 2 above, to the satisfaction of the Environmental Protection Authority, and which shall be in accordance with the principles to be developed in the Environmental Protection Policy for the area pursuant to Condition 3. The target date for the implementation of the integrated catchment management plan shall be 31 December 1990.

5. The proponents shall ensure that the moratorium on clearing and drainage in the Peel-Harvey coastal plain catchment proposed in the Stage 2 Environmental Review and Management Programme (Commitment 3.6) continues until the Minister for Environment is satisfied that these activities would be environmentally acceptable.

6. Relevant decision-making authorities shall ensure that all developments within 2 kilometres of the Peel-Harvey Estuary System (as defined in the Estuarine and Marine Advisory Committee Report to the Environmental Protection Authority, Department of Conservation and Environment Bulletin 88, March 1981.) include appropriate nutrient-attenuating waste disposal systems and management practices, to the satisfaction of the Environmental Protection Authority.

7. Prior to construction, a dredging and spoil disposal management plan for the Dawesville Channel shall be prepared by the proponents, to the satisfaction of the Environmental Protection Authority. Dredging not already forming part of the proposals in the Stage 2 Environmental Review and Management Programme shall be the subject of separate assessment by the Environmental Protection Authority.

8. The proponents shall ensure that weed harvesting and control is continued and increased as necessary to manage the expected initial increase in the occurrence of nuisance macroalgae.

9. Decisions on developments which may release phosphorus or nitrogen to the environment in the Peel-Harvey Estuary area and coastal plain catchment area should be conservative until the new assimilative capacity of the Peel-Harvey Estuary System is determined and the effects of the management elements have been measured or are being managed. To this end, such proposals for development in these areas shall be referred to the Environmental Protection Authority for assessment. These developments include new and expansion of existing intensive horticultural and intensive animal industries.

10. The Peel-Harvey regional park concept, as originally proposed in the System 6 Redbook report (Conservation Reserves for Western Australia: The Darling System - System 6, Department of Conservation and Environment Report 13, Parts I and II, October 1983.) shall be implemented within such time as to be determined by the Minister for Environment.

11. If the Dawesville Channel is constructed, the proponents shall be responsible for ensuring that mosquito management is effective and is carried out in an environmentally acceptable manner, to the satisfaction of the Minister for Environment and the Minister for Health.

12. The proponents shall be jointly responsible for the environmental aspects of:

    (1) the construction, operation, monitoring and maintenance of the Dawesville Channel and its impacts within the estuaries and within the immediate marine environment;

    (2) the management and required monitoring of the catchment, and collection of data necessary for the development of the integrated catchment management plan for the Peel-Harvey catchment; and

    (3) all in-estuary monitoring and management, including weed harvesting.

    All of the above shall be carried out to the satisfaction of the Environmental Protection Authority.

13. Prior to the construction of the Dawesville Channel, the proponents shall prepare in stages, a monitoring and management programme, to the satisfaction of the Environmental Protection Authority. This programme shall include:

    (1) essential additional baseline monitoring required to be in place as soon as possible and prior to construction commencing;

(2) construction stage impacts and monitoring, prior to construction; and

(3) operational and long-term monitoring, in stages, to be determined by the Environmental Protection Authority.

Barry Hodge, MLA
MINISTER FOR ENVIRONMENT

14. Proposals which may release nitrogen or phosphorus to the environment shall not be referred to the Environmental Protection Authority provided that they are consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment. Proposals not consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment shall be referred to the Environmental Protection Authority.

This Condition will apply to the final Statement of Planning Policy for the Peel-Harvey Coastal Catchment when it is gazetted.

Bob Pearce, MLA
MINISTER FOR THE ENVIRONMENT

2 OCT 1991

MANAGEMENT COMMITMENTS MADE BY THE PROPONENTS (Stage II ERMP)

The following list has been amended by the EPA and accepted by the proponents to reflect the 'whole of Government approach' which is essential for management of this proposal.

1. DAWESVILLE CHANNEL

1.1 The proponents will conduct a detailed survey to locate, assess and offer protection to Aboriginal sites and heritage.

1.2 During construction of the Dawesville Channel, the proponents will ensure the continuity of road access, power supply, communications, and water and sewerage services that require relocation, and will minimize dust and noise impacts upon nearby residential areas.

1.3 Spoil from the excavated channel will be used in redeveloping the fill areas as a stable and varied landscape, reflecting naturally occurring topography elsewhere on the coastal strip.

1.4 The proponents will manage spoil disposal to minimize disturbance to important land elements, including coastal dunes, tree belts along Old Coast Road and near the estuary foreshore. Spoil disposed of adjacent to the undisturbed coastal dunes will be contoured to co-ordinate with natural dune topography in order to minimize the potential for erosion.

1.5 The land area used to dispose of excavated material will be contoured to facilitate possible future development into a prime residential and holiday area. Views from existing residences near the estuary will be retained, taking into consideration that these views may have been ultimately reduced by foreshore development and landscaping, irrespective of the proposed channel development.

1.6 Littoral sand drift northwards along the ocean coast will be mechanically bypassed beyond the channel entrance, to minimize siltation within the channel and to avoid adverse effects on beaches to the north and south.

1.7 The Dawesville Channel will be maintained as a navigable waterway, although, as with the existing Mandurah Channel, sea conditions at the ocean entrance may frequently preclude its use by small boats.

1.8 The estuary will be closely monitored to evaluate the management strategy's success in reducing the algal nuisance and to enable the development of appropriate management strategies to mitigate any deleterious effects that may occur. Current and proposed future monitoring studies in the estuary are described in Section 13 of the ERMP and Section 11 of the EPA assessment report.

2. CONTROL OF WEED ACCUMULATIONS

2.1 Weed harvesting will be continued most likely at an increased rate, until the weed nuisance in the estuary is successfully reduced.

2.2 Possible methods of improving the efficiency of harvesting operations, and the possible use of algicides to control weed growth, will be evaluated by the proponents and implemented if shown to be practicable.

2.3 The Peel Inlet Management Authority will continue the existing programme of shoreline management and will rehabilitate areas where weed accumulations or harvesting operations cause excessive retreat of the shoreline.

3. CATCHMENT MANAGEMENT

3.1 The proponents will continue to provide advice to farmers on fertilizer requirements, based on accurate assessment by paddock-specific soil tests.

3.2 The proponents will encourage further development and use of individual-nutrient fertilizers, and will undertake detailed investigations of ways to overcome existing economic constraints to their production and use.

3.3 The proponents will ensure that large-scale field trials are carried out to ascertain the technical and economic feasibility of converting use of sandy soils from agriculture to forestry. Private enterprise involvement in these studies will be encouraged.

3.4 The EPA and the Department of Agriculture will continue to provide advice to producers to define and implement practicable and cost-effective waste management strategies for control of point sources of phosphorus.

3.5 The Department of Agriculture will coordinate the preparation and implementation of a detailed catchment management plan aimed at reducing phosphorus losses to the estuary to less than 85 t/a in a 60 percentile year with minimal economic or social disruption to the catchment community.

3.6 The proponents will implement a moratorium on further clearing and drainage in the catchment, pending determination of the success of the catchment management plan in reducing phosphorus losses from existing cleared land.

3.7 The success of catchment management measures in reducing phosphorus losses to the estuary will be monitored by the proponents and audited by the EPA. The social and economic effects of catchment management measures upon the catchment community will be closely monitored by the proponents. Current and proposed future monitoring studies are described in Section 13 of the ERMP and in Section 11 of the EPA assessment report. The catchment management plan will be regularly reviewed by the EPA.

WESTERN AUSTRALIA

MINISTER FOR THE ENVIRONMENT

STATEMENT TO AMEND CONDITIONS APPLYING TO A PROPOSAL (PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PROPOSAL : PEEL INLET - HARVEY ESTUARY MANAGEMENT STRATEGY, STAGE 2 (010/701)

CURRENT PROPONENT : MINISTER FOR TRANSPORT
MINISTER FOR AGRICULTURE
MINISTER FOR WATERWAYS

CONDITIONS SET ON : 3 JANUARY 1989

CONDITIONS AMENDED ON : 2 OCTOBER 1991

Condition 1 is amended to read as follows:

1A Proponent Commitments

In implementing the proposal, including the amendments reported on in Environmental Protection Authority Bulletins 543 and 640, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made and listed in Appendix 2 of Environmental Protection Authority Bulletin 363, as amended, and subsequently, including the Department of Marine and Harbours letter of 24 February 1992 on reclamation associated with the Dawesville Channel. (A copy of the commitments is attached).

1B Implementation

Subject to the conditions in this amended statement, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

The following conditions and procedure are inserted following condition 14 (which resulted from the amendment of 2 October 1991):

15 Estuary Reclamation (Dawesville Channel)

15-1 The proponent shall ensure that the total area of estuary reclaimed in association with the

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construction of the Dawesville Channel does not exceed 25 hectares (ha). Five hectares of this land may be granted to Wannunup Development Nominees Pty Ltd as part of an existing Land Exchange Agreement with the State Government. The remaining 20 hectares shall be available for public use. Five hectares of this land can include part of the canal waterway, to be available for public use.

15-2 The proponent shall endeavour to reduce the area of reclamation associated with the construction of the Dawesville Channel specified in condition 15-1 by increasing the height of the spoil, consistent with the recreational use of the reclaimed land, to the requirements of the Environmental Protection Authority on advice of the Peel Inlet Management Authority.

16 Foreshore Vegetation (Dawesville Channel)

Foreshore vegetation in and near the area of construction of the Dawesville Channel should be retained wherever possible.

16-1 The proponent shall ensure that the foreshore vegetation in and near the area of construction of the Dawesville Channel is retained wherever possible. Those stands of Casuarina, Paperbark and Tuart which are located on/along the existing foreshore and outside the proposed alignment of the channel should be retained, to the requirements of the Environmental Protection Authority on advice of the Peel Inlet Management Authority.

17 Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

17-1 The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of the Peel Inlet - Harvey Estuary Management Strategy, Stage 2, in consultation with the Environmental Protection Authority.

Procedure

The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.

If the Environmental Protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

Note

Conditions 15 and 16 relate to the construction of the Dawesville Channel and should be audited in association with condition 7.

Kevin Minson MLA
MINISTER FOR THE ENVIRONMENT

16 APR 1993

APPENDIX 2

Specialist Report on the Legal and Administrative Framework for Management

Peel-Harvey Estuary System Management Strategy

SPECIALIST REPORT ON

LEGAL AND ADMINISTRATIVE FRAMEWORK FOR ENVIRONMENTAL MANAGEMENT:

Review of Success and Future Directions

Prepared by
Sally Robinson
STRATEGIC ENVIRONMENTAL SOLUTIONS
(Former Deputy Chairman EPA)

June 2001

ACKNOWLEDGMENTS

The author wishes to thank Mr Barry Carbon and Dr Chris Whitaker for reviewing this document for historical and technical accuracy. Mr Carbon was Chairman of the EPA at the time of the Peel-Harvey assessment, and Dr Whitaker was in charge of the environmental assessments function at that time.

Professor Neil Gunningham of the Australian National University also carried out an informal review and found this report and the Expert Review Committee report to be the best of their kind he had ever seen on a catchment management and complex environmental management topic.

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Summary and Conclusions

The 1988 assessment by the EPA established that only a management package consisting of both a new channel and effective catchment management measures would be likely to succeed in protecting the estuary system in the long term, and that, as first proposed by the EPA in 1985, there would also be a need to underpin management with an effective legal and administrative framework that would foster an adaptive environmental management approach (EPA, 1985; EPA, 1988a).

As well as its technical importance in reducing phosphorus inputs to the system, catchment management was also part of an implied social contract between the broader community of Western Australia which paid for construction of the Dawesville Channel, and the rural community where continuation of farming in the catchment required land use changes and catchment management.

It was important that the phosphorus reduction management target for the catchment, having been established in a technically robust manner, was expressed in a way that would preclude ongoing discussion and challenge. The EPA aimed to achieve this by:

- the management target identified in the EPA's recommendations being specified in an Environmental Condition by the Minister;
- the management target being re-stated in an Environmental Protection Policy as what needed to be achieved (the figure in the Environmental Condition ensured that the EPP could not specify a lower amount); and
- development of a catchment management plan as the on-the-ground means of giving effect to the reduction in phosphorus required from the catchment to meet the management target.

The key elements of the catchment management strategy were defined as being:

- fertiliser management;
- changes in land use;
- control of point sources of phosphorus (and other) pollution;
- preparation of an integrated catchment management plan; and
- continuation of the moratorium on clearing and drainage.

Along with all other elements of the management strategy, these all required consideration in some manner in the development of the legal and administrative framework for management.

The EPA proposed a tiered legal and administrative framework to underpin management (see Figure 3). This consisted of:

a) the EPA's recommendations in the assessment report (EPA, 1985);
b) the proponents' commitments as included in the assessment report;
c) the Minister's Environmental Conditions on the proposal (which included requiring all the proponent commitments to be carried out);
d) the development of the EPP; and

e) use of other statutory instruments and regulations under various Acts, not just the Environmental Protection Act.

Recognising that a mechanism to enable implementation of catchment-wide management had not been developed as recommended in the EPA's 1985 assessment (EPA, 1985), this was to be addressed through the EPP itself.

The Peel-Harvey Environmental Protection Policy (EPP) was one of the first EPP's approved by the Government and was the first which attempted to address diffuse source pollution. At the time it was developed there were no other mechanisms available that would send a clear signal to all stakeholders that the Government was serious about having the environmental problem fixed and the importance of catchment management as a tool for doing so.

The EPP provided a legal statement of intent by government as a whole by setting out the uses to be protected, the management objectives and the program for protecting the environment. It provided a vision of what needed to happen in the long term and a headpower for doing so. The EPP was envisaged as providing an over-arching requirement for all with management responsibilities and would provide a statement of vision and direction that could work in concert with the planning approvals process in Western Australia to deliver sound planning decisions that reflected a catchment-wide environmental management constraint.

The management targets would be given effect on the ground through the development of a comprehensive catchment management plan which would allow for a broad range of approaches to meeting the reduction in phosphorus input required from the catchment. Further definition and implementation of the range of measures to reduce nutrient losses from existing land-uses to the drainage system (for example "appropriate" land management) were to be included in the catchment management plan.

The EPP is a legal instrument which requires everyone, not just proponents, to carry out the actions set down in section 8 of the EPP. This is not discretionary. Any apparent failure of the EPP is the result of lack of implementation by the various parties, specifically landholders, land users, state and local government agencies and the "State" in general.

Although the EPP requires governments and decision-makers at all levels to ensure decisions and actions are compatible with the achievement and maintenance of the environmental requirements of the EPP, there is no evidence that this requirement has been implemented or met, including by the Department of Environmental Protection, or that agencies have been sufficiently active in advising property holders in the Coastal Catchment of everyone's legal obligations in relation to the EPP.

To date, a comprehensive integrated catchment management plan has not been prepared or implemented, although a draft "guidebook" was proposed. This means that the mechanisms envisaged by the EPA for implementing the management strategy in the catchment at the property level and for meeting the requirements set down in the EPP have still not been developed or put in place. The moratorium on clearing and drainage has also not been fully enforced by the proponents or reviewed through the EPP, as envisaged by the EPA (see Section 5 of this Report).

As the catchment management plan was an essential component of the framework for management, its lack of development and implementation has significantly affected the ability of the EPP, and the legal and administrative framework as a whole, to be completely successful in underpinning the management approach.

The objectives of using an EPP as a key aspect of the management framework were:

a) to provide a long-term vision for management of the estuary system;

b) to establish the management targets for phosphorus within a legal instrument;

c) to lead to changes in land use;

d) to discourage some land uses (in particular intensification of agriculture where increased phosphorus losses would result)

e) to provide an over-arching, legal instrument that would establish the environmental constraints on the area and be useful to decision-makers to guide planning, planning decisions, and land uses in the area;

f) to provide an over-arching, legal instrument that would establish the environmental constraints on the area and be useful to land holders and users;

g) to provide a means of focusing all stakeholders into a common direction for management of Peel- Harvey (as an EPP is an instrument that applies to everyone);

h) to provide a mechanism that in combination with the catchment management plan, would allow for flexibility in selection of land uses and land use practices, whilst at the same time ensuring that the environmental management objectives were met; and

i) to send a clear signal about Government's commitment to the successful management of the system.

The concept of the EPP in the management framework, and the objectives above, remain the key to fully successful implementation of the management strategy for the Peel- Harvey and that it should be made to work in the manner envisaged. To do so will necessitate development of the comprehensive integrated catchment management plan (proposed in 1988) as a very high priority.

It was concluded that there were a number of barriers (real or perceived) that may have contributed to the lack of full implementation of the legal and administrative framework and the total management strategy. The perceived barriers include:

- lack of a comprehensive catchment management plan;
- limited understanding of shared co-proponent approach;
- conflicting management objectives;
- ignorance of the management framework, in particular the role of the EPP;
- ongoing challenge to the management target identified by the EPA;
- misperception of the need for the whole management strategy;
- perceptions of equity issues; and
- institutional considerations and reliance on "volunteerism".

There are some real equity issues relating to:

- new developments that are required to be assessed under Part IV of the Environmental Protection Act compared with the lack of requirements on most rural land uses;

- the different degree of regulation being applied to point sources compared with the requirements on diffuse nutrient sources; and

- the increased amount of regulation being applied to some point sources compared with other point sources, regardless of the relative contribution made by each type of development to the nutrient problems (for example, stricter license requirements on waste water treatment plants than on piggeries).

To ensure that all aspects of the proposal would receive the proper level of management, and recognising the "whole of government" aspect of the strategy, the EPA recommended in 1988 that the three proponent Ministers be made co-proponents for implementation of the whole management strategy, on behalf of government, rather than just being responsible for a single portfolio area. This was a deliberate strategy proposed to prevent division of responsibility along traditional lines, to ensure that all issues would be managed and recognised the role of the proponents on behalf of government as a whole. Although the Minister for the Environment made the three Ministers equally responsible for all aspects of the management strategy, at some point a decision was made to resort to the conventional approach of dividing responsibility along agency lines. This division of responsibility has been a factor in the lack of development of the catchment management plan, and in other environmental issues not being managed.

Although the EPA's intention in its 1988 assessment was that the catchment management plan should be developed in a co-operative and voluntary manner, the fact that an adequate plan has still not been developed suggests that it may now be necessary to adopt a more regulatory approach.

The fact that there is no single person within government who has been given the responsibility of ensuring that all aspects of the EPA's and Minister's requirements are met is a contributing factor to the partial success of the legal and administrative framework for management. Furthermore, the lack of a single point of contact has made it more difficult for all land developers and users to obtain the advice they need.

The failure to develop a comprehensive catchment management plan to protect the environmental quality of the Peel-Harvey Estuary System and the public's investment in the Dawesville Channel is an indicator of the broader problems in both the agricultural and pastoral areas of Western Australia, where short-term agricultural survival is given a higher priority than long-term agricultural and environmental sustainability.

There is increasing public and industry concern with the ongoing poor environmental performance of the agricultural sector, and the regulatory inequity whereby most industries and the mining sector are tightly regulated while farming is not. This is despite the clear understanding by the community and Government at all levels that broadacre agriculture is the source of Australia's worst environmental problems including salinity, soil acidification, erosion and sedimentation, loss of biodiversity from land clearing and degradation of waterways. Eutrophication originating from agricultural fertilisers is occurring in inland lakes, rivers and waterways, in estuaries (such as Peel-Harvey) and in some cases has affected near-shore marine embayments (Commonwealth of Australia, 1996).

In Western Australia the legislation and institutional arrangements are inadequate to deal with multi-faceted management problems at the catchment scale where a combination of "top down" vision and leadership at the government level combined with "ground up" voluntary management is required.

Lack of attention to these matters will result in the continued decline of agricultural and rural communities, and the accumulation of multi billion dollar liabilities to the community from soil and water degradation, loss of biodiversity and environmental quality in general. It will even lead to loss of trade as environmental quality becomes more highly regarded as a factor by countries purchasing overseas agricultural products.

Recent advice suggests that the co-operative approach to combined development and use of an EPP and SPP to address land use controls to meet environmental objectives may not be possible legally. If this is the case, then this approach to management of the catchment in Peel-Harvey will have to be abandoned and an alternative developed. This is likely to involve broadening the scope of the EPP and in particular to incorporate control over land uses within the EPP.

From experience, it is not catchment management plans per se that are the problem but the expectation that the magnitude of what must be achieved in terms of nutrient reductions and other environmental improvements can be delivered by volunteerism. The lack of will of Governments and regulatory agencies around Australia to develop, let alone apply to diffuse sources of pollution, the degree of regulation applied to point sources is a major contribution to the lack of achievement of successful catchment management in Australia. It is unlikely that any significant improvement will occur until this institutional attitude, and ultimately barrier to change, is itself changed. In WA there is a lack of leadership on this issue, particularly at the government agency and political levels.

These views are supported by others and show that regional and catchment planning generally lacks resources and expertise (at the Government level) and States have little coordinating capacity, and that lines of responsibility have increasingly blurred and States have become more reliant on Commonwealth resources. Most States have a plethora of agencies with overlapping and contradictory responsibilities and this often leads to ineffective policing of the regulatory regimes that do exist (Industry Commission, 1997).

Young and Evans (1997) state that there is no doubt that institutional change and introduction of appropriate incentives does make a difference in bringing about land-use changes for better environmental management. They also say that "right market mechanisms are being used and are being found to be effective in resource management" and that "experience indicates that right market mechanisms always need to be underpinned by regulations" (p.2).

The Industry Commission (1997) outlined a reform package to move towards ecologically sustainable land management. This consisted of three pillars (p. xxii):

a) to recast the regulatory regime to ensure that resource owners and managers take into account the environmental impacts of their decisions. To impose on natural resource owners, managers and users a duty of care for the environment.

b) create or improve the markets for key natural resources, for example tradeable rights to use resources through mechanisms such as tradeable water entitlements, separating the ownership of trees from the land upon which they are grown, and creating new permit systems for agricultural discharges (including diffuse source discharges). Such measures would result in a reducing the bias in the financial incentives to clear deep-rooted vegetation and over-use water that currently face farmers.

c) encourage nature conservation on private land, in particular the protection of biological diversity and natural heritage.

All the above would be accompanied by complementary steps to strengthen the dissemination of environmental knowledge and know-how, and the ground-level institutions concerned with natural resource management. Institutional change will also be necessary with an increasing need to separate resource management and regulatory functions in government agencies to promote transparency and accountability.

The Legal and Administrative Framework Specialist Report concluded that:

1. The legal and administrative framework proposed by the EPA sets minimum requirements and remains essential to successful and full implementation of the management strategy. It has no "fatal flaws" and should be made to work.

2. The EPP has been partially successful in meeting its objectives, both environmental and institutional as per the intent of the EPA's recommendations in 1988.

3. The comprehensive integrated catchment management plan as envisaged by the EPA has not been prepared and implemented and this has detrimentally affected the effectiveness of the Peel-Harvey management strategy, and the success of the EPP and the legal and administrative framework for management as a whole.

4. The Environmental Conditions relating to the EPP and catchment management plan have not been fully met.

5. The legal and administrative framework proposed by the EPA has been partially successful. The concept of the EPP in the management framework, and the objectives above, remain a key to fully successful implementation of the management strategy for the Peel- Harvey and that it should be made to work in the manner envisaged. To do so will necessitate development of the comprehensive catchment management plan (proposed in 1988) and implementation mechanisms (proposed in 1985 and 1988) as a very high priority.

6. The review concluded that there were a number of barriers (real or perceived) that may have contributed to the lack of full implementation of the legal and administrative framework and the total management strategy. The perceived barriers include:

   - lack of a comprehensive catchment management plan;
   - limited understanding of shared co-proponent approach;
   - conflicting management objectives;
   - ignorance of the management framework, in particular the role of the EPP;
   - ongoing challenge to the management target identified by the EPA;
   - misperception of the need for the whole management strategy;
   - perceptions of equity issues;
   - institutional commitment and reliance on "volunteerism"; and
   - resistance to change from current approaches.

7. The review has found that there are some real equity issues relating to:

   - new developments that are required to be assessed under Part IV of the Environmental Protection Act compared with the lack of similar requirements on most rural land uses;

   - the different degree of regulation being applied to point sources compared with minimal requirements on diffuse nutrient sources; and

- the increased amount of regulation being applied to some point sources compared with other point sources, regardless of the relative contribution made by each type of development to the nutrient problems (for example, stricter license requirements on waste water treatment plants than on dairies).

8. Although the EPA's intention in its 1988 assessment was that the catchment management plan should be developed in a co-operative and voluntary manner, the fact that an adequate plan has still not been developed (let alone successfully implemented) suggests that it may now be necessary to adopt a more regulatory approach.

9. The fact that there is no single person or body within government who has been given the responsibility of ensuring that all aspects of the EPA's and Minister's requirements are met is a contributing factor to the incomplete success of the legal and administrative framework for management. Furthermore, the lack of a single point of contact has made it more difficult for all land developers and users to obtain the advice they need on minimum acceptable environmental practices.

10. The failure to develop a comprehensive catchment management plan to protect the environmental quality of the Peel-Harvey Estuary System and the public's investment in the Dawesville Channel is an indicator of the broader problems in both the agricultural and pastoral areas of Western Australia, where short-term agricultural survival is given a higher priority than long-term agricultural and environmental sustainability. There is increasing public and industry concern with the ongoing poor environmental performance of the agricultural sector, and the regulatory inequity in which most industries and the mining sector are tightly regulated while farming is not. This is despite the clear understanding by the community and Government at all levels that broadacre agriculture is the source of Australia's worst environmental problems including salinity, soil acidification, erosion and sedimentation, loss of biodiversity from land clearing and rising water tables and degradation of waterways. Eutrophication originating from agricultural fertilisers is occurring in inland lakes, rivers and waterways, in estuaries (such as Peel-Harvey) and in some cases has affected near-shore marine embayments (Commonwealth of Australia, 1996).

11. In Western Australia the legislation and institutional arrangements are inadequate to deal with multi-faceted management problems at the catchment scale where a combination of "top down" vision and leadership at the government level combined with "ground up" voluntary management is required.

12. There is no evidence that those with decision-making responsibilities have carried out their actions sufficiently to ensure that the environmental objectives of the EPP have been met. This includes the Department of Environmental Protection which has assessment and licensing responsibilities under the Environmental Protection Act.

13. The Environmental Conditions relating to the EPP and catchment management plan should be retained although some amendment to the wording may be appropriate, particularly relating to responsibilities (see 18 below).

14. The EPP should be publicly reviewed immediately following completion of the Compliance Review by the EPA. In particular the EPA should seek input from the community at least on the following:

- the area the EPP should cover (the Peel-Harvey "system");
- the environmental objectives for the system

- indicators of health, sustainability and vigour for various parts of the system.

15. The overview and scientific investigation coordination role taken by the EPA in defining the management solutions to the Peel-Harvey estuary problems has been the most successful approach to integrated catchment management in WA, to date, and ensured an open and transparent approach to setting the environmental objectives. It would be appropriate for the EPA to once again clearly take on the focus of coordination of integrated research and investigation for catchment scale environmental problems and coordination of long-term monitoring requirements for measuring and demonstrating environmental change. The EPA is already recognised by the public as having the primary role in protection and maintenance of ecosystem processes and in long-term custodial responsibility for the environment.

16. Although the legal and institutional framework for integrated catchment management in Western Australia is the best that could be built using the existing statutory framework, it will continue to be inadequate in the absence of a proper ICM statute. The adopted approach of "change by evolution not revolution" and resistance to developing new, effective ICM and NRM legislation has not delivered catchment management over the last 14 years and it is now time for more radical reform, including an effective and progressive catchment management statute. In addition to other matters, the new statute should establish catchment management authorities and provide them with the power to prepare plans and to raise catchment management rates for development and implementation of the plans. Notwithstanding the minor institutional changes made over recent years (to CALM, Water and Rivers Commission and DEP) associated comprehensive institutional change to the functions and responsibilities of the natural resource management sector in WA is also required. This should involve changes to many of the natural resource agencies, including (*inter alia*) Agriculture WA, the Water and Rivers Commission, the Department of Conservation and Land Management, the Department of Environmental Protection, Ministry for Planning and the associated representative member statutory boards.

17. The management of the Peel-Harvey system has been afforded the greatest degree of legitimacy of any integrated catchment management project in WA to date (see Section 9 of this Report) and some $60 million of taxpayer money has been invested in improving the environmental quality of the estuaries. Such a high investment of public money in an environmental issue requires adequate protection and ongoing investment in the long-term. The Specialist Review of the Legal and Administrative Framework is of the view that if the Government is not willing to address the issues of proper catchment management legislation and agency re-structuring as part of protecting its financial interest in the Dawesville Channel, it does not auger well for salinity mitigation, catchment management and environmental protection in general in WA.

18. To ensure that all elements of the management strategy are implemented, the EPA should be more pro-active and drive the key decision-makers to have implementation occur in accordance with the Conditions and intent of the strategy. Although some of the decision-making rests with parties which are not currently proponents for implementation of the strategy, the framework of the EPP requires that all decision-making for the area occurs in accordance with the environmental objectives of the EPP. Review and education of decision-makers is required to correct the misperception that only parties bound by the Environmental Conditions are

responsible for implementing management. A compliance assistance program would be a positive way of achieving this.

19. Further education of government agencies as proponents is required so they fully understand that the Environmental Protection Act binds the Crown and that they are legally required to implement Environmental Conditions and commitments.

1. TERMS OF REFERENCE FOR SPECIALIST REVIEW OF LEGAL AND ADMINISTRATIVE FRAMEWORK FOR MANAGEMENT

The following basic terms of reference were applied to the review:

- Review the establishment and effectiveness of the legal and administrative framework for implementation of management of the Peel-Harvey as proposed by the EPA's recommendations and reflected in the Minister's Statement;
- Address necessary linking sections to build on or provide linkage between the work and findings of the "Catchment Management" and "Water Quality and Targets" Specialist reviews;
- Propose any improvements to the legal and administrative framework for the management of the Peel-Harvey Estuary System; and
- Prepare a report on the findings of the Legal and Administrative Framework Specialist Review for inclusion as an appendix to the report of the Peel-Harvey Expert Review Committee to the EPA.

The Legal and Administrative Framework review was able to access relevant reports and files and had access to the submissions on the review of the Peel-Harvey Environmental Protection Policy carried out in November 1999. Other experts were consulted as necessary.

2. BACKGROUND AND CONTEXT

2.1 HISTORICAL CONTEXT OF THE LEGAL AND ADMINISTRATIVE FRAMEWORK

The EPA carried out the assessment of the Peel-Harvey Management Strategy in 1988 using the scientific knowledge, statutes and management instruments available at the time - now over 11 years ago. The management strategy was the first attempt in Western Australia at management of a diffuse source pollution problem where catchment management needed to be tackled in association with a major engineering approach. It was early days for integrated catchment management anywhere in Australia and indeed elsewhere in the world. The revised Environmental Protection Act, 1986, was new in its application and the role of Environmental Conditions in achieving management objectives identified by the EPA was still being developed. Developing approaches and mechanisms for auditing compliance by the EPA Department and for proponents had barely commenced, and environmental management systems were in their infancy.

All the above has a bearing on the approach taken at the time of the assessment and also on where it may be appropriate to go now, as a community. Other important contextual considerations include:

a) It was work on the coastal plain sands of the Peel-Harvey catchment that caused a world paradigm shift in the understanding of phosphorus movement in sandy soils.

b) In the Peel-Harvey System , a strong linear relationship between streamflow and applied phosphorus load in the major rivers and drains entering the estuary was

demonstrated (see Specialist Report on Water Quality and Management Targets appended to the EPA Report).

c) The Peel-Harvey Environmental Protection Policy (EPP) was one of the first EPP's approved by the Government and was the first which attempted to address diffuse source pollution. At the time it was developed there were no other mechanisms available that would send a clear signal to all stakeholders that the Government was serious about having the environmental problem fixed and the importance of catchment management as a tool for doing so.

d) A new channel to the ocean (the Dawesville Channel), like all engineering structures, had a design limit that was related to the length, width and depth of the channel. These dimensions, together with the strength of the tidal signal, dictated the maximum flushing capacity of the channel. If the channel was to perform too well, it might be possible to reduce flushing or to add nutrients to the system, but if it under-performed there would be little chance of feasibly increasing its capacity. Thus it was very important to carry out the research and modelling to clearly define the problem to be solved to enable the channel to be properly scaled. It was also important to use catchment management to provide further security to guarantee the performance of the channel in the long term (see (e) below).

e) At the time of the assessment, the scientific data on the management strategy for Peel-Harvey indicated that the Dawesville Channel alone would not be adequate to reverse, or maintain in the long term, the improvements to water quality that were required, unless agriculture was largely removed from the catchment and no further nutrient-exporting development (including residential) was to occur around the estuary. It was considered impractical to remove agriculture and "hold" development in this manner. This led to the development of a combined approach of the Dawesville Channel and catchment management measures which would provide the best chance for significant reductions in phosphorus inputs and would also provide additional buffering to ensure the long-term performance of the Dawesville Channel. Extensive dredging of the Sticks Channel portion of the Mandurah Channel had already occurred and a strong synergistic effect with the Dawesville Channel was expected.

f) The costs of the Dawesville Channel were very substantial (in excess of $60 million), in particular for addressing an environmental problem and it was reasonable for a Government to wish to protect its investment in the Dawesville Channel through a requirement for catchment management. The Dawesville Channel has been described as a "subsidy to agriculture in the Peel-Harvey coastal catchment" (pers. comm.).

The assessment report stated:

> "*Management of the problems of the Peel Inlet and Harvey Estuary waterways and their catchments will require the adoption of a long-term view and a holistic approach. Because some of the remedial measures proposed in this report will be on*

a scale and of a kind not previously undertaken, they will generate considerable world-wide interest. At the local level, the Dawesville Channel will be the largest coastal engineering project undertaken since C Y O'Connor built Fremantle harbour. The proposals to manage agricultural activities in the catchment would also be innovative in that the emphasis is on a co-operative approach rather than on a strict regulatory approach of the kind being adopted by a number of European countries to control similar problems." (EPA, 1988a, p. 1-2).

This recognised the status of the Peel-Harvey as a local icon as well as being a wetland of International importance. An overview of the catchment environment and the management approach is given in Robinson and Humphries (1988).

2.2. THE FOCUS OF MANAGEMENT IN 1987-88

Large green algae, particularly of the genera *Cladophora* and *Chaetomorpha*, became noticeably more abundant in Peel Inlet from the mid to late 1960's, By the 1970's, large algal accumulations were fouling estuary beaches and causing odour and other problems. Increasing public concern stimulated the EPA to pay attention to the problem in the late 1970's.

Studies into the biological and physical aspects of the Peel-Harvey System commenced in 1977 and were initiated by the EPA through its the Estuarine and Marine Advisory Committee (EMAC). The task of EMAC was "to determine the causes of the excessive growth and accumulation of green algae in Peel Inlet and if possible propose methods for its control" (EMAC, 1981, p.6). This constituted Phase 1 of the studies. The principal conclusions presented in the EMAC report of 1981, were:

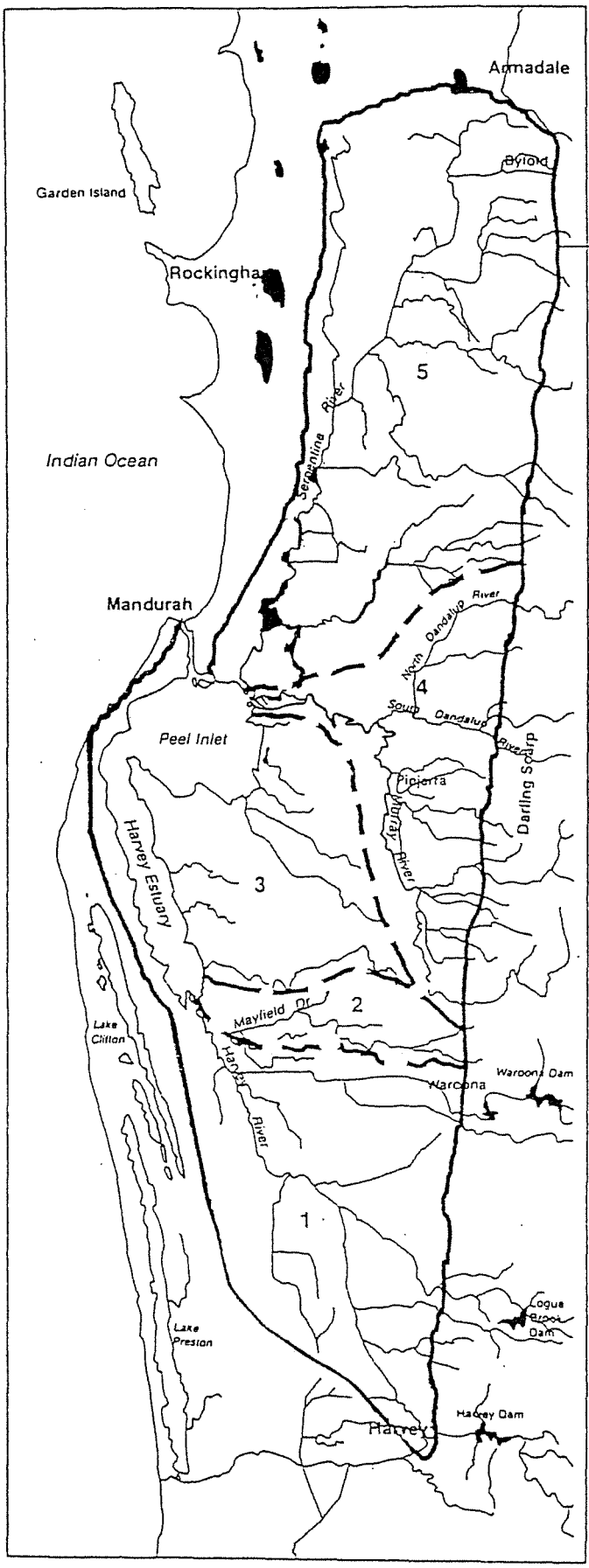
- the Peel-Harvey System is eutrophic (severely nutrient enriched) in that there is an excess of the nutrients phosphorus and nitrogen available for plant growth in the estuaries;
- the excess of nutrient enters the system from activities in the catchment, in particular from the application of phosphorus-rich fertilisers; and
- proper management of the system can only be achieved by reducing the present input of nutrients from agricultural drainage, by preventing the increase of nutrients from other sources and by not further restricting the flushing of nutrients to the sea.

Phase 2 studies began in 1981 and confirmed that the soils and drainage system on the coastal plain catchment were the main source of phosphorus to the system.

Phase 3 examined all the possible management options to determine their effectiveness and feasibility against a set of constraints and objectives (Humphries and Croft, 1983; DCE, 1984). The aim was to keep eutrophication of the estuaries within "acceptable" limits. The study proposed management strategies that would be cost-effective, as well as options that would benefit from further investigation, such as application of bauxite residue ("red mud") to the catchment soils.

EPA carried out an assessment of the proposals in the Stage 1 Environmental Review and Management programme (ERMP) and recommended that a combined strategy of a new channel to the ocean and control of phosphorus inputs from the catchment was essential (EPA, 1985). In the assessment the EPA identified the management objectives as being, in simple terms:

"*to produce and maintain an estuary system that is visibly clean and healthy and is ecologically healthy and resilient*" (EPA, 1985).



Catchment	Area (ha)	Cleared area (ha)	% cleared
1	53,995	41,454	76.8
2	11,044	10,139	91.8
3	26,365	21,296	80.8
4	32,366	29,149	90.0
5	78,645	48,962	62.3
Total	202,415	151,000	74.6

Figure 1

Location map of Peel-Harvey Estuary System and boundaries of the Coastal Plain Catchment and Sub-catchments

This objective was based on the recognition that the Peel-Harvey System had important environmental, economic and social values involving a broad range of stakeholders, not necessarily only those people living within the coastal catchment area.

In 1985, the EPA defined the management area as "the Estuary System" which included the Peel Inlet, the Harvey Estuary and the rivers and drains of the coastal part of the catchment, including the Serpentine, Murray and Harvey Rivers (see Figure 1). The EPA also stated in its conclusions that:

"*it will be necessary to develop a long-term land management plan for the Catchment Area and an appropriate enabling framework, to attain and secure for all time reductions in nutrient loading to the System;*" (EPA, 1988a, page 27 of Part I Report)

Phase 4 was the preparation of the ERMP (Kinhill Engineers, 1988) which examined the management package in detail, followed by the environmental impact assessment by the EPA (EPA, 1988a). In preparing its assessment and recommendations to Government, the EPA provided advice on the legal and administrative framework that would be necessary to underpin successful management of the estuary system's environmental quality over the long term. This was embodied in the recommendations of the EPA in its assessment report (EPA, 1988a) (reproduced in Appendix 1 here) and in the Environmental Conditions set by the then Minister for the Environment (reproduced in Appendix 2 here).

The position taken by the EPA in its assessment of the ERMP in 1988 was:

" *..that the estuarine water quality is presently seriously degraded, and that this requires significant improvement to make it environmentally acceptable and to ensure that the beneficial uses of the system such as direct water contact, recreation, fishing, fishery protection, and habitat protection can continue. To date, catchment land-uses have taken place without due regard for the downstream consequences and impacts on the end receiving water body. The environmental quality of the estuaries has been traded off for the benefit of catchment land-uses. This balance needs to be redressed to achieve conservation and sustainable development of the Peel - Harvey System. Adequate protection of the estuaries' beneficial uses will dictate changes to the amount and types of catchment activities that will be possible.*" (EPA, 1988a, p.1).

By 1988, there were sufficient data and modelling results to enable the EPA assessment to express the management target in both descriptive and numerical terms. The latter was important as it would enable the success of the management strategy over time to be judged.

The descriptive management objectives the EPA set at that time were:

i) *"At least an acceptable to good level of water quality, defined as moderately nutrient enriched (mesotrophic);*

ii) *A high level of resilience in the system to ensure that massive oxygen depletion does not occur;*

iii) *A large reduction in phosphorus input to the system from the catchment area;*

iv) *A solution, that will preferably show major improvement within five years, to ensure that irreversible damage to the system does not occur; and*

v) *A very high probability that the strategy will succeed both in the short and the long term.*

Although not environmental in nature, another important consideration is the overall cost - benefit that would result from the system being adequately managed and becoming healthy and resilient" (EPA, 1988a, p.10)

The target organisms for management at that time were the in-estuary occurrences of a cyanobacterium (blue-green alga) called *Nodularia* as well as large (macro) algae. As *Nodularia* was capable of fixing nitrogen from the air it effectively had unlimited access to nitrogen as an essential nutrient. This led to the focus for management being reducing availability of phosphorus as the means of limiting plant growth.

The full management strategy consisted of:

- *"constructing the Dawesville Channel as soon as possible;*
- *implementing catchment management measures, to include:*
  - *fertiliser management*
  - *changes in land-use*
  - *control of point sources*
  - *continuation of the moratorium on clearing and drainage*
  - *preparation and implementation of an integrated catchment management plan to meet the target for phosphorus load reduction specified in the EPA assessment report;*
- *continue weed harvesting; and*
- *implement appropriate monitoring to measure the success of the strategy."* (EPA, 1988a, p. 16)

The parts to be played by the two main components of the management strategy were set out by the EPA in its 1988 assessment (see Table 1):

Table 1 - Relative Contributions of Dawesville Channel and Catchment Management to Achieving the General Management Criteria (after EPA, 1988a, p.66)

Management Criteria	Dawesville Channel	Catchment Management
At least an acceptable to good water quality	Essential	Essential
Marine or near-marine conditions, for control of *Nodularia*	Essential	-
High resilience in the system to ensure it does not "go over the edge"	Essential	Essential
A large reduction in phosphorus input to the system	-	Essential
Increased removal of phosphorus from the system	Essential	-
Very high chance of success of the strategy and ongoing long-term success	Essential	Essential

At the time of the assessment, the magnitude of the *Nodularia* problem was considerable and in the view of many scientists threatened the ongoing health of the estuary, in particular the Harvey was an indicator of further significant decline in the health of the estuaries and the move to an even more environmentally unstable and less predictable situation. Scientists at the time frequently expressed concern about the likely "collapse" of the estuary health and what this would mean for its ecosystems as well as impacts on residents nearby. There was also concern among some scientists that if such an extreme collapse occurred, it would become impossible to restore the health of the estuary. This provided a sense of urgency in implementing effective, long-term management, as well as introducing the importance of building resilience and a safety margin back into the system.

It became clear that only a management package consisting of both a new channel and effective catchment management measures would be likely to succeed in protecting the estuary system in the long term, and that there would also be a need to underpin management with an effective legal and administrative framework that would foster an adaptive environmental management approach.

2.3 URGENCY OF MANAGEMENT - COMMUNITY ATTITUDE TOWARDS MANAGEMENT OF THE ESTUARIES

An attitudinal survey was carried out in 1985 (Kinhill Stearns, 1985) to gauge the views of local and Perth regional opinions about the need for and timing of a solution to the algal problems in the Peel Inlet and Harvey Estuary. The survey involved interviews with randomly selected respondents as well as five discussions groups of up to ten people representative of selected community interest groups in the area.

Fifty-seven percent of respondents found a high-cost, immediate solution (the new channel) to be acceptable, quite acceptable, or very acceptable, with 32 percent finding it not acceptable to a greater or lesser extent. The preference was for a high cost/immediate solution (47%) over a low cost/long term solution (36%). However this indicates that some 83% of respondents (47% plus 36%) were of the view that the algal problems should be fixed.

3. EVOLUTION OF THE ENVIRONMENTAL MANAGEMENT FRAMEWORK

3.1 GENERAL

In its 1985 Stage 1 assessment of the Peel-Harvey Management Strategy, the EPA recognised the lack of a mechanism in WA to facilitate implementation of a catchment management plan to achieve environmental objectives. It identified the critical elements for the Stage 2 assessment as being estuary management, development of a catchment management plan and development of some sort of policy (perhaps a planning policy) for implementation (Robinson and Humphries, 1996). This lack of an appropriate implementation mechanism was clear, and an important recommendation in the EPA report was:

"*The EPA recommends that in order to protect the Peel-Harvey System from excessive loads of phosphorus (and other nutrients) a Catchment Management plan and an appropriate mechanism to facilitate its implementation be developed. To secure gains already achieved in the Catchment Area, an interim mechanism should be implemented as a priority.*" (EPA, 1985a, Recommendation 2, p.14).

Elsewhere in the EPA's report the interim mechanism was referred to as an "enabling framework" (see EPA, 1988a, Part I, p.27).

Although the Department of Agriculture had commenced a form of catchment management planning in 1985, this work was effectively abandoned when key staff moved to different operational areas around 1987. The disbandment of the Estuarine Impacts Branch by the EPA in late 1989 also removed the central driving interest in keeping the Peel-Harvey problems in the forefront of agency minds. This contributed to a loss of focus and impetus in catchment management as well as in estuary monitoring in the State in general.

Between 1985 and 1988 the enabling framework identified as necessary by the EPA was not developed and in 1988 the EPA was faced with developing a management approach using existing statutes and mechanisms. Although development of a new legal instrument such as a Peel-Harvey System Management Act was considered, it was felt that an Environmental Protection Policy (EPP) may provide an adequate mechanism for protecting the management objectives of the system. It was thought that an EPP, as a whole of Government instrument applicable to all parties, would provide the necessary legal (and environmental) direction to cover all activities, agencies and landholders in the catchment.

The challenge in this approach has been recognised:

"*The administrative challenge was to develop an implementation approach that was fair and yet would ensure that sound environmental decisions were upheld in accordance with the intent of the EPA's assessment and management targets. Specifically in the case of Peel-Harvey, a system was needed that would enable broad scale, diffuse nutrient producing activities to be controlled to within the identified environmental limits and that would still permit landholders to pursue their moneymaking activities. This could be achieved by landholders changing land-use practices and/or management.*" (Robinson and Humphries, 1996, p.12).

It was the intention that the EPP would provide a statement of vision and direction that could work in concert with the planning approvals process in Western Australia to deliver sound planning decisions that reflected a catchment-wide environmental management constraint and that the management targets would be given effect on the ground through the development of

a comprehensive catchment management plan which would allow for a broad range of approaches to meeting the reduction in phosphorus input required from the catchment. The catchment management plan was to be developed using a co-operative rather than a regulatory approach with the EPP providing the only "non-negotiable" element by making a clear statement of what environmental quality objective (expressed as phosphorus reduction) was required to ensure adequate protection of the estuary environment (the "top down" aspect). How this was to be achieved was left to the relevant agencies, local governments and landholders to be creative, develop new approaches and select which to implement (the voluntary aspect). This provided a means of ensuring a combination of the "top down" and "bottom up" approach to integrated catchment management advocated by Mitchell (1991), Hollick and Mitchell (1991), Mitchell and Hollick (1993) and others. Figure 2 shows the relationship between the phosphorus target in the Environmental Condition, the EPP and between "top down" and "ground up" aspects of integrated catchment management.

The reduction in phosphorus input required was discussed in the EPA assessment and described as the management target, expressed in a probabilistic manner to allow for the range from dry to average (50 percentile) to wet (90 percentile) years (Humphries and Robinson, 1995a; 1995b). The estuary management target was then incorporated into the legally binding Environmental Conditions set on the proposal by the Minister for the Environment. Humphries et al (1990) discusses turning estuary management targets into catchment management plans.

The EPA proposed a tiered legal and administrative framework to underpin management (see Figure 3). This consisted of:

a) the EPA's recommendations in the assessment report (EPA, 1985);
b) the proponents' commitments as included in the assessment report;
c) the Minister's Environmental Conditions on the proposal (which included requiring all the proponent commitments, such as the catchment management plan to be carried out);
d) the development of the EPP; and
e) use of other statutory instruments and regulations under various Acts, not just the Environmental Protection Act.

The EPP was envisaged as providing an over-arching requirement for all with management responsibilities to make decisions in accordance with the management strategy. It was also expected that the EPP would be quite prescriptive. The legally binding aspects of the framework for management are the Minister's Environmental Conditions (including the proponent commitments), the EPP and other statutes and regulations.

Considerable scientific work had been carried out over the years in characterising the estuary problems, possible solutions and the phosphorus reduction required. It was important that the phosphorus reduction management target for the catchment, having been established in a technically robust manner, was expressed in a way that would preclude ongoing discussion and challenge. The EPA aimed to achieve this by:

- the management target identified in the EPA's recommendations being specified in an Environmental Condition by the Minister:

- the management target being re-stated in an Environmental Protection Policy as what needed to be achieved (the figure in the Environmental Condition ensured that the EPP could not specify a lower amount); and

- development of a catchment management plan as the on-the-ground means of giving effect to the reduction in phosphorus required to meet the management target.

In relation to catchment management, Recommendation 2 of the assessment report stated:

"*The EPA recommends that proposals for control of phosphorus through catchment management should be developed and implemented as rapidly as possible so that, in conjunction with the Dawesville Channel, the following objective is met:*

- *the Peel-Harvey System is clean, healthy and resilient.*

On the basis of the studies undertaken (see Bulletin 363 Part II) the Authority believes that the above would be achieved with target figures of:

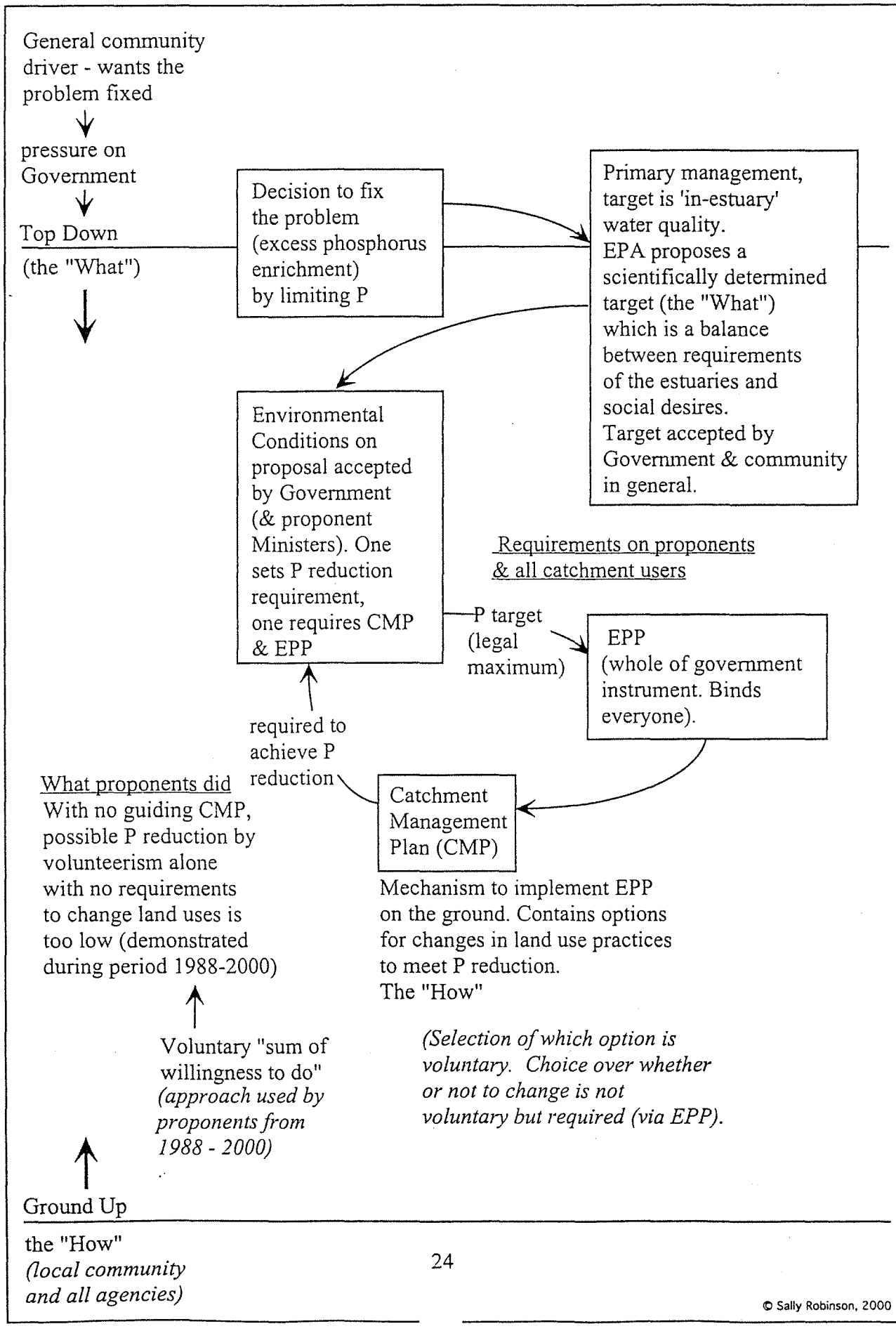
- *annual phosphorus input to the system not to exceed 165 tonnes in nine out of ten years;*

- *average phosphorus concentration in estuary water is not to exceed 0.02 milligrams per litre in nine years out of ten (on average);*

These target figures should be reviewed in the light of measured performance of the system." (EPA, 1988a, p.19).

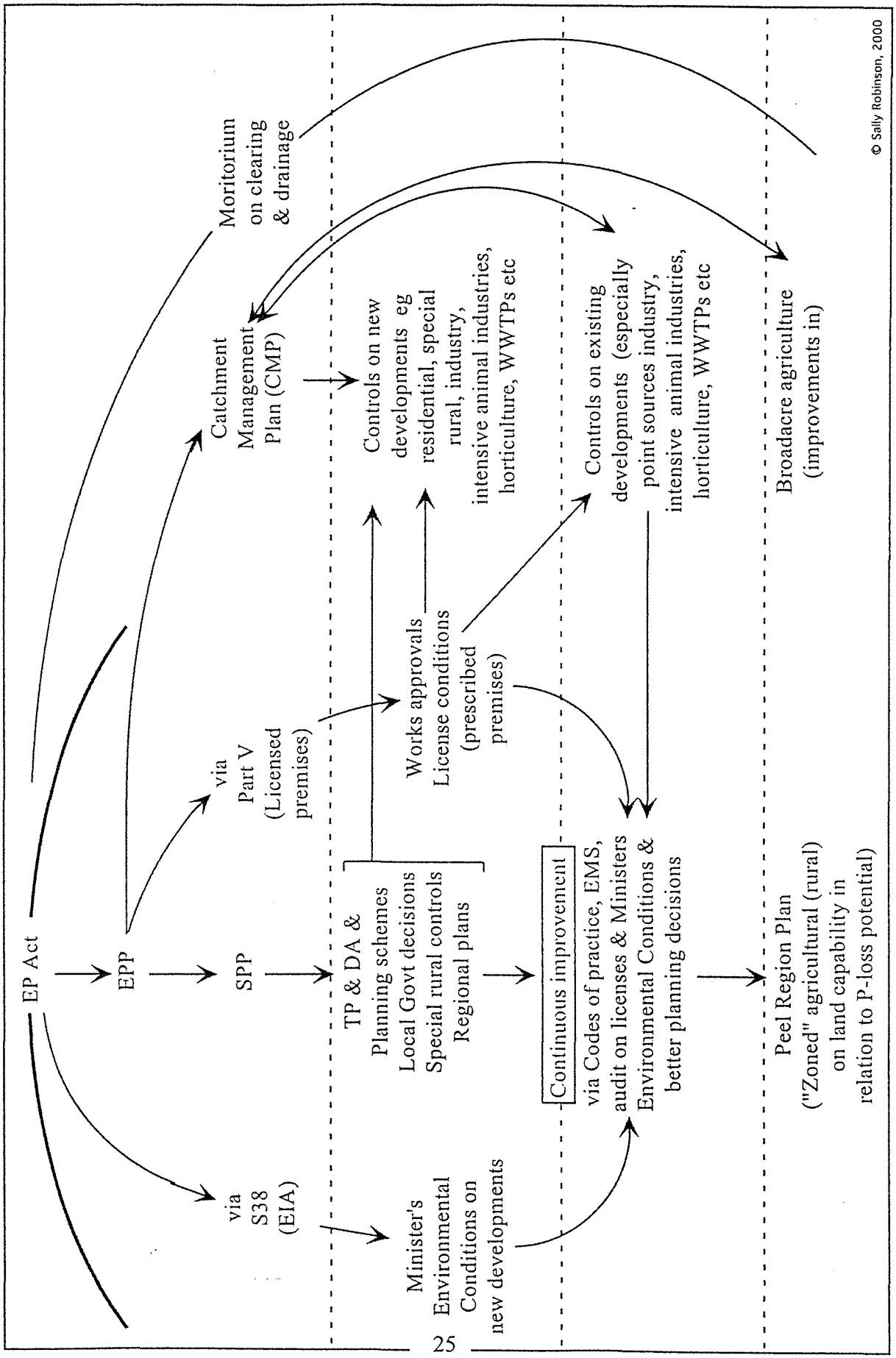
Recommendation 3 required the proponents jointly to prepare an Environmental Protection Policy in accordance with the objective and targets specified in Recommendation 2 (EPA, 1988a, p.19). Meeting these targets involved reducing catchment phosphorus losses by 50 percent, which was considered to be an achievable target which would permit the long-term continuation of most agricultural land-uses in the catchment, with some adjustments being required to the farming methods and practices being used, in particular whether and at what time to apply fertiliser.

Figure 2 - Relationship between the phosphorus target identified in the EPA's assessment report, set in the Environmental Condition and in the Environmental Protection Policy, and between "top down" and "ground up" aspects of integrated catchment management



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Figure 3 - Diagram of legal and administrative framework for management of Peel-Harvey Management Strategy - a conceptual diagram of an integrated solution



3.2 THE IMPORTANCE OF CO-PROPONENTS TO THE MANAGEMENT FRAMEWORK

To ensure that all aspects of the proposal would receive the proper level of management, and recognising the "whole of government" nature of the strategy, the Minister for the Environment designated the three proponent Ministers co-proponents for implementation of the whole management strategy, on behalf of government, rather than just responsible for a single portfolio area. This was a deliberate strategy proposed by the EPA to prevent division of responsibility along traditional lines (Minister for Transport for the Dawesville Channel; Minister for Waterways for the estuaries and its tributaries; Minister for Agriculture for agricultural activities) and was intended to ensure that there would be a collective management responsibility for implementation of all aspects of management of the system. There was concern that if individual Ministers only took care of a part of the strategy, or if allocation of responsibility was too precise, issues that might be regarded as falling outside perceived responsibilities would remain unmanaged.

Prevention of any gaps in management responsibility was considered important. In 1988 agency budgets generally had sufficient amounts of discretionary budget to enable them to address gaps in environmental management responsibilities through co-operative approaches with other agencies. For example, in 1988 no single agency was responsible for wetland management, river management, protection of remnant native vegetation, estuary management or marine environmental management, all of which are relevant to management of the Peel-Harvey. It was only through across-agency co-operation and allocation of small parts of their budgets that progress was being made in these areas.

The issues of managing in the gaps and overlaps between natural resource agencies, and contracting budgets have been identified as significant factors in the difficulties experienced in implementing an ICM approach in WA (Mitchell, 1991; Mitchell and Hollick, 1993; Wallis and Robinson, 1993).

The ongoing reduction in discretionary budgets and the contraction of agencies to their statutory "core business" has continued to increase the gaps between agencies and has led to reduced ability to manage significant environmental protection issues such diffuse source pollution and salinity, both of which require large-scale, strategic integrated catchment management approaches involving the cooperation of multiple agencies and the community. Furthermore, obtaining clear identification of environmental responsibilities within government has proved very difficult (WA Auditor-General, 1998; "The McCarrey Report" of about 1994).

Since the EPA's 1988 assessment, the philosophy of environmental management has moved rapidly to one of continuous improvement and this makes it even more important that the three Ministers continue to be regarded as equal co-proponents for all the strategy. Although continuous improvement as represented today by ISO 14001 was not generally made explicit at the time, the EPA considered that an approach of corporate, ongoing responsibility was required for successful management of the Peel-Harvey, and this is reflected in its recommendation which stated:

"*The EPA recommends that the proponents be jointly responsible for:*

- *the construction, operation, monitoring and maintenance of the Dawesville Channel and its impacts within the estuaries and within the immediate marine environment;*

- *the management and required monitoring of the catchment and collection of data necessary for the development of the integrated catchment management plan of the Peel-Harvey;*

- *all in-estuary monitoring and management, including weed harvesting.*"

(EPA, 1988a, Recommendation 12, p.23).

It should be noted that, contrary to some perceptions that the marine environment was forgotten by the EPA in its assessment, the above recommendation clearly allocates responsibility for impacts from the Dawesville Channel on the nearshore marine environment to the co-proponents. The EPA report also proposed that an appropriate management target for nitrogen should be defined during the catchment management planning process.

The above recommendation, and all others made by the EPA, were accepted at the time by the then Minister for the Environment who set the Environmental Conditions on the project and approved its implementation in accordance with those Conditions. In doing so, the Minister was acting on behalf of the Government as a whole, and had agreement to the Conditions by the proponents.

3.3 RELATIONSHIP BETWEEN PROPONENTS AND ENVIRONMENTAL CONDITIONS

The Environmental Protection Act requires the designation of a "proponent" for a proposal. This is not always a straightforward case of identifying who is referring the proposal but also requires consideration of the Environmental Conditions that will be required for full implementation of the development. The Conditions can only be applied to those identified as the "proponent" and cannot be applied to those that are not proponents, even though the latter may be even more important in achieving successful implementation of the project.

At times, and for very good reasons, a project cannot be made environmentally acceptable by the proponent's actions alone, and it is not uncommon for private industry proponents to find themselves in the position where their project can only be made "environmentally acceptable" if certain actions are taken by government agencies. However, if agency management requirements are not funded a proponent can find themselves in a difficult position even though they are meeting the requirements of Environmental Conditions placed upon them.

Under the current Environmental Protection Act Environmental Conditions cannot be applied to non-proponents even though they may be significant in providing supporting decisions or management to ensure a successful outcome.

Peel-Harvey represented a particularly difficult project for designation of appropriate proponents as the proposal was a "whole of government" project requiring actions across a range of State agencies as well as by local government and landholders for successful implementation.

The Minister for the Environment designated three Ministers as co-proponents with the intention that those Ministers would carry full implementation of the strategy on behalf of government as a whole. A critical intention of this approach was to make each Minister equally responsible for all of the strategy, reflecting a collegiate approach to ensure that all parts of the strategy were covered. Where an action was required that was outside a Minister's direct responsibilities, it was expected that the Minister would take on responsibility at least to the extent of influencing his Cabinet colleagues to take the required actions, and, if necessary take the matter to cabinet for decision.

Peel-Harvey has both "proponent management" agencies (through the Ministers as designated) as well as other "management" agencies whose Ministers were not designated as proponents. Through the "Procedure" part of the Environmental Conditions, actions from non-proponent agencies that are essential to successful implementation of management to ensure proper environmental protection can be defined. It would be useful in amending some of the Environmental Conditions, for the EPA to provide advice to the Minister for the Environment on non-proponent management agencies and for a draft "Procedure" to be prepared for inclusion in the revised Statement.

Recommendation P1

It is recommended that the current three Ministers nominated as co-proponents be retained but be required (through "Procedure") to operate as being equally responsible for implementation of the whole management strategy.

Recommendation P2

It would be useful in amending some of the Environmental Conditions, for the EPA to provide advice to the Minister for the Environment on non-proponent management agencies and for a draft "Procedure" to be prepared for inclusion in the revised Statement.

With Peel-Harvey being a "whole of government" project and to address the institutional failures, in particular the diffuse responsibility for implementation of the full strategy, it would now be useful to allocate the responsibility for "driving" implementation. The interest in ensuring that the EPA's recommendations and the Minister's Environmental Conditions are implemented in full lies with the EPA (on behalf of the community as a whole) and the Minister for the Environment (for government and the community) respectively.

Since Peel-Harvey was assessed, the EPA has developed an EPP for protection of the Swan-Canning river and catchment system. This EPP makes the EPA responsible for the preparation of a catchment management plan for the Swan-Canning, to meet the environmental objectives stated in the EPP. The EPA can develop the plan itself or can delegate responsibility for its preparation, to the satisfaction of the EPA, to another body. For Swan-Canning, the EPA requested the Swan River trust to prepare a draft plan for the EPA to consider.

This approach would be useful to adopt for the Peel-Harvey at this juncture. The revision of the EPP should reflect the relevant clauses from the Swan-Canning EPP. The EPA can then ensure that the comprehensive integrated catchment management plan originally envisaged by the EPA can be prepared and implemented, either by carrying this out itself, or by delegating preparation of the plan (to meet the environmental objectives stated in the EP) to another suitable body. Now that a Peel-Harvey Catchment Council has recently been established, this may be a group that could, with appropriate assistance prepare a draft plan for the EPA's consideration.

Recommendation P3

It is recommended that the EPA should ensure that the provisions for preparation of a catchment management plan from the Swan-Canning EPP are included in the revised Peel-Harvey EPP, and the EPA should take on the responsibility for driving catchment management.

Recommendation P4 -

It is recommended that the EPA give consideration to delegating preparation of the above catchment management plan to an appropriately resourced group to ensure that the EPA's and Minister's requirements are met.

3.4 DEVELOPMENT OF AN IMPLEMENTATION STRATEGY BY PROPONENTS, TO ENSURE CONDITIONS ARE MET

To assist in understanding by proponents and the community, EPA should clearly document the intent of its recommendations in its assessment report, preferably by inserting recommendations throughout the report close to the rationale for that recommendation. Similarly, the intent should be stated adjacent to each Environmental Condition and included in the Statement issued by the Minister for the Environment. Although the intent behind both EPA recommendations and Environmental Conditions is clear from reading the assessment reports, it would be of more assistance to proponents (and to future PCR review teams) if the rationale was made explicit within the Statement.

Proponents should be required by the EPA to propose a strategy to enable evaluation of progress and compliance and EPA and proponents need to reach mutual agreement on this. Following issue of the Statement that a Proposal may be Implemented, the EPA should invite proponents to attend an EPA meeting to discuss and agree on the measures of success that will be used to verify compliance in the next review. The agreed measures of success would then lead to the development of a targeted monitoring program to ensure that the appropriate information to enable compliance to be verified is included.

The proponents should be requested to propose measures to the EPA for consideration and discussion and would be encouraged to consult with key stakeholders and groups. The agreement reached by the proponents and the EPA should form a "contract" that should remain regardless of staff changes either at the EPA or at the proponent company, and should be made public as a draft, to allow for other expert input, prior to being finalised

3.5 KEY ELEMENTS OF THE CATCHMENT MANAGEMENT STRATEGY

The key elements of the catchment management strategy were defined as being:

- fertiliser management;
- changes in land use;
- control of point sources of phosphorus (and other) pollution;
- preparation of an integrated catchment management plan; and
- continuation of the moratorium on clearing and drainage. (EPA, 1988a, p 14).

Along with all other elements of the management strategy, these all required consideration in some manner in the legal and administrative framework for management.

3.6 NEGOTIATING THE ENVIRONMENTAL PROTECTION POLICY

As use of an EPP as a means of controlling a diffuse source pollution problem at a catchment scale had not been attempted in WA before, there were differences of opinion among key agencies as to what such an EPP should contain. In addition, appropriate mechanisms to implement the catchment management plan (as proposed by the EPA in 1985) still had not been developed.

The initial drafts of the EPP were very comprehensive and attempted to incorporate the mechanisms for implementation within the body of the draft EPP by being prescriptive about land uses. However, this was perceived by the State's planning agency at that time as perhaps usurping the role of that agency in land-use planning. There was broad agreement between the planning agency and environment agency that a means of underpinning environmental protection and catchment management was needed, but disagreement over whether this could or should all be achieved through the EPP.

Eventually an approach was negotiated between the two agencies which led to an agreement on the combined use of Environmental Protection Policies and Statements of Planning Policy to meet environmental objectives for management of diffuse sources. Specifically it was agreed (via a Memorandum of Understanding signed by the two Chief Executive Officers) that:

"*Environmental Protection Policies be confined to statements of environmental objective, and for the detail about land-use and management to be contained in the Statement of Planning Policy. The two documents, along with other relevant materials would become the backbone of any catchment management plan being developed, as they provided the high level statements to guide development in an area and the legal means to constrain inappropriate land-uses. The agreement was made public, along with a generalised model for catchment management in a leaflet "Linking the Environment, Planning and Catchment Management" (OCM et al, 1991)*" (Robinson and Humphries, 1996, p. 12: note OCM refers to the then Office of Catchment Management).

As a result, all of the prescriptive detail in the EPP (the "How") was removed and placed into the Statement of Planning Policy, and the EPP retained the statements of the environmental management objectives and targets (the "What"). Section 8(2) of the EPP identified the means of implementation of the management approach required for the achievement of the environmental quality objectives (EQO's), including the requirements on landholders (see Section 6 of this Report).

Further definition and implementation of the range of measures to reduce nutrient losses from existing land-uses to the drainage system (for example "appropriate" land management) were to be included in the catchment management plan.

While the relationship between EPPs and SPPs was being resolved, the Department of Planning and Urban Development was preparing the Peel Region Plan (DPUD, 1990). This Plan proposed land-use zoning for rural land and provided guidance in terms of preferred land uses, taking account of soil types, proximity to drains and other matters. The Peel Region Plan was not statutory and was to rely on voluntary adoption but it was an excellent early attempt at incorporating environmental controls and constraints at the grass roots, property level and to provide a mechanism for implementing the EPP on existing land-uses. An example of the kind of proposals made in the Peel Region Plan is given in Table 2.

Table 2 - Extract from Peel Region Plan for the land-use type unit designated "Rural D"

Land-use type	"Rural D"
Locality	"Pinjarra Plain west of the foothills"
Preferred principal land-use	"Grazing, mixed farming, tree-farming, agro-forestry."
Other possible land-uses	"Rural residential, quarrying"
Management emphasis	"Retain existing rural character, reduce nutrient loss and land degradation." "Groundwater protection."
Main development criteria	"Nutrient application, generation and drainage. Improved vegetation cover, water resources, rehabilitation measures, land capability."
Further planning and management	"Integrated Catchment Management Policy (ICM), Environmental Protection Policy (EPP), Local Authority Rural Strategies and Town Planning Schemes (TPS). Conservation and Land Management (CALM) and WA Department of Agriculture (WADA) extension work. Water Authority of WA (WAWA) Management Areas."

Source: Peel Regional Plan, (DPUD, 1990, p.96)

3.7 THE LEGAL AND ADMINISTRATIVE INSTRUMENTS FOR MANAGEMENT OF THE MAIN CATEGORIES OF PHOSPHORUS-EXPORTING LAND USES - FOR NEW PROPOSALS POST EPA 1988 ASSESSMENT AND EPP

Figure 4 shows examples of the types of nutrient-exporting developments that required strict management following the EPA's 1988 assessment.

The Legal and Administrative instruments available for management of existing phosphorus-exporting land uses are shown in Figure 5. These need to be considered in the context of the over-arching legal and administrative framework for management (Figure 3).

Figure 4 - Examples of Nutrient-exporting (especially P) Land uses and some of the control mechanisms

Intensive Animal Industry (Part V Licensing & COP & guidelines)	Broad Acre Agriculture	Intensive Agricutture (vegetables)	Human Settlements	Drains
* piggeries * animal feedlots * live sheep assembly areas * abattoirs * poultry farms # dairies * kennels	# fertiliser use, clearing and drainage	• gross over-appliocation of water & fertilsers • surface and groundwater pollution	* generalised transmission of pollutants to waterways	# Water Corporation Main Drains (some controls) # other drains (no controls)
Solutions & approach - regulatory	**Solutions & approach** - voluntary # fertliser R & D extension # soil testing (free) # use of new fertilisers + red mud amendment	**Solutions & approach** - voluntary & indirect regulation through water licenses # soil testing # R&D extension # fertiliser management * RIW&I Act (water allocation through licensing) EPA Policy on conventional irrigated horticulture in Peel-Harvey + red mud amendment # irrigation management (eg tailwater capture and recycling)	**Solutions & approach** - partly regulatory * improved sewage treatment (Policy) * infill sewerage and better wastewater treatment * improved sewage treatment (Policy) * wastewater disposal (Pinjarra) to Alcoa * Canal Estates (s38 EIA and Conditions) * TP&D Act conditions on approvals of development applications (eg sewerage condition) * Special Rural requirements (eg Ecomax etc)	**Solutions & approach** - generally not regulated * proposals for new Water Corp drains subject to EIA, others not

* shows strong regulation of these activities # shows weak or no regulation of these activities + = Code of Practice

Figure 5 - The Legal and Administrative Instruments for Management of the Main Categories of Phosphorus-exporting Land uses - for New Proposals post EPA 1988 assessment and EPP

Intensive Animal Industries	Human Settlements	Intensive Horticulture (Vegetables)	Broad Acre Agriculture
• EPP and SPP	• EPP and SPP	Part IV (s38) of EP Act (EIA) Minister's Environmental Conditions	EPP and SPP
• Part IV (s38) of EP Act (EIA) Minister's Environmental Conditions	• TPS Sewerage Condition (State Sewerage policy)	• EPP and SPP	• Moratorium on clearing and drainage
• Part V Works Approval and Licensing (for precribed premises) to ensure the environmental objectives of the assessment and EPP are met	• Rural residential requirements (ATU's/ Ecomax, revegetation) Integrated catchment management plan	Integrated catchment management plan	• Integrated catchment management plan (and EPP)
• Codes of Practice	• Drain water quality management -eg detention basins	• TPS restrictions relating to location	• Little opportunity as catchment already fully developed
• Health Act	• Canal Estates (s38 EIA Conditions)	• Water allocation (RIW&I Act license)	• Trees
• Local government planning and zoning	• Continuous improvement - sewerage and WWTP's		
• Local government development applications	• "Urban" catchment management plans (eg Serpentine-Jarrahdale)		
• Moratorium on clearing and drainage	• Moratorium on clearing and drainage	• Moratorium on clearing and drainage	

Note: Cumulative impacts of all nutrient-exporting developments needs to be taken into account in determinination of potential maximum nutrient loads

4. THE ENVIRONMENTAL PROTECTION POLICY

The EPP was gazetted on 11 December 1992 and is very brief, consisting of just over two pages of text. The remainder is the official description of the boundary of the policy area. The text of the EPP is in Appendix 3. The key sections are as follows:

- **section 5 - Beneficial uses.** This lists the uses declared to be protected under the policy.

- **section 7 - Environmental quality objectives.** This states a median permissible load of total phosphorus to the estuary, and also specifies the median loads of total phosphorus permitted to flow into the estuary from each of the Serpentine River, Murray River, and Harvey River and drains in order to protect the beneficial uses.

- **section 8 - Achievement and maintenance of environmental quality objectives.** This states the mechanisms by which the program of protection will be achieved, and includes statements about on-the-ground actions, advice and compatibility of decision-making (see Section 6 which follows).

In section 7 of the EPP, the means of expressing the management target was changed from that put forward in the EPA assessment report. The assessment report referred to a total percentile load for the estuary of 85 tonnes. This was proportionally allocated to each of the three major water courses in the EPP, rather than being expressed as a single figure total. This change does not make any difference to the actual management target in terms of total load, but the change may have led to some uncertainty and confusion.

There appears to be a view held by some, that once the EPP was developed it replaced and made null the Minister's Environmental Conditions. However, this is not the case. The Environmental Conditions and original intent of the EPA in its 1988 assessment remain relevant and, in the case of the Conditions, legally binding on the proponents.

5. THE CATCHMENT MANAGEMENT PLAN

Some people have claimed that the EPA provided no guidance as to its expectations for the catchment management plan and that catchment management was focused only on rural farmers. In its 1988 assessment, the EPA provided clear guidance about the requirements of the catchment management plan and these included expectations about urban as well as rural areas.

The extract from the EPA report is reproduced here in full.

"It will be necessary to control land uses which presently lead to excessive inputs of phosphorus into the estuaries. It will likely require less area fertilised for agriculture and more area planted under trees.

"The catchment management plan.... would need to address a number of issues, some of which were raised in the ERMP. The plan should include consideration of the following:

- *the environmental water quality requirement for the estuary system will set constraints on land uses in the catchment;*

- *changes in land use should have environmental benefits as the prime objective;*

- *nutrient inputs from all rural sources should be managed so that the total nutrient load is within the assimilative capacity of the Peel-Harvey System (ie 165 tonnes in nine years out of ten);*

- *export of phosphorus from all properties in the catchment must be reduced to meet the above water quality targets;*

- *export of nitrogen from all properties must meet a water quality target for nitrogen, to be specified during the catchment planning exercise;*

- *appropriate fertilisers should be developed for the area, in particular sulphur only or low sulphur fertiliser;*

- *soil testing and provision of fertiliser advice to farmers should continue;*

- *alternative methods of applying fertiliser should be investigated with a view to later spreading;*

- *nutrient inputs from all urban sources should be managed (see also Recommendation 6);*

- *pollution from point sources should be controlled to meet the objectives;*

- *major tree planting programmes should be based on maximising the environmental benefits as the primary objective and should be carried out in accordance with the EPA's recommendations in its assessment of the WA Chip and Pulp Company proposals (EPA, 1988b)*

- *clearing practices in the catchment should be reviewed to ensure environmental protection of the estuary system in accordance with the EPA's recommendations on retention of remnant native vegetation in EPA Bulletin 319 (EPA, 1988c) and Bulletin 329 (EPA, 1988b) (see Recommendation 5); and*

- *drainage practices in the catchment should be reviewed to ensure environmental protection of the estuary system (see Recommendation 5).*" (EPA, 1988a, p.19-20).

During the review of catchment management Conditions complaints were received about the continuation of the moratorium on clearing and in particular on drainage. However, it is apparent that at no time has any approach been made to the Minister for the Environment to remove this Condition and no case for doing so has been proposed. The Condition specifically required maintenance of the moratorium until such time as the Minister for the Environment was satisfied that it was no longer required.

Further information on the generic requirements for catchment management plans and for the Peel-Harvey Coastal Catchment specifically are being addressed separately in the Expert Review Committee report.

6. IMPLEMENTATION MECHANISMS

Recognising that a mechanism to enable implementation of catchment-wide management had not been developed as recommended in the EPA's 1985 assessment, an attempt was made to address this through the EPP itself. Section 8(2) specifies the means of implementing the EPP and states:

"The environmental quality objectives are to be achieved and maintained through -

(a) implementation of the Planning Policy by local authorities through their relevant town planning schemes, and by the State Planning Commission through the Metropolitan Region Scheme;

(b) appropriate land management by landholders and management authorities in the area;

(c) government extension services including the provision of advice to landholders in the policy area; and

(d) local authorities and the State government ensuring that decisions and actions are compatible with the achievement and maintenance of the environmental quality objectives."

The Planning Policy referred to in (a) above is Statement of Planning Policy No 2 (see Appendix 4). The EPP is a legal instrument which requires all parties, not just proponents, to carry out the actions set down in section 8 of the EPP. This is not discretionary, and is particularly relevant to part (d) above. Any apparent failure of the EPP is the result of lack of implementation by the various parties, specifically landholders, land-users, state and local government agencies and the "State" in general.

In effect, s8(2)(b) provided a headpower for implementation of the catchment management plan when developed.

The Environmental Protection Act requires that an EPP be reviewed within 7 years from its gazettal. The review process for the Peel-Harvey EPP was commenced in November 1999 when public comment was sought on the EPP. The review indicated that it was intended to roll over the EPP with its current text until the EPA had finalised its review of the progress and compliance of the proponents with the management strategy.

This approach was strongly supported by the public submissions (see summary of submissions in Appendix 5). Submissions also made suggestions for how the EPP could be improved. These observations about the success of the EPP and proposals for its improvement are covered in sections 8 and 9 below.

Of particular note, however, is the call by several submissions for the EPP to contain the implementation mechanisms and land-use controls currently in the Statement of Planning Policy.

Although legal advice suggests that "land use controls" cannot, in themselves, appear in an EPP, the compatibilities of various activities with achieving the protection of the beneficial uses and environmental quality objectives could be included. Thus the EPP can state what is not allowed.

7. HAS THE EPP BEEN EFFECTIVE?

It has not been possible to determine in a fully objective manner the degree to which the EPP has been effective, as no methodology has been developed by the EPA to enable such a determination to be made.

There are views that the EPP has been very useful and should be continued. There is also a view (particularly among catchment rural land holders) that the EPP has not "worked", although what s meant by "not working" is not defined.

When public submissions were sought on the EPP last November (as part of its review) all submissions supported the EPP and to varying degrees called for greater powers to be incorporated into it and for its scope to be broadened. There were no submissions which suggested that it had not been useful or that it should be abolished. This may be regarded as somewhat unusual as the tendency is for people to make input about matters they are concerned about or do not like, or would like changed. It is quite rare for people to prepare submissions in support of something.

The objectives of using an EPP as a key aspect of the management framework are:

a) to provide a long-term vision for management of the estuary system;

b) to establish the management targets for phosphorus within a legal instrument;

c) to lead to changes in land use;

d) to discourage some land uses (in particular intensification of agriculture where increased phosphorus losses would result)

e) to provide an over-arching, legal instrument that would establish the environmental constraints on the area and be useful to decision-makers to guide planning, planning decisions, and land uses in the area;

f) to provide an over-arching, legal instrument that would establish the environmental constraints on the area and be useful to land holders and users;

g) to provide a means of focusing all stakeholders into a common direction for management of Peel- Harvey (as an EPP is an instrument that applies to everyone);

h) to provide a mechanism that in combination with the catchment management plan, would allow for flexibility in selection of land uses and land use practices, whilst at the same time ensuring that the environmental management objectives were met; and

i) to send a clear signal about Government's commitment to the successful management of the system.

Table 3 summarises the assessment of the success of the EPP according to the above objectives.

Table 3 - Assessment of the success of the EPP

Objective behind having the EPP	Objective met/not met	Specialist Comment
to provide a long-term vision for management of the estuary system	Met	
to establish the management targets for phosphorus within a legal instrument	Met	
to lead to changes in land use	Met to some extent	the lack of a comprehensive catchment management plan has limited the ability of the EPP to deliver on this objective.
to discourage some land uses (in particular intensification of agriculture where increased phosphorus losses would result)	Met to some extent	the EPP contributed to reducing the expansion of irrigated intensive horticulture in the catchment. The lack of a comprehensive catchment management plan has limited the ability of the EPP to deliver fully on this objective.
to provide an over-arching, legal instrument that would establish the environmental constraints on the area	Met	
and be useful to decision-makers to guide planning, planning decisions, and land uses in the area	Met to some extent.	The existence of the EPP meant that planning schemes and development approvals should have been occurring within the environmental constraint. It was useful in providing guidance at the broad scale strategic level but proved difficult to implement at the level of individual developments (other than those assessed through section 38 of the EP Act).

to provide an over-arching, legal instrument that would establish the environmental constraints on the area	Met	
and be useful to land holders and users	Met to some extent.	Comments as above. In addition problems occurred because many landholders and users were not aware of the EPP early enough to avoid buying land that could not be developed in accordance with their expectations. The catchment management plan should have assisted in providing a pro-active tool useful at the property development level.
to provide a means of focusing all stakeholders into a common direction for management of Peel-Harvey	Partially met.	As an EPP is an instrument that applies to everyone, this should have been fully met. However there appears to have been both lack of knowledge of and resistance to the EPP among rural landholders in the catchment.
to provide a mechanism that in combination with the catchment management plan, would allow for flexibility in selection of land uses and land use practices, whilst at the same time ensuring that the environmental management objectives were met	Met	The mechanisms within the EPP, in concert with the catchment management plan, were adequate to guide decision-making to achieve the management objectives within the EPP.
to send a clear signal about Government's commitment to the successful management of the system.	Partially met.	The fact that Government supported the EPP sent a clear signal about commitment to management. However, this may not have been adequately supported in terms of budget and resource requirements. It appears there may have been greater commitment from the political level of government than at the department level. The view has been expressed that the Government gave out mixed signals about management of the system. However, the EPP could have and should have been taken as a clear, legal statement of intent by Government.

Although the objectives for having the EPP were not made explicit by the EPA at the time, and this may have resulted in a lack of understanding about the purpose of the EPP, the absence of the comprehensive integrated catchment management plan, envisaged by the EPA as an essential part of the legal and administrative framework, has been the major contributor to the failure to fully meet the objectives of the EPP and catchment management objectives. The catchment management plan was required to provide the necessary guidance at the property level by building a framework and options from which landholders could select and voluntarily adopt alternative land use practices. This would have resulted in a melding of the "top down", prescribed aspect of the EPP with the "bottom up", voluntary aspect of community catchment management.

It is the judgement of the Specialist Reviewer that the concept of the EPP in the management framework, and the objectives above, remain a key to fully successful implementation of the management strategy for the Peel- Harvey and that it should be made to work in the manner envisaged. To do so will necessitate development of the comprehensive catchment management plan (proposed in 1988) as a very high priority.

While it is clear that some difficulties that have arisen from seven years of trying to implement the EPP in the Peel- Harvey coastal catchment (these are considered briefly in Section 8.1) the above objectives of having an EPP remain valid. The difficulties experienced may assist in fully successful implementation of the revised EPP during the next compliance review period.

8. "BARRIERS" TO EFFECTIVE IMPLEMENTATION OF THE EPP

8.1 LACK OF A COMPREHENSIVE INTEGRATED CATCHMENT MANAGEMENT PLAN

Development and implementation of a comprehensive integrated catchment management plan to ensure that all land-uses in the coastal catchment were carried out in a manner that would enable the management target to be met, was an essential part of the management approach. The preparation of a catchment management plan and moratorium on clearing and drainage in the Peel-Harvey Coastal Catchment were put forward by the proponents as agreed commitments. The EPA supported these in its assessment report and the Minister set down Conditions on these matters.

The Environmental Conditions required that the comprehensive catchment management plan be developed to the satisfaction of the EPA and stated that "the target date for the implementation of the catchment management plan shall be 31 December 1990" (Ministerial Condition 4, dated 3 January 1989).

To date, a comprehensive integrated catchment management plan has not been prepared or implemented, although a draft "guidebook" was proposed. This means that the mechanisms envisaged by the EPA for implementing the management strategy in the catchment at the property level and for meeting the requirements set down in the EPP have still not been developed or put in place. The moratorium on clearing and drainage has also not been fully enforced by the proponents or reviewed through the EPP, as envisaged by the EPA (see Section 5 of this Report).

Section 8(2) of the EPP prescribed the methods to be used to meet the environmental objectives. These included:

- planning measures;
- "appropriate land management by landholders and management authorities in the area";
- "government extension services including the provision of advice to landholders in the area" (advice on how to change agricultural practices to meet the environmental quality objectives specified in the EPP, not advice on how to challenge the figures in the EPP);
- and "local governments and the State ensuring that decisions and actions are compatible with the achievement and maintenance of environmental quality objectives".

In short, it could be reasoned that the EPP intended:

a) that the planning system deliver appropriate land-use planning controls

b) that landholders adopt land management that is appropriate to the environmental sensitivity of the Peel-Harvey Coastal Catchment;

c) that extension services provide proper education about both land-use practices and the obligations on landholders resulting from the management strategy and the legal requirements of the EPP; and

d) governments at all levels to ensure decisions and actions are compatible with achievement and maintenance of the environmental requirements of the EPP. This would include the responsibilities of the EPA and DEP under s38 of the Act as well as the DEP under Part V when issuing Licenses and Works Approvals for "prescribed premises" under the Act. As licenses under Part V of the EP Act provide a significant means of reducing phosphorus (and other nutrient) losses from point sources of pollution this aspect is covered further in Section 9.3 of this Report.

While it is acknowledged that point (d) above is perhaps one of the weakest implementation links between the environmental objectives and the management strategy, there is no evidence that the above requirements of the EPP have been implemented or met, including by the Department of Environmental Protection, or that agencies have been sufficiently active in advising property holders in the Coastal Catchment of everyone's legal obligations in relation to the EPP.

Meeting the requirements of an EPP is not voluntary or optional. An EPP has the force of law as though it has been enacted as part of the Environmental Protection Act (see s33 of the EP Act) and is a whole of Government instrument binding on everyone, whether Government, non Government or the public.

Although the EPA's intention in its 1988 assessment was that the catchment management plan should be developed in a co-operative and voluntary manner, the fact that an adequate plan has still not been developed suggests that it may now be necessary to adopt a more regulatory approach.

The recent Worldwide Fund for Nature (WWF) 2nd Annual Marine Pollution Report Card (June 2000) stated in relation to control of diffuse sources of pollution:

"*While good progress has been made to reduce point source pollution, there has been no corresponding improvement with diffuse pollution from land-based sources. The impact of poor or inappropriate land management practices within catchments has led to a dramatic decline in the health of estuaries and bays....*

"Australia does not appear to possess the will or institutional capacity to deal effectively with the problem of marine pollution from land-based sources. Despite a decade of concerted efforts by Landcare, the establishment of the $1 billion Natural Heritage trust, and the implementation of catchment management plans, sustainable land management remains an elusive goal." (WWF, 2000).

From experience, it is not catchment management plans per se that are the problem but the expectation that the magnitude of what must be achieved in terms of nutrient reductions and other environmental improvements can be delivered by volunteerism. The lack of will of Governments and regulatory agencies around Australia to develop, let alone apply to diffuse sources of pollution, the degree of regulation applied to point sources is a major contribution to the lack of achievement of successful catchment management in Australia. It is unlikely that any significant improvement will occur until this institutional attitude, and ultimately barrier to change, is itself properly addressed. In WA there has been and continues to be a lack of leadership on this issue, particularly at the government agency and political levels, with no appropriate legislation and no clear responsibility for co-ordination to enable the achievement of integrated outcomes at the catchment scale.

These points were also made in the first national State of the Environment Report (Commonwealth of Australia, 1996).

The WWF report also identifies several factors as preventing progress in reducing marine (and estuarine) pollution. These factors also apply to the Peel-Harvey and other catchments and are:

- *"A lack of integrated management across coastal catchments and marine areas, leading to inconsistent, inadequate and at times, conflicting management;*
- *Inadequate regulation and an appropriate mix of regulations and other management tools;*
- *Inadequate levels of adoption of land management practices and land-based sources of marine pollution."* (WWF, 2000).

The report goes on to say:

"In addressing diffuse pollution, management authorities and regulators will need a combination of regulatory instruments and voluntary incentives to achieve widespread adoption of land management practices that result in a dramatic reduction in sediment and nutrient run-off from land holdings.

"Little progress made to reduce diffuse pollution. Poor or inappropriate land management practices are not only threatening the sustainability of agriculture in many regions but is also the cause of declining health of estuaries, bays and marine ecosystems. In many regions this has reached crisis levels. Diffuse pollution will only be reduced when Australia is prepared to take difficult decisions to stop poor and inappropriate land practices within coastal catchments." (WWF, 2000).

The WWF report seeks the introduction of a number of measures to assist Governments and others to reduce marine (and estuarine) pollution, including:

"Regulatory instruments to support voluntary initiatives to control diffuse pollution at sources through setting maximum levels for discharge." (WWF. 2000)

This statement follows the approach taken by the EPA in the 1988 assessment.

The proponent agencies have cited limited resources as a reason for not having fully implemented the Environmental Conditions. All proponents are expected to fully meet their environmental requirements and to allocate resources or reduce other activities, as necessary, to enable allocation of sufficient resources to meet environmental obligations.

8.2 LIMITED UNDERSTANDING OF SHARED CO-PROPONENT APPROACH

Although the Minister for the Environment made the three Ministers equally responsible for all aspects of the management strategy, at some point a decision was made to resort to the conventional approach of dividing responsibility along agency lines. This division of responsibility has been a factor in the lack of development of the catchment management plan and lack of management of other environmental issues. The proponents collectively should have been influential in ensuring that all the Conditions for which they are all legally responsible were met. In reality the co-proponents are all equally responsible legally for meeting all the Conditions.

The fact that there is no single person within government who has been given the responsibility of ensuring that all aspects of the EPA's and Minister's requirements are met is also a contributing factor to the partial success of the legal and administrative framework for management. Furthermore, the lack of a single point of contact has made it more difficult for land developers and users to obtain all the advice they need.

The issue of proponents is critical to ongoing implementation of the management strategy and will be discussed further in the main Expert Review Group Report, along with the PCR process.

8.3. CONFLICTING MANAGEMENT OBJECTIVES

To some extent the initial management objectives are in conflict, because they reflected socio-political issues and not just the environmental requirements for improving the system. The overall productivity of the fishery was enhanced by the increased nutrient levels, so reducing the nutrient status would be expected to lead to an overall reduction in productivity of the fishery or at the very least to an alteration of the dominant species, perhaps to species regarded by humans as less palatable, or that would generate less income.

If agriculture is to continue on the coastal plain, and fertiliser application is continued in an uncontrolled manner, then it is impossible to ever return to background nutrient levels in the catchment area. Continuation of fertiliser-based farming carries and environmental trade-off. The southern end of the Harvey Estuary will continue to experience poorer water quality and catchment lakes such as Lake Goegrup will remain severely degraded. Water quality in the drains throughout the catchment will not meet the ANZECC water quality criteria and furthermore, it would be unreasonable to expect them to do so. Although some have expressed the view that water quality in the drains should meet the ANZECC criteria, this is not appropriate because the criteria are designed for ambient fresh, estuarine and marine systems and are not meant to be directly applied to water quality in pipes and drains. However, drainage systems should be managed in accordance with the requirements of the receiving environment (ie the estuary and the rivers) but at this stage the environmental values to be protected have not been declared sufficiently to enable this to occur.

8.4 IGNORANCE OF THE MANAGEMENT FRAMEWORK

Ignorance has been a barrier to full implementation of the EPP. There is general ignorance in the community (and in some government agencies) of the Peel-Harvey Conditions , the EPP, the SPP and their implications. There is a need for a strategy to be developed to assist people meet the management requirements.

Ordinary landholders are likely to encounter the restrictions in the catchment area when they are trying to obtain approvals on property they have already purchased. It would be more useful if the restrictive nature of land-use in the area was better publicised so that compatible land-uses are encouraged and disappointment from purchase of land inappropriate for development is removed. The catchment management plan should achieve this by including a good environmental constraints map showing where particular land uses are to be encouraged or discouraged.

8.5 ONGOING CHALLENGE TO THE MANAGEMENT TARGET IDENTIFIED BY THE EPA

While the task of developing a catchment management plan was difficult enough, it was made more difficult by the ongoing challenge to the management targets identified by the EPA. The targets were developed following over 10 years of competent and thorough scientific research and the proponent agencies and the community were involved throughout. The EPA targets were technically robust at that time and this has been further verified during this review by the findings of the Water Quality and Management Targets Specialist Review . The targets were set in Conditions which were agreed to by the proponents. Once set substantive changes to the Conditions can only occur through a public process.

What was required was for the key agencies, including proponent agencies to provide leadership to the rural community, by working with the management targets, supporting the management targets accepted by the Government and to foster a more precautionary approach to environmental protection.

8.6 MISPERCEPTIONS ABOUT THE NEED FOR THE WHOLE MANAGEMENT STRATEGY

There is a perception among some of the rural community and their advisers, that now the Dawesville Channel has improved the water quality there is no need to maintain any controls in the catchment. This demonstrates a continuing lack of recognition and acceptance of the causal factors by resource managers.

This view is incorrect and is of concern because the Dawesville Channel has a maximum design capacity and catchment management is needed to provide an adequate buffer to ensure maintenance of estuary health in the long term, and to enable development in the catchment to continue.

Catchment management was also part of an implied social contract between the broader community of Western Australia which paid for construction of the Dawesville Channel, and the rural community where continuation of farming in the catchment required land use changes and catchment management.

The 1999 Peel Region Scheme Environmental Review documentation prepared by the Western Australian Planning Commission has a section on Government Policies and Guidelines (Western Australian Planning Commission, 1999). Although this section mentions

the existence of the Environmental Protection (Peel-Harvey Estuary) Policy 1992 and Statement of Planning Policy (SPP) No 2, 1992, it is perhaps surprising that it does appear to recognise the ongoing requirements for the proponents of the Peel-Harvey Management Strategy to meet the Environmental Conditions, in addition to all parties having to meet the requirements of the EPP.

8.7 PERCEIVED EQUITY ISSUES

There are several equity issues (real or perceived) that may have become barriers to full implementation of the EPP.

a) Responsible developers and owners of some prescribed premises have gone (and are going) to considerable expense implementing management to meet the environmental requirements, where other land-users are not doing so. Major new land-use developments in the Peel-Harvey commonly undergo formal environmental impact assessment which takes considerable time and has significant associated costs, including at times rejection of a development. Such developments are assessed in the context of the current rural contribution of nutrients to the estuary from application of fertilisers. While these new developments are expected to demonstrate a no net increase of nutrients (and preferably a decrease), other activities such as agriculture continue to add nutrients with little or no control being exercised.

Although the rural community has suggested that they are being unfairly targeted (see Specialist Report on Catchment Management), they in fact are escaping the degree of control that is being applied to other, less polluting developments. The target for phosphorus loss reduction of 50 percent from existing rural activities is considered to be achievable without compromising the long-term sustainability of agriculture

b) There are perceptions of equity issues relating to the clearing of native vegetation with one view being that clearing for high value land-uses such as urban development is continuing while rural landholders are not allowed to clear.

There is of course a Cabinet-approved moratorium on clearing and drainage in the Peel-Harvey catchment. The moratorium was initially proposed by the proponents as a commitment in the ERMP document. The EPA recommended that the moratorium be continued, and continuation of the moratorium was an Environmental Condition of approval of the project. The recent EPA Position Statement on Protection of Native Vegetation allows for small amounts of clearing for high value land-uses within the south west as long as certain biodiversity requirements are still met. Unlike agricultural use, high value land-uses can provide opportunities for off-property acquisition and/or management of existing remnant vegetation that may otherwise become degraded. Over the 11 years since the EPA's assessment, reduction in biodiversity in the Peel-Harvey, much of it from passive clearing by stock, has become a pressing problem.

In the Peel-Harvey coastal catchment it is over-clearing and the extensive installation of drainage to permit development of farms in this catchment that led to the environmental problem in the estuaries.

c) There are perceptions of equity issues relating to differences in management of polluting activities. Some polluting activities are prescribed premises under the EP Act and have to be licensed under Part V (eg piggeries, wastewater treatments plants). While licensing provides some degree of regulation of such activities, other land uses, including broadacre agriculture, have little or no regulatory control. Broadacre agriculture still contributes the bulk of the nutrient input to the Peel-Harvey estuary system (some 70%) and

yet, to date, environmentally acceptable sustainable land management practices are not being applied to or required for all land-use activities in the Peel-Harvey Coastal Catchment.

Phosphorus and nitrate losses from horticulture on the Swan Coastal Plain have been described in Lantzke (1997). A means of controlling conventional irrigated horticulture exists through an EPA Position Statement (EPA, 1990) which prohibits the use of conventional irrigation methods for horticulture. Although this was to be implemented through well licensing by the then Water Authority of WA (now Water and Rivers Commission) its implementation appears to have lapsed.

8.8 REAL EQUITY ISSUES

There are some real equity issues relating to:

- new developments that are required to be assessed under Part IV of the Environmental Protection Act compared with the lack of requirements on most rural land uses;
- the different degree of regulation being applied to point sources compared with the requirements on diffuse nutrient sources; and
- the increased amount of regulation being applied to some point sources compared with other point sources, regardless of the relative contribution made by each type of development to the nutrient problems (for example, stricter license requirements on waste water treatment plants than on piggeries).

8.9 INSTITUTIONAL ASPECTS AND RELIANCE ON "VOLUNTEERISM"

In 1997 an investigation into the Natural Resource and Environment Programs executed by the Commonwealth Government agencies, the Department of Primary Industries and Energy (DPIE) and Environment Australia was carried out by the Australian National Audit Office (ANAO). The investigation included programs relying on voluntary uptake such as Landcare and found:

"*The audit found that across all programs examined in DPIE and Environment Australia, program objectives are broad and difficult to measure. ... There were few cases found where objectives were concise, realistic and measurable outcomes-oriented statements of what the program aimed to achieve.*" (ANAO, 1997, p.24).

"*Overall programs in both DPIE and Environment Australia fall short in terms of appropriate monitoring of projects, evaluation and reporting of outcomes* ." (p. 69).

"*Environment Australia is also in a similar position to DPIE in not being able to measure, after eight years since the start of the programs, the extent to which program outcomes are being achieved.*" (ANAO, 1997, p. xvii)

"*Consequently both DPIE and Environment Australia are not well positioned to determine whether Commonwealth funding has been spent for its intended purposes.*" (ANAO, 1997, p.xx).

The indications are that projects reliant on "volunteerism" , for example the Landcare program where projects initially had a focus largely at the single property level, has been less

than successful, to date, in terms of delivering measurable change on the ground or change at catchment scale. Bradsen (1992) went so far as to say:

"*The overwhelming evidence is that voluntary land conservation does not work. Administrative obligations are essential. landholder obligations can take several forms. The key is objective scientific assessment.*" (p.21).

In the Industry Commission 1997 inquiry into ecologically sustainable land management, the Australian Conservation Foundation is reported as saying:

"*The ACF is concerned that in many ways, government's roles in agriculture continue to contribute to environmental degradation and serve as obstacles to ecological sustainability.*" (Industry Commission, 1997, p.52).

That report also provided a summary of the ACF's generalised concerns about community participation in landcare and catchment management (see Table 4).

Table 4 - Generalised concerns with community participation - the ACF's view

- lack of accountability and transparency in decision-making
- lack of ecological expertise, a lack of scientific and economic expertise, and a bias towards expertise in farm management and land degradation
- bias in membership (of catchment groups) towards landholders and water users, sometimes prescribed in legislation and leading to (a potential for) conflicts of interest
- lack of resources, both in terms of information and monitoring resources, and in terms of funds required to implement catchment management strategies
- a bias in catchment management strategies against funding for biodiversity conservation initiatives, and towards land-based on-farm works
- Catchment Management Committees have a regional focus, whereas some environmental, resource management and land management issues must be addressed on a much broader scale (eg river management in the Murray-Darling Basin).

These views are supported by others and show that regional and catchment planning:

- generally lacks resources and expertise (at the Government level);
- States have little coordinating capacity;
- that lines of responsibility have increasingly blurred; and
- States have become more reliant on Commonwealth resources.

Most States have a plethora of agencies with overlapping and contradictory responsibilities and this often leads to ineffective policing of the regulatory regimes that do exist (Industry Commission, 1997).

There are increasing expectations on rural people and farmers to contribute more on a voluntary basis without taking into account the real limitations in time and financial resources to enable them to continue to do so. It is also unreasonable to expect community

members to continue to perform on a voluntary basis on boards alongside public servants on full salaries.

In Western Australia the legislation and institutional arrangements are inadequate to deal with multi-faceted management problems at the catchment scale where a combination of "top down" and "ground up" management is required and where vision and leadership at the government level are necessary. Re-structuring the main natural resource management agencies does not in itself guarantee success in ICM and in some instances may only result in re-arranging the boundary issues. However, the demonstrated failure to fully co-operate at the agency level and the very long delay in achieving successful "working together" across all levels from government through to community (and vice versa) suggests that more radical reform of the ICM structures in WA is now overdue. As Mitchell and Hollick (1993) state:

for ICM "*...even if ideal structures and process could be devised, effective integrated water management requires people with dedication, good will, and mutual trust to make ICM work. As Robinson (1992, p.4) has observed, too often the emphasis is on "amalgamating and restructuring agencies in an attempt to foster co-operation. Not surprisingly this does not work. The crucial thing is to get people at all levels working together, and you cannot make this happen simply by amalgamating agencies - you still have to do the hard work of fostering co-operation and a team spirit.*" (Mitchell and Hollick, 1993, p. 742).

This is not to say that re-structuring will not work, rather that it needs to be sufficiently radical and accompanied by essential organisational cultural change, to foster and build co-operation and a team spirit. This also needs to be developed actively through real partnerships, with catchment management groups, including power-sharing where this is required. However, it should be understood that power sharing does not mean total devolution of power and decision-making to community groups. Governments and government agencies will continue to carry out any functions and decision-making as required by their Acts.

The overview and scientific investigation coordination role taken by the EPA in the solving of the Peel-Harvey estuary problems over the period from establishment of the EPA has been the most successful approach to integrated catchment management in WA, to date. It would be appropriate for the EPA to once again clearly take on the focus of coordination of integrated research and investigation for catchment scale environmental problems and coordination of long-term monitoring requirements for measuring and demonstrating environmental change. The EPA is already recognised by the public as having the primary role in protection and maintenance of ecosystem processes and in long-term custodial responsibility for the environment.

Through its Act, the EPA has been given over-arching responsibility for the Environment. It has the credibility, both from being a Statutory body and from its reputation as an independent body, to take a clear, lead role in coordination of natural resources management in this State, and in associated research initiatives. The fact that the EPA is an independent body as to the advice that it provides, and has to take a long view also makes it the most suitable focus for co-ordination. The timeframes required for proper consideration of long-term environmental condition (state of the environment) and inter-generational equity are longer than those usually considered by Government policy and planning.

The 1997 Task Force for the Review of Natural Resource Management and Viability of Agriculture in Western Australia commented on the institutional arrangements in WA by saying:

"*There is a plethora of State-based regional structures (including at least two within the Agriculture portfolio - the six Sustainable Rural Development Program regions and eleven Agriculture Protection Board Zones Control Authorities) that have been set up for specific advisory, and management and support purposes, all of which work to a different set of regional boundaries.*" (WA Task Force, 1997, p.13).

Other regionalised State Government Departments work to regional boundaries different from those of Agriculture WA. These rarely are the same as those of any other Department and in no instance do these correspond to catchment boundaries.

ICM in WA was developed to overcome degradation of land, water and other environmental resources. Wallis and Robinson (1991) stated:

"*the main areas of concern included wide-spread clearing of native bush for agriculture, eutrophication of water bodies, salinisation of land and water, erosion, and soil degradation. In addition, an ever-increasing human population had heightened the demand for the proper use and protection of natural resources.*" (p.3)

On the advice of the EPA, the WA Government of the day established ICM as a key response to this degradation. Degradation has continued at an increased rate, in particular of land and water from salinisation, and the need for ICM will continue and become even greater. Mitchell and Hollick (1993, p. 739) cite the following as key reasons:

- land, water and related resources are still degrading;
- there are legitimate but different and often conflicting societal interests in those resources;
- relevant government policies sometimes conflict; and
- agency programs are not always complementary.

The 1993 paper of Mitchell and Hollick states:

"*ICM has generally been accepted and endorsed in WA. However, differences of opinion have emerged regarding exactly what it means and how it should be applied. Designing ideal organisational structures for ICM is not sufficient for it to be effective. Ultimately, people have to make ICM function, and therefore it is essential that priority be given to cultivating the good will and trust necessary for ICM to work well. ICM also requires a long-term perspective and appreciation that it requires many people and agencies to move out of current "comfort zones". As a result, initial implementation of ICM usually will encounter turbulence and debate.*" (abstract, p.735).

Although the above may be a reasonable observation about the initial stages of introducing ICM as a new concept, the fact that there is still debate about what ICM and integrated natural resource management (INRM) are has become an obstruction on the progress of using catchment management to address diffuse source pollution problems in WA. Although the priority was given initially to trying to foster trust and good working relationships (over the last 12 years at least), this has proved to be not sufficient in itself to result in effective ICM in any catchment in WA. The need for proper underpinning of catchment management with a suitably crafted statute, and agency re-structuring is overdue.

Overall, the it is considered that although the legal and institutional framework for integrated catchment management in Western Australia is the best that could be developed within the existing statutory framework, it will continue to be inadequate in the absence of a proper ICM statute. The adopted approach of "change by evolution not revolution" has not delivered catchment management over the last 12 years and it is now time for more radical reform, including an effective and progressive catchment management statute. In addition to other matters, the new statute should establish catchment management authorities and provide them with the power to raise catchment management rates. Associated comprehensive institutional change to the functions and responsibilities of the natural resource management sector in WA is also required. This should involve changes to many of the natural resource agencies, including (inter alia) Agriculture WA, the Water and Rivers Commission, the Department of Conservation and Land Management, the Department of Environmental Protection, Ministry for Planning and the associated representative member statutory boards.

The management of the Peel-Harvey system has been afforded the greatest degree of legitimacy of any integrated catchment management project in WA to date (see Section 9 of this Report) and some $65 million of taxpayer money has been invested in improving the environmental quality of the estuaries. Such a high investment of public money in an environmental issue requires adequate protection in the long-term. It is the view of the Specialist Review of the Legal and Administrative Framework that if the Government is not willing to address the issues of proper catchment management legislation and agency re-structuring as part of this protection, it does not auger well for catchment management and environmental protection in any other catchment in WA.

9. FUNDAMENTAL ISSUES RELATING TO ICM

Mitchell (1991) correctly reported on the reasons for development of an ICM approach in Western Australia, and the threats to the introduction of a new way of doing things (common to most countries). He also identified a number of considerations that deserved attention. Because these points are all relevant to this review, this part of Mitchell's report is reproduced in full here (the paragraph reference numbers below are those in Mitchell's report).

"4.1 The need for ICM has emerged from concern about:

(1) continuing and increasing degradation of land, water and related resources,

(2) legitimate but different and often conflicting societal interests related to degradation,

(3) conflicting government policies,

(4) different line agencies with statutory responsibilities leading to programs and activities not always being complementary.

(5) the advantages of using program management to emphasis outputs, outcomes, and accountability, rather than emphasising inputs, and,

(6) increasing expectations from the "public" that they will be more actively involved in planning and management decisions.

4.2 The resulting implications are that there is a need for procedures to:

(1) facilitate the coordination and collaboration of different state and other government agencies,

(2) incorporate the public into planning and management processes, while recognising the legally accountable roles of state and local government agencies, and

(3) deliver services in an efficient and equitable manner.

4.3 It must be recognised that an integrated approach is perceived by some people to threaten their interests, and that this is common in virtually all countries. For example,

(1) some government department Ministers and senior officials see it as a threat to their traditional areas of responsibility and way of conducting business because it implies greater sharing (of power) and, in some instances, a redefinition of roles,

(2) some individuals and non-government organisations view ICM as a "top down" exercise in which the State will impose regulations and other constraints on development in local areas,

(3) some local government officials feel uncomfortable when they do not understand how their responsibilities relate to the activity by state agencies and community catchment groups regarding ICM, and

(4) some developers and development agencies worry that ICM will extend a planning and regulatory process which already is viewed as often taking too long, and/or will create another layer of bureaucracy.

4.4 Thus, if ICM is to be accepted, a number of considerations deserve attention:

(1) politicians as well as state and local government agencies will want ICM to streamline rather than complicate existing arrangements,

(2) state government agencies must be convinced that initiatives associated with ICM will not duplicate activities already in place,

(3) relevant state agencies need to have a feeling of ownership of and responsibility for ICM,

(4) Ministers and state agencies need to believe that ICM will help to further their objectives and mandates, and

(5) citizens and non-government organisations will need to be convinced that ICM is not a totally "top down" process." (Mitchell, 1991, p.13-14).

The key issues still requiring change by individuals and agencies are:

- the perception that an ICM approach is a threat to their interests;
- that fact that a change from traditional areas of responsibility and ways of doing business are required;
- that redefinition of roles is required;

- that a degree of power-sharing is required. Agencies and governments will need to relinquish some power, and communities will gain some power. It is unlikely that the community will be content with the amount of power they may gain - ICM is more about community input to decision-making rather than community decision-making per se. It is also unlikely that agencies will be comfortable with having to give away any power and control;

- recognition that the State already has a great deal of control in terms of ability to regulate and constrain developments at the local level;

- acceptance by all parties that successful ICM involves give and take, that a degree of conflict is to be expected at times in the process, is normal , and signals an opportunity for change of position to occur; and

- acceptance that not everyone will feel comfortable all the time. Changing the way of doing business in rarely comfortable, and discomfort is normal throughout any change process.

10. LEGITIMACY OF THE PEEL-HARVEY MANAGEMENT STRATEGY

Hollick and Mitchell (1991) identified a number of components of a conceptual framework for analysing the ICM policy in WA. These were:

a) **Context:** the historical, cultural and institutional context into which any policy is introduced is critical to defining the most appropriate approach to implementation.

b) **Legitimation:** for effective implementation any policy must be regarded as legitimate and credible by elected officials, relevant agencies and the community. Legitimacy can be afforded by legislative, political, administrative and/or financial means.

c) **Functions:** Decisions must be made on the distribution of functions amongst agencies, organisations and individuals, that are required to implement any policy.

d) **Structures:** Appropriate institutional and organisational structures have to be designed to facilitate efficient delivery of functions.

e) **Processes and mechanisms:** When structures and functions have been decided it is still necessary to determine precisely how the system will operate.

f) **Organisational culture and attitudes:** The effectiveness of implementing any policy is significantly influenced by the culture and attitudes of all organisations and individuals involved.

These are all important and common to successful implementation of ICM in any catchment. What sets the Peel-Harvey apart in WA is the degree of legitimacy the estuary problems and environmental management approach were afforded. The legitimacy applied to Peel-Harvey is relevant both to the scope of the problem and its management, as well as to the use of an ICM approach in achieving a successful outcome.

Legitimacy can be gained in four key ways:

- **Legislation:** This provides a clear legal basis for a policy and provides a directive to those responsible for its implementation that can be used when they are challenged. Legislation also has the advantage of remaining in place while governments and Ministers change. Although it can be changed by a conscious decision of Parliament, it is not as easily dismissed as an approach set up by cabinet or other administrative means.

- **Political commitment:** This is of crucial importance to successful implementation of ICM. By its very nature, ICM cuts across established mandates and boundaries and the Premier and cabinet need to provide clear and consistent signals that they expect ICM to be implemented as a priority over other activities. In many ways it is easier for a government to have an appropriate statute than it is to try and consistently apply a policy on a day to day basis. Mitchell and Hollick observed that:

"If the Government does not provide clear, visible and ongoing commitment to ICM, it is unlikely to be implemented in an effective manner. ..ICM threatens many long-established interests in existing state agencies by promoting collaboration and cooperation, and therefore urging sharing and redefinition of traditional roles." (Hollick and Mitchell, 1991, p.15)

- **Administrative commitment:** This normally comes when Chief Executive Officers provide strong and clear signals to their agencies that ICM is to be part of the corporate culture. This can be done by incorporating ICM into corporate plans and strategies and ensuring that programs and strategies reflect the principles of an ICM approach. Administrative commitment is also shown by CEO's meeting regularly to consider ICM approaches, strategies and actions and show they are prepared to reconsider traditional roles and ways of doing business, including a willingness to share power and work to achieve shared outcomes.

- **Financial commitment:** This is required from both government and state agencies. The level of financing given to any program sends strong signals about government's true priorities. Inadequate support will starve a program and send a signal that government does not take it very seriously. ICM has a strong requirements for a coordinating function and all governments have proved to be poor at allocating any resources to the vital coordination in environmental, health and other sectors.

- **Community perception:** Another important aspect of legitimation is that the community also has to see ICM as a legitimate approach and not just a top down centralised process with no transparency or ability for the community to influence decision-making. Although the EPA's assessment process may be regarded by some as "top down" it is open and transparent, the community has many opportunities to make input and in general it is well accepted as a legitimate process. Syme and Nancarrow (1992) found that where people perceived the process by which a decision was arrived at as being fair and transparent, and they had opportunity to make input to that decision-making process, they were more likely to accept the final decisions even if they did not like them. The Regional Forest Agreement (RFA) process is a case in point where a top down, centralised approach lacking in transparency was used which was clearly not supported by the community. As a result, the RFA does not have the credibility of the community. In contrast, the Peel-Harvey investigations, assessment and decisions about the management strategy were handled in an open and transparent manner and are supported by the community.

With the exception of the Environmental Protection Authority's public consultation processes and advice, Western Australians are unlikely to support a top down, centralised process. However Peel-Harvey is unique in catchment management in WA, in that the

management strategy was assessed by the EPA. For many people this action by the EPA and its advice rendered the project "legitimate" in a way that has not applied to other catchments.

The Peel-Harvey management approach has the greatest degree of legitimacy of any catchment management initiative in Western Australia. Although there was no appropriate statute, the management strategy had bipartisan political support, Cabinet support, a program budget (initially), the commitment of the CEO's of agencies, the involvement of three Ministers as co-proponents, the support of the EPA and the support of the community in general.

Peel-Harvey is also a unique example in WA in that the problem to be managed was well defined, as were the causes and solutions, ICM requirements for the coastal catchment area, the management required, and the means of providing that management. The legal and administrative arrangements required to underpin the strategy as a whole to make it effective were also set down. In spite of this not all aspects of the approved management strategy have been fully implemented.

This is of concern both for the Peel-Harvey situation and in terms of the implications for catchment management in other catchments where there is much less legitimacy, and suggests that legislation is now necessary. Bradsen regards the law as a vehicle for bringing about social change, where mostly an established ethic is used to establish law but in some instances law can be used as a means of establishing an ethic (Bradsen, 1992). He also observes that when you want to shift the focus from changing an ethic to changing behaviour, law is essential (Bradsen, 1992). In relation to the South Australian native Vegetation Management Act 1985, he states:

"*..law can change the ethical position of particular groups by requiring a change in behaviour which becomes accepted. Indeed, it has been suggested that ethics often result from behavioural change rather than the opposite. Democracy does not mean, of course, that majorities can ride roughshod over minorities, and whether a law is legitimate and likely to be effective depends upon the moral strength of the general underlying ethic and the level of justice involved in its application.*" (Bradsen, 1992, p.25).

The perception of justice and its application is also taken up by Syme and Nancarrow (1992) in relation to whether the processes of decision-making (procedural justice) are perceived as fair, open and transparent by participants in a consultation/decision-making process.

It is difficult to see how it will be possible to bring about effective ICM and behavioural change at the catchment level in the absence of a law to move people to changing their behaviour. The need for regulation to bring about behavioural change has also been supported by research in the United States which found that spending money on educating people about the need for them to change their behaviour did not result in behavioural change. What did lead to successful behavioural change was regulating for the behaviour change and then applying the education money to educating people about why that regulation was necessary.

11. JUDGEMENT ABOUT THE SUCCESS OF THE LEGAL AND ADMINISTRATIVE FRAMEWORK FOR MANAGEMENT OF THE PEEL-HARVEY

11.1 PEEL-HARVEY ENVIRONMENTAL PROTECTION POLICY AND STATEMENT OF PLANNING POLICY

The success of the EPP component of the legal and administrative framework for management has been covered in Section 7.

The EPP provided a legal statement of intent by government as a whole by setting out the uses to be protected, the management objectives and the program for protecting the environment. It provided a vision of what needed to happen in the long term and a headpower for doing so.

Many of the submissions on the EPP review stated that they want the EPP to be continued and for its scope to be broadened. Concern was expressed over the narrowness of its original scope - being focused on only phosphorus and only on improving in-estuary water quality. Clearly public expectations have now moved on and people are now wanting the EPP to address protection of the whole estuary system, including its catchment. The attitude is one of having more of an EPP not less. No submission suggested that the EPP should be reduced or abandoned. Several suggested that the Statement of Planning Policy should be discontinued and the land-use controls placed in the EPP as prescriptive detail. Several are seeking a greater level of regulation and requirements on all local governments in the area to have to ensure that nutrients are properly controlled in all activities and developments.

Recent advice suggests that the co-operative approach to combined development and use of an EPP and SPP to address land use controls to meet environmental objectives may not be possible legally. If this is the case, then this approach to management of the catchment in Peel-Harvey will have to be abandoned and an alternative developed. This is likely to involve broadening the scope of the EPP and in particular to incorporate control over land uses within the EPP.

11.2 MINISTER'S ENVIRONMENTAL CONDITIONS AND EPA'S RECOMMENDATIONS

The Ministerial Statement requires compliance with the Conditions set down in that statement which includes the proponents' commitments. The context for the Conditions is provided in the detail of the EPA's assessment report (EPA, 1988a) and it is here that the intent of the EPA recommendations, and subsequently the Minister's Conditions can be found.

It appears that several of the Conditions and commitments have not been met and in some instances it is suggested by the proponents that the Conditions or commitments were inappropriate. A formal public process exists whereby Conditions can be modified or removed (cleared) where they are no longer required, and this should have been used for Conditions considered by the proponents to be inappropriate.

11.3. NON-PROPONENT DECISION-MAKERS, REGULATORY AGENCIES AND RESPONSIBILITIES OF THE PUBLIC IN RELATION TO THE EPP REQUIREMENTS

An Environmental Protection Policy is a statute of government, and all agents of government should be able to demonstrate that they have carried out all decision-making and activities in accordance with the requirements of the EPP.

Non-proponent decision-makers, regulators and members of the public all have a responsibility to act in accordance with the legal and moral requirements of the Environmental Protection Policy.

The key responsibilities of some of the various sectors and agencies are set down below.

a) Department of Environmental Protection

The DEP has the responsibility to license various polluting industries under Part V of the Environmental Protection Act, as well as to provide advice on behalf of the EPA for small developments that may have an effect on the environment, but which are not being formally assessed by the EPA. This advice is often provided to other decision-making authorities including agencies such as local government and the Ministry for Planning. Where the DEP or EPA provides advice which is consistent with meeting the requirements of the EPP, the decision-makers to whom that advice is provided should impose the advice on developers through their own approvals processes.

b) Ministry for Planning (since renamed), and Local Government

Although planning often approaches environmental advice as being an area to which they should "have regard" rather than as a constraint, it should be recognised that for an area covered by an EPP, the need to carry out decision-making actions and implement developments in a manner which meets the requirements of the EPP is not discretionary. In the Peel-Harvey catchment, it makes no sense to construct a Dawesville Channel at high cost to the community, without also limiting the establishment and operation of certain types of development, in particular those that add nutrients to the estuary system. The EPP provides a framework which allows for some flexibility of development as long as the environmental objectives are being met.

c) Health Department

In the Peel-Harvey area one of the major responsibilities of the Health Department and local government is control of mosquitoes. The EPA predicted that mosquito numbers would rise if the Dawesville Channel was implemented. The degree of nuisance occurring from the presence of mosquitoes correlates with the size of the population within the area of exposure. Increasing urbanisation in the Mandurah area has led to increased mosquito nuisance being experienced. The EPA recommended that mosquito control programs should be funded by the government, and resources provided to the Health Department to do so. However, the full amount was not forthcoming and control measures have not been fully implemented. Some work has been carried out in an attempt to develop more environmentally appropriate methods of controlling mosquitoes (eg runnelling to reduce breeding areas; use of fish to reduce numbers of larvae) but the potential impacts on other parts of the ecosystem also have to be taken into account, particularly as the estuaries are

d) Department of Conservation and Land Management

CALM has responsibilities for protection of flora and fauna, and also carries out management planning and management of National Parks, nature reserves and marine parks on behalf of the Conservation Commission.

e) Local Government

Local Government has responsibilities through development of planning schemes to incorporate the requirements of regional plans and implementation of development controls, for example in Special Rural Zones. Local Government also has some responsibilities in regard to provision of drainage and disposal of drainage water in all the urban and some of the rural area.

f) Water Corporation

The Water Corporation has responsibilities for provision of water supplies (domestic and some bulk water for irrigation) and treatment of wastewater where it is collected via sewerage systems, as well as for maintenance of the main drainage system of the area. The Water Corporation has significantly reduced nutrient content of wastewater discharged to river systems within the coastal catchment.

g) General Public

The general public is also covered by an EPP in the same manner as by any other statute, and should ensure that existing and proposed land uses within the EPP area meet the objectives of the EPP.

12. IMPLICATIONS FOR CATCHMENT MANAGEMENT IN GENERAL IN WA

12.1 SOME ISSUES

The failure to develop a comprehensive catchment management plan to protect the environmental quality of the Peel-Harvey Estuary System and the public's investment in the Dawesville Channel is an indicator of the broader problems in both the agricultural and pastoral areas of Western Australia, where short-term agricultural survival is given a higher priority than long-term agricultural and environmental sustainability.

WA now lags behind several other States in not having integrated catchment management (ICM) or total catchment management (TCM) legislation and not having moved to a committed approach of natural resources management at the systems level. The Commonwealth Government is trying to promote such integrated approaches through the requirements of the Natural Heritage Trust Agreements with the States as well as through the objectives of the National Strategy for Ecologically Sustainable Development and recent initiatives such as that on management of salinity in Australia.

The following are the principles of ecologically sustainable development as defined by the Commonwealth Government:

(a) decision-making processes should effectively integrate both long-term and short-term economic, environmental, social and equitable considerations;

(b) if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;

(c) the principle of inter-generational equity - that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations;

(d) the conservation of biological diversity and ecological integrity should be a fundamental consideration in decision-making;

(e) improved valuation, pricing and incentive mechanisms should be promoted.

Clearly principles (a), (c), (d) and (e) are all relevant to catchment management in the Peel-Harvey and elsewhere.

The specific objectives for the agricultural sector outlined by the Commonwealth Government in 1992 are as follows:

i) "to create a framework of integrated governmental policies and programs which promote community-based self-reliant approaches to agricultural resource management;

ii) to promote integrated planning of agricultural resource management and extend measures, particularly community based self-help approaches, which encourage information transfer and landholder adoption of sustainable management;

iii) to reduce and manage effectively the impact of pest plant and animal species on Australia's agricultural areas;

iv) to improve kangaroo management at the National level, including the removal of impediments to a sustainable commercial kangaroo industry; and

v) to ensure effective and safe management of agricultural and veterinary chemicals while improving levels of and access to information on these chemicals." (Commonwealth of Australia, 1994, p.7).

There is increasing public and industry concern with the ongoing poor environmental performance of the agricultural sector, and the regulatory inequity in which most industries and the mining sector are tightly regulated while farming is not. This is despite the clear understanding of the community and Government at all levels that broadacre agriculture is the source of Australia's worst environmental problems including salinity, soil acidification, erosion and sedimentation, loss of biodiversity from land clearing and degradation of waterways. Eutrophication originating from agricultural fertilisers is occurring in inland lakes, rivers and waterways, in estuaries (such as Peel-Harvey) and in some cases has affected near-shore marine embayments (Commonwealth of Australia, 1996).

There is no doubt that institutional change and introduction of appropriate incentives does make a difference in bringing about land-use changes for better environmental management. A report by Young and Evans (1997) for the Land and Water Resources Research and Development Corporation looked at the role of market instruments in managing groundwater pollution and specifically looked at pollution from nitrates, phosphates, pesticides, salinisation, bacteria and sea water intrusion. The report defines a "right-market mechanism" as being:

"*any legal arrangement that grants somebody a right to do something in a manner that permits them to transfer that right to somebody else. Any conditions constraining transfer of that right are prescribed in advance of a person beginning to arrange a transaction.*" (p.1)

and goes on to say:

"*...while right market mechanisms have been used to control surface water pollution they have rarely been used to control groundwater pollution.*"....(Young and Evans, 1997, p.2).

"*While there is little experience with the use of market mechanisms to control groundwater pollution, we draw attention to the growing experience with the use of right-market mechanisms to control surface water pollution. progress in the Hunter River in NSW, the Murray-Darling Basin Salinity Strategy and Victoria's Nyah to Border Salinity reduction scheme are all beginning to demonstrate the greater efficiencies, greater equity and greater capacity of right-market mechanisms to alleviate intractable diffuse pollution problems. Right-market mechanisms are being used and are being found to be effective in resource management.*

"*Experience indicates that right-market mechanisms always need to be underpinned by regulations. Introduction of right-market mechanisms makes it easier to enforce these regulations and obtain local ownership of them.*" (Young and Evans, p.2).

The report recommended to the Council of Australian Governments (COAG) that:

"*no groundwater user be given a secure groundwater use-right in a manner that precludes the attachment of land and water use conditions to that right. When conditions are attached to use rights, groundwater pollution can be controlled efficiently at its source.*" (p.1)

The management requirement is essentially the same for surface water land and water use.

The report identifies five types of right-market mechanisms. These are outlined below with an indication of their potential suitability for application in the Peel-Harvey context.

i) **Tradeable Emission-right System**. Here the total load entering a receiving water body is capped. This is what occurred in the Peel-Harvey through the cap (total load) figure cited in the EPA's recommendations, in the Environmental Conditions and in the EPP. In a right-market environment, polluters are issued with a right to a share of this load (the EPP did this on a proportional basis to each of the Murray, Serpentine and Harvey catchments). Maximum concentrations are set (as in the EPA's report, the Conditions and the EPP). Surrogate indicators can be used to reduce actual monitoring costs.

ii) **Emission-Offset Systems**. In this instance approval for a development is conditional upon pollution reduction elsewhere. In the Peel-Harvey this could happen if a developer contributed to reducing nutrient losses from another property, for example by planting trees. No development is allowed to cause a net increase in the pollution rate. The latter principle has been applied by the EPA in several assessments of major projects where developers have been required to re-design projects and install a very high level of nutrient loss prevention and control.

iii) **Treater-Pays Systems**. Here ecosystem managers pay for pollution reduction activities because this is more cost effective than paying for other forms of water treatment. In the case of Peel-Harvey the general community of WA carried the cost of the Dawesville Channel. This amounted to in excess of $1 million per tonne of phosphorus removed - a very high treatment cost, particularly for pollution to which most people were not contributing and

for which they were not responsible. A more cost-effective approach is for each contributor to pay the costs of reducing nutrient inputs, particularly where this also saves them money by reducing the amount of fertiliser being applied - a double saving.

iv) **Polluter-Pays Systems**. Polluters are forced to share the costs of treatment of phosphorus loaded water in proportion to their contribution to the problem. This is clearly an option for management in the Peel-Harvey catchment.

v) **Conditional Water and Land-use Right Systems.** Conditions are applied to water and/or land-use rights so that polluting activities are either encouraged to move to less vulnerable areas, discouraged, prohibited or phased out.

Young and Evans (1997) provide a subjective assessment of the applicability of a right-market approach in dealing with groundwater pollution (see Table 5).

The table shows that applying economic instruments will encourage change in some areas to an estimated maximum as indicated in the table (the percent column). The table also shows that for some issues, such as pesticides in groundwater applying financial incentives are unlikely to make any significant difference in pollution of groundwater. Pesticides are either used or not used. The amount is determined by the type of pest and application requirements. If pesticides are applied according to need a degree of contamination of groundwater is the likely result.

Table 5 - Subjective assessment of the applicability of right-market mechanisms to reduce non-point source groundwater pollution in Australia

Diffuse pollution problem	Ability of right-market mechanisms to significantly reduce diffuse pollution problem (% of problem area amenable)
1. Nitrates	
1.1 Excess fertiliser applications	30%
1.2 Animal excreta	20%
1.3 Legume pasture	10%
2. Pesticides	1%
3. Groundwater salinisation	
3.1 Land clearing	40%
3.2 Recycling	75%
3.3 Lateral migration	75%
3.4 Irrigation	50%
4. Bacteria, nitrates from septic tanks	50%
5. Sea water intrusion	90%

Source Young and Evans (1997), p.7.

12.2 SOME SOLUTIONS

The Industry Commission (1997) outlined a reform package to move towards ecologically sustainable land management. This consisted of three pillars (p. xxii):

a) to recast the regulatory regime to ensure that resource owners and managers take into account the environmental impacts of their decisions. To impose on natural resource owners, managers and users a duty of care for the environment.

b) create or improve the markets for key natural resources, for example tradeable rights to use resources through mechanisms such as tradeable water entitlements, separating the ownership of trees from the land upon which they are grown, and creating new permit systems for agricultural discharges (including diffuse source discharges). Such measures would result in a reducing the bias in the financial incentives to clear deep-rooted vegetation and over-use water that currently face farmers.

c) encourage nature conservation on private land, in particular the protection of biological diversity and natural heritage.

All the above would be accompanied by complementary steps to strengthen the dissemination of environmental knowledge and know-how, and the ground-level institutions concerned with natural resource management. Institutional change will also be necessary and "there is a need to separate resource management and regulatory functions in government agencies to promote transparency and accountability" (Industry Commission, 1997, p. xxv).

The duty of care referred to would require resource owners, managers and users a duty of care for the environment to take all reasonable and practical steps to prevent harm to the environment that could foreseeably flow from their activities (Industry Commission, 1997, p. xxii). This would promote a broad range of "no regrets" measures to protect the environment. "No regrets" in this context means measures which are low cost or which would reduce costs by increasing productivity, or reducing inputs such as amount of fertiliser used. A "stewardship" focus was also proposed by Binning and Young (1997).

The duty of care forms the centrepiece of the proposed regulatory framework for ecologically sustainable land management proposed by the Industry Commission (1997) and compliance with it would be mandatory, although there would remain choices about the means employed by each landholder, manager or user to demonstrate compliance.

One way of demonstrating compliance with the duty of care is through demonstrated application of locally relevant voluntary standards and codes of practice which would avoid the need for mandated standards. The aim of the voluntary standards and codes of practice is to protect the environmental resource in the long term (for future generations) as well as to guide duty holders (Land owners, managers and users) on how to comply with the law.

An alternative way of complying with the duty of care requirement is through a formal environmental management system based on accepted principles of quality management. An environmental management system should be aimed at:

- setting policy and defining environmental goals;
- establishing a program to meet the goals and implementing that program in day-to-day operations and emergency situations;
- measuring performance in achieving those goals and taking action when the targets are not met; and
- progressively improving the system by ongoing repetition of the cycle (using the previous cycle in an action-learning sense).

However, both of the above means of demonstrating compliance would require greater transparency in decision-making from landholders, managers and users and the participation of other stakeholders (such as conservation interests) in the development of the appropriate voluntary standards, codes of practice and overall environmental goals. This means a very different attitude to private land ownership and use than people are used to and an acceptance that others do have a legitimate interest in what is currently privately owned land.

In some instances Government may need to mandate minium standards for management of natural resources and the protection of the environment, or to enforce standards already set. Peel-Harvey is in the latter category. In effect the EPP was a mandated standard set by the Government to solve the environmental problems of the estuary while protecting the community's investment and also allowing agriculture to continue on the Peel-Harvey coastal plain catchment. Voluntary compliance with the Pig industry code of practice has occurred and in most instances considerable investment in reducing nutrient export form such facilities

has been substantial. It is the diffuse sources of pollution from broad-acre agriculture that now need to be similarly addressed.

For Peel-Harvey and Western Australian integrated catchment management in general, some key considerations are:

- a clear need for legislation to require minimum standards of environmental management of rural activities. The Peel-Harvey EPP is one example but is geographically localised and waterway specific. It may now be time for a whole of State EPP to protect catchments and all waterways. The intention to prepare a statewide rivers and estuaries EPP has been foreshadowed by the EPA.

- a clear need for separation of the responsibilities for regulation of the natural resources and other aspects of agriculture. There is now widely held view that there is a distinct conflict of interest where those charged with custodial responsibilities for long-term protection of natural resources are also responsible for the exploitation of those resources. The perception of conflict is even more acute where there is a direct revenue benefit to the regulator flowing from such an arrangement.

Agriculture Departments in general have a difficult role in being advocates for and promoters of agricultural industries as well as being the regulators in the agricultural sector, for example through control of clearing of vegetation, and conservation of soil and land resources.

Western Australia has already responded to the need to separate responsibilities in the natural resources area by removing the real or perceived conflicts of interest in the water industry and most recently in forest management and exploitation, and it may now be time to do so in the agricultural sector.

- strong support for farmers to make the transition to environmentally sustainable agriculture, with positive and negative incentives, technical support, rural adjustment, social support etc.

Lack of attention to these matters will result in the continued decline of agricultural and rural communities, and the accumulation of multi billion dollar liabilities to the community from soil and water degradation, loss of biodiversity and environmental quality in general. It will even lead to loss of trade as environmental quality becomes more highly regarded as a factor by countries purchasing overseas agricultural products.

An additional approach is to develop some "smart" regulatory approaches for Peel-Harvey. This sill be discussed in more detail in the main Expert Review Committee Report.

13. CONCLUSIONS AND RECOMMENDATIONS

The Legal and Administrative Framework Specialist Report concluded that:

1. The legal and administrative framework proposed by the EPA sets minimum requirements and remains essential to successful and full implementation of the management strategy. It has no "fatal flaws" and should be made to work.

2. The EPP has been partially successful in meeting its objectives, both environmental and institutional as per the intent of the EPA's recommendations in 1988.

3. The comprehensive integrated catchment management plan as envisaged by the EPA has not been prepared and implemented and this has detrimentally affected the

effectiveness of the Peel-Harvey management strategy and the success of the EPP and the legal and administrative framework for management as a whole.

4. The Environmental Conditions relating to the EPP and catchment management plan have not been fully met.

5. The legal and administrative framework proposed by the EPA has been partially successful. The concept of the EPP in the management framework, and the objectives above, remain a key to fully successful implementation of the management strategy for the Peel- Harvey and that it should be made to work in the manner envisaged. To do so will necessitate development of the comprehensive catchment management plan (proposed in 1988) and implementation mechanisms (proposed in 1985 and 1988) as a very high priority.

6. The review concluded that there were a number of barriers (real or perceived) that may have contributed to the lack of full implementation of the legal and administrative framework and the total management strategy. The perceived barriers include:

- lack of a comprehensive catchment management plan;
- limited understanding of shared co-proponent approach;
- conflicting management objectives;
- ignorance of the management framework, in particular the role of the EPP;
- ongoing challenge to the management target identified by the EPA;
- misperception of the need for the whole management strategy;
- perceptions of equity issues;
- institutional commitment and reliance on "volunteerism"; and
- resistance to change from current approaches.

7. The review has found that there are some real equity issues relating to:

- new developments that are required to be assessed under Part IV of the Environmental Protection Act compared with the lack of similar requirements on most rural land uses;

- the different degree of regulation being applied to point sources compared with minimal requirements on diffuse nutrient sources; and

- the increased amount of regulation being applied to some point sources compared with other point sources, regardless of the relative contribution made by each type of development to the nutrient problems (for example, stricter license requirements on waste water treatment plants than on dairies).

8. Although the EPA's intention in its 1988 assessment was that the catchment management plan should be developed in a co-operative and voluntary manner, the fact that an adequate plan has still not been developed (let alone successfully implemented) suggests that it may now be necessary to adopt a more regulatory approach.

9. The fact that there is no single person or body within government who has been given the responsibility of ensuring that all aspects of the EPA's and Minister's requirements are met is a contributing factor to the incomplete success of the legal and administrative framework for management. Furthermore, the lack of a single point of contact has made it more difficult for all land developers and users to obtain the advice they need on minimum acceptable environmental practices.

10. The failure to develop a comprehensive catchment management plan to protect the environmental quality of the Peel-Harvey Estuary System and the public's investment in the Dawesville Channel is an indicator of the broader problems in both the agricultural and pastoral areas of Western Australia, where short-term agricultural survival is given a higher priority than long-term agricultural and environmental sustainability. There is increasing public and industry concern with the ongoing poor environmental performance of the agricultural sector, and the regulatory inequity in which most industries and the mining sector are tightly regulated while farming is not. This is despite the clear understanding by the community and Government at all levels that broadacre agriculture is the source of Australia's worst environmental problems including salinity, soil acidification, erosion and sedimentation, loss of biodiversity from land clearing and rising water tables and degradation of waterways. Eutrophication originating from agricultural fertilisers is occurring in inland lakes, rivers and waterways, in estuaries (such as Peel-Harvey) and in some cases has affected near-shore marine embayments (Commonwealth of Australia, 1996).

11. In Western Australia the legislation and institutional arrangements are inadequate to deal with multi-faceted management problems at the catchment scale where a combination of "top down" vision and leadership at the government level combined with "ground up" voluntary management is required.

12. There is no evidence that those with decision-making responsibilities have carried out their actions sufficiently to ensure that the environmental objectives of the EPP have been met. This includes the Department of Environmental Protection which has assessment and licensing responsibilities under the Environmental Protection Act.

13. The Environmental Conditions relating to the EPP and catchment management plan should be retained although some amendment to the wording may be appropriate, particularly relating to responsibilities (see 18 below).

14. The EPP should be publicly reviewed immediately following completion of the Compliance Review by the EPA. In particular the EPA should seek input from the community at least on the following:

- the area the EPP should cover (the Peel-Harvey "system");
- the environmental objectives for the system
- indicators of health, sustainability and vigour for various parts of the system.

15. The overview and scientific investigation coordination role taken by the EPA in defining the management solutions to the Peel-Harvey estuary problems has been the most successful approach to integrated catchment management in WA, to date, and ensured an open and transparent approach to setting the environmental objectives. It would be appropriate for the EPA to once again clearly take on the focus of coordination of integrated research and investigation for catchment scale environmental problems and coordination of long-term monitoring requirements for measuring and demonstrating environmental change. The EPA is already recognised by the public as having the primary role in protection and maintenance of ecosystem processes and in long-term custodial responsibility for the environment.

16. Although the legal and institutional framework for integrated catchment management in Western Australia is the best that could be built using the existing statutory framework, it will continue to be inadequate in the absence of a proper ICM statute. The adopted approach of "change by evolution not revolution" and resistance to

developing new, effective ICM and NRM legislation has not delivered catchment management over the last 14 years and it is now time for more radical reform, including an effective and progressive catchment management statute. In addition to other matters, the new statute should establish catchment management authorities and provide them with the power to prepare plans and to raise catchment management rates for development and implementation of the plans. Notwithstanding the minor institutional changes made over recent years (to CALM, Water and Rivers Commission and the DEP) associated comprehensive institutional change to the functions and responsibilities of the natural resource management sector in WA is also required. This should involve changes to many of the natural resource agencies, including (*inter alia*) Agriculture WA, the Water and Rivers Commission, the Department of Conservation and Land Management, the Department of Environmental Protection, Ministry for Planning and the associated representative member statutory boards.

17. The management of the Peel-Harvey system has been afforded the greatest degree of legitimacy of any integrated catchment management project in WA to date (see Section 9 of this Report) and some $60 million of taxpayer money has been invested in improving the environmental quality of the estuaries. Such a high investment of public money in an environmental issue requires adequate protection and ongoing investment in the long-term. The Specialist Review of the Legal and Administrative Framework is of the view that if the Government is not willing to address the issues of proper catchment management legislation and agency re-structuring as part of protecting its financial investment in the Dawesville Channel, it does not auger well for salinity mitigation, catchment management and environmental protection in general in WA.

18. To ensure that all elements of the management strategy are implemented, the EPA should be more pro-active and drive the key decision-makers to have implementation occur in accordance with the Conditions and intent of the strategy. Although some of the decision-making rests with parties which are not currently proponents for implementation of the strategy, the framework of the EPP requires that all decision-making for the area occurs in accordance with the environmental objectives of the EPP. Review and education of decision-makers is required to correct the misperception that only parties bound by the Environmental Conditions are responsible for implementing management. A compliance assistance program would be a positive way of achieving this.

19. Further education of government agencies as proponents is required so they fully understand that the Environmental Protection Act binds the Crown, and that they are legally required to implement Environmental Conditions and commitments.

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APPENDIX 1

EPA Recommendations from 1988 and 1985 assessments

EPA Recommendations from 1988 assessment

12. CONCLUSIONS AND RECOMMENDATIONS

12.1 OVERALL CONCLUSIONS AND RECOMMENDATION

The problems in the Peel-Harvey System, their causes and possible solutions have been addressed elsewhere in this report (Sections 3 to 9). From these earlier discussions, it is clear that successful management of this estuary system can only be achieved by both reducing phosphorus and other nutrient inputs to the system, increasing the rate at which phosphorus and other nutrients are lost from the system and by making the system more marine and therefore unfavourable for Nodularia. The former can be achieved by managing activities in the catchment and the latter two by construction of a new channel to the ocean at Dawesville as proposed in the ERMP. Only implementation of both management elements would achieve the recommended target water quality (see Section 7.2.1) within the system and also ensure sufficient resilience in the system to withstand development pressures without further degradation of the environment. The Authority therefore makes the following recommendation:

RECOMMENDATION 1

The EPA concludes that the Dawesville Channel and other management strategies proposed in the Stage 2 Environmental Review and Management Programme, as modified by this assessment report, are environmentally acceptable and recommends that these proceed in accordance with the commitments in Appendix 2 and the EPA recommendations.

12.2 CATCHMENT MANAGEMENT

The catchment management proposals in the ERMP have been assessed in Sections 9 and 10 of this assessment report. It was proposed in the ERMP that the catchment management proposals would achieve about a 40% reduction

in phosphorus entering the estuary system, a drop from 143 tonnes average, to 85 tonnes maximum, as stated in the ERMP.

However, it is clear to the Authority that there is some discrepancy in the above. The Authority, in examining the management proposals in the ERMP, examined both the capacity of the system to assimilate nutrients and the likely effectiveness of the catchment management proposals to achieve the necessary reduction. Although the proponents proposed a maximum loading to the estuary of 85 tonnes of phosphorus per year, the Authority believes that this would be unrealistic and unachievable as it would so seriously restrict catchment land uses. The Authority considered that it would be environmentally acceptable for bloom conditions to occur in the Peel-Harvey System on average one year in ten (10 percent). This would mean that nine years out of ten, or 90 percent of the time, bloom conditions would not occur. The Authority has therefore set as its management target an annual 85 tonnes of phosphorus (60 percentile year) which would mean no blooms in nine years out ten. This would be for 90 percent of the time, and is the 90 percentile level (see Section 7.2.1).

There is no doubt that a target of 85 tonnes is what is required environmentally. However, it is also clear that even if the 85 tonnes level at the 60 percentile (rather than the 100 percentile proposed in the ERMP) is taken, the actual phosphorus reduction required from the catchment would be in the order of a 60 percent reduction and not the 40 percent one stated in the ERMP. This would have obvious implications for land uses in the catchment, which would either have to become very restricted and/or employ stringent pollution control measures. Failure to adequately control land uses in the coastal catchment in particular, would result in the estuarine water quality not being adequate environmentally and the probable failure of the Dawesville Channel as a management measure.

To meet the overall management objectives, careful and detailed agricultural planning of the catchment needs to take place. This has already been commenced by the Department of Agriculture which is coordinating the preparation of an integrated catchment management plan (ICMP) at the request of the Integrated Catchment Management Policy Group. However, to date, this has been proceeding in the absence of clearly stated environmental objectives, or an enabling framework which requires an adequate level of phosphorus reduction. In the Stage 1 assessment report, the Authority identified the need to develop a long-term land management plan for the coastal plain catchment in particular, and an appropriate enabling framework to attain and secure, for all time, reductions in nutrient loadings to the system. In the Stage 2 assessment, the Authority has defined more specific management targets and has determined that the most effective enabling mechanism, one which would provide a statutory base, is an Environmental Protection Policy. Consequently, the Authority recommends:

RECOMMENDATION 2

The EPA recommends that proposals for control of phosphorus through catchment management should be developed and implemented as rapidly as possible so that, in conjunction with the Dawesville Channel, the following objective is met:

the Peel-Harvey System is clean, healthy and resilient.

On the basis of studies undertaken (see Bulletin 363 Part II) the Authority believes that the above would be achieved with target figures of:

annual phosphorus input to the system not to exceed 165 tonnes in nine out of ten years;

average phosphorus concentration in estuary water is not to exceed 0.2 milligrams per litre in nine years out of ten (on average).

These target figures should be reviewed in the light of measured performance of the system.

RECOMMENDATION 3

The EPA recommends that the proponents jointly prepare an Environmental Protection Policy for the Peel-Harvey catchment, in accordance with the objective and targets specified in Recommendation 2 of this report.

RECOMMENDATION 4

The EPA recommends that the proponents develop an integrated catchment management plan to meet the objective and targets specified in Recommendation 2 of this report and in accordance with the principles to be developed in the Environmental Protection Policy for the area pursuant to Recommendation 3.

It will be necessary to control land uses which presently lead to excessive inputs of phosphorus into the estuaries. It will likely require less area fertilised for agriculture and more area planted under trees.

The catchment management plan, to which Recommendation 4 applies, would need to address a number of issues, some of which were raised in the ERMP. The plan should include the following considerations:

- the environmental water quality requirement for the estuary system will set constraints on land uses in the catchment;
- changes in land use should have environmental benefits as the prime objective;
- nutrient inputs from all rural sources should be managed so that the total nutrient load is within the assimilative capacity of the Peel-Harvey System (ie within the target of 85 tonnes in a 60 percentile year or 164 tonnes in a 90 percentile year);
- export of phosphorus from all properties in the catchment must be reduced to meet the above water quality targets;
- export of nitrogen from all properties must meet a water quality target for nitrogen, to be specified during the catchment planning exercise;
- appropriate fertilisers should be developed for the area, in particular sulphur only or low phosphorus sulphur fertiliser;
- soil testing and provision of fertiliser advice to farmers should continue;
- alternative methods of applying fertiliser should be investigated with a view to late winter spreading;

- nutrient inputs from all urban sources should be managed (see also Recommendation 6);

- pollution from point sources should be controlled to meet the objectives;

- major tree planting programmes should have maximising the environmental benefits as the primary objective and should be carried out in accordance with the EPA's recommendations in its assessment of the WA Chip and Pulp Company proposals (EPA, 1988b);

- clearing practices in the catchment should be reviewed to ensure environmental protection of the estuary system in accordance with the EPA's recommendations on retention of remnant native vegetation in EPA Bulletin 319 (EPA, 1988a) and Bulletin 329 (EPA, 1988b) (see Recommendation 5);

- drainage practices in the catchment should be reviewed to ensure environmental protection of the estuary system (see Recommendation 5).

The ERMP proposes a moratorium on clearing and drainage within the coastal catchment. The Authority believes that it is appropriate that clearing and drainage be considered and reviewed as part of the development of the Environmental Protection Policy and integrated catchment management plan. Consequently, the Authority recommends that the moratorium should continue at least until this review has been completed and Government is satisfied that further clearing or draining would not exacerbate the estuaries' problems.

RECOMMENDATION 5

The EPA recommends that the moratorium on clearing and drainage in the Peel-Harvey coastal catchment should continue until the Minister for Environment is satisfied that these activities would be environmentally acceptable.

Another contributor to phosphorus pollution is the use of septic tanks in poor quality coastal plain sands. The Estuarine and Marine Advisory Committee recommended in 1981 that development within 2 kilometres of the estuary system should incorporate appropriate sewage disposal systems that would prevent contamination of ground and surface waters by nutrients. This recommendation was endorsed by Government and has subsequently been used as a guide.

Since then there has been considerable additional concern about the polluting effects of septic disposal systems. Recently a Select Committee on Effluent Disposal investigated the suitability of septic tanks as a means of effluent disposal in coastal plain sands in the Perth Metropolitan Area. The report of this committee has recently been published and recommends, amongst other things, that:

"Septic tanks in their present mode are not to be used as a long-term solution to Perth's effluent disposal needs ...". (Legislative Assembly, 1988, p 43).

As the Peel-Harvey coastal catchment soils are comparable in attenuation capacity to those of the Metropolitan area and as the cost of retrospectively installing infill sewerage systems is so high, the Authority believes it is appropriate to endorse the earlier advice of EMAC and recommends;

RECOMMENDATION 6

The EPA recommends that all developments within 2 kilometres of the Peel-Harvey Estuary System (as defined in Estuarine and Marine Advisory Committee EMAC, 1981) include appropriate nutrient-attenuating waste disposal systems and management practices.

12.3 ESTUARY MANAGEMENT

The Authority believes that most of the issues associated with management of the estuary system following construction of the Dawesville Channel can be managed as part of the ongoing monitoring and management proposals. Five issues are, however, considered to be of sufficient importance to warrant specific recommendations, and these are addressed here.

12.3.1 DREDGING

Dredging and dredge spoil disposal are likely to be ongoing issues in the Peel-Harvey System as new developments are proposed and expectations are raised. In addition there is likely to be some requirement for occasional maintenance dredging. The Authority believes that current and possible future proposals for dredging and spoil disposal need to be addressed in a coordinated manner and that preparation of a dredging and spoil disposal management plan would be a practical way in which to achieve this and to maximise opportunities whilst protecting the environment. The Authority recommends:

RECOMMENDATION 7

The EPA recommends that, prior to construction of the Dawesville Channel commencing, a dredging and spoil disposal management plan for the Dawesville Channel be prepared by the Department of Marine and Harbours, Peel Inlet Management Authority and the Waterways Commission, to the satisfaction of the EPA. Dredging not already part of the proposals in the ERMP would be the subject of separate assessment by the Environmental Protection Authority.

12.3.2 WEED HARVESTING

There is no doubt that some environmental damage results from the weed harvesting operations, mainly as beach erosion and loss of fringing vegetation. However, weed harvesting is currently the best practicable means of removing large amounts of macroalgae from the system. As indicated in Section 8.2.1, macroalgae are expected to increase at least in the short-term with the Dawesville Channel and there is likely to be a requirement for increased weed control measures to manage this. The EPA recommends that:

RECOMMENDATION 8

The EPA recommends that weed harvesting and control should be continued and increased as necessary to manage the expected initial increase in the occurrence of nuisance macroalgae.

12.3.3 ESTUARY AND CATCHMENT DEVELOPMENT

From the assessment of catchment management and probable performance of the Peel-Harvey System with a Dawesville Channel, it is evident that there are

at present some unknowns which apply in particular to possible intensification of development.

Although a prime function of the Dawesville Channel would be to increase the resilience of the system and hence its ability to cope with the pressures of man, the exact extent to which this would occur and hence the extent of additional development possible cannot be determined at this stage.

Monitoring of the altered system would enable an estimation to be made of the new assimilative capacity of the environment. This, in turn, would provide a guide as to the ability of the system to accommodate additional development, whilst maintaining the basic environmental quality. Other aspects also need further consideration, in particular the implications of flood impacts, foreshore reserve requirements and mosquito nuisance.

The Authority believes that while there are unknowns that would have repercussions upon additional estuary and catchment developments, it would be prudent for development decisions to be conservative in the initial period following implementation of the full management strategy and recommends:

RECOMMENDATION 9

The EPA recommends that development decisions in the Peel-Harvey Estuary area and coastal catchment area should be conservative until the new assimilative capacity of the Peel-Harvey Estuary System can be determined and the effects of the management elements have been measured or are being managed, in particular:

- the ability of the system to assimilate more development;
- water quality;
- foreshore reserve requirements;
- impact of increased mosquito nuisance;
- potential flood impacts and review of 100-year flood level.

An additional aspect of estuary development is the implementation of the System 6 Redbook recommendation for a Peel-Harvey regional park (EPA, 1983). These proposals touch on the area of cooperative management as well as other aspects such as foreshore reserves and mosquito control.

Implementation of the regional park concept is progressing, however, the Authority recommends:

RECOMMENDATION 10

The EPA recommends that the Peel-Harvey regional park concept, as originally proposed in the System 6 Redbook report (EPA, 1983) should be implemented.

Clearly, the Peel-Harvey System is considered to be a regional resource, attracting many visitors, fishermen and naturalists from many kilometres away. The area already has a considerable mosquito nuisance and disease risk from mosquito-borne viruses. With the Dawesville Channel, the numbers of mosquitoes and hence degree of nuisance and disease risk are predicted to increase. It would be unreasonable to expect the local authorities in the area to take on full responsibility for mosquito control, particularly as

this is already beyond their technical capacity and financial means. As environmentally acceptable mosquito control will be essential within the regional park, which is a State resource, it would be appropriate for the State to assume a higher profile in mosquito management in the area. The Authority therefore recommends:

RECOMMENDATION 11

The EPA recommends that if the Dawesville Channel is constructed, the proponents should have a responsibility for ensuring that mosquito management is effective and is carried out in an environmentally acceptable manner.

12.4 RESPONSIBILITIES, MANAGEMENT AND MONITORING

12.4.1 RESPONSIBILITIES OF PROPONENTS

Although the ERMP has been presented as if the Department of Marine and Harbours is the agency responsible for the Dawesville Channel and the Department of Agriculture for catchment management, the Minister for Environment has nominated the Minister for Transport, Minister for Agriculture and Minister for Waterways Protection as co-proponents of the whole proposal. These three co-proponents would therefore be equally responsible for the implementation of the whole management strategy, and for the monitoring and management of the proposals and their consequential impacts. In the past, the studies on the Peel Inlet and Harvey Estuary were carried out under the auspices of a Cabinet Sub-Committee and a similar group consisting of the proponents may be an appropriate administrative means of achieving implementation and the necessary funding. A Cabinet Sub-Committee could be supported by a group of senior officers from the Minister's departments who would receive technical advice from a catchment management technical group and an estuarine monitoring group, as is presently the case.

Under the Environmental Protection Act, 1986, the proponents are legally responsible for the implementation of the environmental conditions set on a proposal by the Minister for Environment. The conditions, when set, become legally enforceable. The Authority recommends:

RECOMMENDATION 12

The EPA recommends that the proponents be jointly responsible for:

- the construction, operation, monitoring and maintenance of the Dawesville Channel and its impacts within the estuaries and within the immediate marine environment;

- the management and required monitoring of the catchment and collection of data necessary for the development of the integrated catchment management plan of the Peel-Harvey catchment; and

- all in-estuary monitoring and management, including weed harvesting.

12.4.2 MANAGEMENT AND MONITORING

There will be a requirement for substantial ongoing management and monitoring of the Peel-Harvey System and a requirement for acquisition of some additional base-line water quality data against which to compare the performance of the management strategy, when implemented. This has been

addressed in Section 11 of this report. Proposals for monitoring and management should include:

- sand by-passing;
- estimation of and/or measurement of flushing rates;
- tidal level monitoring;
- water circulation;
- flooding;
- mosquito control;
- catchment groundwater and surface water hydrology;
- catchment nutrient balance;
- estuarine water quality;
- assimilative capacity of the estuaries;
- weed occurrence;
- weed harvesting;
- phytoplankton (including Nodularia) occurrence;
- birds, including a detailed assessment of the regional and international significance of the Peel-Harvey System as a habitat;
- fish; and
- foreshore protection.

The Authority therefore makes the following recommendation:

RECOMMENDATION 13

The EPA recommends that the proponent should prepare in stages a monitoring programme, to the satisfaction of the EPA, prior to the construction of the Dawesville Channel.

The programme should address:

- essential additional baseline monitoring to be in place as soon as possible and prior to construction commencing;

  construction impacts and monitoring, prior to construction; and

  operational and long-term monitoring, in stages, to be determined by the EPA.

SUMMARY AND RECOMMENDATIONS OF STAGE 1 ASSESSMENT REPORT

The Environmental Protection Authority has concluded its review of the Stage 1 ERMP on the Peel-Inlet Harvey Estuary Management Strategy. The Authority's assessment will assist in the development of the investigations leading to the preparation of the Stage 2 ERMP by the proponents.

The Authority has set its objective for management of the system, namely:

> "to produce and maintain an estuary system that is visibly clean and healthy and is ecologically healthy and resilient."

Within the context of the objective, the assessment report address:

- the staged assessment process;
- the description of the problem and its causes;
- possible management measures for reducing the nutrient level; and
- estuary and catchment use and management.

The Authority has reached a number of conclusions. The principal ones are as follows:

- the major source of nutrient input to the Peel-Harvey System is the Catchment Area, but there is also a large nutrient store in the sediments of the estuaries;
- there needs to be a reduction in the level of nutrients entering the estuaries from the Catchment Area, and a reduction in the amount of nutrient already held in the sediments of the estuaries;
- it will be necessary to develop a long-term land management plan for the Catchment Area and an appropriate enabling framework, to attain the secure for all time reductions in nutrient loading to the System;
- improvements to the water exchange between the Peel-Harvey System and the ocean will have to be made to reduce the impact of nutrients and to produce a System that is ecologically resilient;
- the nutrient oversupply cannot be cured either by management in the Catchment Area or by improving water exchange alone. A combination of both measures will be needed to restore the health and resilience of the System within the time that is envisaged; and
- commercial developments and use of suitable low phosphorus fertilisers (eg a sulphur only fertiliser) would be beneficial to the pollution management of the Catchment Area.

In conclusion, the Authority, after giving due consideration to the information presently to hand and subject to the implementation of the following recommendations, is of the opinion that neither management of the Catchment Area nor construction of the Dawesville Channel alone can reduce the level of nutrient enrichment in the System sufficiently to achieve a clean, healthy estuary system, at least in the short term.

SUMMARY AND RECOMMENDATIONS (Contd)

RECOMMENDATION 1

The EPA recommends that initiatives already in place, specifically, commitment to long term continuation of the fertiliser management programme, commercial development of a sulphur only (non-phosphorus) fertiliser, farmer extension programme, weed harvesting and monitoring of aspects of the catchment and estuary should be continued. The latter should be designed to meet the following management objectives:

- verify that the management programme will fulfil the EPA's objective;
- verify/improve predictions about the phosphorus rundown in soils and sediments;
- indicate what occurs if widespread use of sulphur-only (non-phosphorus) fertiliser commences in 1986;
- to allow for prediction of blooms (from measuring the chlorophyll$_a$ level and nutrients in the sediments in the estuaries);
- to provide data on whether and how an oxygen collapse develops; and
- to provide up-to-date information which will allow for an accurate description of the existing environment in the catchments and estuary at any time.

RECOMMENDATION 2

The EPA recommends that in order to protect the Peel-Harvey System from excessive loads of phosphorus (and other nutrients) a Catchment Management Plan and an appropriate mechanism to facilitate its implementation be developed. To secure continuation of gains already achieved in the Catchment Area, an interim mechanism should be instituted as a high priority.

RECOMMENDATION 3

The EPA recommends that the Peel Inlet Management Programme be reviewed and revised to be in accord with the EPA's management objective for the Peel-Harvey System and to be consistent with the Catchment Management Plan and enabling mechanism (see Recommendation 2).

RECOMMENDATION 4

The EPA recommends that if the dredging of both ends of the Mandurah Channel, to improve the flushing in Peel Inlet, is carried out early enough, then the work should be monitored in order to facilitate the following:

- the data obtained from the monitoring of the effects of the above dredging should be used to check the validity of the predictions from the mathematical modelling which has been used to predict the improved flushing of Peel Inlet; and
- the above findings should then be used to further enhance the predictive modelling of solute transport (phosphorus) resulting from the Dawesville

Channel and the interactions between the improved flushing characteristics of the dredged Mandurah Channel and the Dawesville Channel.

RECOMMENDATION 5

The EPA recommends that investigations continue into the size, design, location and implications of construction of a channel (or channels) connecting the sea to the Harvey Estuary, specifically in the context of the EPA's objectives and other recommendations in this report.

In addition, there may be an improvement in the pollution problem in the Harvey Estuary if circulation is improved between the Harvey Estuary and the Peel Inlet. Therefore there should be further investigations into the dredging of the channel between Ward Point and Point Grey (see Section 5.3.1 and Figure 2 of this report).

RECOMMENDATION 6

The EPA recommends that environmental review of the management strategy should continue in the State's environmental impact assessment process in the following manner: (see Figure 7)

- the studies aimed at providing specific information to assist in management decisions contained in Recommendations 1-3 and 5 be implemented**;

- the Stage 2 ERMP be prepared when the results and/or data from the above are available to incorporate into that document;

- the stage 2 ERMP should inter alia:

  - report the results of the implementation of the recommendations made in this assessment report;

  - identify the probability of success associated with the management alternatives for meeting the EPA's objectives;

  - give the timetable for the preferred management strategy and the implications thereof;

  - consider the anticipated effects on the Estuaries resulting from the Catchment Management Plan and enabling mechanism;

  - outline a monitoring programme to verify that the management strategy is fulfilling the EPA's objectives;

  - outline a mechanism for a review and reporting of the monitoring results; and

  - examine the impacts of the construction of a channel (or channels) and its/their consequences.

** this would also apply to Recommendation 4 if the work is completed early enough.

. to ensure a meaningful public review phase the following condition would be necessary:

- ongoing EPA involvment in determining the level, nature and timing of assessment required for possible associated developments.

APPENDIX 2

Environmental Conditions set in 1989, 1991 and 1993

MINISTER FOR ENVIRONMENT

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PEEL INLET-HARVEY ESTUARY MANAGEMENT STRATEGY - STAGE 2

MINISTER FOR TRANSPORT
MINISTER FOR AGRICULTURE
MINISTER FOR WATERWAYS

This proposal may be implemented subject to the following conditions:

1. The proponents shall adhere to the proposal as assessed by the Environmental Protection Authority and shall fulfil the commitments made and listed in Appendix 2 of Environmental Protection Authority Bulletin 363, as amended (copy of commitments attached).

2. The proponents shall develop proposals for control of phosphorus through catchment management, to the satisfaction of the Environmental Protection Authority, and shall implement them as rapidly as possible so that, in conjunction with the Dawesville Channel, the following objective is met:

   . the Peel-Harvey System becomes clean, healthy and resilient.

   To achieve this objective, the following interim targets should be used:

   (1) annual phosphorus input to the system shall not exceed 85 tonnes in more than four years out of ten (on average) and shall not exceed 165 tonnes in more than one year out of ten (on average). [These are based on 60 and 90 percentile loads]; and

   (2) average phosphorus concentration in estuary water shall not exceed 0.2 milligrams per litre in nine years out of ten (on average).

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These target figures shall be reviewed by the Environmental Protection Authority after 3 years or sooner if environmental conditions dictate, in the light of measured performance of the System and may subsequently be varied by the Environmental Protection Authority.

3. The proponents shall jointly prepare an Environmental Protection Policy for the Peel-Harvey catchment in consultation with such persons and agencies as Government may specify, to the satisfaction of the Environmental Protection Authority, in accordance with the objective and targets specified in Condition 2 above. The target date for the Draft Policy (under Section 26 of the Environmental Protection Act 1986) is 31 December 1989.

4. The proponents shall develop in consultation with such persons and agencies as Government may specify, an integrated catchment management plan designed to meet the objective and targets specified in Condition 2 above, to the satisfaction of the Environmental Protection Authority, and which shall be in accordance with the principles to be developed in the Environmental Protection Policy for the area pursuant to Condition 3. The target date for the implementation of the integrated catchment management plan shall be 31 December 1990.

5. The proponents shall ensure that the moratorium on clearing and drainage in the Peel-Harvey coastal plain catchment proposed in the Stage 2 Environmental Review and Management Programme (Commitment 3.6) continues until the Minister for Environment is satisfied that these activities would be environmentally acceptable.

6. Relevant decision-making authorities shall ensure that all developments within 2 kilometres of the Peel-Harvey Estuary System (as defined in the Estuarine and Marine Advisory Committee Report to the Environmental Protection Authority, Department of Conservation and Environment Bulletin 88, March 1981.) include appropriate nutrient-attenuating waste disposal systems and management practices, to the satisfaction of the Environmental Protection Authority.

7. Prior to construction, a dredging and spoil disposal management plan for the Dawesville Channel shall be prepared by the proponents, to the satisfaction of the Environmental Protection Authority. Dredging not already forming part of the proposals in the Stage 2 Environmental Review and Management Programme shall be the subject of separate assessment by the Environmental Protection Authority.

8. The proponents shall ensure that weed harvesting and control is continued and increased as necessary to manage the expected initial increase in the occurrence of nuisance macroalgae.

9. Decisions on developments which may release phosphorus or nitrogen to the environment in the Peel-Harvey Estuary area and coastal plain catchment area should be conservative until the new assimilative capacity of the Peel-Harvey Estuary System is determined and the effects of the management elements have been measured or are being managed. To this end, such proposals for development in these areas shall be referred to the Environmental Protection Authority for assessment. These developments include new and expansion of existing intensive horticultural and intensive animal industries.

10. The Peel-Harvey regional park concept, as originally proposed in the System 6 Redbook report (Conservation Reserves for Western Australia: The Darling System - System 6, Department of Conservation and Environment Report 13, Parts I and II, October 1983.) shall be implemented within such time as to be determined by the Minister for Environment.

11. If the Dawesville Channel is constructed, the proponents shall be responsible for ensuring that mosquito management is effective and is carried out in an environmentally acceptable manner, to the satisfaction of the Minister for Environment and the Minister for Health.

12. The proponents shall be jointly responsible for the environmental aspects of:

    (1) the construction, operation, monitoring and maintenance of the Dawesville Channel and its impacts within the estuaries and within the immediate marine environment;

    (2) the management and required monitoring of the catchment, and collection of data necessary for the development of the integrated catchment management plan for the Peel-Harvey catchment; and

    (3) all in-estuary monitoring and management, including weed harvesting.

    All of the above shall be carried out to the satisfaction of the Environmental Protection Authority.

13. Prior to the construction of the Dawesville Channel, the proponents shall prepare in stages, a monitoring and management programme, to the satisfaction of the Environmental Protection Authority. This programme shall include:

    (1) essential additional baseline monitoring required to be in place as soon as possible and prior to construction commencing;

(2) construction stage impacts and monitoring, prior to construction; and

(3) operational and long-term monitoring, in stages, to be determined by the Environmental Protection Authority.

Barry Hodge, MLA
MINISTER FOR ENVIRONMENT

14. Proposals which may release nitrogen or phosphorus to the environment shall not be referred to the Environmental Protection Authority provided that they are consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment. Proposals not consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment shall be referred to the Environmental Protection Authority.

This Condition will apply to the final Statement of Planning Policy for the Peel-Harvey Coastal Catchment when it is gazetted.

Bob Pearce, MLA
MINISTER FOR THE ENVIRONMENT

2 OCT 1991

MANAGEMENT COMMITMENTS MADE BY THE PROPONENTS (Stage II ERMP)

The following list has been amended by the EPA and accepted by the proponents to reflect the 'whole of Government approach' which is essential for management of this proposal.

1. DAWESVILLE CHANNEL

1.1 The proponents will conduct a detailed survey to locate, assess and offer protection to Aboriginal sites and heritage.

1.2 During construction of the Dawesville Channel, the proponents will ensure the continuity of road access, power supply, communications, and water and sewerage services that require relocation, and will minimize dust and noise impacts upon nearby residential areas.

1.3 Spoil from the excavated channel will be used in redeveloping the fill areas as a stable and varied landscape, reflecting naturally occurring topography elsewhere on the coastal strip.

1.4 The proponents will manage spoil disposal to minimize disturbance to important land elements, including coastal dunes, tree belts along Old Coast Road and near the estuary foreshore. Spoil disposed of adjacent to the undisturbed coastal dunes will be contoured to co-ordinate with natural dune topography in order to minimize the potential for erosion.

1.5 The land area used to dispose of excavated material will be contoured to facilitate possible future development into a prime residential and holiday area. Views from existing residences near the estuary will be retained, taking into consideration that these views may have been ultimately reduced by foreshore development and landscaping, irrespective of the proposed channel development.

1.6 Littoral sand drift northwards along the ocean coast will be mechanically bypassed beyond the channel entrance, to minimize siltation within the channel and to avoid adverse effects on beaches to the north and south.

1.7 The Dawesville Channel will be maintained as a navigable waterway, although, as with the existing Mandurah Channel, sea conditions at the ocean entrance may frequently preclude its use by small boats.

1.8 The estuary will be closely monitored to evaluate the management strategy's success in reducing the algal nuisance and to enable the development of appropriate management strategies to mitigate any deleterious effects that may occur. Current and proposed future monitoring studies in the estuary are described in Section 13 of the ERMP and Section 11 of the EPA assessment report.

2. CONTROL OF WEED ACCUMULATIONS

2.1 Weed harvesting will be continued most likely at an increased rate, until the weed nuisance in the estuary is successfully reduced.

2.2 Possible methods of improving the efficiency of harvesting operations, and the possible use of algicides to control weed growth, will be evaluated by the proponents and implemented if shown to be practicable.

2.3 The Peel Inlet Management Authority will continue the existing programme of shoreline management and will rehabilitate areas where weed accumulations or harvesting operations cause excessive retreat of the shoreline.

3. CATCHMENT MANAGEMENT

3.1 The proponents will continue to provide advice to farmers on fertilizer requirements, based on accurate assessment by paddock-specific soil tests.

3.2 The proponents will encourage further development and use of individual-nutrient fertilizers, and will undertake detailed investigations of ways to overcome existing economic constraints to their production and use.

3.3 The proponents will ensure that large-scale field trials are carried out to ascertain the technical and economic feasibility of converting use of sandy soils from agriculture to forestry. Private enterprise involvement in these studies will be encouraged.

3.4 The EPA and the Department of Agriculture will continue to provide advice to producers to define and implement practicable and cost-effective waste management strategies for control of point sources of phosphorus.

3.5 The Department of Agriculture will coordinate the preparation and implementation of a detailed catchment management plan aimed at reducing phosphorus losses to the estuary to less than 85 t/a in a 60 percentile year with minimal economic or social disruption to the catchment community.

3.6 The proponents will implement a moratorium on further clearing and drainage in the catchment, pending determination of the success of the catchment management plan in reducing phosphorus losses from existing cleared land.

3.7 The success of catchment management measures in reducing phosphorus losses to the estuary will be monitored by the proponents and audited by the EPA. The social and economic effects of catchment management measures upon the catchment community will be closely monitored by the proponents. Current and proposed future monitoring studies are described in Section 13 of the ERMP and in Section 11 of the EPA assessment report. The catchment management plan will be regularly reviewed by the EPA.

WESTERN AUSTRALIA

MINISTER FOR THE ENVIRONMENT

STATEMENT TO AMEND CONDITIONS APPLYING TO A PROPOSAL (PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PROPOSAL :	PEEL INLET - HARVEY ESTUARY MANAGEMENT STRATEGY, STAGE 2 (010/701)
CURRENT PROPONENT :	MINISTER FOR TRANSPORT MINISTER FOR AGRICULTURE MINISTER FOR WATERWAYS
CONDITIONS SET ON :	3 JANUARY 1989
CONDITIONS AMENDED ON :	2 OCTOBER 1991

Condition 1 is amended to read as follows:

1A Proponent Commitments

In implementing the proposal, including the amendments reported on in Environmental Protection Authority Bulletins 543 and 640, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made and listed in Appendix 2 of Environmental Protection Authority Bulletin 363, as amended, and subsequently, including the Department of Marine and Harbours letter of 24 February 1992 on reclamation associated with the Dawesville Channel. (A copy of the commitments is attached).

1B Implementation

Subject to the conditions in this amended statement, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

The following conditions and procedure are inserted following condition 14 (which resulted from the amendment of 2 October 1991):

15 Estuary Reclamation (Dawesville Channel)

15-1 The proponent shall ensure that the total area of estuary reclaimed in association with the

Published on

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construction of the Dawesville Channel does not exceed 25 hectares (ha). Five hectares of this land may be granted to Wannunup Development Nominees Pty Ltd as part of an existing Land Exchange Agreement with the State Government. The remaining 20 hectares shall be available for public use. Five hectares of this land can include part of the canal waterway, to be available for public use.

15-2 The proponent shall endeavour to reduce the area of reclamation associated with the construction of the Dawesville Channel specified in condition 15-1 by increasing the height of the spoil, consistent with the recreational use of the reclaimed land, to the requirements of the Environmental Protection Authority on advice of the Peel Inlet Management Authority.

16 Foreshore Vegetation (Dawesville Channel)
Foreshore vegetation in and near the area of construction of the Dawesville Channel should be retained wherever possible.

16-1 The proponent shall ensure that the foreshore vegetation in and near the area of construction of the Dawesville Channel is retained wherever possible. Those stands of Casuarina, Paperbark and Tuart which are located on/along the existing foreshore and outside the proposed alignment of the channel should be retained, to the requirements of the Environmental Protection Authority on advice of the Peel Inlet Management Authority.

17 Compliance Auditing
In order to ensure that environmental conditions and commitments are met, an audit system is required.

17-1 The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of the Peel Inlet - Harvey Estuary Management Strategy, Stage 2, in consultation with the Environmental Protection Authority.

Procedure

The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.

If the Environmental Protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

Note
Conditions 15 and 16 relate to the construction of the Dawesville Channel and should be audited in association with condition 7.

Kevin Minson MLA
MINISTER FOR THE ENVIRONMENT

16 APR 1993

APPENDIX 3

Environmental Protection (Peel Inlet - Harvey Estuary) Policy 1992 (as Gazetted)

SCHEDULE

(Clause 2)

ENVIRONMENTAL PROTECTION ACT 1986

ENVIRONMENTAL PROTECTION (PEEL INLET-HARVEY ESTUARY) POLICY 1992

Approved by the Minister under section 31 (d).

PART 1 — PRELIMINARY

Citation

1. This policy may be cited as the *Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1992*.

Purpose of policy

2. The purpose of this policy is —

(a) to set out environmental quality objectives for the Estuary which if achieved will rehabilitate the Estuary and protect the Estuary from further degradation; and

(b) to outline the means by which the environmental quality objectives for the Estuary are to be achieved and maintained.

Interpretation

3. In this policy, unless the contrary intention appears —

"environmental quality objectives" means the environmental quality objectives set out in clause 7;

"Estuary" means Peel Inlet and Harvey Estuary;

"median load (mass) of total phosphorus" means the middle observed phosphorus load in the observed series of measured annual phosphorus loads, measured over the immediately preceding 10 year period;

"Planning Policy" means "Statement of Planning Policy No. 2; The Peel-Harvey Coastal Plain Catchment" prepared by the State Planning Commission under the *Town Planning and Development Act 1928* and published in the *Gazette* of 21 February 1992 at pp. 947-955, and includes any amendments made to that Policy;

"policy area" means the portion of the environment to which this policy applies;

"this policy" means this environmental protection policy.

Application

4. The portion of the environment to which this policy applies is the area of land defined in Schedule 1.

PART 2 — BASIS FOR PROTECTION OF ESTUARY, ENVIRONMENTAL QUALITY OBJECTIVES, AND ACHIEVEMENT AND MAINTENANCE OF THOSE OBJECTIVES

Beneficial uses

5. The following uses of the Estuary are declared to be beneficial uses to be protected under this policy —

(a) use of the Estuary as a resource for studying the natural environment;

(b) use of the Estuary as a habitat for diverse and abundant native flora and fauna communities;

(c) use of the Estuary to support commercial and amateur fisheries;

(d) use of the Estuary for recreation, tourism and landscape amenity;

(e) use of the Estuary as a focus for residential development.

Basis for protection of Estuary

6. (1) Nutrient enrichment of the Estuary has been caused by the clearing of native vegetation in the policy area and by land uses that result in nutrients, especially phosphorus, leaching into waterways in the policy area and then flowing into the Estuary.

(2) Nutrient enrichment in the Estuary has stimulated the excessive growth of algae, causing the degradation of the Estuary and creating a serious public nuisance.

Environmental quality objectives

7. The environmental quality objectives to be achieved and maintained in respect of the Estuary are a median load (mass) of total phosphorus flowing into the Estuary of less than 75 tonnes with —

(a) the median load (mass) of total phosphorus flowing into the Estuary from the Serpentine River being less than 21 tonnes;

(b) the median load (mass) of total phosphorus flowing into the Estuary from the Murray River being less than 16 tonnes; and

(c) the median load (mass) of total phosphorus flowing into the Estuary from the Harvey River and drains being less than 38 tonnes.

Achievement and maintenance of environmental quality objectives

8. (1) The rehabilitation and protection of the Estuary is to be effected by the achievement and maintenance of the environmental quality objectives, objectives which will prevent excessive growth of algae in the Estuary.

(2) The environmental quality objectives are to be achieved and maintained through —

(a) implementation of the Planning Policy by local authorities through their relevant town planning schemes, and by the State Planning Commission through the Metropolitan Region Scheme;

(b) appropriate land management by landholders and management authorities in the policy area;

(c) government extension services including the provision of advice to landholders in the policy area; and

(d) local authorities and the State ensuring that decisions and actions are compatible with the achievement and maintenance of the environmental quality objectives.

SCHEDULE 1

(Clause 4)

POLICY AREA

PEEL HARVEY CATCHMENT AREA

All that portion of land bounded by lines starting from the southernmost southeastern corner of Lot 1 of Wellington Location 50A as shown on Office of Titles Diagram 13001, a point on a northeastern side of the dedicated section of Korijekup Avenue, and extending northwesterly along that side and the northeastern side of the undedicated section of that road and onward to a northwestern side of Government Road; thence southwesterly along that side to the northern side of Harrison Road; thence westerly along that side to the southeastern corner of Lot 3 of Location 696 as shown on Office of Titles Plan 3500 (3); thence northerly along that boundary to the easternmost southern boundary of Location 3297; thence easterly, northerly and westerly along boundaries of that location to the easternmost southeastern corner of Uduc Agriculture Area Lot 46; thence northerly along the easternmost eastern boundary of that lot and onwards to a northern side of Fouracre Road, thence westerly along that side to an eastern side of Wellard Road; thence northerly and westerly along sides of that road to a eastern side of Babbage Road; thence northerly along that side to the prolongation easterly of the northern side of Smith Road; thence westerly to and along that side and onwards to a western side of Richardson Road; thence generally northerly along sides of that road to a southern side of Riverdale Road; thence generally westerly along sides of that road to a northeastern side of Old Coast Road; thence generally northwesterly along sides of that road to the southwestern corner of Lake Clifton Townsite; thence easterly and northerly along boundaries of that townsite to a southern side of Clifton Road; thence easterly and generally southeasterly along sides of that road to the prolongation southerly of the western boundary of the southwestern severance of Location 3168; thence northerly to and along that boundary to the southeastern corner of Lot 162 of Murray Location 793 as shown on Office of Titles Plan 15946; thence westerly along the southern boundary of that lot and the southern boundaries of Lots 163, 165, 166, 167 and westerly along the southern boundary of Lot 103 as shown on Office of Titles Plan 15944 and onwards to a northeastern side of Old Coast Road; thence generally northwesterly and generally northeasterly along sides of that road to the prolongation southeasterly of the southwestern boundary of Lot 46 of Location 723 as shown on Office of Titles Plan 14504; thence northwesterly to and along that boundary and onwards to the southern boundary of Location 721; thence westerly and generally northwesterly along boundaries of that location to the southernmost southwestern corner of the southeastern severance of A Class Reserve 12189; thence generally northwesterly, northerly, westerly, again northerly and generally northeasterly along boundaries of that severance and onwards to the prolongation southerly of the eastern boundary of the northern severance of that Reserve; thence northerly to and northerly, northwesterly, northeasterly and again northwesterly along boundaries of that severance to the southernmost southeastern corner of Location 1788 (A Class Reserve 12189); thence westerly, northeasterly and generally northwesterly along boundaries of that location and generally northwesterly, northerly and easterly along boundaries of Location 1787 (A Class Reserve 12189) and onward to the prolongation southerly of the southernmost western boundary of Location 506; thence northerly to and northerly, westerly and again northerly along boundaries of that location to the southernmost southeastern corner of Location 285; thence northerly, westerly, again northerly and easterly along boundaries of that location to the prolongation southeasterly of a southwestern side of the undedicated portion of Old Coast Road as shown on Office of Titles Plan 7823 (1); thence northwesterly to and generally northwesterly and northerly along sides of that road and generally northerly and generally

northeasterly along sides of the dedicated portion of Old Coast Road and onwards to the prolongation southwesterly of the southeastern boundary of Location 1562; thence northeasterly to and along that boundary to the southeastern corner of that location; thence southeasterly to the centreline of the Old Mandurah Bridge; thence northeasterly along that centreline and onwards to the prolongation southerly of a western side of Mandurah Terrace; thence northerly to and northerly and generally northeasterly along sides of that road to the prolongation westerly of a northern side of Gordon Road; thence easterly to and generally easterly and generally northeasterly along sides of that road to a southwestern side of Mulga Drive; thence generally northerly along sides of that Drive to the prolongation northwesterly of a southwestern side of Merrit Road; thence southeasterly to and generally easterly along sides of that road and onwards to a southeastern side of Stock Route Road; thence generally northerly along sides of that road to a southern side of Paganoni Road; thence easterly along that side to the prolongation southerly of an eastern side of Nairn Road; thence northerly to and generally northeasterly along sides of that road to a southern side of Harvey Road; thence easterly and generally northerly along sides of that road to a southern side of Stakehill Road, thence easterly and northeasterly along sides of that road to the prolongation southeasterly of the northeastern boundary of Lot 34 of Peel Estate Lots 856, 857 and 858 as shown on Office of Titles Diagram 75678; thence northwesterly to and northwesterly and generally northeasterly along boundaries of that lot to the southeastern corner of Lot 33 of Lots 855 and 856; thence northeasterly, westerly and northerly along boundaries of that lot to a southern side of Churcher Road; thence easterly along that side to the prolongation southerly of an eastern side of Foster road; thence northerly to and along that side and onwards to the southern boundary of Lot 91 of Lot 746 as shown on Office of Titles Diagram 64485; thence westerly, northerly and southeasterly along boundaries of that lot to the prolongation southwesterly of the northwestern boundary of Lot 93 as shown on Office of Titles Plan 15231; thence northeasterly to and along that boundary to a southwestern side of Wandoo Drive; thence southeasterly and easterly along sides of that drive to the prolongation southerly of the western boundary of Lot 141 of Lot 742 as shown on Office of Titles Plan 15233; thence northerly to and northerly and easterly along boundaries of that lot to the southeastern corner of Lot 143; thence northwesterly along the northeastern boundary of that lot to the southern side of Yates Court; thence easterly and generally northerly along sides of that Court to the westernmost northwestern corner of Lot 145; thence northerly to the southwestern corner of Lot 148; thence northerly along the western boundary of that lot and northerly and northeasterly along boundaries of lot 150 as shown on Office of Titles Diagram 67290 to the prolongation southerly of the eastern boundary of Lot 571; thence northerly to and along that boundary and northerly and southwesterly along boundaries of Lot 22 of Lot 643 as shown on Office of Titles plan 14716 (2) to the easternmost southeastern corner of Lot 18 of Lots 643, 653, 65 and 644; thence northerly along the eastern boundary of that lot and onwards to the southern boundary of Lot 10 of Cockburn Sound Location 16 as shown on Office of Titles. Plan 14716 (1); thence easterly and northerly along boundaries of that lot to a southwestern boundary of Lot 26; thence generally northwesterly and easterly along boundaries of that lot to the southeastern corner of Peel Estate Lot 640; thence northeasterly along the southeastern boundary of that lot and the southeastern boundaries of Lots 639, 638 and 637 to the southern boundary of Lot 325; thence easterly and northerly along boundaries of that lot to the southern boundary of Lot 323; thence easterly and generally northwesterly along boundaries of that lot and onwards to the southern corner of Lot 312; thence northeasterly, northwesterly and northerly along boundaries of that lot and onwards to the southern boundary of Lot 308; thence easterly, northerly and westerly along boundaries of that lot to the southwestern corner of Lot 296; thence northerly along the western boundary of that lot to a southern side of Kerosene Lane; thence easterly and generally northeasterly along sides of that lane to the prolongation southerly of the eastern boundary of Lot 291; thence northerly to and along that boundary to the southern boundary of Cockburn sound Location 2173; thence easterly and northerly along boundaries of that location and northerly along the eastern boundary of Location 2170 to the northeastern corner of that location; thence northwesterly to the westernmost southwestern corner of Kwinana Lot 279, a point on a southeastern side of Parmelia Avenue; thence generally northeasterly and generally northeasterly and generally northwesterly along sides of that avenue to a southeastern side of Sulphur Road; thence generally northeasterly along sides of that road and onwards to the prolongation southeasterly of a

northeastern side of McLauchlan Road; thence generally northwesterly to and along sides of that road and onwards to a northeastern side of Thomas Road; thence generally northwesterly along sides of that road to an eastern side of Postans Road; thence generally northerly along sides of that road and onwards to a northeastern side of Hope Valley Road; thence generally southeasterly along sides of that road to a northwestern side of Hill Road; thence generally northeasterly and northerly along sides of that road to the southeastern corner of Kwinana Lot 606; thence northerly along the eastern boundary of that lot to the southwestern corner of Peel Estate Lot 792; thence northerly and easterly along boundaries of that lot and onwards to a southwestern boundary of Lot 663; thence generally northwesterly and easterly along boundaries of that lot to the western boundary of Lot 681; thence northerly and easterly along boundaries of that lot and onwards to a southern side of Rowley Road; thence easterly along that side and onwards to the prolongation southerly of an eastern side of Lyon Road; thence northerly to and along that side and onwards to the northern side of Gaebler Road; thence easterly along that side to the southwestern corner of Lot 6 of Jandakot Agriculture Area Lot 415 as shown on Office of Titles Diagram 31466; thence northerly along the western boundary of that Lot and the western boundaries of Lots 5, 4, 3, 2 and 1 to the southwestern corner of Lot 7 as shown on Office of Titles Diagram 44679; thence northerly and easterly along boundaries of that lot and onwards to a northeastern side of Beenyup Road; thence generally northwesterly along sides of that road to a northern side of Gibbs Road; thence easterly along that side to the prolongation northerly of the western boundary of Lot 427; thence southerly to and along that boundary and southerly along the western boundary of Lot 27 and onwards to a southern side of Oxley Road; thence easterly along that side and onwards to the southwestern side of Road Number 1832; thence southeasterly along that side to a northern side of Road Number 8977; thence easterly along that side and onwards to the prolongation northwesterly of a northeastern side of Hopkinson Road; thence southeasterly along that side to a northern side of Rowley Road; thence generally southerly and generally southeasterly and easterly along sides of that road and onwards to the northern corner of Reserve Number 35706; thence southwesterly along a northeastern boundary of that reserve to the southwestern corner of Lot 161 of Canning Locations 401 and 146 as shown on Office of Titles Diagram 15070; thence easterly along the southern boundary of that lot and onwards to the eastern side of Pharlap Drive; thence southerly and southeasterly along sides of that drive to the northwestern corner of Lot 185; thence easterly and southeasterly along boundaries of that lot and onwards to the western corner of Lot 190 of Locations 146 and 22 as shown on Office of Titles Diagram 78121; thence generally southeasterly along boundaries of that lot and southeasterly along the southwestern boundary of Lot 191 to a northwestern corner of Lot 90 of Locations 22 and 245 as shown on Office of Titles Diagram 42273; thence northeasterly, northwesterly, again northeasterly and generally southeasterly along boundaries of that lot to the prolongation westerly of the southern side of Keenan Street; thence easterly to and along that side and onwards to the prolongation northerly of the western boundary of Lot 1 of Location 245 as shown on Office of Titles Diagram 47352; thence southerly to and generally southerly along boundaries of that lot and Lot 12 of Locations 306 and 22 as shown on Office of Titles Plan 14456 to the prolongation westerly of the northern side of Butcher Road; thence easterly to and along that side and onwards to a southeastern side of South Western Highway; thence generally southwesterly along sides of that Highway to an eastern boundary of Cockburn sound Location 16; thence southerly along that boundary to a northwestern corner of Lot 10 of Location 16 and Murray Locations 1352 and 1353 as shown on Office of Titles Plan 14695; thence southerly and westerly along boundaries of that lot and onwards to the northeastern corner of Cockburn Sound Location 461; thence southerly along the eastern boundary of that Location to the northeastern corner of the northern severance of Lot 2 of Locations 773 and 16 as shown on Office of Titles Plan 13999; thence southerly along the eastern boundary of that severance and onwards to and southerly along the southernmost eastern boundary of the southern severance of that lot to the northernmost northeastern corner of Lot 29 as shown on Office of Titles Plan 4616; thence generally southerly along boundaries of that lot to the northwestern corner of Lot A16 as shown on Office of titles Plan 740A; thence generally southerly along boundaries of that lot and onwards to a northeastern boundary of the eastern severance of Lot 151 as shown on Office of Titles Plan 10914; thence northwesterly, southwesterly, again northwesterly, southerly and easterly along boundaries of that severance to a northeastern corner of Murray Location 1; thence southerly and

westerly along boundaries of that location to the northeastern corner of Location 1173; thence southerly and westerly along boundaries of that location to the northwestern corner of Location 1207; thence southerly along the western boundary of that location and southerly along the western boundaries of Locations 54 and 976 and onwards to the northwestern corner of Location 977; thence southerly and southeasterly along boundaries of that location to the prolongation northerly of the westernmost western boundary of Location 717; thence southerly, to and along that boundary and southerly along the western boundary of Location 718 to the northernmost northeastern corner of Lot 3 of Locations 375, 1136 and 1177 as shown on Office of Titles Diagram 26469; thence southerly, easterly and southeasterly along boundaries of that lot and southerly to the northeastern corner of Lot 6 of Locations 925, 1177, 1138 and 151 as shown on Office of Titles Diagram 35248; thence generally southwesterly, westerly, again generally southwesterly and southeasterly along boundaries of that lot and onwards to the prolongation westerly of the northern boundary of Lot 1 of Location 311 as shown on Office of Titles Diagram 13105; thence easterly to and easterly, southeasterly and southwesterly along boundaries of that lot to a northeastern side of Burnside Road; thence generally southeasterly and southwesterly along sides of that road and onwards to a prolongation southeasterly of a southwestern side of Maddison Road; thence northwesterly to and northwesterly and westerly along sides of that road to the northwestern corner of Location 310; thence southerly along the western boundary of that location and the western boundary of Location 532 to the northern boundary of Location 308; thence easterly and southerly along boundaries of that location and onwards to the northern boundary of Location 131; thence westerly along that boundary and westerly and southerly along boundaries of Location 219 to the northwestern corner of Location 220; thence southerly along the western boundary of that location and onwards to the easternmost northern boundary of Lot 2 of Location 9 as shown on Office of Titles Plan 6022; thence easterly, and generally southwesterly along boundaries of that lot to the northeastern corner of Lot 4 as shown on Office of Titles Diagram 14119; thence southerly along the eastern boundary of that lot and generally southerly along sides of Bowles Road and onwards to the northern boundary of Location 255; thence westerly, southerly and easterly along boundaries of that location to the northeastern corner of Location 652; thence southerly along the eastern boundary of that location to the northern boundary of Location 203; thence easterly, southerly and westerly along boundaries of that location to the westernmost northwestern corner of Location 513; thence southerly along the westernmost western boundary of that location and southerly and easterly along boundaries of Location 265 to the northwestern corner of the western severance of Location 482; thence southerly and easterly along boundaries of that severance to the northeastern corner of Lot 4 of Location 180 as shown on Office of Titles Plan 15400; thence southerly along the eastern boundary of that lot and onwards to and southerly and westerly along boundaries of Lot 5 to the northwestern corner of Location 458; thence southerly along the western boundaries of that location and Location 195 to the northeastern corner of Location 184; thence easterly and southerly along boundaries of that location to its southwestern corner, a point on a southern side of Lyons Road; thence westerly along that side and onwards to and westerly along a southern side of Weir Road to the northeastern corner of Lot 12 of Location 26 as shown on Office of Titles Diagram 72050; thence southwesterly and northwesterly along boundaries of that lot and northwesterly and westerly along boundaries of Lot 9 as shown on Office of Titles Diagram 55788 to the southernmost southeastern corner of Location 1816; thence easterly along the southern boundary of Lot 8 of Location 26 to a northeastern side of 'South Western Highway; thence generally southerly along sides of that Highway to a northeastern side of Waterous Road; thence generally southeasterly along sides of that road to the prolongation easterly of the northern boundary of the southwestern severance of Location 484; thence westerly to and westerly southerly and southeasterly along boundaries of that location to the prolongation northerly of the eastern boundary of Location 916; thence southerly to and along that boundary and, southerly along the western boundary of Wellington Location 354 to the westernmost northeastern corner of the northern severance of Location 366; thence westerly and southerly along boundaries of that severance and onwards to the northwestern corner of the southern severance of that location; thence southerly and easterly along boundaries of that severance to the westernmost northwestern corner of Murray Location 247; thence southerly along the westernmost western boundary of that location to the northern boundary of Location 868; thence westerly and southerly along

boundaries of that location and southerly and easterly along boundaries of Location 1160 to the prolongation northerly of the eastern boundary of Wellington Location 4238; thence southerly to and along that boundary to the northernmost northwestern corner of Location 4201; thence southerly, westerly and again southerly along boundaries of that location to the northern corner of the northern severance of Location 5156; thence southwesterly, southerly, southeasterly and again southerly along boundaries of that severance to the southernmost northwestern corner of the northwestern severance of Location 2281; thence southerly along the southernmost western boundary of that severance and onwards to and along the westernmost western boundary of the southern severance of that location to the northern boundary of Location 2682; thence westerly, southerly and easterly along boundaries of that location to the northeastern corner of Location 1253; thence southerly along the eastern boundary of that location to the northern boundary of Location 804; thence westerly and southerly along boundaries of that location and onwards to the northern boundary of Location 816; thence westerly, southerly and easterly along boundaries of that location to a western boundary of Location 688; thence southerly along that boundary to a northern side of Black Rock Road, thence generally southwesterly along sides of that road to a northeastern side of South Western Highway; thence generally southerly along sides of that highway to the prolongation easterly of the southern boundary of Lot 11 of Location 50A as shown on Office of Titles Diagram 53874; thence westerly to and generally southerly, southeasterly, southwesterly and northwesterly along boundaries of that lot to the northwestern corner of Lot 7 as shown on Office of Titles Plan 9197; thence southwesterly along the northwestern boundary of that lot to the prolongation easterly of the southern boundary of Lot 5 as shown on Office of Titles Diagram 12515 and thence westerly, northeasterly, generally northwesterly, southwesterly and northwesterly along boundaries of that lot and onwards to the starting point.

JIM McGINTY, Minister for the Environment.

HEALTH

HE401

HEALTH ACT 1911

Health Department of WA,
Perth, 8 December 1992.

8603/92.

The appointment of Mr David Coultas as an Environmental Health Officer to the City of Kalgoorlie-Boulder effective for the period 10 December 1992 to 24 December 1992 is approved.

BRIAN DEVINE, delegate of
Executive Director, Public Health.

LAND ADMINISTRATION

LA101

CORRIGENDUM

CITY OF GOSNELLS

(Road Dedication)

Department of Land Administration,
Perth, 9 December 1992.

File Ref: 2074/1986.

On page 2733 of the *Government Gazette* dated 26 June 1992 after the subheading Road No. 18429 (Sevington Street) read—

"Office of Titles Diagram 46116"

in lieu of—

"Office of Titles Diagram 46166"

A. A. SKINNER, Chief Executive,
Department of Land Adminstration.

APPENDIX 4

Statement of Planning Policy No 2 - the Peel - Harvey Coastal Plain Catchment

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TOWN PLANNING AND DEVELOPMENT ACT 1928

STATEMENT OF PLANNING POLICY No. 2

THE PEEL-HARVEY COASTAL PLAIN CATCHMENT

05730/2/92—1750

TOWN PLANNING AND DEVELOPMENT ACT 1928

STATEMENT OF PLANNING POLICY NO. 2

THE PEEL - HARVEY COASTAL PLAIN CATCHMENT

PREPARED UNDER SECTION 5AA WITH THE APPROVAL OF THE MINISTER FOR PLANNING BY THE DEPARTMENT OF PLANNING AND URBAN DEVELOPMENT AND APPROVED BY HIS EXCELLENCY THE GOVERNOR

BACKGROUND

1. The Peel-Harvey Estuarine System is an important regional resource of Western Australia. It has been placed on the Register of the National Estate. The Estuary is surrounded by a substantial population and investment in homes, tourist development, agriculture and infrastructure. The Estuary currently receives 70% -100% more phosphorus per year from the Peel-Harvey Coastal Plain Catchment than it can assimilate resulting in excessive seasonal growth of algae which degrades the estuarine system and creates a serious public nuisance. Clearing of vegetation in the catchment exacerbates the problem by resulting in a rise in the water table and increasing run-off, which requires artificial drainage. The replacement of native vegetation with land uses which result in increased nutrient application is a major contribution to increased nutrient pollution of the estuary. These developments have increased the surface drainage and nutrient loads into the Estuary.

2. In 1981, the State Government of the day resolved that:

   'Measures be taken to ensure that there is no significant increase of nutrients into the estuary from urban sources by requiring that all developments within 2 km are to include appropriate sewage disposal systems.'

3. Intensive studies undertaken over past years have attempted to find ways of improving the environmental quality of the estuary. Specifically a two stage Environmental Review and Management Programme and associated EPA Assessment Reports have resulted in a strategy to improve the condition of the estuary. This strategy includes the construction of the Dawesville Channel to improve flushing, and active catchment management to reduce nutrients entering the estuary. The strategy has been endorsed by Government and funding for its implementation has been committed.

4. In January 1989 a general moratorium on clearing and drainage proposed in the Stage 2 ERMP was set as a Ministerial Condition. These controls are to continue until the Minister for Environment is satisfied that these activities are be environmentally acceptable. In addition new potentially nutrient discharging industries are tightly regulated within the Catchment. These controls have had the effect of requiring the proponents of the ERMP (the Ministers for Transport, Agriculture and Waterways) to exercise control on clearing and drainage. Some flexibility has been permitted in the interpretation of these controls provided projects are designed to significantly reduce nutrient flows to the estuary.

5. Planning controls have not existed in the past over new market gardens which are likely to pollute ground and surface waters with fertilisers. No planning approval has been required to change from broad scale rural use to market gardening. The absence of this control led to the assumption that although Water Authority well licences are required such development could automatically take place. The EPA has the power to formally assess proposals for new market gardens under Part IV of the Environmental Protection Act when they are likely to cause significant pollution. This is an unsatisfactory way to achieve the environmentally sound location of such small proposals.

6. In October 1990 the Government resolved that a Statement of Planning Policy under Section 5AA of the Town Planning and Development Act 1928(as amended) be prepared to draw attention to the unacceptability of uses of specified types which are likely to result in pollution of surface or ground waters.

7. This policy statement should be read in conjunction with the following;-

- Policy No. DC 2.5 Special Residential Zones.
- Policy No. DC 2.8 Town Planning Considerations in the Provision of Effluent Disposal.
- Policy No. DC 3.4 Rural Land Use Planning Policy
- Policy No. DC 6.3 Planning Considerations in the Metropolitan Region for sources of Public Water Supply and Sensitive Water Resource Areas.
- Guidelines for the Preparation of a Local Rural Strategy.
- Guidelines for Protecting Watercourse Reserves, Planning Bulletin 1/90.
- The draft Peel Regional Plan.
- The Catchment Management Plan for the Peel-Harvey Coastal Plain Catchment.
- The Draft Environmental Protection Policy (Peel-Harvey Estuarine System) 1992.

The policy replaces Town Planning Board policy P.12, Subdivision in the vicinity of the Peel-Harvey Estuarine System.

STATEMENT OF PLANNING POLICY
THE PEEL-HARVEY COASTAL PLAIN CATCHMENT.

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1. INTRODUCTION

1.1 This policy is required to recognise the requirements of the Minister for the Environment in consultation with the Minister for Planning, and to ensure that land use changes within the Peel-Harvey Estuarine System likely to cause environmental damage to the estuary are brought under planning control and prevented. A major purpose of the policy is to ensure that landowners seek development approval prior to committing their investments, however it is not the purpose of the policy to require a new series of approvals for existing developments.

1.2 The policy will be implemented by reference to it in the Draft Environmental Protection Policy (Peel-Harvey Estuarine System) 1992 and town planning schemes (in accordance with a model text amendment appended to the policy), and by its adoption by the State Planning Commission. It will also ensure that significant public investment being committed to the improvement of the environment via the Dawesville Channel is not jeopardised and that the area is carefully managed for sustainable agriculture. This policy provides guidance regarding planning requirements that will be expected to be in place before development can proceed.

2. POLICY OBJECTIVES

The objectives of this policy are:-

- To improve the social, economic, ecological, aesthetic, and recreational potential of the Peel-Harvey Coastal Plain Catchment.
- To ensure that changes to land use within the Catchment to the Peel-Harvey Estuarine system are controlled so as to avoid and minimise environmental damage.
- To balance environmental protection with the economic viability of the primary sector.
- To increase high water-using vegetation cover within the Peel-Harvey Coastal Plain Catchment.
- To reflect the environmental objectives in the Draft Environmental Protection Policy (Peel-Harvey Estuarine System) 1992.
- To prevent land uses likely to result in excessive nutrient export into the drainage system.

3. APPLICATION OF POLICY

This Policy applies to all residential, commercial, industrial, rural and recreation land uses, and public sector undertakings within that portion of the Catchment of the Peel-Harvey Estuarine System that lies on the Swan Coastal Plain of Western Australia and as defined generally on the attached plan (Figure 1), and specifically on Figure 2 'Boundary of the Peel-Harvey Coastal Plain Catchment'.

4. DEFINITIONS

Intensive agriculture

means the use of land for the purposes of trade, commercial reward or gain, including such, buildings and earthworks normally associated with the following:

- the production of grapes, vegetables, flowers, exotic and native plants, fruit and nuts;
- the establishment and operation of plant and fruit nurseries;
- the development of land for irrigated fodder production and irrigated pasture (including turf farms);
- the development of land for the keeping, rearing or fattening of pigs, poultry (for either egg or meat production), rabbits (for either meat, or fur production), and other livestock in feedlots;
- dairy milking sheds;
- the development of land for the keeping, rearing or fattening of other livestock above those stocking rates recommended by the Department of Agriculture in consultation with surrounding farmers for the applicable pasture type;
- aquaculture,

Aquaculture

means any fish farming operation for which a fish farm licence issued pursuant of the provisions of Part V of the Fisheries Act 1905 (as amended) and the Fisheries Regulations 1938 (as amended) is required.

5. GENERAL POLICY PROVISIONS

Development, including both material changes in land use and the construction of buildings, in the policy area should relate to land capability and suitability and specific management practices (such as effluent treatment, red mud amendment, revegetation, and stocking rates). Moreover some of the policy provisions are likely to be conservative and modifications are likely as knowledge improves and new technology becomes available.

5.1 Except in accordance with this policy, land shall not be rezoned for urban purposes (which includes special residential but not rural residential or special rural) unless certification is received from the Water Authority that arrangements have been made so that connection to an adequate sewerage service, or alternative system satisfactory to the EPA and Health Department, will be available to all lots in the subdivision.

5.2 Proponents shall ensure that proposed changes to land zonings take account of land capability/suitability criteria with regard to the net effect that such changes are likely to have on the nutrient load discharging from that catchment into the Peel-Harvey Estuarine System.

5.3 Land used for intensive agriculture, which is likely to drain towards the Peel-Harvey Estuarine System shall be managed to reduce or eliminate nutrient export from than land.

5.4 The retention and rehabilitation of existing remnant vegetation is to be encouraged. A catchment target of 50% of land area established to deep rooted perennial plants, preferably local indigenous species but including high water using and suitable exotic species, shall be attempted. Remnant vegetation shall be retained along water courses, or the margins shall be replanted to higher water-using vegetation, to maintain the stability of banks and exert some control on sediment and nutrient movement.

5.5 Subdivision proposals shall make provision for a drainage system which maximises the consumption and retention of drainage on site. Biological wetland filters, or other means of drainage water retention or treatment approved by the EPA, will need to be incorporated into the drainage design possibly by amendment of the soils in drainage basins or by the provision of wetland filters with nutrient retentive soil amendments in accordance with drainage management to the satisfaction of the State Planning Commission and the EPA. Conservation reserves are not appropriate as biological wetland filters. Development near conservation reserves may require special constraints to protect and preserve them.

5.6 Open space recreation areas should be carefully designed to retain native vegetation and water, and plant with water using vegetation to minimise the need to apply fertiliser and water. The treatment of open space soils with nutrient retentive soil amendment should be undertaken where phosphorus retention is low and the necessity for this soil amendment should be identified in nutrient management plans prepared by developers. Drainage should be designed to retain nutrients on site in most years; direct drainage off-site will not be permitted unless to the satisfaction of local government.

5.7 The Commission may consider, upon the advice of the Water Authority, the Health Department and the EPA, small-scale subdivisional developments with alternative wastewater treatment and effluent disposal systems for evaluative purposes. The onus of proof will rest with the subdivider to provide sufficient technical and engineering evidence that alternative systems or site modifications remove any adverse effects on public health, water resources or the environment while not detrimentally impacting on the character of the area.

5.8 Local Government is responsible for the supervision and management of alternative effluent systems, particularly Aerated Treatment Units (ATUs).

5.9 Approvals will be required from the Water Authority with regard to water supply from bores, wells, rivers in proclaimed water management areas and WAWA drains and for connection of private and local authority drains to WAWA drains. The limited availability of water may constrain some types of development.

6. SPECIFIC POLICY PROVISIONS

6.1 Residential and Special Residential zones with lot size up to 4000m^2 and tourist development.

6.1.1 All lots created in the Policy area for residential and tourist use are to be connected to a reticulated sewerage system unless exempted under the provisions of 5.7.

6.1.2 Existing vegetation should be retained except where there are defined building envelopes, approved utility requirements and firebreaks. Replanting should be encouraged - particularly along water courses and drains. Where lots do not have building envelopes, existing vegetation may be removed for the construction of approved buildings.

6.1.3 The keeping of horses, sheep, goats and other grazing animals shall be subject to the prior approval of the Council. Animal stocking rates shall not exceed those recommended by the Department of Agriculture for the pasture type for the policy area.

6.2. Rural residential lots over 4000m^2

6.2.1 Lots that are created in this category should only use conventional on-site effluent disposal if:

a) factors such as slope, soil type, permeability, vegetation cover and system design have been addressed. (The onus of proof rests with the subdivider to justify that on-site disposal and/or any associated site modifications would be acceptable to remove any adverse effects on public health, water resources or the environment while not detrimentally impacting on the character of the area),
b) environmental acceptability can be demonstrated to the EPA,
c) at least a 2m vertical separation exists between the base of the leach drain and the highest known groundwater level or bedrock,
d) there is at least 100m horizontal separation between the disposal system and the nearest water body, and
e) the land unit is satisfactory for on-site disposal at a density of not more than one domestic system per hectare.

6.2.2 Development within public groundwater resource areas utilising on-site effluent disposal will require approval from the Water Authority of Western Australia. Disposal systems require Health Department approval.

6.2.3 Because of potential nitrate contamination of the groundwater, on-site effluent disposal will be limited to densities of no more than one effluent disposal system per 1 hectare unless specific investigation of the capacity of the local environment to absorb the effluent is undertaken and subject to alternative systems as set out in Clause 5.7.

6.2.4 Existing vegetation should be retained except where there are defined building envelopes, approved utility requirements and firebreaks. Where lots do not have defined building envelopes existing vegetation may be removed from an area of up to 1000m2 for the construction of approved buildings except where special approval is granted for a greater area of clearing.

6.2.5 The keeping of horses, sheep, goats and other grazing animals shall be subject to the prior approval of the Council. Animal stocking rates shall not exceed the stocking rates recommended by the Department of Agriculture for the pasture type for the policy area.

6.3 Recreational facilities (including golf courses, ovals and large grassed areas).

6.3.1 Local government authorities and landowners shall develop, in association with appropriate government departments, nutrient management plans which identify appropriate irrigation, fertilisation regimes and vegetation patterns.

6.4 Commercial development

6.4.1 New development must incorporate effluent management systems approved by the Health Department, the EPA and the Water Authority of Western Australia, or connect to an existing reticulated sewerage system if available.

6.5 Industrial development

6.5.1 Proposals to develop land for industry, where the industrial process would create liquid effluent, must include provision for connection to a reticulated sewerage system.

6.5.2 Works approvals and licences will be required from the EPA where the proposal has a wastewater discharge or falls within the list of scheduled premises under Part V of the Environmental Protection Act. Some types of industrial development may require an impact assessment under Part IV of the Environmental Protection Act.

6.6 Intensive agriculture

6.6.1 Proposals to develop land for intensive agriculture will require formal development approval from the local government authority.

6.6.2 In considering applications for the use of land or a rezoning for intensive agriculture, a local authority shall take account of the environmental advice of the EPA and land suitability advice from the Department of Agriculture.

6.6.3 The responsible authority will take account of soil types, slope and groundwater flows and surface water drainage and proximity to the Estuary in considering the suitability of land for intensive agricultural use. Generally only land on the foothills of the Darling Scarp or deep yellow Spearwood soils on the Western edge of the catchment have suitable qualities to sustain intensive agriculture apart from such uses which rely on hydroponics and thereby do not result in contamination of groundwater or surface drainage, or include red mud, or other suitable soil amendment, at rates recommended by the Department of Agriculture.

6.6.4 Proposals which would provide additional direct drainage to the Estuary, its tributaries or Water Authority drainage systems will not be permitted without appropriate nutrient reduction measures.

6.6.5 Works approvals and licences will be required from the EPA where the proposal has a wastewater discharge or falls within the list of scheduled premises under Part V of the Environmental Protection Act. Some intensive agricultural proposals may require environmental impact assessment under Part IV of the Environmental Protection Act.

7. IMPLEMENTATION THROUGH TOWN PLANNING SCHEMES

7.1 It is the Policy of the State Planning Commission that all town planning schemes operating within the Peel-Harvey Coastal Plain Catchment shall require development to be subject to the provisions of this Policy.

7.2 Town planning schemes should be amended to add 'Intensive Agriculture' and 'aquaculture' to the list of interpretations, or the definition should be amended to incorporate the expanded interpretation. This may require the amendment of existing interpretations to exclude the activities now defined within intensive agriculture. The use class table should be amended to include 'Intensive agriculture', cross-referenced with an 'AA' or 'X' in all Rural zones.

7.3 Town planning schemes are to incorporate the salient provisions of this policy by using the model scheme text provisions set out in Appendix 1 and by the delineation of the Catchment boundaries on the scheme map.

APPENDIX 1

A town planning scheme shall refer to this policy in the following manner:

'THE PEEL-HARVEY COASTAL PLAIN CATCHMENT'

1.1 FOR THE PURPOSES OF THIS SCHEME THE PEEL-HARVEY COASTAL PLAIN CATCHMENT MEANS THE PEEL HARVEY COASTAL PLAIN CATCHMENT AS SET OUT IN STATE PLANNING COMMISSION STATEMENT OF PLANNING POLICY NO. 2, TOGETHER WITH ANY AMENDMENTS THERETO.

1.2 COUNCIL SHALL BE GUIDED BY THE OBJECTIVES AND POLICY STATEMENTS CONTAINED IN THE DRAFT ENVIRONMENTAL PROTECTION POLICY (PEEL-HARVEY ESTUARINE SYSTEM) 1992 AND THE PEEL-HARVEY COASTAL PLAIN CATCHMENT STATEMENT OF PLANNING POLICY, AS AMENDED, A COPY OF WHICH SHALL BE KEPT AND MADE AVAILABLE FOR PUBLIC INSPECTION AT THE OFFICES OF THE COUNCIL.

1.3 FOR THE PURPOSES OF THE DEFINITION OF DEVELOPMENT UNDER THE ACT 'INTENSIVE AGRICULTURE' SHALL BE DEEMED TO BE A MATERIAL CHANGE OF USE REQUIRING APPROVAL OF THE COUNCIL.

1.4 NOTWITHSTANDING ANY OTHER INTERPRETATION CONTAINED WITHIN THE SCHEME, INTENSIVE AGRICULTURE MEANS THE USE OF LAND FOR THE PURPOSES OF TRADE, COMMERCIAL REWARD OR GAIN, INCLUDING SUCH BUILDINGS AND EARTHWORKS, NORMALLY ASSOCIATED WITH THE FOLLOWING:

- THE PRODUCTION OF GRAPES, VEGETABLES, FLOWERS, EXOTIC AND NATIVE PLANTS, FRUIT AND NUTS;
- THE ESTABLISHMENT AND OPERATION OF PLANT AND FRUIT NURSERIES;
- THE DEVELOPMENT OF LAND FOR IRRIGATED FODDER PRODUCTION AND IRRIGATED PASTURE (INCLUDING TURF FARMS);
- THE DEVELOPMENT OF LAND FOR THE KEEPING, REARING OR FATTENING OF PIGS, POULTRY (FOR EITHER EGG OR MEAT PRODUCTION), RABBITS (FOR EITHER MEAT, OR FUR PRODUCTION), AND OTHER LIVESTOCK IN FEEDLOTS;
- DAIRY MILKING SHEDS;
- THE DEVELOPMENT OF LAND FOR THE KEEPING, REARING OR FATTENING OF OTHER LIVESTOCK ABOVE THOSE STOCKING RATES RECOMMENDED BY THE DEPARTMENT OF AGRICULTURE FOR THE APPLICABLE PASTURE TYPE IN CONSULTATION WITH SURROUNDING FARMERS;
- AQUACULTURE,

  AQUACULTURE MEANS ANY FISH FARMING OPERATION FOR WHICH A FISH FARM LICENCE ISSUED PURSUANT OF THE PROVISIONS OF PART V OF THE FISHERIES ACT 1905 (AS AMENDED) AND THE FISHERIES REGULATIONS 1938 (AS AMENDED) IS REQUIRED.

1.5 IN CONSIDERING A PROPOSAL TO DEVELOP LAND FOR INTENSIVE AGRICULTURE THE COUNCIL SHALL:

i. TAKE ACCOUNT OF SOIL TYPES, SLOPE AND GROUNDWATER FLOWS AND SURFACE WATER DRAINAGE AND PROXIMITY TO THE ESTUARY,
ii. TAKE ACCOUNT OF THE OBJECTIVES OF THE PEEL-HARVEY COASTAL PLAIN CATCHMENT STATEMENT OF PLANNING POLICY, AS AMENDED WITH RESPECT TO THE POTENTIAL IMPACT OF THE PROPOSAL ON THE ENVIRONMENT AND WATER QUALITY.
iii. SEEK ADVICE FROM THE DEPARTMENT OF AGRICULTURE AND ENVIRONMENTAL PROTECTION AUTHORITY AND TAKE ACCOUNT OF THAT ADVICE IN MAKING ITS DETERMINATION OR DEFER THE DECISION PENDING A FORMAL ASSESSMENT UNDER PART IV OF THE ENVIRONMENTAL PROTECTION ACT."

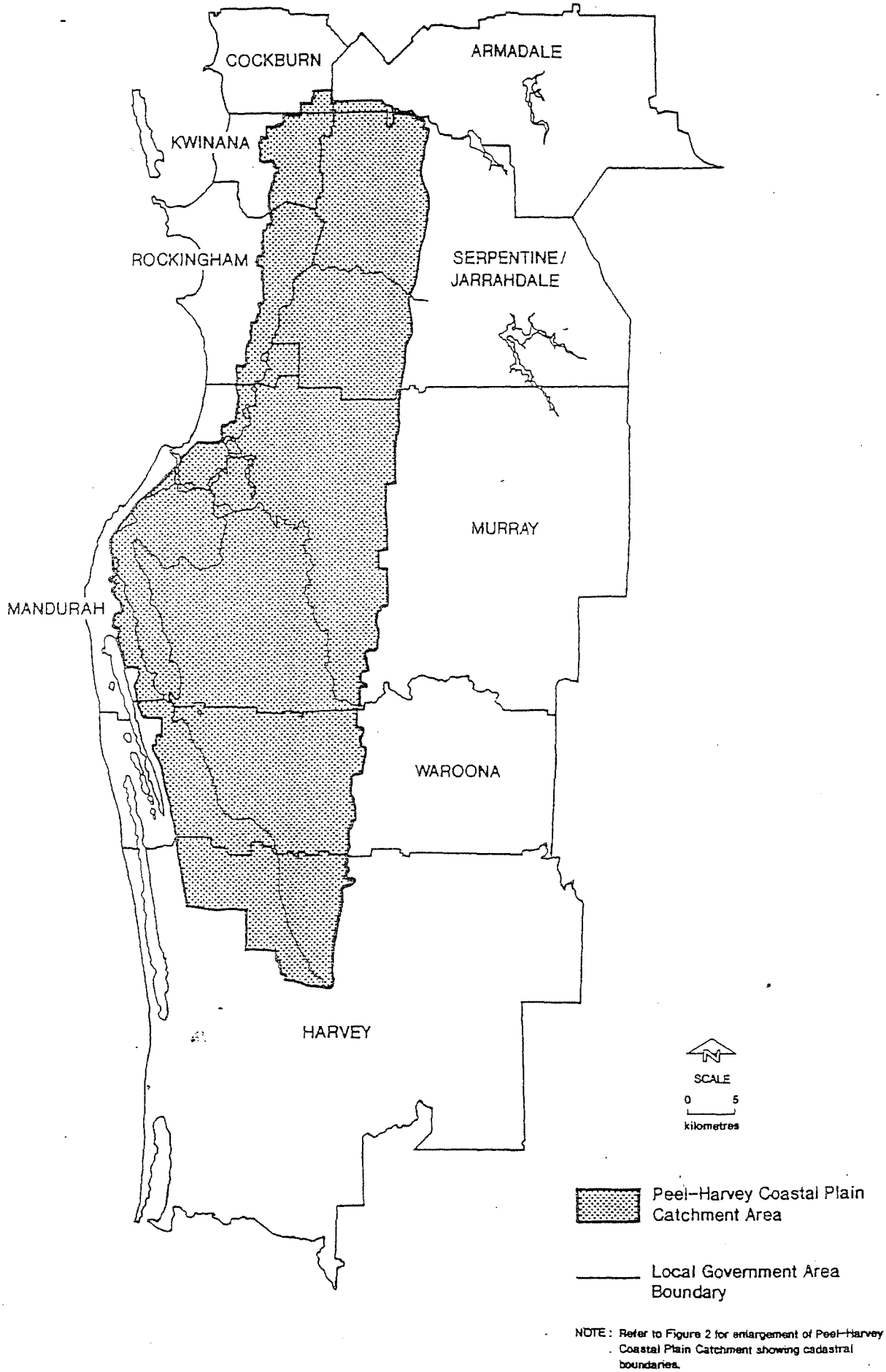


Figure 1 BOUNDARY OF THE PEEL-HARVEY COASTAL PLAIN CATCHMENT

APPENDIX 5

Summary of points raised in 1999 public review of draft EPP

1. **Shire of Serpentine-Jarrahdale**

a) s8(2)a of the EPP is being implemented by the Shire of Serpentine-Jarrahdale through use of Planning Guidelines for Nutrient Management which are given effect through the Town Planning Scheme. The Guidelines cover:

- stormwater management;
- effluent disposal;
- revegetation;
- protection of vegetation.

b) The review of the EPP did not provide any quantitative data on nutrient changes.

c) The focus of the EPP was control of phosphorus but it should now be re-focused on Best Management Practices and not just total Phosphorus loads. BMP's should be developed at the local level.

d) State Government is ill-equipped to regulate existing and new agribusinesses.

e) The local LCDC, Department of Agriculture and Water and Rivers Commission are developing and implementing a Catchment Management Plan for the Shire. (The CMP sets targets and actions which identify who will do what and by when).

f) The emphasis of management was nutrients in the estuary but nutrients into the ocean should also be of concern.

2. **Minister for Transport**

a) The EPP should be retained unchanged until the review of the PCR is complete, then the EPP should be reviewed in detail.

3. **Waterbird Conservation Group Inc**

a) the scope of the EPP is inadequate. It should be on delivering an acceptable environmental outcome for the region and is not doing so. It needs strengthening and broadening to have a healthy, sustainable estuary.

b) Notes that there will be a further review after the EPA reports on the PCR. Want full public input at that time.

c) Want all remnant vegetation within the policy area protected.

d) They are interested in any monitoring of waterbird usage pre- and post Dawesville Channel.

e) The EQO's need expansion and must include the following:

- P concentration
- N concentration

- condition and extent of remnant vegetation
- condition and extent of saltmarsh
- Dissolved organic carbons
- total dissolved solids

f) Foreshore buffers - ongoing reduction in these in condemned.

g) Government should provide sufficient resources for monitoring, policing and investigation so that the EPP is not taken as a token document.

4. Dr Christine Sharp MLC

a) Agrees that the most appropriate time for the review of the EPP is following the EPA's report on the progress and compliance review.

b) Questions the "use of the estuary as a focus for residential development" as being a beneficial use. Section 5(e) of the EPP relating to this should be completely removed.

c) There should be no further canal development within the estuary and its catchment area.

d) An estuary buffer zone of at least 100m should be implemented.

e) The "uses" in section 5 of the EPP should be listed in order of importance, to read as follows:

5(a) use of the estuary as a habitat for diverse and abundant native flora and fauna communities; (previously s5(b))

5(b) use of the estuary as a resource for studying the natural environment; (previously s5(a))

5(c) use of the estuary for recreation, tourism and landscape amenity; (previously s5(d))

5(d) use of the estuary to support commercial and amateur fisheries; (previously s5(c)).

The previous s5(e) relating to residential use should be deleted.

5. Conservation Council of WA

a) Strong support for the EPP to protect the conservation values of the Peel-Harvey. The review of the EPP is a good opportunity to review the effectiveness of the EPP.

b) Conservation Council would like a copy of the procedure developed for reviewing effectiveness of EPP's.

c) The EPP should identify more specifically the conservation values of the EPP policy area. Protection should be a purpose.

d) The residential beneficial use is not compatible with the other four uses.

e) The EQO's for P should not be just as loads but as concentrations as well.

f) The EQO's need to address a wide range of water quality factors, biodiversity and habitat protection and retention and should include targets and criteria for nitrogen concentration, dissolved organic carbons, total dissolved solids and native vegetation.

g) There should be no further clearing or loss of fringing vegetation.

h) A protective foreshore buffer is needed.

i) The EPP policy area should be expanded to include above the Darling Scarp.

j) The EPP should be reviewed within the context of the Peel Region Scheme review (or vice versa) in terms of setting the objectives for the Pee-Harvey EPP.

k) There should be no net increase in P and N exports into any of the 3 rivers or the estuary from any development.

6. Urban Bushland Council of WA Inc

a) There is conflict in the stated beneficial uses as residential development is not compatible with the others.

b) The EPP needs broader EQO's to cover all the environmental values and not just the Phosphorus.

c) The EPP should include tight restrictions on clearing of vegetation in the Peel-Harvey catchment.

7. Town of Kwinana

a) Supports the aims of the EPP.

b) The EPP should be developed further to achieve the EQO's advocated.

c) Measures to attain the EQO's should be defined in the EPP and there should be consistent application across the catchment regardless of local government boundaries.

d) The EPP should include a statutory basis for implementation of nutrient retention systems across all Councils in the area. (Serpentine-Jarrahdale and Kwinana already require Nutrient Retentive Effluent Disposal Systems for all developments in the area).

e) Endorses the specific P loads as in the EPP EQO's but these should be monitored within the catchment and estuary, especially in the Peel main Drain.

f) The current management of the Peel Main Drain by the Water Corporation precludes "streamlining".

g) The moratorium on clearing has had limited success. It should be altered to achieve the objective of reversing clearing and retaining native vegetation, including requirements for rehabilitation plantings (as per the list in EPP s8).

h) Peel-Harvey catchment management should be carried out in conjunction with the adjoining local government authorities, eg Cockburn.

8. WA Wildflower Society

a) Disappointed that there is not a proper review occurring.

b) A major concern is clearing in the catchment area.

c) There should be no further loss of remnant vegetation including estuary fringing vegetation. Vegetation should be included in the EQO's.

d) The EPP should identify conservation values for the whole catchment area.

9. Peel Preservation Group

a) Expresses concern over the death of fringing vegetation and lack of foreshore reserve.

b) The EPP policy area should be extended inland to at least Narrogin.

c) Nitrogen should be included as well as phosphorus.

d) There should be a moratorium on all nutrient producing industries in the area.

e) High water mark should be revised and foreshore reserves/buffers recalculated to take account of the changed tidal range. They should be a minimum of at least 50 - 100 metres.

f) There should be protection of all the Peel-Harvey wetlands.

g) The prediction of population increase in the area should be reduced and the numbers of people living in the area reduced,

h) Residential use should be removed from the list of beneficial uses.

10. Melville Conservation Group

a) Overdevelopment of population and residential development are producing an adverse impact on the environment. Population in the area needs to be stabilised.

b) Additional foreshore areas to provide a protective buffer are needed.

c) There should be no further loss of fringing or remnant vegetation throughout the catchment area.

d) The EPP should protect all conservation values and identify measures for doing so.

e) The Environmental Quality Objectives need broadening to include phosphorus and nitrogen concentrations, dissolved organic carbons, and total dissolved solids, retention of remnant vegetation (especially fringing vegetation) vegetation condition and related habitat quality.

11. Private individual (1)

a) It is reasonable to believe that acid sulphate soils (ASS) may be a problem in the Peel-Harvey area and it would be useful to assess the extent and effects of ASS within the Policy area as a first step for better ASS management in the area.

12. Private individual (2)

a) The Dawesville Cut appears to have been an unqualified success and the EPP is to be applauded.

b) Beneficial use 5(e) "use of the estuary as a focus for residential development" appears to be in conflict with other environmental beneficial uses.

c) Clearing of large tracts of bushland (for any purpose) would not be beneficial for the area.

d) The policy area appears to include Lake Clifton which contains stromatolites - no development which allows soil disturbance, fertiliser or run-off from housing should be allowed within this section of the catchment.

e) The Creery Wetlands are registered in the Ramsar Agreement and are a staging post for migratory birds. Large tracts of native bushland should be retained as their buffer zone with no residential or commercial development allowed within that zone.

12. Health Department of WA

a) The EPP review should reconfirm whether the validity of environmental assumptions about nutrient impact from on-site wastewater disposal systems is real or in need of reconsideration.

b) Implementation using a planning policy is ineffective unless local government adopts the planning protocol. Implementation of the EPP requires consideration of reimbursement to local government and other organisations to encourage compliance with the environmental quality objectives.

13. Lake Mealup Preservation Society (Inc)

a) which conflicts with at least three of the other beneficial uses identified. It is not necessary or appropriate for an EPP to define such development or imply that it is desirable.

b) The overall environmental quality objective for the Peel-Harvey Estuary should be "to rehabilitate the Estuary and protect the Estuary from further degradation". The single objective of phosphorus management is not adequate to achieve this overall objective.

c) Each protected beneficial use requires quantitative environmental quality objectives to monitor and/or control, especially the prime value of the Estuary for native flora and fauna (measures of abundance and diversity), fringing vegetation (quantity and quality).

d) Retention of fringing vegetation and bushland around the estuary should be seen as ends in themselves not just for improving nutrient inputs.

e) With the Dawesville Cut, emphasis on phosphorus control alone to prevent eutrophication is no longer appropriate. A quantitative target for nitrogen should be set, also concentration levels for phosphorus and nitrogen, not just loads.

f) Inappropriate to only consider nutrient inputs from the 3 rivers. Residential and other urban activities must be prevented from contributing high levels of nutrient pollution to the Estuary (eg stormwater run-off, control of use of garden fertilisers, deep sewerage infill programs). Conditions should be put on to prevent any net increase of P or N (as was the case with the Point Grey development).

g) The EQO's need to be supported by an adequately resourced monitoring and compliance program.

14. Naragebup Rockingham Regional Environment Centre (Inc)

a) The EPA objective of "protect the environment and prevent, control and abate pollution" is a more appropriate policy than that in the EPP.

b) Current fringing vegetation should be retained and protected for its intrinsic value.

c) The EPP should point towards rehabilitation, restoration and protection of the Estuary, surrounding flora and fauna habitat and sustainable health of water and land-based life.

d) Existing developments are threatening the delicate ecosystems - migratory bird species. Increased residential areas would escalate nutrient pollution far beyond historical pollution via the rivers with nitrogen loadings being a significant concern.

15. Department of Minerals and Energy

No substantive comment.

16. Goodale Sanctuary Pty Ltd

a) "use of the estuary as a focus for residential development" (s5(e)) is not compatible with environmental protection.

b) Inherent dangers from nutrient increases from residential development are potentially astronomical.

c) Too early to know what the Dawesville Cut has done, particularly in regard to migratory bird behaviour, although changes are already being observed.

d) Use 5(b) "use of the estuary as a habitat for diverse and abundant native flora and fauna communities" has been and will be the world renowned benefit of the Peel-Harvey Estuary System. Use 5(e) would ensure loss of these objectives.

e) Total water quality protection is needed. Managing phosphorus in isolation does little to protect the estuaries.

17. Nyungah Circle of Elders

a) The policy should include and mention the protection of Nyungah Cultural and Religious Sites and all Aboriginal Sites in their own right not just thorough the native vegetation and wetlands. Waterways and Wetlands are sacred to us since the beginning of time.

18. City of Armadale

Defer comment until after the review of compliance is complete.

19. City of Rockingham

a) Supports the roll-over of the EPP until after the compliance review as this will allow a clear statement by Government of the relationship between the EPP and Environmental Conditions and allow clarification of which agencies have the key responsibilities in the management of the Estuary and the Catchment.

b) Efficacy of the EPP relies heavily on the implementation of the Statement of Planning Policy No 2. Local Governments in the catchment have applied the measures in the SPP when developing Scheme Amendments and in setting conditions on development. These measures have imposed additional requirements on Council, developers and landowners. The effectiveness of the measures should be reviewed to see if they are achieving a reduction in phosphorus export to the estuary

c) The review of effectiveness could be done by the Senior Officers Group.

20. City of Mandurah

a) The larger picture shows that:

- Water quality in the Serpentine and Murray Rivers has not improved and catchment management has been largely ineffective in dealing with this issue.
- Catchment Management in the peel has proven difficult to monitor and actions appear to have been without an overall strategy for action.
- Flooding, as predicted, has increased considerably on high tides and has increased the prevalence of mosquitoes and Ross River Virus.

- Flooding and increased water velocity has created considerable scouring of islands and some foreshore areas. This is washing out the root zones of fringing vegetation and creating salt scalds and vegetation death beyond the foreshore beach ridge. The deaths of large stands of Melaleuca are starting to appear in the Harvey Estuary.

- Coastal erosion has been significant on beaches to the north of the Dawesville Channel. Avalon and Falcon Bay have been most notably affected with boat ramps washed out and primary dunes under active erosion seasonally. Adjustments to sand bypassing are attempting to correct these issues to some extent, however this is unlikely to replace the natural distribution of sand from north to south.

b) The policy should reflect the whole catchment and not stop at the Darling Scarp.

c) section 5(e) should read "use of the estuary surrounds for residential development and conservation" as in the inner Peel Structure Plan.

d) It is agreed that water quality is of critical importance but there are wider issues which should also be considered. The Peel-Harvey Inlet is listed on the Register of the National Estate for its broad environmental values and the quality objectives of the EPP should reflect this wider view.

e) Section 8 of the EPP puts the onus onto local governments to integrate the objectives of the EPP within their activities. It is noted that the major instrument to adopt the EPP is the SPP, a non-statutory instrument administered by another Department. The objectives that should be complied with should be included within the new EPP and should be binding on all agencies which have an input to land use activities within the whole catchment.

f) There is a need for education/awareness raising, possibly through some workshops.

21. Shire of Harvey

No comments.

22. Coolup LCDC

a) Would require more than 3 weeks to make input as only meet monthly. Eight weeks review should be the minimum.

23. Westrail

a) The EPP is acceptable. No specific comments.

24. Private individual (3)

a) The Policy area should be extended to include the whole catchment.

b) Sources and leaching effects of nitrogen and other nutrients should be monitored.

c) The moratorium on further clearing and drainage in the catchment should be implemented.

d) The statement that "little effect on fringing vegetation has been observed" may be incorrect. There is evidence of severe degradation of fringing vegetation due, presumably to higher tides and extra salinity.

e) A separate EQO should be included to protect and where necessary rehabilitate all remaining native vegetation in the Policy area.

f) Concern over the objectives including residential. In addition to clearing and degradation of native vegetation, dredging, jetties, canals, humans and their pets affect the flora and fauna habitat value.

g) The most important objective is 5(b) maintain and improve its habitat value for "diverse and abundant native flora and fauna communities".

h) Use of the estuary for fishing should have continued monitoring and unattended nets and pots (both professional and recreational) should not be allowed in the area.

i) A minimum of 100m wide foreshore areas should be set aside in any future development and additional buffer zones provided.

25. Private individual (4)

Generally in support of the EPP

a) Concern over damage to native vegetation, especially by government agencies. Public sector authorities as well as private operators should have to abide by requirements drawn up to protect the environment.

b) Use of the estuary for any purposes should be approached with an attitude of "what is the best outcome for the environment" when any area is opened up for public use.

c) The Dawesville Cut has caused flooding of some properties. Public should be excluded from such fragile areas.

d) Strongly dispute the Lord & Associates, 1998 statement that "little effect on fringing vegetation has been observed". Fringing vegetation along the west side of the Harvey Estuary is dying since flooding of the area.

e) Section 2(c) relating to "government extension services" should be more specific so that landholders know what action they can take and through which government extension services.

f) Concern over how many authorities are involved with the management of Peel-Harvey. Who does have the overall authority and is able to advise us?

g) The foreshores around the estuaries are being altered by the high tides from the Dawesville Cut. Flooding has exacerbated the mosquito problem and there needs to be a strategy to combat this.

APPENDIX 3

Specialist Report on Water Quality and Review of Management Targets

Peel-Harvey Estuary System Management Strategy

SPECIALIST REPORT ON WATER QUALITY AND REVIEW OF MANAGEMENT TARGETS

Prepared by
David M Deeley
Acacia Springs Environmental

October 2002

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SUMMARY

Environmental monitoring shows that water quality in the Peel-Harvey estuary has improved significantly in terms of nutrient concentrations, chlorophyll a and Secchi depths (transparency) since completion of the Dawesville Channel. *Nodularia* blooms have not been observed in the estuary since the Channel was completed, even though there has been two years where streamflow and nutrient delivery to the estuary was above the threshold level that would have triggered a *Nodularia* bloom prior to the Dawesville Channel.

The improvement in water quality in the estuary is cause for optimism. The success of the restorative measures in the estuary will only become apparent in future years as the system continues to equilibrate to the altered hydrological regime, and after there have been additional years of larger flows and nutrient delivery.

Of increasing concern to the local community are continuing blooms of *Nodularia* and other cyanophytes (blue green algae) in the lower reaches of the Serpentine River. In recent years, there have also been localised accumulations of macroalgae in the southern portion of the Harvey estuary. This means although the system has improved, it is still in a fragile condition and reductions in nutrient loads from the catchment as required by Ministerial conditions are still needed.

Monitoring the three main rivers has shown that there appears to have been small reductions in nutrient loads for the Serpentine and Harvey rivers. Although these apparent reductions are encouraging, there is still considerable additional improvement required before target nutrient loads are met. Based on monitoring since 1993, the Serpentine River measured at Dog Hill gauging station requires a 72% improvement and the Harvey River measured at Clifton park requires a 21% reduction to meet TP targets. The situation in recent years may appear better than it actually is because these years had below average rainfall, runoff and nutrient delivery.

The Murray River appears to be within its target for TP although this river is subject to extreme flow events (like February 2000), and a different pattern may emerge when data for extreme events such as this are considered.

Scaled targets for the Serpentine River at Dog Hill, the Murray River at Pinjarra and the Harvey River at Clifton Park have been provided to complement system-wide targets contained in Ministerial conditions. This provides a nested series of catchment targets for different scales of application which will better support compliance testing.

The community's growing expectation for continual improvement and the continuing degraded condition of the lower Serpentine River means that current targets for estuarine water quality and catchment runoff should be maintained and reviewed within 10 years. This will allow for a longer series of flow years on which to base a system-wide performance audit. Additionally it is recommended that other measures of system health for the estuary, rivers, streams, wetlands and the Peel-Harvey catchment be explored.

Table of existing TP targets for the Peel-Harvey system including new scaled TP - targets for gauging stations on the three main rivers.

Application	**TP - Target for average conditions**	**TP - Target for extreme conditions**	**Source**
• *Entire catchment*			
Peel-Harvey catchment	85 t (60 percentile)	165 t (90 percentile)	Ministerial conditions
• *Catchments down to the estuary*			
Serpentine plus drains	21 t (50 percentile)	-	Peel-Harvey EPP
Murray River plus Dandalups	16 t (50 percentile)	-	Peel-Harvey EPP
Harvey River plus drains	38 t (50 percentile)	-	Peel-Harvey EPP
• *Rivers at gauging stations*			
Serpentine River - Dog Hill S614030	14 t (50 percentile)	44 t (90 percentile)	Areal scaling
Murray River at Pinjarra S614065	15 t (50 percentile)	36 t (90 percentile)	Areal scaling
Harvey River at Clifton Park S613052	27 t (50 percentile)	57 t (90 percentile)	Birch-Forbes scaling

Scope of Report

The following tasks were requested to be undertaken.

a) Catchment

- Evaluate the past sampling strategy as to its suitability to report on nutrient loading targets for the catchment;
- Reallocate the existing targets to the Serpentine River at Dog Hill, the Murray River at Pinjarra and the Harvey River at Clifton Park;
- Report on nutrient loadings from the Serpentine River at Dog Hill, the Murray River at Pinjarra and the Harvey River at Clifton Park in the context of the split targets with an assessment of variance;
- Recommend on future monitoring to audit nutrient loss from catchments including the possibility of very large episodic events from inland catchments.

b) Estuary

- Review median TP concentrations in the estuary pre and post Dawesville Channel;
- Review *Nodularia* bloom frequency pre and post Dawesville Channel;
- Review estuary and catchment nutrient targets in the context of better-than expected flushing from the Dawesville Channel using Vollenweider modelling and the Parslow model if possible;
- Explore measures of ecosystem health (vigour, organisation and resilience) for the estuary and streams;
- Prepare a report on the findings of the Water Quality and Targets Working Group for inclusion as an appendix to the report of the Peel-Harvey Expert Review Committee to the EPA.

Acknowledgements

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Dr Bob Humphries	Water Corporation
Mr Geoff Bott	Department of Environmental Protection
Mr Robert Donohue	Water and Rivers Commission
Mr Brian Chester	Water and Rivers Commission

1 Introduction

The pattern of runoff from southwest catchments is highly variable (Deeley et al, 1999) because of seasonal differences rainfall, inter-annual variability and the presence of very large but rare episodic events. There is also a significant variability in the range of nutrient concentrations observed for a particular site over time. Nutrient concentrations from southwest catchments appear to show both seasonal and flow effects. This means that higher flows are normally associated with higher nutrient concentrations although wash-out over the wet season means that this effect becomes less pronounced over time.

These variable patterns of runoff and nutrient delivery to receiving waterbodies results in significant variability in salinity and in the concentrations of dissolved and particulate nutrients. Estuaries that have an annual fresh and saline phase may have much more complex patterns of faunal migration, establishment and distribution than "ideal" estuaries described from the northern hemisphere. There may also be significant horizontal and vertical displacement of both marine and fresh species at times of the year (John, 1987; John, 1988). Communities of estuarine plankton, benthic microalgae and macrobenthos may be 'reset' after flood events in estuaries subjected to significant seasonal cycles in rainfall and runoff.

Estuaries like the Peel-Harvey system are complex ecosystems and monitoring the impacts of human disturbance or conversely the success of restorative efforts in systems that are subject to spatial and temporal heterogeneity is problematical.

Factors influencing the trend detection in these systems include:

- The nature of physical, chemical and biological processes;
- The presence of input - output lags;
- The variable nature of inflows and outflows;
- The presence of variable sink - source characteristics;

For the Peel-Harvey system, a number of environmental indicators have been established in order to audit the success of restorative efforts in the catchment and estuary. The following sections report on the performance of the system and the appropriateness of the nominated environmental indicators.

1.1 Catchment runoff quality

Changes in water quality from the Peel-Harvey catchment have been identified as the main measure of performance of improved catchment management efforts and these can be assessed using concentration data and statistical trend analysis (Gilbert, 1987), or by assessing streamflow and thus estimating mass loadings of nutrients. Trend analysis using concentrations can be undertaken reliably with a limited number of samples that adequately reflect the seasonal and event response of the stream (Gilbert, 1987; Loftis *et al.*, 1991; McBride *et al.*, 1993).

Assessing concentrations is important because they can be used statistically to accurately define changes in water quality over time. Also when considering xenobiotic contaminants such as metals, pesticides or synthetic organic compounds, concentrations are important because they establish the level of chronic or acute exposure of aquatic animals to these contaminants. The actual concentrations of bio-stimulants such as nutrients is of less

consequence to aquatic organisms, because of very high threshold no-effect levels for chronic or acute effects.

Assessing mass loadings is important for bio-stimulants because nutrients are retained and reprocessed in estuaries through a range of biological and physico-chemical processes. In the Peel-Harvey estuary, very large winter inputs of FRP are assimilated into winter diatom blooms. The diatom blooms collapsed as the salinity increased and nutrient regeneration mechanisms from the sediments fuelled cyanophyte blooms later in the year (Lukatelich and McComb, 1986a). This means that the intensity of the cyanophyte blooms in spring was influenced more by winter mass loading and spring nutrient regeneration than than by concentrations in winter runoff.

The estimation of mass loadings must be based on an appropriate sampling regime. Fixed interval sampling where the cell width used to calculate loads is large (like say weekly), are highly unreliable (Rekolainen *et al.*, 1991). Fixed interval sampling, where the cell width is small and matches the event response of the stream, or flow proportional sampling is required for the reliable estimation of mass loadings (Stevens and Stewart, 1981).

Assessment of streamflow is also an important part of defining changes in water quality from a catchment because there is a significant increase in the volume and velocity of runoff following clearing. Conversely there is usually a decrease in flow volume when catchment restoration measures, such as the establishment of filter strips, riparian buffers, catchment revegetation and constructed wetlands are established. Indicators based on nutrient concentrations alone may not detect subtle increases or decreases in mass loading resulting from changes in flow volume.

It may be concluded that streamflow, nutrient concentrations and nutrient mass loadings are all core indicators for streams in the Peel-Harvey system. Streamflow volumes, velocities and mass loadings may be considered as diagnostic indicators and nutrient concentrations may form the basis of a compliance indicator suite. Nutrient mass loads have been established as statutory compliance indicators for the streams of the Peel-Harvey catchment and the target loadings were based on a probabalistic assessment of inter-annual variability in runoff and mass loadings (Kinhill, 1988; Deeley *et al.*, 1995; Humphries and Robinson, 1995).

For some larger streams, the cell-width used to calculate mass loads was small (samples taken by auto-samplers at 6-hourly intervals, daily composited) and for other smaller streams the cell-width was large (weekly samples). There have clearly been problems with the catchment monitoring programme for the Peel-Harvey, typical of all monitoring programmes including:

- Lack of QA/QC in program design;
- Inappropriate sample collection;
- Unreliable chemical analyses;
- Data storage and handling problems;
- Inappropriate data analysis;
- Lack of statistical power and much uncertainty;
- Poor reporting and information generation;
- No performance auditing of the monitoring cycle.

The following sections comment on these issues in more detail and a concluding section offers some recommendations as to how the performance of the system might be better assessed.

2 Catchment - Evaluate the past sampling strategy as to its suitability to report on nutrient loading targets for the catchment

•

2.1 Mass loads for the Serpentine, Murray and Harvey Rivers

Continuous monitoring of streamflow has been undertaken for the Serpentine River at Dog Hill (S614030), the Murray River at Baden-Powel Water Spout (S614006) and at Pinjarra (S614065) and for the Harvey River at Clifton Park (S613052). Composite daily nutrient samples were collected by autosamplers at the Serpentine River at Dog Hill, the Murray River at Pinjarra and for the Harvey River at Clifton Park. These three rivers have large catchments and are subjected to less event variability than smaller streams.

It was concluded that the monitoring programme to determine nutrient mass loads for the Serpentine, Murray and Harvey rivers was appropriate to provide reliable estimates for compliance tracking purposes.

Since the combined catchment areas of these three rivers comprise over 80% of the Peel-Harvey coastal catchment, it was concluded that reliable auditing of these three streams may be considered to be representative of the system as a whole. It was further recognised that because of the intractable nature of diffuse source pollution and the size of these catchments that it may take up to several decades to determine the exact nature of changes in runoff quality even if there had been widespread improvements in land management practices.

2.2 Mass loads for research sub-catchments

Three research sub-catchments were established in the early 1980s to identify the magnitude of losses from relatively homogeneous land units and to track changes in runoff quality from smaller sub-catchments. Continuous monitoring of streamflow has been undertaken for Meredith Drain (S613053 deep grey sands), the Mayfields Sub G (S613054 sand over clay soils) and the Samson Brook North (S613014 clay and loamy soils) sub-catchments.

Composite daily nutrient samples were collected from Meredith Drain and weekly grab samples were collected from Mayfields Sub G and Samson Brook North sub-catchments.

It was concluded that the monitoring program to determine nutrient mass loads for the Meredith drain sub-catchment was appropriate to provide reliable estimates for tracking the relationship between land management practices and runoff quality. Because of the flashy nature of runoff from very small catchments and the need for sampling rigour, it was concluded that the monitoring programme for the Mayfields Sub G and the Samson Brook North catchments was not appropriate to provide reliable estimates of nutrient mass loading.

2.3 Mass loads for smaller streams and drains

Continuous monitoring of streamflow has been undertaken for a number of smaller streams in the Peel-Harvey catchment. Weekly grab samples were collected for he smaller streams.

It was concluded that the monitoring programme to determine nutrient mass loads for the smaller drains was not appropriate to provide reliable estimates for compliance auditing or for tracking the relationship between land management practices and runoff quality.

2.4 Trends in water quality using nutrient concentrations

Reliable statistical tests can be undertaken and used as a basis for detecting trends in stream water quality using nutrient concentrations rather than mass loads. When sampling frequency is not responsive to flow volumes and is simply based on fixed interval sampling, estimates of mass load may be accompanied by significant levels of error and bias. This means that collecting a number of representative samples and analysing them for nutrient concentrations may be the most cost-effective method of water quality trend detection.

There are however several important considerations that need to be considered when using nutrient concentrations to audit trends in water quality that were alluded to in the introduction earlier in this report and are again emphasised here.

The assumption for concentration-based trend detection is that the effect of season and streamflow volume on nutrient concentrations is known and can be incorporated statistical tests of trend. The effect of land use change on streamflow volumes may not be known and may confound such tests. For example, as a catchment is progressively developed for urban or rural enterprises the volume and rate of streamflow may increase. Conversely, as the efforts of landcare groups and catchment repair is undertaken, tree plantings, constructed wetlands and other BMPs may reduce stream flows. The increasing or decreasing streamflows may dilute or concentrate the nutrient concentrations in streams and confound trend detection.

As an extreme example, a landholder having very high nutrient exports measured both as high concentrations and high nutrient mass loads may be able to confound attempts at pollution control if concentrations only are used to audit trends. Simple dilution of the waste stream would result in a decrease in concentrations when in fact the nutrient mass loads had not changed.

It is therefore important to monitor nutrient concentrations, streamflow and nutrient mass loadings for compliance auditing purposes where there is a high probability that land use change will have a significant impact on streamflow volumes. Monitoring programmes will need to be designed to take account of the inherent variability of the system so that the statistical power of the monitoring programme can be determined.

3 Catchment - Reallocate the existing targets to the Serpentine River at Dog Hill, the Murray River at Pinjarra and the Harvey River at Clifton Park

The existing water quality targets for the Peel-Harvey system apply for the whole catchment including ungauged areas subject to tidal influences adjacent to the estuary. During the preparation of the Stage II ERMP and earlier, a series of spot measurements were taken in streams below gauging stations and relationships derived between gauged and ungauged areas. While this was appropriate during the estimation of total loads to the system and for setting overall loading targets for the system, it has made statistical testing of compliance difficult. There are different levels of uncertainty associated with the gauged and ungauged portions of the catchment which confound compliance testing.

To facilitate ongoing performance testing and to avoid the expense of attempting to gauge smaller streams and drains possibly subjected to tidal influences, targets should be allocated to each of the three main streams for the portion of the catchment above gauging stations. This includes the Serpentine River at Dog Hill, the Murray River at Pinjarra and the Harvey River at Clifton Park.

Some original computer code has been uncovered which contains the factors used to spatially extrapolate loads measured at the three gauging stations mentioned above for the whole catchment including the ungauged portions. The algorithms and the spatial extrapolations have been recreated so that the portion of the statutory targets, which applies to the gauged catchment, can be determined.

3.1 Serpentine River at Dog Hill

A correction factor which takes flow for the Serpentine River at Dog Hill together with Dirk Brook at Hopelands Road and Peel Main Drain at Karnup Road was developed by the EPA in the mid 1980s to take account of the ungauged catchment. The relationship used for the period after 1984 was:

Day flow ($10^3 m^3$)for the Serpentine catchment = Dog Hill + (Peel Main Drain * 23.412) + Dirk Brook .....{1}

This relationship appears to have been derived during a period of low flow from the Peel Main Drain. Reliable data for the Peel Main Drain are only available for 1990 to 1992 and applying the relationship to this period produces flow estimates for the whole Serpentine River catchment which are 6 times greater than those measured at Dog Hill and these are clearly in error.

A simple aereal adjustment (Table 1) has been made to the target set for the whole Serpentine River catchment to scale the target for the catchment measured above the Dog Hill gauging station on the Serpentine River.

Table 1 Areal scaling of the targets for the Serpentine River.

Catchment	Area (km^2)	50 % ile target (tonnes)	90% ile target[a] (tonnes)
Whole Serpentine River including ungauged area	1,669	21.0	44.0
Serpentine R Dog Hill	1,128	14.2	29.7

target[a] = Source of targets page 33 of EPA Bulletin 363, Peel-Harvey EPP, 1992.

3.2 Murray River at Pinjarra

The Murray River has been monitored at the Baden Powel Water Spout near Dwellingup for many years. In the late 1970s several dye dilution investigations were undertaken (Black and Rosher, 1980) to determine the relationship between flow for the Murray River measured at Baden Powel Water Spout and at Pinjarra. In 1993 a gauging station was established at Pinjarra.

A simple areal adjustment (Table 2) has been made to the target set for the whole Murray River catchment to scale the target for the catchment measured above Pinjarra and above Baden Powel Water Spout.

Table 2 Areal scaling of the targets for the Murray River.

Catchment	Area (km^2)	50 % ile target (tonnes)	90% ile target[a] (tonnes)
Whole Murray River including ungauged areas	7,708	16.0	39.0
Murray River at Pinjarra	7,193	14.9	36.4
Murray River Baden Powel Water Spout	6,840	14.2	34.6

target[a] = Source of targets page 33 of EPA Bulletin 363, Peel-Harvey EPP, 1992.

3.3 Harvey River at Clifton Park

The spatial extrapolation for the Harvey River at Clifton Park was developed to take account of a number of drains which enter the eastern shoreline of Harvey estuary. These include Caris Drain, Coolup South Main Drain, Fauntleroy Drain and Mayfields Main Drain.

To spatially extrapolate daily flow for the Harvey River measured at Clifton Park to account for ungauged drains entering the Harvey River eastern shoreline the following regression was used.

Harvey River at Clifton Park plus drains flow = Harvey River at Clifton Park day flow (m^3) * 1.334 - 44.7 .....{2}

To spatially extrapolate TP concentrations for the Harvey River sampled at Clifton Park to account for ungauged drains entering the Harvey River eastern shoreline, the following regression was used.

Harvey at Clifton Park plus drains TP conc = Harvey River at Clifton Park TP (mg/l) * 1.06 .....{3}

Thus substituting equations {2} and {3}:

Harvey River at Clifton Park plus drains TP load = [Harvey River at Clifton Park day flow (10^3m^3) * 1.334 - 44.7] * [Harvey River at Clifton Park TP (mg/l) * 1.06] ...{4}

For daily data from 1/1/83 to 31/12/92 ($p \leq 0.001$) this approximates to :

Harvey River at Clifton Park plus drains TP load = 1.41403 * Harvey River at Clifton Park TP load .....{5}

This means that the statutory TP loads which apply to the Harvey River plus drains can be reduced by 70.72% (reciprocal of 1.414) to apply to the Harvey River at Clifton Park. Table 3 shows the existing targets which apply to the Harvey River and drains and the adjusted targets which should apply for the Harvey River at Clifton Park.

Table 3 Scaling of the TP - targets for the Harvey River using the Birch-Forbes model and simple areal scaling.

Catchment	Area (km^2)	50 % ile target (tonnes)	90% ile target[a] (tonnes)
Whole Harvey River including ungauged area	944	38.0	81.0
Harvey River Clifton Park Birch Forbes adjustment	727	26.9	57.3
Harvey River Clifton Park areral adjustment	727	29.3	62.4

target[a] = Source of targets page 33 of EPA Bulletin 363, Peel-Harvey EPP, 1992.

4 Catchment - Report on nutrient loadings from the Serpentine River at Dog Hill, the Murray River at Pinjarra and the Harvey River at Clifton Park in the context of the split targets with an assessment of variance

Monitoring data were available from 1985 to 1998 for the three rivers. A five parameter log-linear model (Belval et al, 1995) was used to interpolate daily nutrient concentrations where there were gaps in the daily composite samples collected from autosamplers for the three main rivers. The model took account of both season (first flush effect) and the magnitude of flow (washout effect). The general form of the model was:

$$\ln[C] = b0 + b1(\ln[Q/'Q]) + b2(\ln[Q/'Q])^2 + b3[T-'T] + b4[T-'T]^2 + b5\sin[2\pi T] + b6\cos[2\pi T] + e \quad \ldots\ldots\ldots \{6\}$$

Where: C = constituent concentration (mg/l)
Q = instaneous discharge (ft3/sec)
T = time in years with decimal days (Note; Year 1=0.###)
b = model coefficiants
e = model error
'Q = centering variable for flow
'T = centering variable for time

Daily nutrient loads were calculated my multiplying daily streamflow and observed and interpolated nutrient concentrations. Annual nutrient loads were calculated by summing the daily loads for each year. Average annual nutrient loads were estimated from the range of annual values.

Errors were also determined for the nutrient loads. For gauged catchments, an estimate of variance in discharge was derived from the reliability of the discharge rating curves across a range of flow strata. This was used to develop a measure of variance for each of the daily discharge measurements. For observed nutrient concentrations, variance was taken as the error associated with laboratory analyses (typically < 1%). For the interpolated nutrient concentration values, an estimate of the error of model fit was derived from the 5 parameter log-linear model.

A randomisation procedure was used to derive up to 100 values of each daily flow value and for each daily nutrient concentration value which had the same statistical distribution as the observed or modelled values and their variances. The randomised daily flows and nutrient concentrations were used to produce up to 100 estimates of daily (then annual) nutrient load for each year and each of the three main rivers. The statistical distribution of the resulting 100 estimates of annual nutrient load was then used to obtain mean values together with an estimate of variance (error).

Figure 1 shows the TP loads for the Serpentine, Murray and Harvey Rivers with target lines generated for the three gauging stations (Tables 1 to 3) superimposed. It can be concluded that although there appears to have been some improvement in TP loads from these three catchments, significant improvements are still required before target loads are achieved in the Serpentine and Harvey catchments. The Murray River at Pinjarra is currently meeting its target.

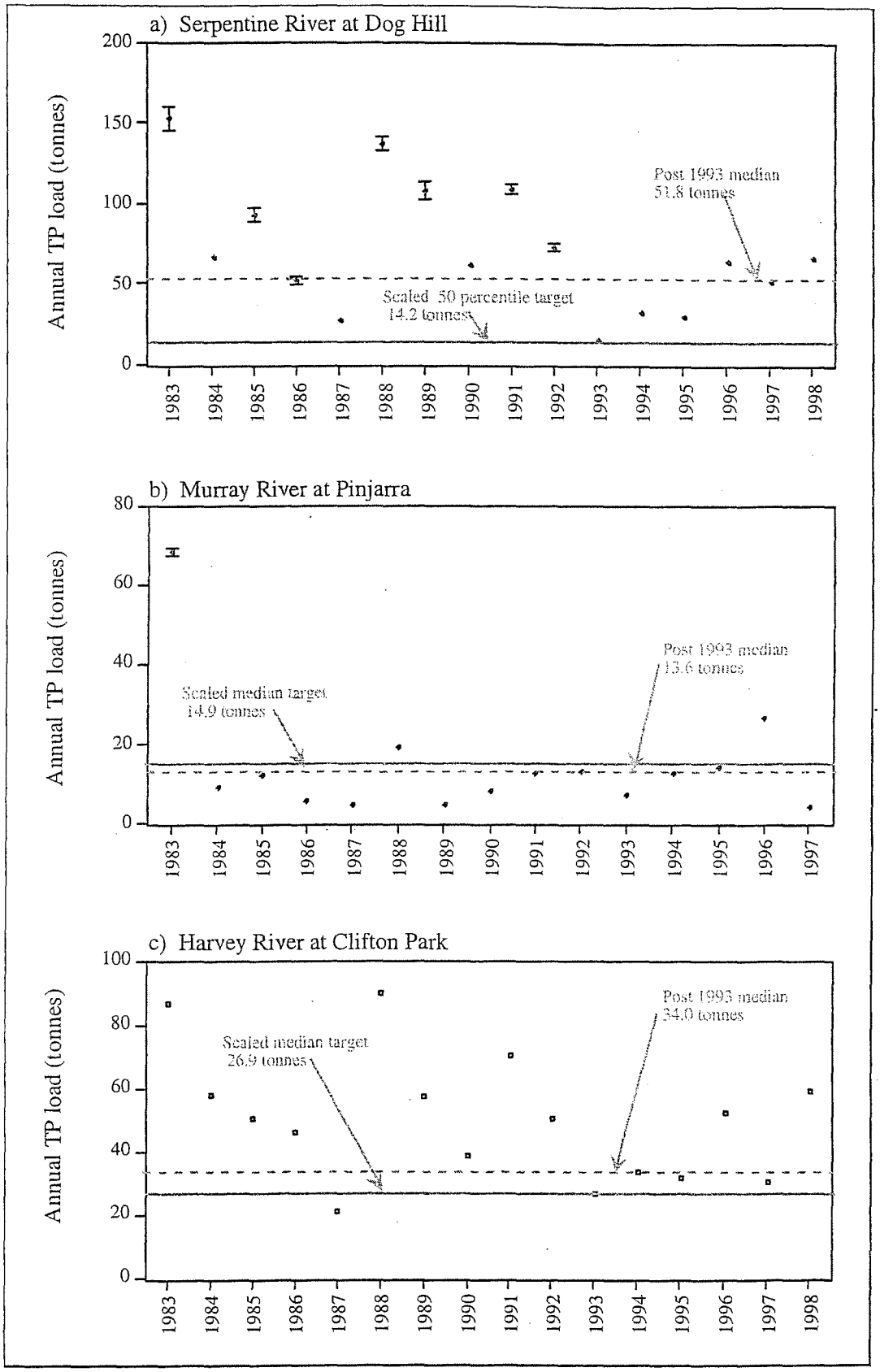


Figure 1 Total phosphorus loads for the Serpentine River at Dog Hill, the Murray River at Pinjarra and the Harvey River at Clifton Park with scaled targets and median loads since 1993 superimposed. Error bars are standard deviation units from 100 randomisations for each year. (see note in Appendix A concerning errors).

5 Recommend on future monitoring to audit nutrient loss from catchments including the possibility of very large episodic events from inland catchments

5.1 Mass loads for the Serpentine, Murray and Harvey Rivers

For compliance auditing purposes, it is recommended that the current monitoring for mass loads for the Serpentine River at Dog Hill and the Harvey River at Clifton Park based on representative daily samples collected by autosamplers be continued. It is also recommended that the autosampler be reinstated to collect representative samples from the Murray River at Pinjarra. Even though in most years the loads from the Murray are relatively small, large loads may result from years when very large episodic events lead to floods from the Murray River like that observed in the Swan-Canning in 2000. This level of monitoring is required as part of Ministerial Conditions.

5.2 Mass loads for the research sub-catchments

There is currently no statutory requirement for the proponents to continue monitoring of nutrient mass loads for the three research sub-catchments at Meredith Drain, Mayfields Sub G and Samson Brook North. Because improvements in water quality are likely to be observed in these smaller sub-catchments much earlier than in the three main rivers, it may be desirable to continue monitoring these streams. The proponents may need to foster some form of involvement by Universities or other arrangements to provide for continued monitoring of these three streams. The Water Corporation currently monitors streams in other catchments as part of its Community Service Obligations. If responsibility for monitoring these streams were to pass to other agencies, a monitoring protocol, which took account of quality assurance procedures would need to be applied.

5.3 Mass loads for smaller streams and drains

Because of the and technical logistical difficulties associated with accurate monitoring of nutrient mass loads from small flashy streams, it is not recommended to continue monitoring nutrient mass loads in the minor streams and drains for compliance purposes. There may be a need to monitor these streams for other purposes however.

There remains an obligation on the proponents or other parties to provide monitoring feedback for land managers on the success of improved land management practices. A monitoring programme based on statistical analysis, which is more responsive to soil type and changed land management practices, has potential to provide more a cost-effective assessment of water quality throughout the catchment.

It may be appropriate for Landcare District Committees or other community groups to take a lead in this type of monitoring as it will relate directly to the success of their management efforts and provide results to the wider community from these model catchments. If this type of monitoring is to be undertaken by landholders and community groups, a monitoring protocol would nee to be developed, which described the best methodology for collecting representative samples in space and time, provided guidance in the statistical interpretation of monitoring results and incorporated quality assurance procedures.

6 Estuary - Review median TP concentrations in the estuary pre and post Dawesville Channel

Results of a statistical analysis of the water quality data for the Peel-Harvey estuary are presented in Table 4. This shows that there has been a significant improvement in the estuary since the Dawesville Channel, particularly over the warmer months.

Table 4 Median values of a range of water quality variables observed in surface and bottom waters at six sites in the Peel-Harvey estuary pre and post Dawesville Channel.

Variable	preDC[a] all data[c]	postDC[b] all data	preDC dry season[d]	postDC dry season
Salinity ppt	23.1 (1079)	33.5 (702)	33.2 (528)	37.9 (366)
% Oxygen saturation	90.6 (1052)	94.9 (702)	92.4 (502)	96.1 (366)
NH_4-N µg/l	21 (1079)	11 (704)	6 (528)	8 (368)
NO_3-N µg/l	15 (1079)	5 (704)	7 (528)	4 (368)
TN µg/l	1291 (1080)	418 (701)	1197 (528)	405 (368)
FRP µg/l	9 (1079)	5 (704)	3 (528)	4 (368)
TP µg/l	99.5 (1080)	64.0 (703)	82.5 (528)	64.0 (368)
Secchi depth metres	0.8 (540)	1.2 (291)	1.0 (264)	1.2 (145)
Chlorophyll a µg/l	6.1 (1079)	2.1 (704)	8.5 (528)	2.4 (368)
N to P ratio	14.0 (1079)	8.9 (704)	12.0 (528)	6.6 (368)

preDC[a] = Prior to the Dawesville Channel 1990-1993
postDC[b] = Post Dawesville Channel 1994 – 1997
all data[c] = Data for all months
dry season[d] = Data for dry season from October to May
(709) = Numbers in brackets are number of observations

7 Estuary - Review *Nodularia* bloom frequency pre and post Dawesville Channel

It has been difficult to determine the nature of improvements in water quality in the estuary in terms of the occurrence of blooms of *Nodularia* because there has not been a bloom in the Peel-Harvey estuary since the Dawesville Channel has been completed. There has however been annual blooms of *Nodularia* in the lower reaches of the Serpentine River which have required management by local authorities. Warning signs have been placed to warn the community to avoid contact with water contaminated with *Nodularia.*

It is none-the-less instructuve to look at concentrations of chlorophyll a and secchi depths in the estuary as an indication of the reduction of phytoplankton numbers in the estuary since the Dawesville Channel. It should be appreciated that even though chlorophyll a is a good measure of the numbers of phytoplankton such as diatoms, it is not a good for cyanophytes (blue-green algae) which have different types of plant pigments. Secchi depth is a measure of water transparancy and again is not directly related to *Nodularia* numbers and can be confounded by the presence of suspended solids and other forms of turbidity.

Table 4 shows that there has been a significant reduction in chlorophyll a concentrations in the estuary since the Dawesville Channel especially over the dry season. Median chlorophyll a concentrations from October to may have decreased form 8.5 to 2.4 µg/l. There has also been a significant improvement in the clarity of the water with Secchi depths increasing from 1.0 to 1.2 m for the similar period.

Figure 2 summarises TP loads for the Harvey measured at Clifton Park with the occurrence of *Nodularia* blooms superimposed. It can be seen that in 1996 and 1998 that the TP loads were large enough to have triggered a *Nodularia* bloom in pre Dawesville Channel conditions. Although there have only been two years with sufficient river flow and hence nutrient delivery to determine the success of the channel in preventing *Nodularia* blooms in the estuary, these results are encouraging.

8 Estuary - Review estuary and catchment nutrient targets in the context of better-than –expected flushing from the Dawesville Channel using Vollenweider modelling and the Parslow model if possible

This analysis was not undertaken for several reasons. The Parslow model is currently not available for widespread use and continues to be developed. Secondly it was felt that there needs to be several more years of river flows and nutrient delivery above the threshold needed to trigger *Nodularia* before the targets should be reassessed. The continued presence of severe *Nodularia* blooms in the lower reaches of the Serpentine River and the recent occurrence of localised macroalgal blooms in the southern region of Harvey estuary indicate that the system is still under threat.

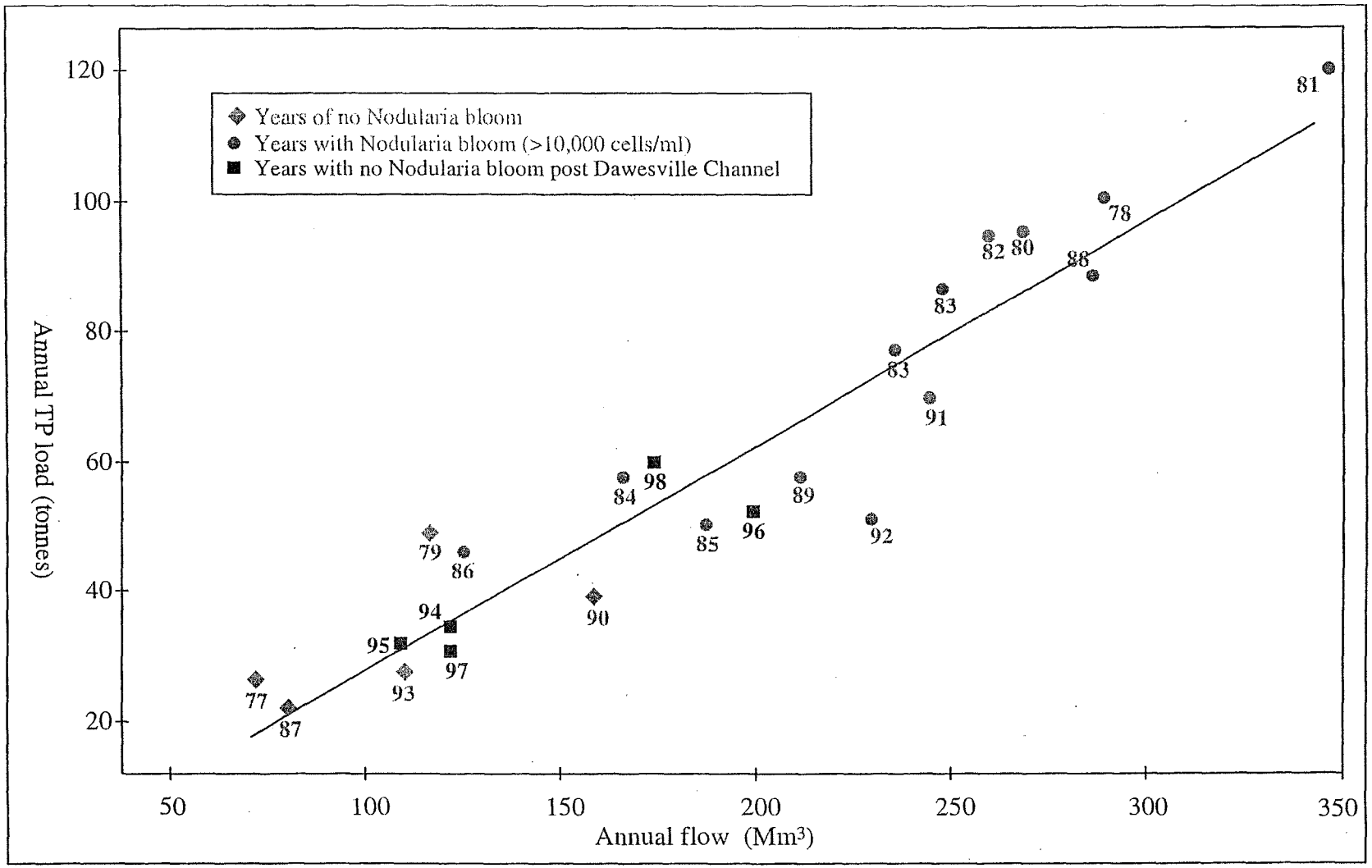


Figure 2 Annual flow and total phosphorus (TP) loads for the Harvey River at Clifton Park showing of Nodularia blooms in the estuary.

9 Estuary - Explore measures of ecosystem health for the estuary and streams

9.1 Defining ecosystem health

An ecosystem is considered healthy if it is stable and sustainable, if it is active and maintains its organisation and autonomy over time and is resilient to stress. This can be further simplified to three components vigour, organisation and resilience, which together encapsulate the characteristics of healthy or unhealthy ecosystems. The vigour of a system refers to its activity, metabolism or primary productivity. Biomass of particular trophic groups may be considered as a measure of vigour, although in the absence of organisation, highly vigorous systems such as those found in eutrophic conditions are undesirable and not considered healthy.

The organisation of a system refers to the number and diversity of interactions between system components and is not as easily measured as activity or vigour (Costanza *et al.*, 1998a). Traditional measures of species richness and diversity are indicators of system organisation. These inventory indicators fail to provide information about rates and processes and do not incorporate exchange pathways connecting system components, which are an important characteristic of healthy systems (Fairweather, 1997).

Relationships between diversity and stability have been described from experimental evidence (Tillman and Downing, 1994), as non-linear with a threshold, after which no additional stability is gained from increasing diversity (Harris, 1994). There have been few published accounts of the nature of diversity-stability relationships and debate continues as to the general applicability of this rule (Hurlbert, 1971). Identification of the impacts of anthropogenic stress and changes in system organisation in the context of a naturally depauperate and heterogeneous biotic community, such as those found in undisturbed oligotrophic streams and estuaries in the southwest of Western Australia is difficult.

The resilience of a system is defined as its ability to maintain its structure and normal patterns of behavior in the presence of stress. Measuring the resilience of a system is problematical because it is based on assumptions about the behavior of complex inter-linked processes subjected to external stressors. Because of the dynamic nature of estuarine systems and the interplay of seasonal cycles, their response to a particular level of external stress may not be predictable or repeatable.

Estuarine ecosystems in the southwest of Western Australia are resistant to natural disturbances brought about by variable patterns of runoff and they are able to recover rapidly after large episodic floods. Estuarine organisms are generally well-adapted to periods of low dissolved oxygen and salinity variations through patterns of migration, physiological adaptations or effective (r-strategist) reproductive strategies. The natural structural organisation of benthic communities is however simplified, because of regular disturbances which "reset" these communities to immature states following each bout of disturbance (Poore and Kudenov, 1978; Rainer and Fitzhardinge, 1981; Poore, 1982; Jones, 1987).

Estuaries in the southwest of Western Australia, because of their evolutionary history of oligotrophic conditions, are not particularly resilient to nutrient enrichment and biological communities found in undisturbed estuaries are easily modified and replaced by opportunists following nutrient addition.

N.B. This means that biological communities in southwest estuaries can rapidly recover from natural disturbances that have been part of their evolutionary history, but they are easily modified through disturbance brought about by cultural nutrient enrichment that has not been part of their recent evolutionary experience.

Ecosystem health has been defined as when a system has: homeostasis; an absence of ecosystem distress syndrome; diversity or complexity; stability or resilience; vigour or scope for growth and; a balance between system components (Costanza *et al.*, 1998b). All of these concepts are related to ecosystem health, but none of them in isolation fully describes the multidimensional concept of ecosystem well being. Measuring ecosystem health has been described as: a comprehensive, multiscale, dynamic, hierarchical measure of ecosystem resilience, organisation and vigour (Costanza *et al.*, 1998b). These definitions imply that a system can maintain its structure (organisation or inventory), and function (vigour or processes) over time in the face of external stressors (resilience). In simple terms, it is a measure of the overall performance of a complex system that is constructed from the behavior of its parts.

9.2 Defining ecosystem health and the Peel-Harvey estuarine system

There is an established literature which describes factors contributing to the ill-health of ecosystems including (After Havens 1994, Birkett and Rapport 1996):

- Changes in nutrient capital;
- Change in primary productivity;
- Simplification of food webs, loss of mutualism;
- Reduction in species diversity;
- Community redundancy declines;
- Increased dominance by opportunists;
- Reduced size distribution of biota;
- Increased amplitude of species populations;
- Increased prevalence of disease, abnormalities;
- Circulation of contaminants in biota and media.

Some of these characteristics may be able to be measured in the Peel-Harvey estuary but most are too esoteric for this type of application. Most of these measures are only applicable at coarse spatial and temporal scales.

The progression from defining the values of an ecosystem, to defining which measurement endpoints best represent those values and which environmental indicators provide the correct information toward arriving at the desired measurement endpoints (Figure 3) is not without difficulty. An ecological indicator is a characteristic of the environment that, when measured, quantifies the magnitude of stress, habitat characteristics, degree of exposure to the stressor, or degree of ecological response to the exposure (Hunsaker and Carpenter, 1990) and which provides information toward a measurement endpoint. Measurement endpoints must be related to management, which will of course embody current interpretations of social and environmental values. The spatial and temporal scales of the endpoints of monitoring will be dictated by the management goals.

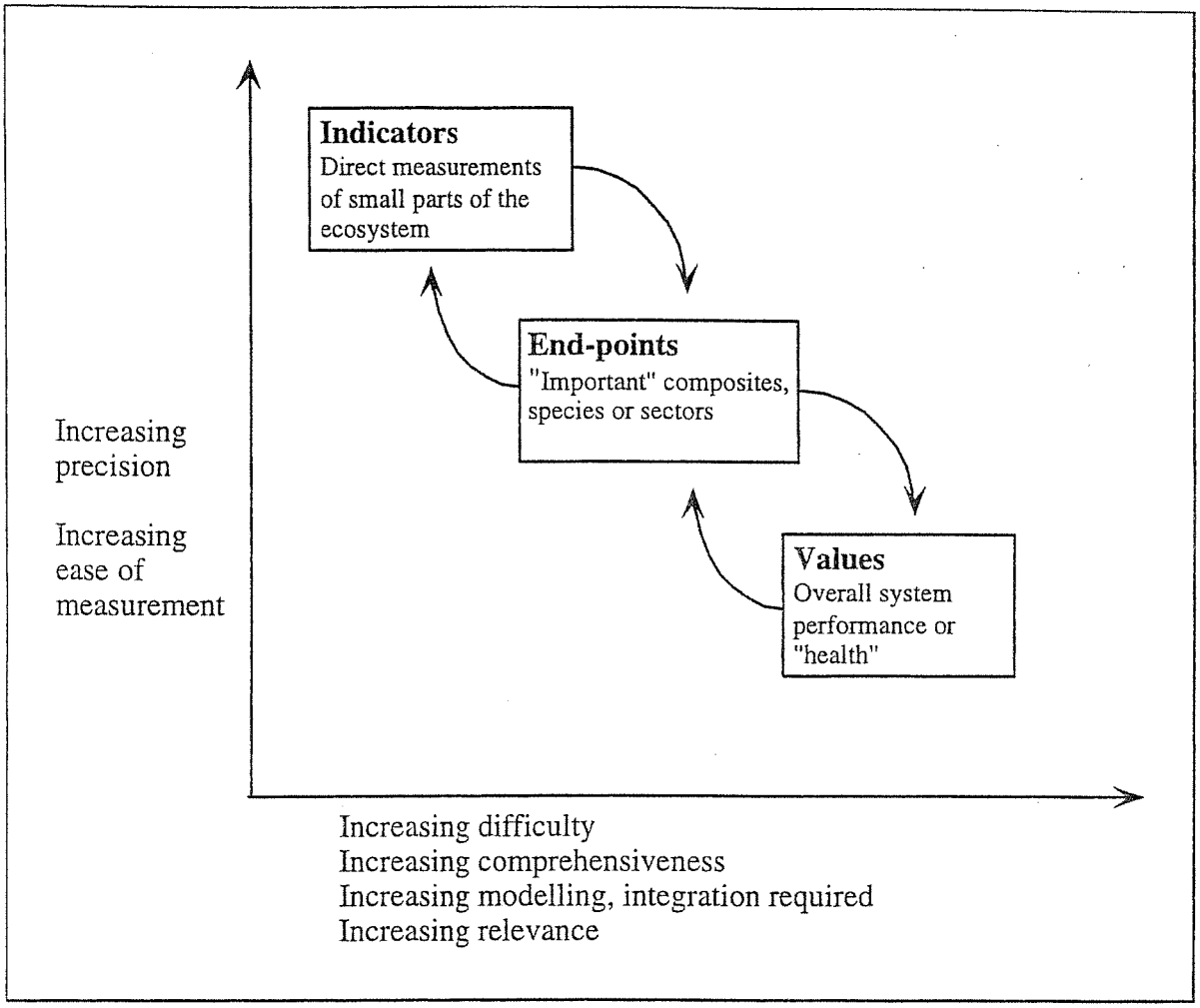


Figure 3 Relationship between indicators, end-points and system values (After Costanza et al., 1998a).

Although numerous indicators having potential to define estuarine health have been proposed (Fairweather and Napier, 1998; Ward *et al.*, 1998a; Ward *et al.*, 1998b), few have been tested to date. Testing must include an evaluation of the indicator's sensitivity, so that meaningful conclusions about measurement endpoints and system condition can be drawn from it's application. Testing should ensure that the indicator behaves predictably, is repeatable and has precision and accuracy. Although every measurable parameter has some value with regard to assessing environmental conditions, measuring every variable or assimilating a large amount of information into the decision making process is not possible. Environmental parameters or indicators must be selected that are useful in judging the degree to which specified environmental conditions have been achieved or maintained.

The search for measures that will uniquely indicate the effects of pollution or any other deleterious change in the environment of a community has been longstanding. There is a requirement for experimentation which identifies indicator variables which are causally linked to human impacts (Keough and Quinn, 1991; Fairweather, 1997). Biological responses tend to integrate the independent and interactive effects of many stressors, a property that makes them potentially more robust indicators of ecosystem condition than the concentrations and loadings of individual chemicals (Cairns Jr. *et al.*, 1993a; Clarke, 1994).

Biological indicators should be (After Round, 1991, Whitton, 1991, Dixit et al, 1992):

- Simple;
- Able to quantify the rate of degradation or recovery in water quality;
- Applicable over a large geographic region;
- furnish data on background or reference conditions and natural variability;
- Be present throughout the length of a wetland, river, estuary;
- Should grow in a specific well defined habitat;
- Should be easily sampled and present in abundance;
- Should be unaffected by life cycle stages;
- Should react to changes in water quality so that specific groups can be used as markers;
- Presence rather than absence in response to environmental stimulus is a preferred characteristic for indicator organisms.

There are a myriad of biological indicators published in the literature, particularly in recent years, as the limitations of physico-chemical indicators became known and it was felt that waterway managers required less ambiguous measures of the ability of ecosystems to sustain themselves and their biota. Biological indicators may be described as a hierarchy of measures of i) ecosystem function, ii) community structure, iii) biotic indices, iv) indicator species, v) biomarkers and vi) combinations of these. Clearly each of the various types of biological indicators describe processes at different spatial and temporal scales and perform different functions as indicators of environmental stress. Care should be taken in the use of these indicators especially in heterogeneous systems and when using them to investigate the effects of nutrient enrichment (Patrick and Palavage, 1994).

There are three types of indicators that should be included in a suite to assess the health of estuaries. Core indicators form the basis of assessment programmes, developmental indicators are those where the research is advanced, but their applicability to a particular management situation requires additional work, and research indicators, which need considerable additional research to be of use (Cairns Jr. *et al.*, 1993b). Continued basic research in the area of ecosystem health indicators is needed, particularly in the context of fostering better links between research scientists and ecosystem managers. Research should be aimed at translating scientific concepts related to ecosystem integrity into concrete measures that can be used in management.

Within the core indicator set there are compliance indicators which are used to judge the achievement of particular environmental objectives, diagnostic indicators which are used to determine the causes of impacts and early warning indicators which are especially sensitive to a particular ecosystem stress and can detect potential deleterious impacts before significant impact has occurred.

9.3 Potential environmental indicators for the Peel-Harvey system

The EPA during its assessment of the Stage II ERMP (EPA Bulletin 363) identified a number of environmental indicators, which had potential to describe the health of the Peel-Harvey system. The Peel-Harvey system in this instance is taken as the estuary, rivers, streams, wetlands and its catchment.

Environmental indicators recommended for the Peel-Harvey system included:

Catchment

- Streamflow;
- Phosphorus and nitrogen analyses of soils;
- Phosphorus and nitrogen analyses of streams;
- Areal water yeilds to the estuaries;
- Surface and groundwater balance;
- Clearing and drainage;
- Land use changes;
- Point source discharges;

Estuary

- Salt distribution in the estuaries;
- Transparancy of estuarine waters;
- Oxygen status of sediments;
- Seasonal nutrient levels;
- Tissue nutrient status of estuarine flora;
- Tidal amplitude and tidal velocities;
- Sedimentation in the Dawesville Channel;
- Innundation of fringing vegetation;
- Mosquito nuisance;
- Fish populations;
- Bird numbers;

System

- System nutrient budget;

Additional indicators which could be considered include:

Catchment

- Extent of development and adoption of "Best Management Practices BMPs";
- Proportion of farmers regularly using tissue and soil testing;
- Status of riparian vegetation along streams and drains;
- Biodiversity of wetlands (lakes, streams) in the catchment.

Estuary

- Occurrence of Nodularia blooms in lower riverine reaches;
- Presence of macroalgal biomass in the lower Harvey estuary.

System

- Biodiversity of system (remnant vegetation, riparian areas, rivers, estuary).

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APPENDIX A

Table of total phosphorus (TP) loads for the Serpentine River at Dog Hill, the Murray River at Pinjarra and the Harvey River at Clifton Park together with scaled targets for these three rivers. Standard deviation was calculated from 100 randomisations of daily (summed to annual) load incorporating errors for daily streamflow, analytical errors and errors for interpolated nutrient concentrations using 5 parameter log-linear model (Belval et al, 1995).

Year	Serpentine Dog Hill TP tonnes	Standard deviation	Murray Pinjarra TP tonnes	Standard deviation	Harvey Clifton park TP tonnes	Standard deviation
1983	152.8	7.34	68.3	1.03	87.0	0.64
1984	67.1	1.81	9.3	0.08	58.0	0.64
1985	92.2	4.22	12.3	0.13	50.7	0.37
1986	51.3	2.25	6.0	0.07	46.1	0.31
1987	26.9	1.45	4.9	0.10	21.4	0.21
1988	137.1	4.22	19.3	0.20	89.7	0.60
1989	107.9	5.47	5.1	0.04	57.8	0.62
1990	62.1	1.84	8.2	0.11	38.6	0.31
1991	108.7	3.51	12.8	0.15	70.9	0.69
1992	72.2	2.05	13.3	0.13	50.8	0.42
1993	15.0	0.37	7.2	0.04	26.8	0.19
1994	32.2	1.72	12.9	0.08	34.0	0.47
1995	30.3	1.33	14.2	0.07	32.1	0.37
1996	64.8	0.55	27.0	0.14	52.5	0.50
1997	51.7	0.53	4.4	0.02	30.9	0.28
1998	66.7	0.60	na	na	59.5	0.67
Targets 50 percentile	14.2		14.9		26.9	
90 percentile	29.7		36.4		57.3	

NOTE: The method used in this report to estimate mass loads does not take into consideration the effects of sampling bias or the effects of systematic errors in streamflow measurement caused by instabilities in stage-discharge relationships.

Errors associated with sampling bias are expected to be relatively small for sites with comprehensive nutrient sampling strategies like the Harvey River where 4 samples were collected daily and mixed to produce a single daily sample in an autosampler. For the Murray and Serpentine Rivers, errors caused by sampling bias are expected to be greater because of the weekly fixed interval sampling up to 1997. After that time, autosamplers collecting daily composite samples were installed.

Systematic errors in streamflow measurement caused by instabilities in stage-discharge relationships are generally very low where appropriate weirs have been constructed to control flow. For the Harvey River at Clifton Park and the Serpentine River at Dog Hill, natural controls have been used. Systematic errors in streamflow for these rivers are expected to be significant (15-50%) and accordingly, nutrient mass loading estimates may contain similar errors. The WRC is currently developing a methodology to account for these types of errors.

APPENDIX 4

Specialist Report on Catchment Management

Peel-Harvey Estuary System Management Strategy

SPECIALIST REPORT ON CATCHMENT MANAGEMENT

Prepared by
John Yeates
CH2M HILL INTERNATIONAL

18 August 2002

Executive Summary and Conclusions

The Peel-Harvey Expert Review Committee (P-HERC) agreed that the following Terms of Reference (TOR) should be addressed during the review of the Peel-Harvey Stage II ERMP Progress and Compliance Report on Environmental Conditions (ECs) related to catchment management:

1. *Verify the statements made in the Progress and Compliance Report (PCR) in relation to the development and implementation of the integrated catchment management plan (ICMP) and determine what changes have occurred in the catchment since 1989 and what these have achieved in terms of nutrient reduction to the estuary from the catchment.*

2. *Examine what the proponents have done in terms of developing and implementing the ICMP to meet the requirements of the Environmental Conditions – specifically that the ICMP had to be produced to the satisfaction of the EPA and implemented by December 1990.*

3. *Prepare a Specialist Report on the findings related to catchment management for inclusion as an appendix to the report of the Peel-Harvey Expert Review Committee to the EPA.*

Information considered relevant to the TOR was made available on request from the Proponent Ministers' agencies, Environmental Protection Authority (EPA) and Department of Environmental Protection (DEP) files, and other sources. To assist in clarifying or resolving issues, meetings and discussions were also held with personnel from various agencies and other bodies with experience and interests in the issues addressed in the PCR.

Conclusions

The conclusion of this Specialist Report is that the PCR, while providing valuable information on the current status of implementation of measures related to compliance with the Peel-Harvey Stage II ERMP ECs, contains some conclusions which are not supported by available evidence, and that the PCR is rather simplistic in its treatment of a number of issues related to compliance.

It is considered that the interpretation by the authors of the PCR of a number of the ECs is open to question, as are the actions apparently considered by the proponents to be necessary or sufficient to comply with some of the ECs. The PCR asserts that some ECs have been met because progress has been made towards compliance, or some actions have been taken in relation to those ECs. However, this Specialist Report concludes that, of the ECs considered by the PCR to have been met, many have only partially been met, and it is open to question whether partial compliance meets the intent of the ECs.

This Specialist Report identifies a number of issues which are believed to have negatively impacted on both compliance with the ECs, and the meeting of catchment targets. These include difficulties encountered in accurately measuring catchment parameters relevant to catchment management ECs, such as the level of implementation or adoption of management programs or success of the programs in terms of reduction in water and nutrient loss to the catchment. This complicates the assessment of compliance with ECs.

Another issue identified as impacting compliance with the ECs was dissatisfaction by catchment landholders and managers (including staff of proponent Ministers' Departments) with the process by which the Peel-Harvey Stage II ECs were developed and implemented,

which is considered to have lead to lack of commitment to meet the ECs. Lack of funding to or by authorities (including the Stage II Peel-Harvey Ministerial proponents' Departments) for components of the catchment management strategy for the Peel-Harvey also appears to have severely restricted the implementation of programs related to compliance with ECs.

This Specialist Report also concluded that failures occurred within the proponent Ministers' Departments, and within the EPA/DEP (and likely others), including a lack of leadership on compliance with the ECs, consistency in developing and implementing policies, absence and/or diversion of funds for programs and catchment management measures, lack of management commitment to the catchment management strategy, and lack of timely development, implementation and review of policies and plans. These have negatively impacted on compliance with the ECs.

The ECs sought, via legally binding commitments on three Government Ministers, to achieve catchment management objectives mostly through voluntary changes by landholders to landuse practices. However, poor adoption of these changes of practice, and other contributory factors have resulted in poor compliance with the ECs related to catchment management, and have caused catchment nutrient loss targets to not be met. Currently, the proponent Ministers' agencies appear to lack the mechanisms required to achieve adoption of these changes, although there would appear to be no reason why this deficiency could not be corrected, if the will existed.

This Specialist Report also concludes that top-down regulation is likely to be less effective in achieving the overall objectives of the ECs and outcomes acceptable to all stakeholders in the Peel-Harvey catchment than a pragmatic, proponent agency-driven consistent and pro-active mix of regulation, enforcement and voluntary co-operation, backed by financial incentives.

Recommendations to the Expert Review Committee

General Recommendations

1. The desired environmental outcomes and targets of the Peel-Harvey catchment strategy should be re-endorsed by the EPA, and involve extensive community consultation.

2. The current catchment ECs should be reviewed and/or redefined to ensure that all commitments are practicable, achievable and are likely to deliver the desired outcome.

3. The catchment ECs should be audited against the mix of enforcement mechanisms currently available to the proponent agencies, and, if necessary, either the ECs should be modified, or appropriate mechanisms should be created or strengthened within the agencies.

4. The roles and mix of landuse regulatory and voluntary measures currently in place in the catchment should be re-assessed and redefined with a view to developing or reconfirming a mix which will achieve compliance with the ECs, and the desired environmental outcomes.

5. Government agency funding for Peel-Harvey catchment management should be reassessed and re-prioritized.

Specific Recommendations

1. A full, integrated and practicable catchment management plan (Integrated Catchment Management Plan, ICMP) should be developed and implemented, incorporating all

measures and mechanisms required to achieve the specified catchment nutrient loss and other targets, and the desired environmental outcomes of the Peel Harvey Strategy

2. A single point of leadership, authority and coordination should be established within one agency and charged with the development and implementation of measures incorporated into the ICMP, which will, as best as currently can be determined, achieve the desired environmental outcomes of the Peel Harvey Strategy.

3. Best management practices (BMPs) for all catchment land uses and an effective catchment education program related to the BMPs should be developed, endorsed by the EPA, and implemented by the Peel Harvey strategy proponents and other relevant agencies.

4. An effective and enforceable system should be developed within the catchment for identification and regulation (via assessment and licensing) of land uses which have been demonstrated to have high nutrient loss potential (such as intensive horticulture and point source emissions).

5. Mandatory farm and other land use planning requirements, involving use of BMPs, should be introduced catchment wide. Plans should be developed by each landholder or manager, and approved and audited annually by relevant agencies. The approvals process for these plans would not specify allowable land uses (with the exception of those with high demonstrated nutrient loss potential) but would nominate nutrient loss and other environmental targets which must be achieved.

6. Specific catchment and sub-catchment nutrient export targets should be defined, and effective monitoring systems should be developed for these catchments to enable the success of catchment management to be measured.

7. A nutrient emissions/discharge trading system should be developed, such that allowable land uses (with the exception of those with high, demonstrated nutrient loss potential) would not be specified if sub-catchment and catchment targets could be shown to be met.

8. A strict system should be developed to effectively deal with enforcement of and non-compliance with planning requirements, approvals, farm plans and BMP measures.

9. A suitable sub-catchment within the Peel-Harvey catchment should be identified and used as a demonstration of environmentally acceptable and economically viable and sustainable land use. This pilot catchment would be used to demonstrate and build landholder confidence in and understanding of appropriate fertiliser use, alternative land uses, soil amendment technology, zero discharge intensive animal industries, drainage retention basins and landcare initiatives such as streamlining and re-vegetation. Biological and economic yields would need to be measured, in conjunction with nutrient losses.

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1. BACKGROUND AND STRUCTURE OF THE SPECIALIST REPORT ON CATCHMENT MANAGEMENT

This Specialist Report (on catchment management) is one of three technical reports prepared by members of the Peel-Harvey Expert Review Committee (P-HERC). All three Specialist Reports are included as Appendices to the P-HERC Report to the EPA.

The following section of this Specialist Report addresses Items 1 and 2 of its Terms of Reference and follows exactly the sequence and format of the PCR. The PCR did not directly address the original ECs for the Peel-Harvey Stage II ERMP, but rather addressed elements of the audit table (referred to below as the 'audit elements') developed from the ECs by the DEP Environmental Audit Branch (document dated 9/9/96). In this Specialist Report, each statement made in the PCR in relation to ECs involving catchment management has been specifically addressed under and in the same order as the 'audit elements'.
For explanation of the development of the audit elements from the ECs, readers are referred to the 9/9/96 audit table document.

In addressing statements made by the PCR, this Specialist Report reproduces in italics the original wording of each catchment management-related EC (or the catchment management-related sections of them) from the Stage II ERMP. Where appropriate, such as where the PCR has interpreted an EC, this Specialist Report also quotes (in italics) from the PCR and other relevant documents as background to conclusions drawn. However, reference should be made to the PCR and other cited documents for the context of quotations and conclusions drawn by this report.

In this report:

- Ministerial Conditions and Proponent Commitments are collectively referred to as Environmental Conditions (**EC**s).
- The Stage II ERMP Progress and Compliance Report on Environmental Conditions is referred to as **PCR**.
- An **M** prefix refers to ECs imposed by the Minister for the Environment, and a **P** prefix refers to Proponent Commitments required to be complied with following EPA assessment of the Stage II ERMP.
- The number immediately following the letter M or P refers to the EC number, i.e. a one or two digit whole number followed by zero, one or two decimal place digits.
- A semicolon (;) separates the EC number from any DEP 'audit elements' relevant to the EC (e.g. MO2.2:1; P1.08:2.13).
- The numbers following the **PCR** prefix (e.g. 2.3.2.4) refer to the PCR report section number, the EC title and the EC number as they are identified in the PCR.

During the process of gathering information on catchment management in the Peel-Harvey Estuary System, a number of meetings were held, as set out in Appendices A and B of this report. Mr Jon Warren of the Department of Agriculture is given special mention for assisting in the arrangements for these meetings and for the provision of information. Mr David Deeley, a member of the was also present at the meetings.

During these meetings interviewees repeatedly advised that a request was made in 1993 to have some of the ECs reviewed (and changed) under section 46 of the Environmental Protection Act 1986. This process was apparently initiated to address difficulties being experienced or perceived by the proponent Ministers and/or their Departments. To ensure that all relevant information was available for consideration, Environmental Protection Authority

Department (EPAD, now Department of Environmental Protection, DEP) files were researched to clarify the issue. This resulted in the location of documents which indicate that the EPA supported a Waterways Commission recommendation that the ECs be revisited, and suggested that the proponent Ministers seek changes to the ECs through a request to the Minister for the Environment under section 46 of the Environmental Protection Act 1986 (17 February 1993). Subsequently, the Minister for the Environment amended Condition 1 and added Conditions 15, 16 and 17 (19 April 1993). The Minister also requested that "the EPA under section 46 of the Environmental Protection Act 1986 inquire into and report on whether the conditions or procedures pertaining to the Peel-Harvey Management Strategy as previously reported on by the EPA should be changed" (17 May 1993). As part of this process, a review of the Peel-Harvey Management Strategy Stage II ECs was submitted to the EPA on behalf of the proponent Ministers (21 December 1993). On 28 July 1994 a public discussion paper on the review of the Peel-Harvey Management Strategy Stage II ECs was released by the EPA as Bulletin 749. This discussion paper included the proponent Ministers' review of the ECs (21 December 1993) which is hereafter referred to as 'the 1994 section 46 request'.

Whilst minor EC amendments were made in April 1993, the comprehensive EC review following release of EPA Bulletin 749 was never finalised and the ECs as in existence in 1994 were not altered. The documents mentioned above, together with material prepared by Government agencies on behalf of the three proponent Ministers and public submissions received in response to Bulletin 749, have been taken into account by this Specialist Report.

The '1994 section 46 request', is reproduced in part below and elsewhere in this document where appropriate as general background to some of the issues addressed in this Specialist Report, and to indicate the views held in regard to the ECs by the proponent Ministers' Departments at that time..

In the introductory summary to the '1994 section 46 request', under 'Specific Programs: Catchment', it states that:

> *"The process of land use change is now largely managed by the Department of Planning and Urban Development, who have developed a Statement of Planning Policy for the catchment. The EPA has participated in the Management Program through policy development, pollution control, environmental assessment of small and large development proposals, and through review of regional and local planning strategies.*
>
> *Successful implementation of catchment initiatives required a shift in community attitude toward local ownership of the problem and acceptance of responsibility. Local landholders have now been recognised as an essential part of the management process and are beginning to provide leadership in the development and implementation of solutions."*

and, under 'General', it further states that:

> *"The Peel-Harvey program was the first use in WA of formal Environmental Impact Assessment procedures on a wide ranging program affecting a complex range involving engineering, geographic, statutory and social situations. As such, it can be expected that any review will find areas capable of further refinement.*
>
> *Where the conditions apply to well defined engineering situations (i.e. construction of the Dawesville Channel) it is appropriate that they continue. Formal assessment has proved less appropriate for the catchment-wide components of the program. Considerable flexibility of approach has been needed to implement the program.*

The wording of some of the original conditions is now causing difficulties and may put Ministers in technical breach of Ministerial Conditions. This is particularly the case for the six Ministerial Conditions over which the proponents have little or no decision-making authority. Performance of the proponents cannot be judged on matters over which they have no control. Where it has not been possible to meet the specific letter of conditions applicable to the proponents alternative mechanisms have been developed and adopted to ensure the intent is met.

Additionally, there have been major concerns in the communities of the catchment at the implications of the statutory process itself. Perceived inconsistencies between the Ministerial Conditions and some recent land use changes, along with inappropriate landuses within the catchment which remain unmanaged, have fuelled this scepticism and reduced the credibility of the entire catchment management program. Examples include ongoing confusion over the perceived clearing and drainage 'moratorium', the fact that some major point sources have continued unabated until very recently, and the difficulties in providing effective sewerage to urban development.

Many aspects of the current catchment program go beyond the intent of the Conditions. While phosphate load reduction remains the core of the program, its operations have broadened significantly and are now directed towards the attainment of sustainable land-use throughout the catchment."

The Conclusions and Recommendations section of this Specialist Report contains general conclusions in relation to management of the Peel-Harvey Catchment. It also explores additional issues identified during the course of this review which are outside the strict scope of the Terms of Reference, but are considered relevant to the findings of this review.

This Specialist Report has been produced in accordance with Scope Item 3 of the Terms of Reference.

2. SCOPE OF ITEMS 1 AND 2 OF THE TERMS OF REFERENCE

1. Verify the statements made in the Progress and Compliance Report (PCR) in relation to the development and implementation of the integrated catchment management plan (ICMP) and determine what changes have occurred in the catchment since 1989 and what these have achieved in terms of nutrient reduction to the estuary from the catchment.
2. Examine what the proponents have done in terms of developing and implementing the ICMP to meet the requirements of the Environmental Conditions – specifically that the ICMP had to be produced to the satisfaction of the EPA and implemented by December 1990.

2.1 Interim Target

2.1.1 EPA Review Interim Target (M02:1; PCR 2.1.1)

"... so that, in conjunction with the Dawesville Channel, the following objective is met: The Peel-Harvey System becomes clean, healthy and resilient.

To achieve this objective, the following interim targets should be used:

(1) annual phosphorus input to the system shall not exceed 85 tonnes in more than four years out of ten (on average) and shall not exceed 165 tonnes in more than one year out of ten (on average). [These are based on 60 and 90 percentile loads]; and

(2) average phosphorus concentration in estuary water shall not exceed 0.2 milligrams per litre in nine years out of ten (on average).

These target Conditions shall be reviewed by the Environmental Protection Authority after 3 years or sooner if Environmental Conditions dictate, in the light of measured performance of the System and may subsequently be varied by the Environmental Protection Authority." (M02)

Compliance or otherwise with EC M02 can only be assessed by analysis of riverine and estuarine P-load monitoring data collected since the EC was imposed. The PCR provides a review of events relating to monitoring data and the interpretation of that data, and, despite identifying difficulties with monitoring and data interpretation, concludes that the annual phosphorus input into the Peel-Harvey system has not been reduced to below 85 tonnes/annum load target in any year between 1978 and 1996. This finding has also been confirmed by the analyses conducted by Mr David Deeley in his review of the water quality and targets (see Appendix 4 of the Peel-Harvey Expert Review Committee Report to the EPA).

The PCR recommends that the targets be reviewed, using the approach currently being employed (at that time) in the Swan Canning System. Whether the targets need to be reconsidered, either in response to improved water quality resulting from the Dawesville Channel construction, or for other reasons, is not considered here.

The PCR recommendation 2 to the EPA, that: the proponents have met the requirements of the Condition within budget constraints cannot be concurred with. No evidence is available to support the statement that EC M02 has been met, and budgetary situation is considered to be of no relevance in assessing whether or not an EC has been met.

Recommendation 3 of the PCR 2.1.1, that EC M02 be cleared, as it is ongoing and should be included in the EPP as an ongoing agency requirement, is not addressed in this Specialist Report. As concluded above, no evidence has been presented in the PCR to support the statement that EC M02 has been met, i.e. the requirement that *annual phosphorus input to the system shall not exceed 85 tonnes in more than four years out of ten (on average) and shall not exceed 165 tonnes in more than one year out of ten (on average). [These are based on 60 and 90 percentile loads].*

Recommendation 4 of the PCR, that the proponents for EC M02 be changed, is addressed in other sections of this P-HERC report.

Other recommendations are not considered here, but it is noted that inclusion of targets for N (estuarine load targets?) would seem likely to have the same measurement and interpretation difficulties as those for P. In any case, control of N loadings to the Peel-Harvey system would in all likelihood be very difficult to achieve.

It is noted that in 'the 1994 section 46 request' it was stated by the proponents that, in regard to EC MO2, *"the current condition needs re-assessment. It may be appropriate for the proponents, or stakeholders, to prepare an amended management program, with readily measurable targets, providing regular feed-back could be provided by the EPA during such a review."*

2.2 Catchment Management

> Examine what the proponents have done in terms of developing and implementing the ICMP to meet the requirements of the Environmental Conditions – specifically that the plan had to be produced to the satisfaction of the EPA and implemented by December 1990. (P-HERC TOR 2)

2.2.1 Integrated catchment management plan (M04; PCR 2.2.1)

> *"The proponents shall develop in consultation with such persons and agencies as Government may specify, an integrated catchment management plan designed to meet the objective and targets specified in Condition 2, to the satisfaction of the Environmental Protection Authority, and which shall be in accordance with the principles to be developed in the Environmental Protection Policy for the area pursuant to Condition 3. The target date for the implementation of the integrated catchment management plan shall be 31 December 1990."* (M04)

The PCR and supporting documentation details actions taken within the catchment of relevance to EC M04. The PCR suggests that implementation and success of the catchment management program in the Peel-Harvey has been adversely affected by factors related to community acceptance of the Peel-Harvey ERMP and the EC-setting process, and that the process was not equitable in the eyes of the non-urban Peel-Harvey community. The PCR articulates the strategy being used by the Department of Agriculture, in conjunction with the Water and Rivers Commission, to achieve the outcome of an integrated catchment management plan (ICMP).

EC M04 expressly requires the development and implementation of an ICMP. Despite the activities undertaken to date, no single ICMP has been developed or implemented. I t is certainly clear that a plan has not been developed 'to the satisfaction of the EPA'. Several Department of Agriculture representatives stated that a draft plan was developed in 1990 and submitted to the EPA for comment, but comments were never received and the developmental process was stopped in favour of the approach subsequently implemented by the Department of Agriculture, as detailed on page 7 of the PCR. This includes activities undertaken directly by the Department, and also by other agencies, Shires and Land Conservation District Committees (LCDCs), mostly through voluntary participation.

It should be noted that the activities cited by the Department of Agriculture as its response to EC M04 do cover a broader range of issues other than compliance. The Department's now disbanded 'Sustainable Rural Development Program South West', within which a policy and procedures manual for land use was to have been prepared, is one example, but it does not expressly address the Peel-Harvey ECs.

In summary, a single documented ICMP has not been prepared in response to EC M04, but rather a series of actions has been undertaken in an endeavour to obtain the voluntary cooperation of non-urban landholders and managers in the catchment. No evidence is available from water quality monitoring to demonstrate that these actions have enabled EC M02.2 to be met. Whether such a voluntary system, without a single integrated plan, will ever enable EC M02.2 to be met, cannot be concluded at this time. This issue is discussed elsewhere in this report.

Recommendation 1 of PCR 2.2.1 to the EPA on EC M04, that the proponents have met the requirements of the Condition, cannot be verified as an ICMP has not been developed to the satisfaction of the EPA. No complete ICMP has ever been submitted to the EPA and the EPA has given no indication of its satisfaction.

As with EC M02.2, the recommendation that implementation of EC M04 remains ongoing and requires ongoing action appears inconsistent with a recommendation that the Condition has been met, although it is recognized that any ICMP would require continuous review and amendment.

In the 1993 documentation submitted to the EPA in support of 'the 1994 section 46 request' (but not reproduced in the Bulletin 749, 1994) it was recommended that in relation to EC MO4:

> *"the Condition should be cleared following EPA endorsement of the approach (then) currently being followed, the progress made, and the documentation prepared. This endorsement needs to recognise that catchment management is an ongoing process which cannot be encapsulated into a single final plan."*

EC P3.5 stated that:

> *"The Department of Agriculture will coordinate the preparation and implementation of a detailed catchment management plan aimed at reducing phosphorus losses to the estuary to less than 85t/a in a 60 percentile year with minimal economic or social disruption to the catchment community".*[1]

The 1993 documentation supporting 'the 1994 section 46 request' in relation to EC P3.5 stated that:

> *"production of a definitive (ICMP) has not been possible given the paucity of feasible and acceptable phosphate reduction techniques, and the absence of community ownership of the phosphate problem and its solutions. Production of such a plan, as envisaged in the commitment, is no longer considered the most practical method;* and that *acceptance is required that a (ICMP) is best recognised as consisting of a range of documents produced by the range of groups and agencies involved in the program. A unified landholder group has been formed to oversee finalisation of the ongoing program as it is currently envisaged."*

The documentation recommended *endorsement of the current (1994) co-operative approach* and stated that the Department of Agriculture was prepared to produce an annual program each March, which would require ongoing formal feedback. It proposed that inclusion of this suggestion in the next edition of 'The Guidebook', together with practical techniques, would constitute what was originally referred to as a catchment management plan.

In considering both the PCR and the 1994 section 46 documentation, it is evident that, regardless of the intent of actions taken by the proponents, or the adequacy of the plan or plans developed to address the ICMP - related ECs, closure was never reached between the proponent agencies and the EPA on what constituted an appropriate ICMP to meet EC M04. This point was repeatedly made by people interviewed during this review and must be considered to be a systems failure, and this failure appears to have been an ongoing point of contention between Government agencies. It has been deemed by some proponent agency

[1] This proponent commitment is not explicitly addressed in the PCR as EC P3.5, but is addressed de facto under MO4. However, through MO1 and MO2 the specific commitments made in EC P3.5 were included in Ministerial Conditions.

officers to demonstrate a Government lack of commitment and consistency in regard to Peel-Harvey catchment management.

2.2.2 Develop proposals for phosphorus management (M02:1; PCR 2.2.2)

> *"The proponents shall develop proposals for control of phosphorus through catchment management, to the satisfaction of the Environmental Protection Authority, ... so that, in conjunction with the Dawesville Channel (DC,) the following objective is met:*
>
> *The Peel-Harvey System becomes clean, healthy and resilient.* "(M02)

2.2.3 Implement proposals for phosphorus management (M02:2; PCR 2.2.3)

> *"The proponents shall develop proposals for control of phosphorus through catchment management, to the satisfaction of the Environmental Protection Authority, and shall implement them, as rapidly as possible so that, in conjunction with the Dawesville Channel (DC), the following objective is met:*
>
> *The Peel-Harvey System becomes clean, healthy and resilient".* (M02)

What would constitute compliance with EC M02 is considered to be open to interpretation for the following reasons:

- Proposals may not meet the desired outcome, despite that being the intention of the development and implementation of the proposals;
- There is no evidence that the EPA has expressed satisfaction or otherwise with respect to proposals for phosphorus control; and

Subsequent to the completion of the Dawesville Channel, parts of the *Peel-Harvey System* may be considered to have become *clean, healthy and resilient.* Other parts of the system, such as Goegrup Lakes and southern Harvey Estuary, appear not to have significantly improved since EC M02 was imposed. The improvements which have occurred may not be permanent or sufficient for the EC to be considered to have been met. Further, improvements which have occurred may not be due to phosphorus control measures being developed and/or implemented, or some catchment management targets being met.

It is concluded that EC M02 has been interpreted and approached by the proponents as one requiring research and voluntary community participation for implementation. No evidence exits that the P loadings to the estuary have been significantly reduced by catchment activities, although re-analysis of data by Mr David Deeley in his review of the water quality and management targets (see Appendix 4 of the P-HERC Report to the EPA) suggests that clear evidence is unlikely to be obtained for the period over which catchment measures have been in place in the Peel-Harvey system.

Specific reasons for a demonstrated lack of reduction of P loadings to the estuary could include:

- Lack of precision in P loading measurement;
- Lack of development of effective P control proposals (for reasons of funding or commitment, or because of limited options within the perceived sphere of each agency's operations);
- Inability of agencies (for funding, commitment or jurisdiction issues) to effectively implement proposals which have been developed;
- Lack of acceptance by landholders and managers in the catchment of either the proposals or the need to implement them, for a range of reasons (economic, commitment); and

- A time effect between development, implementation and measurement of impact (i.e. reduction in P loadings).

One specific issue, that of Alkaloam (Alcoa 'red mud') illustrates some of the difficulties encountered in attempting to develop and implement measures to control P loss from the catchment. Though subject to intensive research and development investment, numerous difficulties have been encountered in implementing this measure voluntarily within the catchment due to a range of (real or perceived) legal and environmental issues. It is considered that some of these could have been overcome by a more positive approach by the proponents to the issue, to ensure the benefits of this (and other) measures were better understood within the farming community.

EC M02 raises issues related to the economic impact of proposals to control P use in the catchment and reduction of P loadings by the introduction of voluntary measures. Reduction of application of P fertilisers or change in fertiliser types or application regimes would be expected to occur if landholders were convinced that it was in their economic interests, either because of resultant direct cost savings, or because of other applicable incentives/disincentives. From the information obtained during this review it would appear that landholders (farmers, intensive industries, other land users) are:

- not convinced that there are significant economic advantages in reducing or modifying P use; and/or
- not concerned about or do not understand the long term environmental impacts of continued inappropriate application of P fertilisers; and/or
- not greatly concerned about or not aware of regulatory action (at least in the short term) which may be taken in support of improving compliance with the Peel-Harvey ECs.

These complex issues are addressed further in following sections of this report.

The PCR recommendations, that EC M02 has been met, and/but is ongoing, requires a review of the intent of the EC, and assessment against the fact that targets for P loading into the estuary from the catchment are well below the levels currently occurring. However, it cannot be concluded in this review that this condition has been met.

2.2.4 Clearing and drainage moratorium (M05; PCR 2.2.4)

> *"The proponents shall ensure that the moratorium on clearing and drainage in the Peel-Harvey coastal plain catchment proposed in the Stage 2 ERMP (Commitment 3.6) continues until the Minister for the Environment is satisfied that these activities would be environmentally acceptable."* (M05)

EC M05 was imposed following review of evidence obtained in the original Peel-Harvey investigations that P export was closely correlated with both the proportion of sub-catchments which was (cleared and) used for agriculture, and the density of drainage (length of drains per unit area). It is noted that the latter finding has been queried (see statements in the PCR, p12).

The moratorium on clearing has been in place since January 1989. It has been implemented by the Department of Agriculture, via the Soil and Land Conservation Act, and through the EPA's formal assessment of specific proposals. The moratorium on drainage has been in place since 1985 when the (then) WA Water Authority ceased to construct new major public drains. In relation to private drains, the EPA has addressed specific proposals and drainage and this issue is covered in the SPP.

Since gazettal of the Soil and Land Conservation Regulations on 17 June 1992, there has been a requirement for a landowners in the Peel-Harvey catchment to notify the Commissioner (for

Soil and Land Conservation) 90 days prior to clearing land or pumping or draining water from land. Implementation of the clearing moratorium on private land is the subject of an April 1997 MOU between six parties: the Commissioner for Soil and Land Conservation, the Environmental Protection Authority, the Department of Environmental Protection, the Department of Agriculture, the Department of Conservation and Land Management, and the Water and Rivers Commission. The MOU specifically refers to areas of greater than 1 ha of native vegetation but does not cover areas of less than 1 ha, areas greater than 1 ha which may be slowly degraded as a result of open grazing, or multiple or adjacent areas each of less than 1 ha which may be cleared over a period of time.

On 5 May 1999 new administrative procedures were put in place under the Soil and Land Conservation Act to augment the MOU. These procedures require landholders to prove that any proposed land clearing will not cause land degradation.

The Minister for the Environment not being known to be 'satisfied that these (clearing and drainage) activities (that is, those activities currently allowed under the assessment procedures in place) would be environmentally acceptable'. Therefore, the intention of the moratorium, to stop clearing and drainage in the Peel Harvey catchment, would appear to be still applicable. The Department of Agriculture notes that "*after initial operational difficulties, ...the implementation of the moratorium on clearing has been successful in agricultural areas*," but also notes that the area of uncleared agricultural land is relatively small. However, "*implementation (of the moratorium) in peri-urban or rural residential areas has been more difficult due to lower levels of awareness and confusion arising from clearing being allowed in urban areas and landholders not understanding the zoning system.*" The Department of Agriculture holds the further view that "*the moratorium on clearing has been ineffective in urban areas (as) the Commissioner (for Soil Conservation) does not usually receive NOIs for clearing and (in) the event it occurs the NOI is referred to the local Government authority.*"

The PCR states that "*this Condition* (M05) *has become a contentious issue for catchment management in the Peel-Harvey*," as a result of perceived inequality between rural and urban landholders in the way the EC is enforced. The PCR cites cases where the mechanism for implementation of the moratorium was overridden by other legal and planning instruments. Similar cases were also cited by individuals during the course of the current review. Specifically, the PCR indicates that the Ministry for Planning does not consider that the moratorium on clearing is applicable in all cases of urban development, or that the Soil and Land Conservation Act applies to non-rural situations. This issue is somewhat unclear: guidelines issued by the Department of Agriculture (Land Clearing Proposals for Rural Zoned Land in Western Australia, undated but post May 1999) state that:

> "*under the Soil and Land Conservation Act and Regulations, owners or occupiers of land are required to notify the Commissioner for Soil and Land Conservation of their intention to clear more than 1 ha where there is a change in land use;*"

and,

> "*if the land proposed to clear is zoned other than rural it is assessed by the Commissioner under the 1994 procedures for the assessment of clearing proposals;*"

and in "

> *NOICs may be received for land clearing proposals in this area and where the Commissioner is of the opinion that land degradation will not occur, he will refer these clearing proposals to the DEP for a decision.*"

During the course of this review, the Department of Agriculture officers expressed the view that they did not consider the Soil and Land Conservation Act and the moratorium to apply to urban clearing (or drainage), and that it was the responsibility of other agencies to address this issue. Further, they considered that they had no legal powers to control urban land clearing

activities. This would in fact appear to be incorrect both legally, and from the perspective of the intent of the Peel Harvey ECs.

The Department of Agriculture was also of the view (as expressed by officers interviewed during the course of this review), based on GIS analysis of the catchment, that if all vegetation areas designated for urban development in the Inner Peel Region Structure Plan were cleared it would mean an 8% reduction in the area of remnant vegetation in the whole of the legislated catchment area. If just the area within the Inner Peel Region Structure Plan (comprising the area closest to the estuary and rivers) was considered, remnant vegetation loss within this area would be 17% of that remaining within the area. Although the impact of clearing of this area would need to be assessed in terms of the water and nutrient export potential (a function of both the soil type and the water and nutrient loss under urban land use), this issue clearly has the potential to undermine public confidence in the credibility of the clearing and drainage moratorium EC and the way in which it is currently being implemented.

From Department of Agriculture data, of the 667 ha within the Peel Harvey catchment for which NOICs were received between 1989 and the present, no objection was raised for clearing of 573 ha. Satellite imagery has estimated that 575 ha of rural coastal catchment has been cleared since 1989, and 752 ha of catchment land has been cleared over the same period. During the same period, the Department of Agriculture estimates that 1750 ha of remnant vegetation has been protected and 1200 ha of re-vegetation (including 260 km of streamlining) has occurred in the catchment.

The PCR states that an MOU is currently being developed for drainage (10 years after the EC for a moratorium on drainage was imposed), which is similar in function to the clearing MOU, and includes statutory processes operating in non-rural areas. Anecdotal evidence again indicates that to date the moratorium on drainage has not been fully effective, with enforcement being a major difficulty and 'drainage' not well defined. Specific issues identified by the Department of Agriculture were that: the Department of Agriculture had limited regulatory powers over drainage; the EC was not well defined; rural drainage managed by the Water Corporation had no applicable environmental standards; detection of illegal drainage activities was difficult; and the distinction between new and maintenance activities and agricultural and non-agricultural drainage was very difficult. Whether or not for these reasons, it is nonetheless apparent that no comprehensive data have been collected on drainage activities in the catchment since the moratorium has been in force

From information made available from various sources for this review, it is clear that no uniform agreement exists between agencies with respect to the interpretation of clearing, remnant vegetation and re-vegetation data which has been collected in the Peel Harvey catchment by various agencies. However, (notwithstanding various difficulties and the lack of comprehensive data) it is apparent that clearing and drainage has continued in the Peel-Harvey catchment despite the moratorium.

The PCR recommendations to the EPA are that EC M05 (moratorium on clearing and drainage) has been met, as it applies to the Department of Agriculture, but that it has not been met where the Department of Agriculture does not have jurisdiction. For the reasons discussed above, this recommendation cannot be supported by this review.

PCR Recommendation 2 on EC M05 is that the current arrangements for enforcement of the EC be reviewed to ensure equal treatment of rural and urban land. This recommendation is supported. However a wider issue is that of definition of which land (proposed for clearing and drainage) land uses pose a real risk of unacceptable P export, so that the original intent of this EC can be met. This in part relates to a statement in this recommendation regarding "*the ability to implement new and innovative drainage methods that minimise nutrient levels*

entering the estuary from rural land production." Binding ECs related to (audited) P export could be applied to any proposal for clearing and drainage if drainage under these ECs was allowable.

The '1994 section 46 request' sought clearance of EC M05, essentially on the grounds that:

- no overarching legal framework existed to fully implement this EC;
- the issue considered only a narrow aspect of the broader issue of drainage requirements for land; and
- perceived inconsistency in the wording of the EC relating to the circumstances requiring formal assessment by the EPA.

No evidence was provided at that time that the intent of the EC had been met, or the desired outcomes achieved. It is also considered that, if 'no overarching legal framework existed to fully implement this EC' exists, that it is incumbent on the Peel Harvey proponents to ensure one was developed.

A relate"

> *The proponents will implement a moratorium on further clearing and drainage in the catchment, pending determination of the success of the catchment management plan in reducing phosphorus losses from existing cleared land.*"

'The 1994 section 46 request' recommended that EC P3.6 be cleared on the basis that controls were in place over new clearing and drainage, to ensure that they were environmentally acceptable, without in fact providing evidence that they were in fact achieving the intended outcome of the EC.

2.2.5 Fertiliser advice to farmers (P3.1; PCR 2.2.5)

> *"The proponents will continue to provide advice to farmers on fertiliser requirements, based on accurate assessment by paddock-specific soil tests".* (P3.1)

In defining the intent of EC P3.1, the PCR translates 'provision of advice' into 'ensuring that advice is available', and states that this outcome is necessary due to agency 'imperatives'. Fertiliser advice is reportedly available to farmers, using soil sample analysis advice and the Phosul K predictive model. However, discussion with advisors at the catchment centre in Pinjarra indicated that the dispensing of such advice from the centre is in fact rare, for the following reasons: emphasis is not given to one-on-one farmer advice; some advisors did not have the skills; free soil sampling programs are no longer available to farmers; and most of the advisory role has been taken up by fertiliser companies and private consultancies. Moreover, proponent funds are apparently not available to support the provision of such advice.

Data quoted in the PCR indicate that fertiliser use changes have varied from shire to shire. However, in discussion with advisory staff, it was agreed that data availability from fertiliser vendors on fertiliser sales and use is restricted for commercial reasons, and actual use and changes in use are not able to be accurately measured or verified by the Department of Agriculture. Of further concern is that there appears to be no verification that fertiliser advice to farmers from current sources is accurate. However, there is clear evidence that in some cases soils are still being over-fertilized.

'The 1994 section 46 request' proposed that EC P3.1 should continue, "*but only as part of the overall package developed in co-operation with landholders in order to achieve sustainable land-use and associated phosphorus load reductions*" (p20).

2.2.6 Develop new fertilisers (P3.2; PCR 2.2.6)

> *"The proponents will encourage further development and use of individual-nutrient fertilisers, and will undertake detailed investigations of ways to overcome existing economic constraints to their production and use."* (P3.2)

The Department of Agriculture has for many years conducted investigations into the use of alternatives to superphosphate and other traditional fertilisers. Alternatives have been shown to be not effective in many circumstances. However, in general, the nature of the fertiliser industry in WA - few suppliers and the dominance of production for broad acre wheatbelt farming (making high volume lines relatively low in price) - has tended to act against the research and development of fertilisers for specific use in small areas (such as the Swan Coastal Plain) and to make their production economically marginal or non-viable. This has been the case in the Peel-Harvey catchment.

Early attempts to produce a range of situation-specific fertilisers for the Peel-Harvey catchment met with some success, but manufacture and use of these fertilisers was in general not encouraged by fertiliser companies, and superphosphate was and is still the major fertiliser used in the catchment, despite its lack of suitability in many situations. Subsequent research has identified other options, such as high sulphur and potassium, and low phosphorus slow release fertilisers, and these are currently being further researched (such as superphosphate/'red mud' mixes, with a lower water soluble phosphorus content than unamended superphosphate). Some are commercially available (for example 'Iron Man Gypsum). However, the problems of commercial production and farmer acceptability still exist, though it is clear that development work is ongoing, in compliance with EC P3.2. The extent to which "*detailed investigations of ways to overcome existing economic constraints to their production*" have taken place, is unclear.

'The 1994 section 46 request' proposed that EC P3.2 should continue, "*but only as part of the overall package developed in co-operation with landholders in order to achieve sustainable land-use and associated phosphate load reduction*" (p20).

2.2.7 Trial forestry (P3.3; PCR 2.2.7)

> *"The proponents will ensure that large-scale field trials are carried out to ascertain the technical and economic feasibility of converting use of sandy soils from agriculture to forestry. Private enterprise involvement in these studies will be encouraged."* (P3.3)

Contrary to claims of viability made by the Department of Conservation and Land Management (CALM) during the development of the Peel-Harvey Stage II ERMP, few data were available at the time to verify the viability of commercial forestry on the deep grey sands, the primary target for this measure. In 1994 CALM withdrew support for forestry trials, leaving further work on commercial forestry on the sandy soils to the three Peel Harvey proponents.

The PCR refers to a number of activities related to re-afforestation which have been carried out in the catchment, but concludes that "*agroforestry is not feasible in the current economic climate on this section of the Swan Coastal plain* due to *competing land uses and a lack of suitable sites*, and further, that *it is unreasonable to expect large-scale adoption of the practice given the value of land and rates, and landholders' need for immediate financial return.*" This is interpreted as meaning that forestry has failed as a P–management option, but no work appears to have been conducted on quantification of the impact of this failure or on possible alternatives (such as alley farming) aimed at assisting meeting catchment targets.

This review concludes that the intent of EC P3.3 should be revisited, to ascertain, in conjunction with other catchment measures, other viable land use change which will assist in meeting P loss reduction targets.

The '1994 section 46 request' appears to indicate a view that large scale agroforestry trials had failed to show that extensive land use change to forestry was feasible, and that therefore EC P3.3 had been met and should be cleared.

2.2.8 Control point sources (P3.4; PCR 2.2.8)

> *"The EPA and the Department of Agriculture will continue to provide advice to producers to define and implement practicable and cost-effective waste management strategies for control of point sources of phosphorus."* (P3.4)

Various aspects of EC P3.4 are covered in the PCR. The PCR report concludes that EC P3.4, although met by the proponents, is ongoing. It is also pointed out in the PCR that disbanding the Estuarine Research Branch of the then EPAD resulted in the loss of technical expertise which had been available to farmers in the catchment, and effectively resulted in the responsibility for this EC being transferred to the Department of Agriculture (which is technically correct, as the Department of Agriculture is a proponent, and not the EPAD).

Various discussions with Department of Agriculture staff and others indicated the following in relation to EC P3.4:

- Insufficient attention had been paid to both identification of point sources by the licensing authorities, and enforcement of discharge limits on facilities. This had led to a level of cynicism by farmers and others about the level of commitment to the catchment strategy by these authorities;
- Little financial incentive had been given to farmers to implement dairy effluent standards, in addition to the above, despite the fact that research has been completed and guidelines established;
- No policy framework exists for P trading and credits in WA;
- The horticulture point source policy not enforced; and
- Local LCDCs have not been effective in addressing point source emissions, as they have no authority and consequently little influence.

It is concluded in this review that although advances have been made in the reduction of P losses from point sources, the program has not been well coordinated, and policies have not been uniformly implemented. Within the context of the review of the EPP, a review should be undertaken of both the catchment-wide strategy for control of point sources of phosphorus and the co-ordination of activities and standards within the catchment.

Due to the nature of point sources of P (and N) loss within the catchment, control of these sources would seem to be relatively easy compared with diffuse sources, through a coordinated program of identification, technology transfer, licensing, and enforcement.

The intent of EC P3.4, to *"continue to provide advice to producers to define and implement practicable and cost-effective waste management strategies for control of point sources of phosphorus,"* may have been met. However, no evidence was presented during this review to indicate the proportion of significant point sources to which management measures have been applied, or the success of these measures (measured via source monitoring or other means).

This Specialist Report supports the recommendation in the PCR that EC P3.4 be ongoing and become an integral part of the ICM approach being developed.

2.3 Catchment Monitoring

2.3.1 Catchment monitoring and management (M12.2; PCR 2.3.1)

> *"The proponents shall be jointly responsible for the environmental aspects of:*
> *(2) the management and required monitoring of the catchment, and collection of data necessary for the development of the integrated catchment management plan for the Peel-Harvey catchment ... to the satisfaction of the Environmental Protection Authority."* (M12.2)

The PCR concludes that the proponents have met the requirements of EC M12.2, but that it is ongoing.

While it is agreed that considerable monitoring data have been collected (refer to the PCR), the data are fragmented and it cannot be agreed that they meet the requirement of being *necessary for the development of the integrated catchment management plan for the Peel-Harvey catchment*. There is no ICMP (see earlier), and it is apparent that there is still no consensus on many aspects of the technical data related to catchment management. Examples include: the loss rates of P from various soil types, and the management required to achieve target P loss rates; actual fertiliser use and changes in use in response to management initiatives; P loss from sub-catchments; the impacts of drainage; and revegetation statistics and the impact of vegetation on P losses (including streamlining). Lack of or reduction in funding for this work was cited as a major reason for limited data collection activity.

The PCR recommends that EC M12.2 be accepted as having been met, but that it remains ongoing, as a component of the ICM approach. This is supported in part by this review, but a full review of the data required to fully develop the ICMP, the suitability of ongoing programs to obtain these data, and the responsibility of the proponents and other agencies for collection of the data should be conducted.

Condition element P1.8 states that:

> *"The estuary will be closely monitored to evaluate the management strategy's success in reducing the algal nuisance and to enable the development of appropriate management strategies to mitigate any deleterious effects that may occur. Current and proposed future monitoring studies in the estuary are described in Section 13 of the ERMP and Section 11 of the EPA assessment report."* (P1.8)

The PCR has interpreted EC P1.8 and has broken it down into the following sub-headings (indicated by dot points):

- **Monitor point sources (P1. 8:2.15; PCR 2.3.2.1)**

> *"Monitoring of the effluent from point sources of phosphorus loss; monitor point sources of phosphorus loss from intensive industries and horticulture; estimation of cumulative discharges from known point sources because of their significance to phosphorus load."* (PCR 2.3.2.1)

As pointed out in the PCR, the licensing of point sources is the responsibility of the DEP through Part V of the Environmental Protection Act 1986. However it is unclear whether EC P1.8 meant to require monitoring to be conducted by the proponents or by point source industries, as operators of prescribed premises. Nevertheless, the proponents have not

conducted this monitoring, and therefore "*estimation of cumulative discharges from known point sources because of their significance to phosphorus load*" is not possible at this time.

- **Fertiliser use (P1.8:2.11; PCR 2.3.2.2)**

See P3.1; PCR 2.2.5.

- **Drainage and clearing (P1.8:2.12; PCR 2.3.2.3)**

> "*Monitor drainage and clearing in the catchment (as inputs to water balance and nutrient balance).*" (PCR 2.3.2.3)

(Also see clearing and drainage moratorium (M05; PCR 2.2.4)

Data provided on 19 June 2000 by the Department of Agriculture demonstrate that monitoring of clearing has been undertaken. No data on drainage in the catchment were provided either in the PCR or more recently. Furthermore, the supposed relationship between clearing and drainage on water and nutrient loss, which underpinned the imposition of the moratorium, has been questioned by the proponent agencies (and some Department of Agriculture data in part justifies this uncertainty). The impact of 'streamlining' and riparian re-vegetation on water and P loss is similarly not clear (as no monitoring data have been collected to assess effectiveness), although according to the PCR (apparently based on experience elsewhere in the world, but without supporting local data) there are indications that it is beneficial in reducing losses from the catchment to drainage.

The PCR recommends to the EPA that "*the proponents have met the requirements of the condition where the implementation falls within the legislative responsibility of the Department of Agriculture* and that *the MOU on Clearing and Drainage needs to be reviewed to ensure equitable application of the requirements in urban and rural lands, ... and to implement new and innovative drainage methods... .*"

The moratorium issue should be re-assessed to evaluate the basis for its imposition and the legal and administrative framework within which it is currently operating. The impact of clearing and drainage on salinity in the Peel-Harvey catchment should also be considered in conjunction with nutrient loss issues.

This review concludes that the proponents have not fully complied with the relevant ECs related to clearing and drainage.

- **Land use changes (P1.8:2.13; PCR 2.3.2.4)**

> "*Monitor land use changes; the effects on phosphorus and water loss to drainage, as these are relevant to changes in phosphorus load to the system.*" (PCR 2.3.2.4)

The primary intent of this part of EC P1.08 is assumed to be to monitor the impact of change in land use on water and nutrient loss to drainage. This can only be achieved if land use change and water and nutrient loss are accurately measured.

No conclusive evidence has been provided in the PCR to show that land use change is currently being accurately recorded. Rather, the PCR states that, some 10 years after the ECs were imposed, base land use data maps are only now under development. Although the Department of Agriculture is involved with some initiatives related to land use change, these initiatives cannot be viewed as meeting the requirements of this part of EC P1.8. When

requested, no data could be provided detailing land use changes that have occurred in the catchment since the Peel-Harvey ECs were imposed on the proponents.

- **Load monitoring (P1.8:2.14; PCR 2.3.2.5)**

  "Continuous gauging and sampling of the three river systems for determination of nitrogen and phosphorus loads; monitoring streamflow; phosphorus and nitrogen concentrations in streams and drains to determine input loads and flow weighted mean concentrations; areal water yield to the estuaries; nutrient budget for fine tuning management of the system and as a performance measure. " PCR 2.3.2.5)

This part of EC P1.8 has been largely addressed by another technical report of the P-HERC (Appendix 4 of the P-HERC Report to the EPA). However, the intent of the requirement, for "*nutrient budget for fine tuning management of the system and as a performance measure,*" has evidently not been met, as data to achieve these outcomes are not available.

- **Murray catchment (P1.8:2.16; PCR 2.3.2.6)**

  "Measure performance of the Murray catchment east of the scarp as a control for catchment management in the coastal plain catchment." (PCR 2.3.2.6)

The PCR argues that measurement of the performance of the Murray catchment (which is mostly east of the Darling Scarp) is not relevant for management of the coastal catchment of the Peel-Harvey, and acknowledges that this part of EC P1.8 has not been met.

This review concludes that "*even though in most years the loads from the Murray are relatively small, large loads may result from years when very large episodic events lead to floods from the Murray like that observed in the Swan-Canning in 2000. (this) (autosampler) ...level of monitoring is required as part of Ministerial Conditions.*"

It is understood from discussion with staff of the Department of Agriculture that changes in agricultural practices and increased fertiliser use in the Murray catchment east of the scarp are likely to increase nutrient loss (and salt discharge) from these areas over time, and hence use of the Murray catchment as a 'control' catchment in the long term will therefore be invalid. This raises separate concerns not addressed here. However this Specialist Report recommends that the issue of the Murray River be further considered.

A control catchment for the estuarine system would seem to have some merit. However, once processes known to control loadings are understood, and tolerable loadings are quantified, the necessity for control catchment data is questionable. However, aside from this issue, there would appear to be good reason to monitor the Murray River catchment.

2.3.2 Success of catchment management measures (P3.7:1; PCR 2.3.2.7)

"The success of catchment management measures in reducing phosphorus losses to the estuary will be monitored by the proponents and audited by the EPA." ...(P3.7)

The PCR states that the requirements of this part of EC P3.7 have been met, but that it is ongoing, and should be amended to reflect its incorporation into the ICMP and its inclusion in the South West Sustainable Rural Development Program implemented by the Department of Agriculture (which has now been replaced by the Agricultural Resource Management program, implemented regionally, with what is understood to be a reduced operating budget)

This recommendation, contained in the PCR, is not supported by this Specialist Report because, although some indicators have been established, clear indicators have not been developed for measuring the success of catchment management measures.

Further, although the PCR implies that the catchment program, in its present form, is meeting the targets (and that the ECs have, in large part, been met), this for the most part cannot be verified by the information available to this review.

'The 1994 section 46 review' of P3.7 suggested that approaches to monitoring could be further developed following EPA audit of the ECs relating to monitoring.

2.4 Land Use Controls and Environmental Protection Policy

2.4.1 Environmental Protection Policy (M03; PCR 2.13.1)

> *"The proponents shall jointly prepare an Environment Protection Policy for the Peel-Harvey catchment in consultation with such persons and agencies as Government may specify, to the satisfaction of the Environmental Protection Authority, in accordance with the objective and targets specified in Condition 2 above. The target date for the Draft Policy (under Section 26 of the Environmental Protection Act, 1986) is 31 December 1989."* (M03)

A review of the legal and administrative framework for management, including the EPP, is the subject of a separate Specialist Report (See Appendix 3 of the P-HERC Report to the EPA). However, it is apparent from the review of the catchment management ECs that a review of the EPP (and/or of the Statement of Planning Policy for the Peel-Harvey System) should include assessment of those ECs requiring joint agency participation, and clarification of the roles and responsibilities of each of the proponents.

2.4.2 Liquid waste disposal for new developments within 2 km (M06; PCR 2.13.2)

> *"Relevant decision-making authorities shall ensure that all developments within 2km of the Peel-Harvey Estuary System (as defined in the Estuarine and Marine Advisory Committee Report to the Environmental Protection Authority, Department of Conservation and Environment Bulletin 88, March 1981) include appropriate nutrient-attenuating waste disposal systems and management practices, to the satisfaction of the Environmental Protection Authority."* (M06)

This Specialist Report concurs with the comments made in the PCR in relation to EC M06.

2.4.3 Refer new developments and expansions (M09; 2.13.3)

> *"Decisions on developments which may release phosphorus or nitrogen to the environment in the Peel-Harvey Estuary area and coastal plain catchment area should be conservative until the new assimilative capacity of the Peel-Harvey Estuary System is determined and the effects of the management elements have been measured or are being managed. To this end, such proposals for development in these areas shall be referred to the Environmental Protection Authority for assessment. These developments include new and expansion of existing intensive horticultural and intensive animal industries."* (M09)

This Specialist Report concurs with the comments made in the PCR in relation to EC M09. However, during the review of other ECs addressed in the PCR, it became apparent from

comments made by interviewees that referrals to and decision-making by authorities other than the EPA/DEP (i.e. to the Ministry of Planning and local authorities) are inconsistent and not necessarily in accordance with the objectives of the Peel-Harvey ECs.

'The 1994 section 46 request' recommended that EC M09 be cleared, as the decision-making authorities were not the proponents of the Peel-Harvey strategy; that is, the (then DPUD), EPA and Local Authorities have responsibility for environmental planning and approvals for land use change, and the (then) WAWA has well-licensing authority.

For horticultural developments, the Horticultural Strategy at the time was under review.

'The 1994 section 46 request' document also indicated that the approvals system was relatively ad hoc. These comments were reinforced by information received from then Department of Agriculture during the course of the current review. Although piggeries, sewerage treatment plants, dairies and feedlots are required to either be licensed or subject to other controls, it is apparent that conditions are not always enforced for a range of reasons. Control of these sources important for nutrient loss control, and also to demonstrate that Government is serious about catchment management, and that controls are uniformly and equitably enforced.

2.4.4 New developments (M14; PCR 2.13.4)

> *"Proposals which may release nitrogen or phosphorus to the environment shall not be referred to the Environmental Protection Authority provided that they are consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment. Proposals not consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment shall be referred to the Environmental Protection Authority.*
>
> *This Condition will apply to the final Statement of Planning Policy for the Peel-Harvey Coastal Catchment when it is gazetted."* (M14)

Comments above on EC M09 are also applicable to EC M14

'The 1994 section 46 request' recommended that EC M14 be cleared, as the decision making authorities were not the proponents of the Peel-Harvey strategy; that is, DPUD, EPA and Local Authorities have responsibility for environmental planning and approvals for land use change, and the (then) WA Water Authority has well-licensing authority. Concern was expressed that the SPP, which incorporated EC M14, was difficult to apply to specific sub-division developments, and had not been shown to be effective. Concern was also expressed that the inclusion of nitrogen within EC M14 was outside the original intent of the Peel-Harvey Stage 2 ERMP (as it was included only in the ECs set after assessment by the EPA of the ERMP).

It is concluded again that if the legal or administrative framework does not currently exist to fully implement an EC, it is incumbent on the Peel Harvey proponents, as the bodies legally responsible to ensure the conditions are complied with, to ensure the deficiencies are corrected.

2.5 Social and Economic Impacts

2.5.1 Social and economic impacts of measures monitored (P3.7:2; PCR 2.14.1)

> *"...The social and economic effects of catchment management measures upon the catchment community will be closely monitored by the proponents.."* (P3.7)

Despite comments made in the PCR, EC P3.7 is considered by this review not to be related solely to the impacts of the Dawesville Channel.

During this review of the PCR, comments were made by several senior staff members in proponent Ministers' Departments on the ECs relating to catchment management. The lack of community involvement during the Condition-setting stage (claimed to result in lack of community ownership) was criticized by these officers, and the initial involvement of Government agencies in the program was described as bureaucratic and lacking in consultation, and, in some cases, based on erroneous processes and information. Implementation of the catchment management measures has further been described as flawed in process, particularly discriminatory and against the economic interests of farmers. The views of other sections of the catchment community, for example land developers, are not clear from information provided in the PCR, or from the other sources of information accessed during this review.

It is apparent that concerns over social equity and other issues were present at the time of 'the 1994 section 46 request' relating the ECs, and are still being expressed. However, no objective evidence was obtained during this review to support the concerns raised, and neither has objective evidence been provided to the effect that all stakeholders support the views expressed. No data from comprehensive monitoring of "*social and economic effects of catchment management measures upon the catchment community*" was made available during the course of the current review. Comments made by interviewees during the course of this review on the impacts of catchment management measures (many of which have been concluded by this review not to have been implemented anyway) appear to have been based solely on anecdotal information.

2.6 Other issues

2.6.1 Peel-Harvey regional park concept (M10; PCR 2.15.1)

> "*The Peel-Harvey regional park concept, as originally proposed in the System 6 Redbook report (Conservation Reserves of Western Australia: The Darling System – System 6, Department of Conservation and Environment Report 13, Parts I and II, October 1983) shall be implemented within such time as to be determined by the Minister for the Environment.*" (M10)

This Specialist Report offers no comment on EC M10, as it is has been considered by the P-HERC technical report on Legal and Administrative issues (see Appendix 3 of the P-HERC Report to the EPA).

3. CONCLUSIONS, AND RECOMMENDATIONS TO THE PEEL-HARVEY EXPERT REVIEW COMMITTEE

The conclusion of this Specialist Report is that the PCR, while providing valuable information on the current status of implementation of measures related to compliance with the Peel-Harvey Stage II ERMP ECs, contains some conclusions which are not supported by available evidence, and is rather simplistic in its treatment of a number of issues related to compliance. It is considered that the interpretation by the authors of the PCR of a number of the ECs is open to question, as are the actions apparently considered by the proponents to be necessary or sufficient to comply with some of the ECs. The PCR asserts that some ECs have been met because progress has been made towards compliance, or some actions have been taken in relation to those ECs. However, this Specialist Report concludes that, of the ECs considered by the PCR to have been met, many have only partially been met, and it is open to question whether partial compliance meets the intent of the ECs.

Table 1 Verification of compliance with Environmental Conditions for the Peel-Harvey Stage II ERMP

Environmental Condition	Description	Met	Partially Met	Not Met
M02	EPA Review Interim Target			✔
M04	Develop and implement Integrated Catchment Management Plan			✔
M02	Develop proposals for phosphorus management		✔	
M05	Clearing and drainage moratorium		✔	
P3.1	Fertiliser advice to farmers		✔	
P3.2	Develop new fertilisers		✔	
P3.3	Trial forestry		✔	
P3.4	Control point sources		✔	
M12.2	Catchment monitoring and management			✔
P1.8	Monitoring 2.15 – Point sources 2.11 – Fertiliser use 2.12 – Drainage and clearing 2.13 – Land use changes 2.14 – Load monitoring 2.16 – Murray catchment		✔ ✔ ✔ ✔ ✔	 ✔ ✔
P3.7	Success of catchment management measures			✔
M03	Environmental Protection Policy	✔		
M06	Liquid waste disposal for new developments within 2 km	✔		
M09	Refer new developments and expansions	✔		
M14	New developments	✔		
P3.7	Social and economic impacts of measures monitored			✔
M10	Peel-Harvey regional park concept			✔

During this review a number of issues were identified which are believed to have negatively impacted on both compliance with the ECs, and the meeting of catchment targets. These include difficulties with respect to measurement of catchment factors, such as the level of implementation or adoption of management programs, or success of the programs in terms of reduction in water and nutrient loss to the catchment. This complicates the assessment of compliance with ECs.

Another issue was dissatisfaction leading to some lack of co-operation by landholders and managers (including staff of proponent Ministers' Departments) with respect to the process by which the Peel-Harvey Stage II ECs were developed and implemented. The primary reasons given for this dissatisfaction related to perceptions of lack of community consultation, inequity, lack of accurate data and lack of financial compensation programs for those potentially disadvantaged economically by the ECs.

Lack of funding to or by authorities (including the Stage II Peel-Harvey Ministerial proponents' Departments) for components of the catchment management strategy for the Peel-Harvey also appears to have severely restricted the implementation of programs related to compliance with ECs.

A level of cynicism exists within at least one of the proponent Ministers' Departments as to the enforceability (legal and practical) of the ECs, and therefore the need to fully and diligently address the ECs. This review also concluded that a number of failures have occurred within the proponent Ministers' Departments, and within the EPA/DEP (and likely others), including a lack of leadership on compliance with the ECs, consistency in developing and implementing policies, absence and/or diversion of funds for programs and catchment management measures, lack of management commitment to the catchment management strategy, and lack of timely development, implementation and review of policies and plans.

The ECs sought, via legally binding commitments on three Government Ministers, to achieve catchment management aims. However, the proponent Ministers' agencies lack the mechanisms to effectively implement the ECs and achieve the EC objectives, other than by encouraging voluntary change by landholders. Thus, even if the proponents fully pursue development and implementation of modified land use practice options, it may not be possible to meet catchment targets and estuarine management aims, and thereby fully comply with the ECs, without proactive changes to the regulatory regime, within the context of legally binding ECs on Government Ministers. Legally, there would appear to be no reason why the defects in the current regulatory regime cannot be corrected. There also appears no reason why farming landholders and other catchment users should not be subject to the same land use rights and restrictions of other industries over whom the *Environmental Protection Act 1986* has effective and enforceable jurisdiction. Furthermore, there would appear to be no reason why land users in the Peel-Harvey catchment should expect to have the sole right to determine their land use practices which have impacts off site from their particular land use. The entire community – catchment landholders, those directly impacted by the estuarine degradation problems and the wider community - are all stakeholders, so failure of catchment landholders to achieve catchment aims is not just a landholder issue.

Practical experience in Australia and elsewhere has pointed to the many difficulties of top-down regulation in addressing complex landuse problems in farming communities, because of various economic, educational, political and other issues. In the Peel-Harvey catchment, it would therefore seem prudent to explore a pragmatic mix of regulation, enforcement and voluntary co-operation, including a much more pro-active approach from the proponent agencies, in order to strongly encourage adoption of changed land use management practices, backed by financial incentives, to achieve outcomes acceptable to stakeholders, rather than to attempt to rely heavily on a sub-set of mechanisms.

Recommendations to the Expert Review Committee

General Recommendations

1. The desired environmental outcomes and targets of the Peel-Harvey catchment strategy should be re-endorsed by the EPA, and involve extensive community consultation.

2. The current catchment ECs should be reviewed and/or redefined to ensure that all commitments are practicable, achievable and are likely to deliver the desired outcome.

3. The catchment ECs should be audited against the mix of enforcement mechanisms currently available to the proponent agencies, and, if necessary, either the ECs should be modified, or appropriate mechanisms should be created or strengthened within the agencies.

4. The roles and mix of landuse regulatory and voluntary measures currently in place in the catchment should be re-assessed and redefined with a view to developing or reconfirming a mix which will achieve compliance with the ECs, and the desired environmental outcomes.

5. Government agency funding for Peel-Harvey catchment management should be reassessed and re-prioritized.

Specific Recommendations

1. A full, integrated and practicable catchment management plan (Integrated Catchment Management Plan, ICMP) should be developed and implemented, incorporating all measures and mechanisms required to achieve the specified catchment nutrient loss and other targets, and the desired environmental outcomes of the Peel Harvey Strategy

2. A single point of leadership, authority and coordination should be established within one agency and charged with the development and implementation of measures incorporated into the ICMP, which will, as best as currently can be determined, achieve the desired environmental outcomes of the Peel Harvey Strategy.

3. Best management practices (BMPs) for all catchment land uses and an effective catchment education program related to the BMPs should be developed, endorsed by the EPA, and implemented by the Peel Harvey strategy proponents and other relevant agencies.

4. An effective and enforceable system should be developed within the catchment for identification and regulation (via assessment and licensing) of land uses which have been demonstrated to have high nutrient loss potential (such as intensive horticulture and point source emissions).

5. Mandatory farm and other land use planning requirements, involving use of BMPs, should be introduced catchment wide. Plans should be developed by each landholder or manager, and approved and audited annually by relevant agencies. The approvals process for these plans would not specify allowable land uses (with the exception of those with high demonstrated nutrient loss potential) but would nominate nutrient loss and other environmental targets which must be achieved.

6. Specific catchment and sub-catchment nutrient export targets should be defined, and effective monitoring systems should be developed for these catchments to enable the success of catchment management to be measured.

7. A nutrient emissions/discharge trading system should be developed, such that allowable land uses (with the exception of those with high demonstrated nutrient loss potential) would not be specified if sub-catchment and catchment targets could be shown to be met.

8. A strict system should be developed to effectively deal with enforcement of and non-compliance with planning requirements, approvals, farm plans and BMP measures.

9. A suitable sub-catchment within the Peel-Harvey catchment should be identified and used as a demonstration of environmentally acceptable and economically viable and sustainable land use. This pilot catchment would be used to demonstrate and build landholder confidence in and understanding of appropriate fertiliser use, alternative land uses, soil amendment technology, zero discharge intensive animal industries, drainage retention basins and landcare initiatives such as streamlining and re-vegetation. Biological and economic yields would need to be measured, in conjunction with nutrient losses.

APPENDIX A

Summary of points raised by interviewees, in relation to the Peel-Harvey Catchment Management Program 1980s and 1990s

(Note: These are arranged as closely as possible into groups related to the ECs, though some relate to a number of the Conditions. These are not the opinions of the reviewer.) Blanks indicate specific comments noted.

ENVIRONMENTAL CONDITION	ISSUES IDENTIFIED BY INTERVIEWEES	
	HISTORICAL ISSUES	CURRENT AND ONGOING SSUES
Interim target		
EPA review interim target	A draft report on water quality monitoring in the Peel-Harvey catchment from 1990 to 1992 was provided to the Peel-Harvey catchment support group for review. Comments were collated and returned but the Waterways Commission chose not to publish or make this report available to catchment stakeholders. This further hampered efforts by stakeholders to identify hot spots and refine management efforts. The catchment group sought clarification of the catchment targets in terms of gauged catchments and the ungauged drains area and received no response from the EPA.	Water quality in the estuary has undoubtedly improved. Severe *Nodularia* blooms have continued in the Serpentine River and Lake Goegrup. The focus of management needs to shift from P in the estuary to include N in the estuary but also to have a major shift toward the catchment and estuary as a system. Sustainability of agricultural enterprises, and the ecological health of riparian areas, wetlands, streams and rivers all need to be given greater emphasis.
Catchment Management Plan		
Integrated catchment management plan	The catchment support group prepared a comprehensive catchment strategy document in 1989 and although requested, did not receive any feed back from the EPA. Following initial problems (late 1980s – early 1990s) there was a major commitment to improving communication and coordination between the community and government and within government agencies. Land capability mapping for the catchment was completed. Environmental constraints were included in the statutory planning process and the approval process was simplified. The disbandment of the EPA's Estuarine Impact Branch signalled to catchment stakeholders that the EPA's commitment to the Peel-Harvey system had lapsed. A full-time Waterways Commission research officer who was funded under the Peel-Harvey strategy was directed to other duties in other catchments and had very little time for Peel-Harvey issues. The catchment group accepted the CSIRO's WinCMSS model as a good vehicle for decision support. It was accepted that the model was only as good as the local data applied to it. There was no support of the use of WinCMSS from the EPA and no local data were provided so its evaluation gave only marginal results. In general, it is perceived by farmers that that planning and real financial support for the Peel-Harvey catchment was lacking.	There is no formal, comprehensive, single and integrated catchment management plan. Catchment management initiatives for broadacre land use are voluntary. There has been considerable progress in improving rural planning, and land management standards have been developed and in part implemented. Catchment action plans have been developed for the Shire of Serpentine-Jarrahdale and for the Coolup LCDC. Many more are currently being prepared. There appears to have been a major reduction (down from $1.3 million pa) in funds available for the Peel-Harvey catchment from state and local government and industry. Current funding is understood to be around $180K pa. There seems to have been a loss of corporate memory in Government agencies and PIMA which has resulted in reduced momentum for the management strategy. 30% of LCDCs in the area are active in coastal plain management to reduce P losses, 30% are 'neutral', and 30-40% are not interested in the issue. Voluntary catchment management is a long term issue, and short term successes are unlikely.

Develop proposals for P management	A central reference library was established at the community catchment centre. Horticulture codes of practice were developed and improved management options for reducing nutrient loss were developed. No Government financing was available to purchase (re-purchase) land which was targeted for P–loss related controls.	No P credits system has been introduced, though it has been talked about. Some form of P credit scheme may have a role in the Peel-Harvey, particularly given increasing P applications to coastal soils and majority of soils in high to very high P status, There are some 270km of streamlining completed, resulting in an estimated reduction of application of 5-8t P in the catchment (the buffer areas taken out by the streamlining),
Implement proposals for P management	Soil amendment was recognised as a useful tool for improving pasture production and reducing P losses. A management related monitoring program was initiated to help identify P loss hot spots and to focus the management effort.	There has been success in streamlining and fencing of riparian areas in some areas of the catchment. Pollution control inspection is no plausible threat to landholders. There is almost no chance of getting caught with bad practice so they have now become widespread. If there are prosecutions they need to be equitable. There has been good industry and federal funding support for some initiatives in the catchment but generally landholders are required to provide equal or up to 4 times more support. There are no free soil tests available, and little other specific support to farmers for catchment management initiatives. This has stretched many stakeholders. There has been a low adoption rate by dairy farmers for improved waste management strategies (for which research has been conducted, and guidelines are in place) because of the perceived costs and the apparent lack of punitive actions for non-compliance with the guidelines The catchment groups and the Department of Agriculture see Alkaloam (Alcoa 'red mud') as part of a strategic program to manage fertiliser losses from sandy soils. There have been delays and difficulties in getting Alkaloam approved for broadscale use in the catchment. EPA has now given approval. The Department of Agriculture is focussing on behaviour modification, but not specifically on P loadings or P reduction. There needs to be a greater emphasis on an implementation strategy with agreement on direction and standards and a promotion of awareness and standards. Enforced production of farm plans is understood in principal but would probably not work in practice because of a lack of ownership and political unacceptability of enforcement.
Clearing and drainage moratorium	The significance of drainage issues was doubted as data were not available to support early management statements. Government waiving drainage rates sent the wrong message to the catchment and reduced funds available for more integrated drain management.	Water Corporation does not enforce its own drainage legislation. Landholders frequently establish multiple connections to drains and have little regard for the sediment content or quality of runoff discharged to dains.

ertiliser advice to armers		Fertiliser advisory services continued and the Phosul K program was updated and linked to the GIS. There are many part time farmers in the catchment, without a knowledge or understanding of catchment nutrient issues, and without a current fertiliser extension program.
)evelop new fertilisers	There has been extensive research into a soil amendment to reduce P discharge and a range of low P or slow release fertilisers	Research into low or slow release P fertilisers continues and one zero P fertiliser (Iron Man Gypsum) has been commercialized. Despite showing agronomic promise, some fertilisers may not be released by private companies due to perceptions of low demand and volumes. Adverse publicity has reduced demand for the soil amendment technology.
rail forestry	Some of the disappointment over the failure of the tree trust program had eased and farmers saw tree plantings as a useful tool in managing the water balance.	LCDCs have established trail forestry plots, but there is not any ongoing forestry research in the catchment. In WA, *E. globulus* appears to have failed in all areas <800 mm or where there are near surface soil hard pans under sandy soils. There have been extensive losses in *E. globulus* from plantations in the Peel-Harvey, and land use management or changes involving the species is generally not seen as viable by land holders. There is a need for alternative land use options for the area.
Control point sources	Most major point sources had effluent treatment systems in place and EPA pollution control licenses had been issued. A successful program was undertaken to reduce the nutrient losses from piggeries.	Horticulture is now well regulated through codes of practice and well-license applications. There is an active dairy program which has prepared effluent management guidelines, and fertiliser management guidelines. Sheep and cattle feed lots in the catchment (especially in the Shire of Serpentine-Jarrahdale) and other point sources in the catchment are still perceived by farmers to be largely ignored as pollution sources, creating a lack of equity with respect to the requests made of farmers. LCDCs have little influence or control over point source pollution. Point sources in the catchment should be revisited in terms of improving license Conditions and reducing pollution exports. Some form of industry assistance may achieve greater adoption of improved dairy waste management. There is an increase in the intensification of rural land uses throughout the catchment, particularly in the north. There is a perception that controls over this intensification are ineffective

Catchment monitoring and management	The EPA's catchment data on which the strategy had been based, was required to help identify hot spots and to prioritise management efforts. Successive requests for provision of these data by catchment stakeholders failed. The data were lost in the filing system. P monitoring and its use as a tool for gauging the success of catchment management initiatives is not seen as a credible tool due to a range of technical issues and difficulties.	It is difficult to get farmers to respond to surveys.
Monitor point sources		
Fertiliser use		CSBP and Wesfarmers remain committed to industry assistance with continuing soil and tissue testing, fertiliser advice and assistance in the development of improved dairy fertiliser use efficiency. Possibly excessive amounts of P fertilisers continue to be applied to the catchment and most soils are in the high to very high P status. Fertiliser applications to beef country may have reduced while it may have increased to dairy country, based on assessed economic returns.
Drainage and clearing	Water management became a major tool for P management. Water Corporation was perceived as trying to divert drainage management to shires. Drainage rates of $400K/year were lost (?)	Drain management in the catchment requires revisiting. There needs to be multi-criteria operational guidelines which may include such things as incorporating riparian replanting, wetlands and weirs for retention, riffles, stream fauna etc.
Land use changes		
Load monitoring		
Murray catchment		
Catchment management measures of success		There is continuing loss of vegetation in the catchment through remnants becoming smaller, paddock tree deaths, clearing of some blocks. Re-vegetation has occurred at Amarillo, Wandalup and Alcoa but mostly with exotic species. There are major issues with continuing loss of biodiversity in the catchment.
Land Use Controls and Environmental Protection Policy		
Environmental Protection Policy		
Liquid waste disposal for new developments within 2 km		
Refer new developments and expansions	The DEP approved clearing applications for urban and other developments while there was a clearing and drainage moratorium and this sent the wrong message to farmers.	
New developments		There is a perception by landholders that urban and peri-urban clearing and development causes more problems than other land uses, but is not subject to the controls they are asked to abide by.

Social and Economic Impacts		
Social and economic impacts of measures monitored	There was a rapid increase in the number of landcare groups and of farmer participation. Attention given to, and programs resulting from, early Government Peel-Harvey initiatives was seen as ignoring many stakeholders, and as legalistic and unfair to land holders.	There is a feeling amongst farmers that their position and situation is being better considered than it was during the preparation of the management strategy in the late 1980s. There is a greater partnership with the Peel Development Commission and the economic realities of farming in the catchment are better considered. There are 4 active LCDCs and 28 community groups in the catchment. Catchment stakeholders remain suspicious and sceptical of EPA motives and government agencies generally. There appears to be a continuing inequity between the costs and benefits of improved catchment management. The benefactors of improved receiving water quality are not perceived to be those being asked to pay for it. Motivation for (and therefore) by farmers is therefore seen as low. How empowered are the community groups?
Other		
Peel-Harvey Regional Park concept		

APPENDIX B

Summary of source documents, meetings held, and individuals consulted during this review

Documents referenced

West Australian Government Gazette, June 17, 1992. Soil and Land Conservation Regulations 1992.

Review of Peel Inlet – Harvey Estuary Management Strategy, Stage 2, Environmental Conditions. Environmental Protection Authority, Perth Western Australia, Bulletin 749, July 1994.

Summary of Comments on the Peel Harvey Environmental Protection Policy from Submissions received by the EPA during Public Review in November/December 1999 (unpublished).

Peel Harvey Project Management Progress and Compliance Report: Report to Environmental Protection Authority (submitted to EPA October 1998).

Neil Gunningham and Darren Sinclair, 1998. Designing Smart Regulation (Smart Regulation: Designing Environmental Policy: Ed. N. Gunningham and P Grabosky, Oxford University Press).

Environmental Review and Management Program: Peel Harvey Estuary Management Study – Stage 2, May 1998.

Memorandum of Understanding for the Protection of Remnant Vegetation on Private Land in the Agricultural region of Western Australia (dated 6 March 1997).

Land Clearing Proposals for Rural Zoned Land in Western Australia. The Department of Agriculture Western Australia, May 2000.

A. R. McHolm, September 1995. Draft Procedures for the Administration and Assessment of Drainage Regulations (1992). The Department of Agriculture.

Expert Review Committee Meetings	Working Group 3 Committee Meetings
9 April 1999 (informal)	
27 April 1999	
24 May, 1999	24 May, 1999
12 July, 1999	17 July, 1999
27 August, 1999	30 August, 1999
8 October, 1999 (informal)	8 October, 1999
15 November, 1999	11 October, 1999
20 December 1999	15 November, 1999
17 March, 2000	20 December 1999
8 May, 2000	13 March, 2000
19 June 2000	6 May, 2000
1 September 2000	19 June 2000
28 September 2000	

Other Meetings	Attendees	Date
Shire of Serpentine-Jarrahdale	Jan Starr, President Andrew Del Marco, Planning Officer	24 May, 1999
Integrated catchment Management Group	Jon Warren, Department of Agriculture	24 May, 1999
Department of Agriculture WA Officers, Pinjarra Office	Jon Warren, Department of Agriculture Rob Summers, Department of Agriculture Martin Clarke, Department of Agriculture Jon-Paul Van Moort, Department of Agriculture Tom Rose, Peel Harvey	11 October, 1999

Individuals Consulted	Date
Garry Middle, DEP	30 August,1999
Ross George, Department of Agriculture	30 August, 1999
Keith Bradby, Agriculture Minister's Office	8 October, 1999
Jon Warren, Department of Agriculture	30 August, 1999 February 2000

APPENDIX C

Acronyms

BMP	Best Management Practice
CMP	Catchment Management Plan
DEC	Department of Environment and Conservation
DEP	Department of Environmental Protection
DPUD	Department of Planning and Urban Development
EC	Environmental Condition
EPA	Environmental Protection Authority
EPAD	Environmental Protection Authority Department
ERMP	Environmental Review & Management Program
ICMP	Integrated Catchment Management Plan
LCDC	Land Conservation District Committee
MOU	Memorandum of Understanding
NOIC	Notice of Intent to Clear
PCR	Progress & Compliance Report
P-HERC	Peel-Harvey Expert Review Committee
TOR	Terms of Reference
WAWA	Western Australian Water Authority

APPENDIX 5

Table A5 - Summary advice to the EPA from the Expert Review Committee on the recommendations on the Conditions made by the proponents in the PCR

Notes:

(1) The lefthand column in the following table lists the points as presented in the PCR document (in bold), starting at page 1 of the PCR and progressing to the last page of the PCR in the order in which they appear in that document.

(2) In the left hand column of the table, where a number in brackets has the prefix "M", this indicates that this is a Condition set by the Minister, thus M02 is Condition No 2 of the Ministerial Statement.

Table A5 - Summary advice to the EPA from the Expert Review Committee on the recommendations on the Conditions made by the proponents in the PCR

PCR Topic, contents number, and Condition reference	PCR Recommendations to EPA	Page No in the PCR of PCR Recs to EPA	Expert Review Committee Advice to EPA on the recommendations made by the proponents in the PCR document
2.1.1 EPA review interim target (M02.2:1)	a) the proponents recommend that a review of the targets (particularly the catchment loads) is required to be consistent with the approach for the Swan-Canning system and to align with world developments in target definition.	6	Both concentrations and loads are important. Concentrations are best indicators for short-term local performance. Loads are best indicator for long-term regional performance. The use of these 2 indicators reflects current world's best practice.
	b) the proponents have met the requirements of the condition within budget constraints.	6	No evidence is available to support the statement that the Condition has been met. Budgetary situation is not relevant to the requirement to comply with an Environmental Condition.
	c) the Condition is ongoing in that target loads need to be achieved for the healthy functioning of the system and these relate to the success of catchment management. The targets should be, after review, included into the EPP as the ongoing agency requirement. The Condition should therefore be cleared.	6	The EPP is developed through a consultative process. Therefore retaining the Condition is useful as the P Condition ensures that effective P targets are included in the EPP. The EPA should initiate and coordinate a public review process to determine the qualitative management targets now being sought by the community for the system as a whole. The current phosphorus target does not require review. The nitrogen target needs to be stated as required by the EPP (see Section 6.4 on review of targets)
	d) The proponent agency for this Condition is Water and Rivers Commission in association with Agriculture WA.	6	Do not agree (see Section 10 on proponents). EPA process to develop new qualitative targets (see above)
	e) Review of the EPP should be brought forward to 1998.	6	Not applicable. EPP review commenced in Nov 1999 with a view to a full review occurring following EPA's report on Progress and Compliance.
	f) Targets for nitrogen and other water quality parameters need to be developed.	6	The need for a Nitrogen target was set out in the EPP. Other targets should be developed during the public review process to be carried out by the EPA (see above).

2.2.1 Integrated catchment management plan (M04)	a) the proponents have met the requirements of the Condition.	8	The EPA set down its broad requirements for a CMP in its assessment report. A comprehensive integrated catchment management plan as envisaged by the EPA and required by the Environmental Condition was not prepared. Closure has never been reached between the proponents and the EPA on an earlier review of Conditions. The Condition remains ongoing.
	b) implementation of the Condition remains ongoing and requires appropriate ongoing action. This can best be achieved by incorporation of the ICM philosophy into the South West Sustainable Rural Development Program implemented by Agriculture WA and by incorporation into the EPP.	8	Not supported. Condition still required regardless of whether the ICM philosophy is incorporated as proposed. For this catchment the environmental quality is paramount and the required P reduction and control is the driving constraint on the ICM plan.
	c) the proponent agencies for this Condition should be the Department of Agriculture and the Water and Rivers Commission in association with other natural resource management agencies.	8	Do not support (see Section 10 on proponents)
2.2.2 Develop proposals for phosphorus management (M02.1:1)	a) the proponents have met the requirements of the Condition.	10	Not supported. Some proposals were developed but were not included in a comprehensive integrated catchment management plan. Targets for P load reduction from the catchment are not being met.
	b) the Condition remains ongoing and forms part of the integrated catchment management approach being implemented in Condition M04 and forms part of the South West Sustainable Rural Development Program implemented by Agriculture WA and should be incorporated into the EPP.	10	Not supported. The Condition should be retained and reworded. The requirements for ongoing phosphorus management in the catchment are not negotiable. It is the means of delivering P management that is negotiable via the catchment plan. The EPP is developed through a consultative process. Therefore retaining the Condition is useful as the P Condition ensures that effective P targets are included in the EPP.

	c) the proponent agencies should be Agriculture WA in association with the Water and Rivers Commission.	10	Do not support (see Section 10 on proponents)
2.2.3 Implement proposals for phosphorus management (M02.1:2)	a) the proponents have met the requirements of the Condition.	11	Not supported. The comprehensive integrated catchment management plan has not been developed. Targets for P load reductions from the catchment are not being met.
	b) the Condition remains ongoing and forms part of the integrated catchment management approach being implemented in Condition M04 and forms part of the South West Sustainable Rural Development Program implemented by Agriculture WA and should be incorporated into the EPP.	11	The EPP is developed through a consultative process. Therefore retaining the Condition is useful as the P Condition ensures that effective P targets are included in the EPP.
	c) the proponent agency should be Agriculture WA.	11	Not supported. The task should be given to the Peel-Harvey Community Catchment Council.
2.2.4 Clearing and drainage moratorium (M05)	a) the proponents have met the requirements of the Condition where the implementation falls within the legislative powers of Agriculture West. It is noted that a number of decisions have been taken where clearing of land has resulted and occurred outside the powers of the proponent. In instances this has occurred in contradiction to the advice of the responsible proponents.	13	The claim that the Condition has been met cannot be supported. Co-proponents were proponents on behalf of the whole of government. PCR states moratorium to be implemented by State Planning Commission, however the proponents accepted this as one their commitments (see EPA, 1988, p.93-94). Clearing and drainage controls apply to all land under the Soil and Land Conservation Act and the EPA made no distinction between rural and urban land uses in its assessment of 1988.
	b) the MOU on Clearing and Drainage needs to be reviewed to ensure equitable application of the requirements in urban and rural lands. Particularly the implementation of the clearing component on rural land only and the ability to implement new and innovative drainage methods that minimise nutrient levels entering the estuary from rural land production.	13	The moratorium on clearing and drainage needs to be implemented not interpreted. It applies to all land in the coastal catchment area and was to remain in place until the Minister for the Environment is satisfied that moratorium is no longer required. No approach to demonstrate that it is no longer required has been made to the Minister.
	c) the proponent agencies should be Agriculture West and Ministry for Planning in association with the Water and Rivers Commission.	13	Do not support (see Section 10 on proponents)

2.2.5 Fertiliser advice to farmers (P3.1)	a) the proponents have met the requirements of the Condition.	14	There is evidence that in some cases soils are still being over fertilised. Uptake of fertiliser advice to farmers was voluntary and AgWA has not measured farmer uptake. AgWA is not recording actual fertiliser use and AgWA has not developed a means of measuring accurately changes in use. There is no verification that fertiliser advice to farmers is accurate.
	b) the Condition remains ongoing and forms part of the integrated catchment management approach being implemented in Condition M04 and forms part of the South West Sustainable Rural Development Program implemented by Agriculture WA and should be incorporated into the EPP.	14	Condition should be retained to ensure that accurate advice is provided and as an input into the EPP. The EPP is developed through a consultative process. Therefore retaining the Condition is useful as the P Condition ensures that effective P targets are included in the EPP. Uptake of fertiliser advice to farmers was voluntary and AgWA has not measured farmer uptake.. Agreed it forms part of ICM approach. It should be part of farm management plans incorporated as part of the ICM plan.
	c) the proponent agencies should be Agriculture West.	14	Do not support (see Section 10 on proponents)
2.2.6 Develop new fertilisers (P3.2)	a) Refer to Section 2.2.2 "Development of proposals for phosphorus management".	14	The use of alternative less polluting fertilisers should be a requirement of farm management plans. Needs to be economically attractive.
2.2.7 Trial forestry (P3.3)	a) the proponents have met the requirements of the Condition.	16	Approach abandoned from lack of data, although large scale agro-forestry trials failed to show it as being feasible (economically). The intent of the Condition should be revisited.
	b) the proponents recommend that the Condition be cleared as agroforestry is not feasible in the current economic climate on this section of the Swan Coastal Plain. Competing land uses and a lack of suitable sites within the Catchment are underlying reasons for this recommendation. Further investigations will form part of the integrated catchment management approach being implemented in Condition M04 (Section 2.2.1).	16	The objective of the Condition was to require 50% of sandy soils to be converted to non- phosphorus loss activities. Proponent failed to identify an alternative land use to achieve this objective or take any initiative in doing so. Nothing in the PCR demonstrates that further investment into achieving the 50% is to be made. Continued work to reduce P losses should form part of the ICM planning and implementation requirements.

	c) Ongoing efforts to promote agroforestry will still be undertaken, however it is unreasonable to expect large-scale adoption of the practice given the value of land and rates, and landholders' need for immediate financial return.	16	Not demonstrated that agro-forestry will meet the intent of the Condition.
	d) the proponent agencies should be Agriculture West.	16	Do not support (see Section 10 on proponents)
2.2.8 Control point sources (P3.4)	a) The proponents have met the requirements of the Condition.	18	The intent may have been met, but no evidence obtained to indicate proportion of or success of point source measures as a contribution to the management strategy.
	b) The Condition remains ongoing and could become a component of the part of the integrated catchment management approach being implemented in Condition M04 (Section 2.2.1).	18	Agree Condition be retained and reworded. Could be part of farm management plans and ICM plan.
	c) The proponent agencies - DEP in association with Agriculture Western Australia.	18	Do not support (see Section 10 on proponents)
2.3.1 Catchment monitoring and management (M12:2)	a) the proponents have met the requirements of the Condition.	20	Partly met, but a full review of data requirements for an ICM plan is required. Some data already collected but additional data required.
	b) the Condition remains ongoing and could become a component of the part of the integrated catchment management approach being implemented in Condition M04 (Section 2.2.1). The Condition should be incorporated into the EPP and SPP.	20	Do not agree. Condition should be retained. Continuous improvement philosophy essential. As the EPP is developed through a consultative process, retaining the Condition is useful as it ensures that effective measures are included in the EPP.
	c) The Ministers shall ensure joint responsibility, the Peel-Harvey project managers group continues with representation from natural resource management agencies (Water and Rivers Commission, Agriculture Western Australia, CALM, Fisheries and DEP).	20	Management structure and responsibility needs review so that there is a single point of contact (not multiple) and independent audit by EPA can occur (See Section 10 on proponents and audit)
	d) The proponent agencies - Agriculture Western Australia and Water and Rivers Commission.	20	Do not support (see Section 10 on proponents)

2.3.2.1 Monitor point sources (P1.08:2.15)	a) The Condition should be cleared, as the proponents have no direct role in ensuring that licensed premises comply with monitoring conditions.	20	Specialist report on catchment management says this has not been done and estimation of discharges from known point sources is therefore not possible at this time. Not supported. The requirement relates to monitoring of point sources which can be done by the proponents at the point where emissions leave the point source sites. This was the requirement on the co-proponents not the DEP. If the co-proponents monitoring revealed a problem, then they should contact the DEP for action.
	b) the Condition is ongoing as defined in the EP Act and the DEP will maintain the responsibility for implementation.	20	Co-proponents should still be responsible for monitoring outside the point source sites, including of cumulative impacts.
2.3.2.2 Fertiliser use (P1.08:2.11)	refer to 2.2.5	21	
2.3.2.3 Drainage and clearing (P1.08:2.12)	a) the proponents have met the requirements of the Condition where the implementation falls within the legislative responsibility of Agriculture WA.	21	Individual agency legislative requirements (or perceptions thereof) are irrelevant given the overarching requirements of the EPP. The co-proponents were made proponents on behalf of the whole of Government for the whole management strategy and all its requirements and had a responsibility to vigorously pursue implementation of the management strategy in the catchment and estuaries, regardless of land use. They have responsibilities to ensure implementation and to monitor this.
	b) the MOU on Clearing and Drainage needs to be reviewed to ensure equitable application of the requirements in urban and rural lands. Particularly the implementation of the clearing component on rural land only and the ability to implement new and innovative drainage methods that minimise nutrient levels entering the estuary from rural land production.	21	The MOU is not relevant to the Condition. Implementing the Condition and monitoring the moratorium are the requirements. Condition can only be cleared when the Minister for the Environment is satisfied that the environmental quality in the System is sufficiently good to no longer require the moratorium.
	c) the requirement should be included into the SPP.	21	Not appropriate. The Condition should be retained.

2.3.2.4 Land use changes (P1.08:2.13)	a) the proponents have met the requirements of the Condition.	23	The requirements of the Condition have not been met. No conclusive evidence in PCR to show that land use change is being accurately recorded, and base land use data maps are only under development now (some 11 years on). Land use changes have not been monitored.
	b) the Condition remains ongoing and forms part of the integrated catchment management approach being implemented in Condition M04 (Section 2.2.1) and forms part of the South West Sustainable Rural Development Program implemented by Agriculture Western Australia.	23	Condition should be retained.
	c) the proponent agencies - Agriculture Western Australia.	23	Do not support (see Section 10 on proponents)
2.3.2.5 Load monitoring (P1.08:2.14)	a) the proponents have met the requirements of the Condition.	25	Intent of the Condition has not been met as data sufficient to develop nutrient budget for fine tuning management of the system and as a performance measure to achieve the outcomes required by the Condition are not available.
	b) that the requirement to measure loads be reviewed to include alternative compliance testing methodologies developed by the Water and Rivers Commission.	25	Do not agree. Continued measurement/estimation of loads is essential for gauging long-term performance of the bottom end of the System (estuaries). Concentration data at a local scale will assist in fine tuning of Best Management Practices (BMP's)
	c) the Condition remains ongoing and should be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as part of the EPP.	25	Retain Condition and review when EPA's review of qualitative targets is complete (see Section 6). Not a part of the EPP as proposed.
	d) the proponent agencies should be Water and Rivers Commission in association with Agriculture Western Australia.	25	Do not support (see Section 10 on proponents)

2.3.2.6 Murray catchment (P1.08:2.16)	a) the proponents have not met the requirements of the Condition because the concept of using a scarp catchment as a control for coastal plain catchments was demonstrated not to be valid.	26	There are some indications that there may be future increase of nutrient load in the Murray River, particularly under extreme events. The PCR does not demonstrate that using a scarp catchment as a control for performance auditing of coastal plain catchments is not valid.
	b) the Condition should be repealed, Alternatively the catchment management area for the Peel-Harvey Estuarine management Strategy be extended to include the entire catchment rather than only the coastal plain portion. This would enable incorporation of the impacts of significant landuse changes east of the scarp on the system.	26	Do not agree that the Condition should be repealed. Condition may need review to take account of the advice of the Specialist reports on catchment management and water quality and input following the EPA's public review of the qualitative targets for the System as a whole.
2.3.2.7 Catchment management success of measures (P3.7:1)	a) the proponents have met the requirements of the Condition.	26	Specialist report on catchment management states that this Condition has not been met as clear indicators have not been developed for measuring the success of catchment management measures and appropriate monitoring has not been done.
	b) the wording of the Condition should be amended to reflect it's incorporation into the integrated catchment management approach.	26	Do not agree. Condition should be retained and performance measured against indicators of catchment health to be developed (see below, and section 11)
	c) the Condition remains ongoing and forms part of the integrated catchment management approach being implemented in Condition M04 (Section 2.2.1) and forms part of the South West Sustainable Rural Development Program implemented by Agriculture Western Australia. The Condition should be incorporated into the EPP.	26	Do not agree with incorporation of Condition into the EPP. The EPP is developed through a consultative process. Therefore retaining Conditions is useful as it ensures that effective P targets and other effective measures are included in the EPP. The requirement to identify measures of success should be specified in the EPP but not the detailed program or monitoring requirements. Monitoring will need to be developed to meet requirements specified by the EPA.
	d) the proponent agencies should be Agriculture WA.	26	Do not support (see Section 10 on proponents)

2.4.1 Dawesville Channel - environmental responsibilities and impacts (including immediate marine environment). (M12:1.0)	see all of section 2.4 2 to 2.4.9 below	27	Some ongoing responsibility for monitoring hydro-dynamics and sediment so that management can be implemented to ensure that adequate flushing is maintained.
2.4.2 Dawesville Channel monitoring (P1.08:2.40)	It is recommended that this Condition be cleared as it is addressed through other commitments (in sections 2.4.3, 2.4.4, 2.4.5)	27	Some ongoing responsibility for monitoring hydro-dynamics and sediment so that management can be implemented to ensure that adequate flushing is maintained.
2.4.3 Tide heights (M12:1,1)	a) the proponents have met the requirements of the Condition.	30	
	b) the Condition should be cleared.	30	
2.4.4 Inundation extent (M12:1.2)	a) the proponents have met the requirements of the Condition.	31	Some ongoing responsibility for monitoring of inundation, particularly as it relates to management of fringing vegetation and wetlands.
	b) the Condition should be cleared.	31	Do not agree. Further work on impacts on fringing vegetation and wetlands is required.
2.4.5 Hydrodynamics (M12:1.3)	a) the proponents have met the requirements of the Condition.	32	
	b) the Condition should be cleared.	32	
2.4.6 Nearshore marine impacts (M12:1.4)	It is recommended that this Condition be cleared as it is addressed through other commitments (in sections 2.4.3, 2.4.4, 2.4.5)	33	
2.4.7 Channel bed(s) (P1.08:2.41)	a) the proponents have met the requirements of the Condition.	33	
	b) the Condition should be cleared. Further monitoring will be conducted as part of DOT's commitment to maintain the channel as navigable.	33	May still be required, as the intent was to be able to gauge need for sand by-passing which is an ongoing risk and has consequences for adequate flushing regime.

2.4.8 Tidal velocity (P1.08:2.42)	a) the proponents have met the requirements of the Condition.	34	
	b) the Condition should be cleared.	34	
2.4.9 Phosphorus export through channel (P1.08:2.43)	a) the proponents have not fully met the requirements of the Condition. Monitoring within the estuary and nearshore marine environments has been undertaken, however an extrapolation of the phosphorus export through the channel has not been undertaken.	34	Export of phosphorus through the channel is essential to understanding the nearshore marine effects and long-term nutrient balance in the system. It would be a valuable input to developing a new mass balance of phosphorus and nitrogen for the System.
	b) the Condition should be reviewed to assess whether specific measurements of export are required or whether extrapolation of existing data provides sufficient information. Additionally monitoring only the Dawesville Channel exports does not provide a comprehensive assessment of load discharges to the ocean. The work undertaken in M12:1.4 (Section 2.4.6 - Nearshore marine environments) identifies impacts and should be sufficient to meet the requirements of this Condition.	35	Supported, but some ongoing, low-level baseline monitoring may be appropriate.
	c) if the Condition is reviewed and determined that ongoing monitoring is required it should be incorporated into the EPP. The probable proponent agencies would be the Water and Rivers Commission.	35	Do not support (see Section 10 on proponents). Other agencies (eg CALM & MPRA) have responsibilities in the marine environment?
2.5.1 Estuary monitoring and management (M12:3)	a) the proponents have met the requirements of the Condition.	35	Do not agree as the requirement for monitoring is ongoing. Many issues have not been adequately investigated, for example riparian vegetation impacts, mosquitoes, water quality in the Lower Serpentine. Additional and ongoing monitoring are required to meet the requirements of the Condition.
	b) the Condition is ongoing and should be incorporated into a review process as part of the EPP and not maintained as a separate Condition.	35	The Condition should be retained. The EPP is developed through a consultative process. Therefore retaining Conditions is useful as it ensures that effective P targets and other effective measures are included in the EPP. The EPP is reviewed every 7 years and review of this element of management more frequently than every 7 years is desirable.

	c) the proponent agency is the Water and Rivers Commission	35	Do not support (see Section 10 on proponents).
2.5.2 Weed monitoring, harvesting and control (M08:1)	a) the proponents have met the requirements of the Condition.	35	This may have been met for the immediate term but there are long-term implications if above average wet years return or if catchment nutrient exports increase. Weed harvesting may then have to resume.
	b) the Condition is ongoing and should be incorporated into the EPP.	35	The Condition should be retained and the requirements for weed harvesting monitored.
	c) the proponent agency is the Water and Rivers Commission.	35	Do not support (see Section 10 on proponents).
2.5.3 Evaluate success of management on estuary (P1.08:1)	a) the proponents have met the requirements of the Condition.	35	The temporal aspect has not been considered. Long-term work is required with annual compliance reports and independent audits to be carried out by the EPA every 3 years (see Section 10).
	b) the Condition is ongoing and should be incorporated into a 5 year review process as part of the EPP.	35	Do not agree. The Condition should be retained.
	c) the proponent agency is the Water and Rivers Commission.	35	Do not support (see Section 10 on proponents).
2.6.1 Water quality standard parameters (P1.08:2.21)	a) the proponents have met the requirements of the Condition.	38	Agreed. However, implementation of effective catchment management is essential to ensure adequate protection of the System in the long-term and such catchment management measures have not yet been developed and implemented.
	b) the Condition is ongoing and should be incorporated into a 5 year review process as part of the EPP.	38	Do not agree. The Condition should be retained. The EPP is developed through a consultative process. Therefore retaining Conditions is useful as it ensures that effective P targets and other effective measures are included in the EPP
	c) that the detailed monitoring program be reviewed and a cost effective ongoing monitoring program be agreed by the EPA and WRC.	38	Ongoing monitoring program should be proposed by the proponents to meet the requirements of the EPA.

	d) the proponent agency is the Water and Rivers Commission.	38	Do not support (see Section 10 on proponents).
2.6.2 Nodularia blooms (P1.08:2.22)	a) the proponents have met the requirements of the Condition.	39	Agreed. However, implementation of effective catchment management is essential to ensure adequate protection of the System in the long-term and such catchment management measures have not yet been developed and implemented.
	b) the Condition is ongoing and should be incorporated into Condition M08. The Condition should be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as part of the EPP.	39	The Condition should be retained. The EPP is developed through a consultative process. Therefore retaining Conditions is useful as it ensures that effective P targets and other effective measures are included in the EPP. The EPP is reviewed every 7 years and review of this element of management more frequently than every 7 years is desirable.
	c) the proponent agency is the Water and Rivers Commission.	39	Do not support (see Section 10 on proponents).
2.6.3 Stratification (P1.08:2.23)	a) the proponents have met the requirements of the Condition.	40	
	b) the Condition is ongoing and should be incorporated into Condition M08. The Condition should be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as part of the EPP.	40	The Condition should be retained. The EPP is developed through a consultative process. Therefore retaining Conditions is useful as it ensures that effective P targets and other effective measures are included in the EPP The EPP is reviewed every 7 years and review of this element of management more frequently than every 7 years is desirable..
	c) the proponent agency is the Water and Rivers Commission.	40	Do not support (see Section 10 on proponents).
2.6.4 Sediment monitoring (P1.08:2.24)	a) the proponents have met the requirements of the Condition.	41	Adequate sediment monitoring in the estuaries needs to continue to ensure that bio-available nutrients in the sediments do not become a problem. An adequate sediment sampling programme, to meet the requirements of the EPA, should be submitted to the EPA.

	b) The Condition should be cleared on completion of a sediment monitoring program planned for 1997/98. After this time it should be incorporated into Condition M08. The Condition should be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as part of the EPP.	41	The Condition should be retained. Adequate sediment monitoring in the estuaries needs to continue to ensure that bio-available nutrients in the sediments do not become a problem. An adequate sediment sampling programme, to meet the requirements of the EPA, should be submitted to the EPA.
	c) the proponent agency is the Water and Rivers Commission.	41	Do not support (see Section 10 on proponents).
2.7.1 Wetlands (P1.08:2.31)	a) the proponents have met the requirements of the Condition to date.	42	Only limited work has been carried out on sensitive wetlands. Further work is required.
	b) the monitoring program is not due for completion until the end of 1998. At that time the Condition should be reviewed for clearing.	42	An ongoing watching brief will be necessary until the System has demonstrably reached its new final equilibrium condition in terms of impacts up-estuary and into the catchment.
	c) the proponent agency is the Department of Conservation and Land Management.	42	CALM is not currently a proponent. Do not support (see Section 10 on proponents).
2.7.2 Fringing vegetation (P1.08:2.32)	a) the proponents have met the requirements of the Condition to date.	42	Only limited work has been carried out and impacts are occurring on fringing vegetation.
	b) the monitoring program is not due for completion until the end of 1998. At that time the Condition should be reviewed for clearing.	42	An ongoing watching brief will be necessary until the System has demonstrably reached its new final equilibrium condition in terms of impacts on fringing vegetation, and new fringing vegetation is developing.
	c) the proponent agency is the Department of Conservation and Land Management.	42	CALM is not currently a proponent. Do not support (see Section 10 on proponents).
2.7.3 Birds (P1.08:2.33)	a) the proponents have met the requirements of the Condition to date.	43	Limited work on birds has been carried out and impacts have been observed.
	b) additional monitoring will be undertaken from 1997 to 1999. At that time the Condition should be reviewed for clearing.	43	An ongoing watching brief will be necessary to assess impacts on birds as new developments are implemented.
	c) the proponent agency is the Department of Conservation and Land Management.	43	CALM is not currently a proponent. Do not support (see Section 10 on proponents).

2.7.4 Fish, crab and prawn monitoring (P1.08:2.34)	a) the proponents have met the requirements of the Condition to date	44	Agreed.
	b) the monitoring program is not due for completion until the end of 1998. At that time the Condition should be reviewed for clearing.	44	Agreed.
	c) the responsible agency is the Department of Fisheries.	44	Agreed.
2.8.1 Dawesville Channel mosquito management (M11)	a) the proponents have met the requirements of the Condition to date through the activities of the Health Department of WA	49	Some work carried out but more control work may be required.
	b) mosquito control costs have far exceeded expectations and consequently ongoing funding for this activity needs to be resolved (Senior Officers Group need to consider this in detail).	49	EPA predicted significant increase in mosquito nuisance was likely and that substantial funding from Government would be required. This was not forthcoming.
	c) The Condition should be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as part of the EPP.	49	Incorporation into the EPP is not appropriate.
	d) the implementation agency is the Health Department of WA.	49	Health Dept has a primary role but proponents of all developments, decision-makers and local governments have responsibilities when approving developments within the range of mosquitoes.
2.9.1 Weed monitoring, harvesting and control (M08:1)	a) the proponents have met the requirements of the Condition.	51	Agreed. However, implementation of catchment management is essential to ensure adequate protection of the System in the long-term. Requirement for weed harvesting may return if higher than current flows into the estuary occur.
	b) the Condition should be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as part of the EPP.	51	The Condition should be retained and the requirements for weed harvesting monitored. The EPP is developed through a consultative process. Therefore retaining Conditions is useful as it ensures that effective P targets and other effective measures are included in the EPP. The EPP is reviewed every 7 years and review of this element of management more frequently than every 7 years is desirable.

	c) the proponent agency is the Water and Rivers Commission.	51	Do not support (see Section 10 on proponents).
2.9.2 Improve weed harvesting operations (P2.2:1)	a) the proponents have met the requirements of the Condition and should be cleared.	52	Requirement for weed harvesting may return if higher than current flows into the estuary occur.
	b) the Condition should be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as part of the EPP.	52	The Condition should be retained and the requirements for weed harvesting monitored. The EPP is developed through a consultative process. Therefore retaining Conditions is useful as it ensures that effective P targets and other effective measures are included in the EPP. The EPP is reviewed every 7 years and review of this element of management more frequently than every 7 years is desirable.
	c) the proponent agency is the Water and Rivers Commission.	52	Do not support (see Section 10 on proponents).
2.9.3 Algicide investigation (P2.2:2)	a) the proponents have met the requirements of the Condition.	52	Do not agree. The proponents decided not to proceed with feasibility study and trials but did not seek amendment to the requirement of the Condition
	b) the Condition should be deleted.	52	
2.9.4 Rehabilitate shoreline weed harvesting impacts (P2.3)	a) the proponents have met the requirements of the Condition.	53	An ongoing requirement associated with the impacts on fringing vegetation. Further rehabilitation work may be necessary.
	b) the Condition should be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as part of the EPP as shoreline rehabilitation may be required from time to time.	53	The EPP is developed through a consultative process. Therefore retaining Conditions is useful as it ensures that effective P targets and other effective measures are included in the EPP. The EPP is reviewed every 7 years and review of this element of management more frequently than every 7 years is desirable
	c) the proponent agency is the Water and Rivers Commission.	53	Do not support (see Section 10 on proponents).

2.10.1 Dawesville Channel - baseline monitoring prior to construction (M13.1)	a) the proponents have met the requirements of the Condition.	53	Agreed.
	b) the Condition should be cleared.	53	Agreed.
2.10.2 Dawesville Channel - Aboriginal and heritage sites (P1.01)	a) the proponents have met the requirements of the Condition.	54	Agreed.
	b) the Condition should be cleared.	54	Agreed.
2.10 Dawesville Channel - construction stage impacts and monitoring, including groundwater (M13:2)	a) the proponents have met the requirements of the Condition.	56	Agreed.
	b) the Condition should be cleared.	56	Agreed.
2.10.4 Dawesville Channel - Public utilities and access (P1.02:1)	a) the proponents have met the requirements of the Condition.	56	Agreed.
	b) the Condition should be cleared.	56	Agreed.
2.10.5 Dawesville Channel - Dust and noise (P1.02:2)	a) the proponents have met the requirements of the Condition.	57	Agreed.
	b) the Condition should be cleared.	57	Agreed.
2.11.1 Prepare Dawesville Channel-dredge and spoil disposal management plan (M07:1)	a) the proponents have met the requirements of the Condition.	57	Agreed.

	b) the Condition should be cleared.	57	Agreed.
2.11.2 Dawesville Channel - spoil disposal area of reclamation (M15.1)	a) the proponents have met the requirements of the Condition.	58	Agreed.
	b) the Condition should be cleared.	58	Agreed.
2.11.3 Dawesville Channel - spoil disposal (M15.2)	a) the proponents have met the requirements of the Condition.	58	Agreed.
	b) the Condition should be cleared.	59	Agreed.
2.11.4 Dawesville Channel - protect foreshore vegetation (M16) (during construction)	a) the proponents have met the requirements of the Condition.	59	Agreed.
	b) the Condition should be cleared.	59	Agreed.
2.11.5 Dawesville Channel - protect vegetation and contour (P1.04)	a) the proponents have met the requirements of the Condition.	59	Agreed.
	b) the Condition should be cleared.	59	Agreed.
2.11.6 Dawesville Channel - contour (P1.03)	a) the proponents have met the requirements of the Condition.	60	Agreed.
	b) the Condition should be cleared.	60	Agreed.
2.11.7 Dawesville Channel - prepare landscape plan (P1.01:1)	a) the Condition should be cleared.	61	Agreed.

2.11.8 Dawesville Channel - implement landscape plan (P1.01:2)	a) the Condition remains active until landscaping is complete.	61	Agreed.
	b) the Condition should be cleared following the implementation of the landscape plan by the end of 1998.	61	The Condition should not be cleared until after the issue of long-term management responsibility for the landscaped area has been resolved.
	c) long-term management of the landscaped area needs to be resolved.	61	The Condition should not be cleared until after the issue of responsibility for implementing the landscaped area and long-term management of the area have been resolved.
2.11.9 Dawesville Channel - contoured to facilitate possible future development (P1.05)	a) the proponents have met the requirements of the Condition.	62	
	b) the Condition should be cleared.	62	
2.12.1 Dawesville Channel - operational and long term monitoring (M13:3)	a) the proponents have met the requirements of the Condition.	62	Short-term requirements have been met. Hydrodynamic monitoring and auditing of bio-available nutrients need to be continued in the long-term. Adequate sediment monitoring in the estuaries needs to continue to ensure that bio-available nutrients in the sediments do not become a problem. An adequate sediment sampling programme, to meet the requirements of the EPA, should be submitted to the EPA.
	b) the Condition should be cleared.	62	Short-term requirements have been met. Hydrodynamic monitoring and auditing of bio-available nutrients need to be continued in the long-term. Adequate sediment monitoring in the estuaries needs to continue to ensure that bio-available nutrients in the sediments do not become a problem. An adequate sediment sampling programme, to meet the requirements of the EPA, should be submitted to the EPA.
2.12.2 Dawesville Channel - sand by-passing and beach profiles (P1.06:1)	a) the proponents have met the requirements of the Condition	64	Do not agree as there is an ongoing requirement for this monitoring (see above).

	b) the Condition should be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as part of the EPP as there is an ongoing requirement for sand by-passing.	64	The Condition should be retained. EPP is reviewed every 7 years and more frequent review of this element is desirable.
	c) the proponent agency is the Department of Transport.	64	Agreed that the management for maintaining navigability is the Department of Transport as DoT is responsible under their legislation, for maintaining navigable channels. However, there is a flushing aspect to consider (see below) and this is the ongoing responsibility of the proponents as a group.
2.12.3 Dawesville Channel - maintain as navigable (P1.07)	a) the proponents have met the requirements of the Condition	65	Agreed that the management for maintaining navigability is the Department of Transport as DoT is responsible under their legislation, for maintaining navigable channels. However, there is a flushing aspect to consider (see below) and this is the ongoing responsibility of the proponents as a group.
	b) the Condition should be incorporated into a 5 year review process for the Peel-Harvey Estuarine Management Strategy as the Department of Transport will need to maintain the Channel as navigable by DOT.	65	Condition should not be incorporated into the EPP. Condition should be retained and reworded to ensure that the flushing in the Channel is maintained at an adequate level for estuary water quality protection regardless of requirements for navigability.
	c) the proponent agency is the Department of Transport.	65	Do not support (see Section 10 on proponents).
2.13.1 Environmental Protection Policy (M03)	a) the proponents have met the requirements of the Condition	66	Do not agree, although an EPP has been prepared, the task was undertaken by the EPA.
	b) the Condition should be cleared.	66	An EPP is now operating and will be reviewed in accordance with the Environmental Protection Act requirements.
	c) the EPP should be reviewed jointly with the SPP and incorporate the ongoing requirements of the Conditions assessed in this report. This will enable ongoing auditing of the performance of the agencies against Conditions and the environmental changes.	66	It appears to be inappropriate to incorporate Conditions into the EPP when the Conditions should remain independent. The EPP is not the best way to audit compliance with Conditions. Ongoing audit against individual Conditions is easier if they are separate.

	d) the proponent agency is the Department of Environmental Protection.	66	Do not agree. The DEP cannot be a proponent agency for the EPP as it is the EPA's technical adviser. Furthermore, an EPP is a whole of Government instrument. The DEP can be made responsible for ensuring that reviews occur, in accordance with the EPA's requirements.
2.13.2 Liquid waste disposal for new developments within 2km	a) the proponents are not the relevant agencies for decision-making related to this Condition.	66	The co-proponents were made proponents on behalf of the whole of Government for the whole management strategy and all its requirements and were expected to have worked vigorously to ensure that decision-making in this area was in accordance with the requirements of the management strategy. The co-proponents were expected to have used influence and third party management to make this happen.
	b) the Condition should be modified to reflect the decision-making bodies of Ministry for Planning and local government.	66	Agreed.
	c) the Condition should be reviewed.	66	Agreed. The purpose of the review of this Condition should be to make it the clear responsibility of the decision-makers in this area.
	d) the proponent agency is the Ministry for Planning and Health Department of WA.	66	Too narrow. There are other relevant decision-making bodies involved.
2.13.3 Refer new developments and expansions (M09)	a) the proponents are not the relevant agencies for decision-making related to this Condition.	66	While this may be strictly the case, the co-proponents were made proponents on behalf of the whole of Government for the whole management strategy and all its requirements and were expected to have vigorously pursued ensuring that development decisions were in accordance with the management requirements and were expected to have used influence and third party management to make this happen
	b) the Condition should be modified to reflect the decision-making bodies of Ministry for Planning and local government.	66	Agreed that this should reflect all other relevant bodies involved in the approval of new developments and expansions.
	c) the Condition should be incorporated into a 5 year review process for the Peel-Harvey Management Strategy (as part of the SPP and EPP).	66	The Condition should be retained and not incorporated into the EPP.

	d) the responsible agencies are the Ministry for Planning, local government and DEP.	66	Do not agree. EPA is a key agent in the approvals processes for major environmental and planning issues. Others responsible for referrals include developers and members of the public.
2.13.4 New developments (M14)	a) the proponents are not the relevant agencies for decision-making related to this Condition.	67	While this may be strictly the case, the co-proponents were made proponents on behalf of the whole of Government for the whole management strategy and all its requirements and were expected to have vigorously pursued ensuring that development decisions were in accordance with the management requirements. The co-proponents were expected to have used influence and third party management to make this happen.
	b) the Condition should be modified to reflect the decision-making bodies of Ministry for Planning and local government.	67	Do not agree. There are other relevant decision-making bodies involved.
	c) the Condition should be incorporated into a 5 year review process for the Peel-Harvey Management Strategy (as part of the SPP and EPP).	67	The Condition should be retained and not incorporated into the EPP/SPP.
	d) the proponent agency is the Ministry for Planning.	67	Do not agree. MfP is not currently a proponent for the Peel-Harvey project and would have to be designated as such.
2.14.1 Social and economic impacts of measures monitored (P3.7:2)	a) the proponents have met the requirements of this Condition.	70	Not demonstrated. Specialist report on catchment management states that this cannot be verified. It reported that people still do not understand the management targets, approach or condition-setting process. No performance measures for verifying this have been developed.
	b) the Condition should be cleared.	70	Condition should be retained.
2.15.1 Peel-Harvey regional park concept (M10)	a) the proponents are not the relevant agencies for decision-making related to this Condition.	70	The co-proponents were made proponents on behalf of the whole of Government for the whole management strategy and all its requirements and are responsible on behalf of the whole of government for implementation of all the management strategy. This was expected to have been pursued by the proponents.

	b) the Condition should be modified to reflect the legislative responsibility of the Department of Conservation and Land Management and be incorporated into the SPP.	70	CALM is not currently a proponent and would have to be designated as such for the Condition to be applied to CALM.
	c) the proponent agency is the Ministry for planning.	70	Do not agree. MfP is not currently a proponent for the Peel-Harvey project and would have to be designated as such. Also this appears to contradict point (b) above.
2.15.2 Compliance auditing (M17)	a) the proponents have met the requirements of this Condition with this report.	70	Do not agree. Preparation of the PCR requires consultation with the EPA. The EPA was not consulted in the preparation of the Compliance report.
	b) the Condition should be cleared and ongoing requirements of the Conditions be incorporated where appropriate into the EPP and SPP.	70	The Condition should be retained, Incorporating it into the EPP is not appropriate.
2.15.3 Minor amendments (M01.2:2)	a) the proponents have met the requirements of this Condition to date.	71	However, minor amendments may well be ongoing thus it has not yet been met.
	b) the Condition should be cleared.	71	The Condition cannot be cleared when it has only been met "to date" - implying that there is further requirement for the Condition to be ongoing. The Condition should be retained.
2.15.4 Dawesville Channel - further dredging (M07:2)	a) the proponents have met the requirements of this Condition with this report.	71	
	b) the Condition should be cleared.	71	

APPENDIX 2

Statement that a Proposal may be Implemented (1989) and subsequent amendments (1991 & 1993)

MINISTER FOR ENVIRONMENT

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PEEL INLET-HARVEY ESTUARY MANAGEMENT STRATEGY - STAGE 2

MINISTER FOR TRANSPORT
MINISTER FOR AGRICULTURE
MINISTER FOR WATERWAYS

This proposal may be implemented subject to the following conditions:

1. The proponents shall adhere to the proposal as assessed by the Environmental Protection Authority and shall fulfil the commitments made and listed in Appendix 2 of Environmental Protection Authority Bulletin 363, as amended (copy of commitments attached).

2. The proponents shall develop proposals for control of phosphorus through catchment management, to the satisfaction of the Environmental Protection Authority, and shall implement them as rapidly as possible so that, in conjunction with the Dawesville Channel, the following objective is met:

   . the Peel-Harvey System becomes clean, healthy and resilient.

   To achieve this objective, the following interim targets should be used:

   (1) annual phosphorus input to the system shall not exceed 85 tonnes in more than four years out of ten (on average) and shall not exceed 165 tonnes in more than one year out of ten (on average). [These are based on 60 and 90 percentile loads]; and

   (2) average phosphorus concentration in estuary water shall not exceed 0.2 milligrams per litre in nine years out of ten (on average).

Published on
4 JAN 1988

7th Floor, May Holman Centre,
Phone (09) 325 4133

These target figures shall be reviewed by the Environmental Protection Authority after 3 years or sooner if environmental conditions dictate, in the light of measured performance of the System and may subsequently be varied by the Environmental Protection Authority.

3. The proponents shall jointly prepare an Environmental Protection Policy for the Peel-Harvey catchment in consultation with such persons and agencies as Government may specify, to the satisfaction of the Environmental Protection Authority, in accordance with the objective and targets specified in Condition 2 above. The target date for the Draft Policy (under Section 26 of the Environmental Protection Act 1986) is 31 December 1989.

4. The proponents shall develop in consultation with such persons and agencies as Government may specify, an integrated catchment management plan designed to meet the objective and targets specified in Condition 2 above, to the satisfaction of the Environmental Protection Authority, and which shall be in accordance with the principles to be developed in the Environmental Protection Policy for the area pursuant to Condition 3. The target date for the implementation of the integrated catchment management plan shall be 31 December 1990.

5. The proponents shall ensure that the moratorium on clearing and drainage in the Peel-Harvey coastal plain catchment proposed in the Stage 2 Environmental Review and Management Programme (Commitment 3.6) continues until the Minister for Environment is satisfied that these activities would be environmentally acceptable.

6. Relevant decision-making authorities shall ensure that all developments within 2 kilometres of the Peel-Harvey Estuary System (as defined in the Estuarine and Marine Advisory Committee Report to the Environmental Protection Authority, Department of Conservation and Environment Bulletin 88, March 1981.) include appropriate nutrient-attenuating waste disposal systems and management practices, to the satisfaction of the Environmental Protection Authority.

7. Prior to construction, a dredging and spoil disposal management plan for the Dawesville Channel shall be prepared by the proponents, to the satisfaction of the Environmental Protection Authority. Dredging not already forming part of the proposals in the Stage 2 Environmental Review and Management Programme shall be the subject of separate assessment by the Environmental Protection Authority.

8. The proponents shall ensure that weed harvesting and control is continued and increased as necessary to manage the expected initial increase in the occurrence of nuisance macroalgae.

9. Decisions on developments which may release phosphorus or nitrogen to the environment in the Peel-Harvey Estuary area and coastal plain catchment area should be conservative until the new assimilative capacity of the Peel-Harvey Estuary System is determined and the effects of the management elements have been measured or are being managed. To this end, such proposals for development in these areas shall be referred to the Environmental Protection Authority for assessment. These developments include new and expansion of existing intensive horticultural and intensive animal industries.

10. The Peel-Harvey regional park concept, as originally proposed in the System 6 Redbook report (Conservation Reserves for Western Australia: The Darling System - System 6, Department of Conservation and Environment Report 13, Parts I and II, October 1983.) shall be implemented within such time as to be determined by the Minister for Environment.

11. If the Dawesville Channel is constructed, the proponents shall be responsible for ensuring that mosquito management is effective and is carried out in an environmentally acceptable manner, to the satisfaction of the Minister for Environment and the Minister for Health.

12. The proponents shall be jointly responsible for the environmental aspects of:

    (1) the construction, operation, monitoring and maintenance of the Dawesville Channel and its impacts within the estuaries and within the immediate marine environment;

    (2) the management and required monitoring of the catchment, and collection of data necessary for the development of the integrated catchment management plan for the Peel-Harvey catchment; and

    (3) all in-estuary monitoring and management, including weed harvesting.

    All of the above shall be carried out to the satisfaction of the Environmental Protection Authority.

13. Prior to the construction of the Dawesville Channel, the proponents shall prepare in stages, a monitoring and management programme, to the satisfaction of the Environmental Protection Authority. This programme shall include:

    (1) essential additional baseline monitoring required to be in place as soon as possible and prior to construction commencing;

(2) construction stage impacts and monitoring, prior to construction; and

(3) operational and long-term monitoring, in stages, to be determined by the Environmental Protection Authority.

Barry Hodge, MLA
MINISTER FOR ENVIRONMENT

14. Proposals which may release nitrogen or phosphorus to the environment shall not be referred to the Environmental Protection Authority provided that they are consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment. Proposals not consistent with the draft Statement of Planning Policy for the Peel-Harvey Coastal Catchment shall be referred to the Environmental Protection Authority.

This Condition will apply to the final Statement of Planning Policy for the Peel-Harvey Coastal Catchment when it is gazetted.

Bob Pearce, MLA
MINISTER FOR THE ENVIRONMENT

2 OCT 1991

MANAGEMENT COMMITMENTS MADE BY THE PROPONENTS (Stage II ERMP)

The following list has been amended by the EPA and accepted by the proponents to reflect the 'whole of Government approach' which is essential for management of this proposal.

1. DAWESVILLE CHANNEL

1.1 The proponents will conduct a detailed survey to locate, assess and offer protection to Aboriginal sites and heritage.

1.2 During construction of the Dawesville Channel, the proponents will ensure the continuity of road access, power supply, communications, and water and sewerage services that require relocation, and will minimize dust and noise impacts upon nearby residential areas.

1.3 Spoil from the excavated channel will be used in redeveloping the fill areas as a stable and varied landscape, reflecting naturally occurring topography elsewhere on the coastal strip.

1.4 The proponents will manage spoil disposal to minimize disturbance to important land elements, including coastal dunes, tree belts along Old Coast Road and near the estuary foreshore. Spoil disposed of adjacent to the undisturbed coastal dunes will be contoured to co-ordinate with natural dune topography in order to minimize the potential for erosion.

1.5 The land area used to dispose of excavated material will be contoured to facilitate possible future development into a prime residential and holiday area. Views from existing residences near the estuary will be retained, taking into consideration that these views may have been ultimately reduced by foreshore development and landscaping, irrespective of the proposed channel development.

1.6 Littoral sand drift northwards along the ocean coast will be mechanically bypassed beyond the channel entrance, to minimize siltation within the channel and to avoid adverse effects on beaches to the north and south.

1.7 The Dawesville Channel will be maintained as a navigable waterway, although, as with the existing Mandurah Channel, sea conditions at the ocean entrance may frequently preclude its use by small boats.

1.8 The estuary will be closely monitored to evaluate the management strategy's success in reducing the algal nuisance and to enable the development of appropriate management strategies to mitigate any deleterious effects that may occur. Current and proposed future monitoring studies in the estuary are described in Section 13 of the ERMP and Section 11 of the EPA assessment report.

2. CONTROL OF WEED ACCUMULATIONS

2.1 Weed harvesting will be continued most likely at an increased rate, until the weed nuisance in the estuary is successfully reduced.

2.2 Possible methods of improving the efficiency of harvesting operations, and the possible use of algicides to control weed growth, will be evaluated by the proponents and implemented if shown to be practicable.

2.3 The Peel Inlet Management Authority will continue the existing programme of shoreline management and will rehabilitate areas where weed accumulations or harvesting operations cause excessive retreat of the shoreline.

3. CATCHMENT MANAGEMENT

3.1 The proponents will continue to provide advice to farmers on fertilizer requirements, based on accurate assessment by paddock-specific soil tests.

3.2 The proponents will encourage further development and use of individual-nutrient fertilizers, and will undertake detailed investigations of ways to overcome existing economic constraints to their production and use.

3.3 The proponents will ensure that large-scale field trials are carried out to ascertain the technical and economic feasibility of converting use of sandy soils from agriculture to forestry. Private enterprise involvement in these studies will be encouraged.

3.4 The EPA and the Department of Agriculture will continue to provide advice to producers to define and implement practicable and cost-effective waste management strategies for control of point sources of phosphorus.

3.5 The Department of Agriculture will coordinate the preparation and implementation of a detailed catchment management plan aimed at reducing phosphorus losses to the estuary to less than 85 t/a in a 60 percentile year with minimal economic or social disruption to the catchment community.

3.6 The proponents will implement a moratorium on further clearing and drainage in the catchment, pending determination of the success of the catchment management plan in reducing phosphorus losses from existing cleared land.

3.7 The success of catchment management measures in reducing phosphorus losses to the estuary will be monitored by the proponents and audited by the EPA. The social and economic effects of catchment management measures upon the catchment community will be closely monitored by the proponents. Current and proposed future monitoring studies are described in Section 13 of the ERMP and in Section 11 of the EPA assessment report. The catchment management plan will be regularly reviewed by the EPA.

WESTERN AUSTRALIA

MINISTER FOR THE ENVIRONMENT

STATEMENT TO AMEND CONDITIONS APPLYING TO A PROPOSAL (PURSUANT TO THE PROVISIONS OF SECTION 46 OF THE ENVIRONMENTAL PROTECTION ACT 1986)

PROPOSAL : PEEL INLET - HARVEY ESTUARY MANAGEMENT STRATEGY, STAGE 2 (010/701)

CURRENT PROPONENT : MINISTER FOR TRANSPORT
MINISTER FOR AGRICULTURE
MINISTER FOR WATERWAYS

CONDITIONS SET ON : 3 JANUARY 1989

CONDITIONS AMENDED ON : 2 OCTOBER 1991

Condition 1 is amended to read as follows:

1A Proponent Commitments

In implementing the proposal, including the amendments reported on in Environmental Protection Authority Bulletins 543 and 640, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made and listed in Appendix 2 of Environmental Protection Authority Bulletin 363, as amended, and subsequently, including the Department of Marine and Harbours letter of 24 February 1992 on reclamation associated with the Dawesville Channel. (A copy of the commitments is attached).

1B Implementation

Subject to the conditions in this amended statement, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

The following conditions and procedure are inserted following condition 14 (which resulted from the amendment of 2 October 1991):

15 Estuary Reclamation (Dawesville Channel)

15-1 The proponent shall ensure that the total area of estuary reclaimed in association with the

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19 APR 1993

construction of the Dawesville Channel does not exceed 25 hectares (ha). Five hectares of this land may be granted to Wannunup Development Nominees Pty Ltd as part of an existing Land Exchange Agreement with the State Government. The remaining 20 hectares shall be available for public use. Five hectares of this land can include part of the canal waterway, to be available for public use.

15-2 The proponent shall endeavour to reduce the area of reclamation associated with the construction of the Dawesville Channel specified in condition 15-1 by increasing the height of the spoil, consistent with the recreational use of the reclaimed land, to the requirements of the Environmental Protection Authority on advice of the Peel Inlet Management Authority.

16 Foreshore Vegetation (Dawesville Channel)

Foreshore vegetation in and near the area of construction of the Dawesville Channel should be retained wherever possible.

16-1 The proponent shall ensure that the foreshore vegetation in and near the area of construction of the Dawesville Channel is retained wherever possible. Those stands of Casuarina, Paperbark and Tuart which are located on/along the existing foreshore and outside the proposed alignment of the channel should be retained, to the requirements of the Environmental Protection Authority on advice of the Peel Inlet Management Authority.

17 Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

17-1 The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of the Peel Inlet - Harvey Estuary Management Strategy, Stage 2, in consultation with the Environmental Protection Authority.

Procedure

The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.

If the Environmental Protection Authority, other government agency or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

Note

Conditions 15 and 16 relate to the construction of the Dawesville Channel and should be audited in association with condition 7.

Kevin Minson MLA
MINISTER FOR THE ENVIRONMENT

16 APR 1993

APPENDIX 3

Towards a further draft Environmental Protection Policy for the Peel Inlet and Harvey Estuary (EPP)

Towards a further draft Environmental Protection Policy for the Peel Inlet and Harvey Estuary (EPP)

discussion paper for public comment

Environmental Protection Authority
Perth, Western Australia
January 2003

Have your say -:

The EPA invites written submissions on any issues raised by this document until **Friday 30 April 2003.**

Please address your written submissions to:	*Or*	e-mail your submission to the EPA via:
Environmental Protection Authority **141 St Georges Tce** **PERTH** **WA 6000**		julie.tilleke@environ.wa.gov.au For enquiries contact the Policy and Sustainability Branch, EPA Services Unit
Attention: Julie Tilleke		*tel:* **9222 7000**

List of Appendices:

Appendix 1: Revised Draft Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1999 (ie.1992 EPP unchanged)

Appendix 2: Summary of submissions and EPA responses

Appendix 3: Ministerial Conditions for the Peel Inlet-Harvey Estuary Management Strategy

Appendix 4: Summary of the EPA's advice in its review of the Report on Compliance for the Peel Inlet-Harvey Estuary Management Strategy

Appendix 5: The inter-relationship of the processes for the review of the Peel Harvey Management Strategy and the development of the further draft EPP

Appendix 6: Proposed modifications to the Revised Draft EPP 1999: an annotated format.

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1.2 Background

2. Existing Environmental Protection status in the Peel Inlet-Harvey Estuary

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2.2 Peel Inlet-Harvey Estuary Management Strategy
2.3 EPA's review of the Progress and Compliance Report
2.4 The Revised Draft Peel-Harvey EPP 1999 (Previously 1992) and related SPP

3. Towards a further draft Peel Inlet-Harvey Estuary EPP

3.1 Objectives of the Revised Draft Peel-Harvey EPP 1999
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1. Introduction

1.1 Purpose

This discussion paper is intended to seek public input on the issues which the EPA is currently considering as part of its preparation towards a further draft Environmental Protection Policy (EPP) for the Peel Inlet and Harvey Estuary. These issues are summarised below and your comments on them would be appreciated.

1. The EPP should protect and encompass **Ecosystem health** in a wider context than currently exists. Environmental Values (EV's) will be declared on this basis. As a result, the boundaries of the existing draft EPP may also have to be reconsidered (refer section 4.1);

2. **Environmental Quality Objectives** (EQO's) should be established as the benchmark for protection of the EV's (refer section 4.2);

3. **Environmental Quality Criteria** (EQC's) should be used to measure the effectiveness of the EPP against its EQO's (refer section 4.3);

4. An **Environmental Management Plan** (EMP) for implementation by the relevant agencies should be developed via the EPA under the EPP. This should be based on catchment management principles for water quality improvement (refer section 5.1);

5. The EPA should develop an understanding with the newly established **Peel-Harvey Catchment Council** in relation to the initiatives to be undertaken by the EPA as a result of this EPP eg. the EMP (refer section 5.2);

6. A **coordinating entity** should be established under the EPP that reports to the EPA on the implementation of the EMP which has been approved by the EPA (refer section 5.3);

7. The coordinating entity should also be responsible for reporting to the EPA on continuous **performance monitoring and review** of the EPP (refer section 5.4).

1.2 Background

In November 1999 the EPA conducted its review of the 1992 Peel-Harvey EPP and invited comment as to the process, issues and factors to be considered during such a review. For this purpose the EPA re-issued the 1992 Peel-Harvey EPP unchanged as the *Draft Peel Inlet - Harvey Estuary EPP 1999* for public consultation.

The review of the 1992 Peel-Harvey EPP has been complicated because of the timing of the EPA's Review of the Progress and Compliance Report (PRC) and review of the Ministerial Conditions relating to the EPA's 1988 assessment of the Peel Inlet-Harvey Estuary Management Plan and legally binding Ministerial Conditions arising from this assessment (refer section 2.3).

The EPA recommended that further revision of the EPP should not occur prior to the EPA's Review of the PRC. In light of submissions received and further consultation with stakeholders, the EPA prepared for the Minister for the Environment's consideration, a *Revised Draft Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1999* (ie 1992 Policy unchanged) (Appendix 1) and a summary of submissions and EPA responses (Appendix 2).

On consideration of the EPA's recommendations, the Minister sought re-consideration by the EPA of the Revised Draft EPP 1999 in conjunction with the EPA's Review of the PRC noting that a number of key submissions to the review of the EPP supported this approach.

The EPA has now reconsidered the Revised Draft EPP 1999 and proposes changes as highlighted in this discussion paper (Appendix 1). It is considered appropriate, therefore, that the EPA again consult with key stakeholders and interest groups regarding the proposed changes before reporting back to the Minister for the Environment on the EPP.

2. Existing Environmental Protection in the Peel Inlet-Harvey Estuary

2.1 The need for protection

The Peel Inlet-Harvey Estuary, located 75km south of Perth, is a long shallow waterway with a large catchment with strong seasonal river inflows and which is poorly flushed. It is, on average, 2.5km long, 200m wide and 5m deep and is connected to the ocean via a narrow 5km long inlet with restricted tidal flushing.

Land use and land management practices within the catchment of the estuary have contributed to algal blooms and water quality problems (generally) being experienced within the waterway, particularly over the last 20 to 30 years. Excessive quantities of phosphorus have been washed into the estuary from the surrounding landscape via, primarily, the Harvey, Serpentine and Murray Rivers. High quantities of phosphorus have accumulated in the sediments of the estuary, contributing to excessive algal growth and associated eutrophication problems.

2.2 Peel Inlet-Harvey Estuary Management Strategy

In 1985, the EPA assessed the Stage 1 ERMP for the proposed Peel Inlet-Harvey Estuary Management Strategy (Peel Harvey Study Group, 1985). Stage 2 of the Peel Inlet-Harvey Estuary Management Strategy (Kinhill, 1988) was assessed by the EPA in 1988 (EPA, 1988).

In summary, the Peel Inlet-Harvey Estuary Management Strategy consisted of three key elements:

- catchment management, to reduce the input of phosphorus into the estuary;
- construction of the Dawesville Channel, to increase the water exchange (flushing) with the ocean thereby reducing the biologically available phosphorus in the estuary; and
- weed harvesting, to alleviate the effects of weed accumulations on residential areas adjacent to the waterway (Peel-Harvey Study Group, 1985: p39).

The EPA found that the proposed Peel Inlet-Harvey Estuary Management Strategy was environmentally acceptable and recommended that the strategy proceed in accordance with the proponents commitments and EPA recommendations at that time. A list of these commitments and the Ministerial Conditions set by the Minister for the Environment in January 1989, and subsequent amendments, is included in Appendix 3.

2.3 EPA's review of the Progress and Compliance Report

Insert text here including the Expert Review Committee (ERC) and the EPA's report on compliance. Appendix 4 to include a summary of the advice of the EPA as set out in its review report.

The EPA Peel Inlet-Harvey Estuary is still fragile despite the Dawesville Channel. This is demonstrated by still regular occurrences of algal blooms in the Serpentine River. Accordingly there is still a requirement for a decrease in nutrients as required by the Ministerial Conditions for the Peel Inlet-Harvey Estuary Management Strategy.

One of the focus points of the ERC report was the requirement for an integrated catchment management plan (ICMP) to the satisfaction of the Environmental Protection Authority (EPA), to fulfil Environmental Condition number 4 of the Ministerial Statement of 2 October 1991 for the Peel Inlet – Harvey Estuary Management Strategy (Appendix 3). The ERC noted that the proponents undertook a number of actions during the 1990's, but this did not include the preparation of an ICMP. Perhaps more importantly, the target for a reduction in the annual phosphorous inputs into the river system set in Environmental Condition 2 has not been achieved.

It should be noted that the EPA is not seeking comment on aspects of the Ministerial Conditions or its Review of the Progress and Compliance Report, relating to its 1988 assessment of the Peel Inlet-Harvey Estuary Management Strategy.

2.4 The Revised Draft Peel-Harvey EPP 1999 (previously 1992) and related SPP

As part of its assessment of the Peel Inlet-Harvey Estuary Management Strategy (refer section 2.2), the EPA recommended that an EPP be prepared for the Swan Coastal Plain catchment of the Peel-Harvey Estuary to ensure that land uses within the catchment are properly controlled (EPA, 1988: Part 1, p19). A subsequent Ministerial Statement required that an EPP be prepared to ensure that decision-making authorities approved and managed developments and land use (generally) consistent with the purposes of the

policy and to ensure individual landowners managed lands in accordance with the objectives of the Peel Inlet-Harvey Estuary Management Strategy.

The EPP was to be given effect through development of a Statement of Planning Policy (SPP) prepared by the (now) Western Australian Planning Commission (WAPC) and through planning schemes and property land management.

SPPs are prepared under the Town Planning and Development Act. Whilst a SPP is prepared under statute it is not a statutory instrument in itself. Nevertheless, SPPs are still considered to be powerful planning tools as they set a policy framework within which planning decisions are made.

The Peel-Harvey EPP was proclaimed in December 1992, with the Peel-Harvey Coastal Plain Catchment (SPP No. 2) being gazetted in February 1992.

The SPP has been used by local authorities as a policy framework when amending their statutory Town Planning Schemes and/or to develop rural strategies.

3. Towards a further draft Peel Inlet-Harvey Estuary EPP

3.1. Objectives of the Revised Draft Peel-Harvey EPP 1999

The principal objectives of the Revised Draft Peel-Harvey EPP 1999 are:

- to declare, under the Environmental Protection Act, the environmental quality objectives for the Estuary which if achieved would rehabilitate the estuary and protect the estuary from further degradation; and
- to outline the means by which the environmental quality objectives for the estuary are to be achieved and maintained.

In order to achieve this objective, the Revised Draft Peel-Harvey EPP 1999:

- defines the policy area;
- identifies the beneficial uses of the estuary to be protected within the policy area;
- declares the environmental quality objectives to be achieved and maintained so as to prevent excessive growth of algae in the estuary; and
- establishes a program for the protection of the environmental quality objectives.

3.2. Area to which the Policy applies

The Revised Draft Peel-Harvey EPP 1999 applies to the Swan Coastal Plain catchment of the Peel-Harvey Estuary as identified in Schedule 1 of the EPP. For the purpose of clarity only, the narrative used in the 1992 Peel-Harvey EPP to describe the policy area was replaced in the Revised Draft Peel-Harvey EPP 1999 by a map depicting the same policy area (Appendix 1). The area to which the policy applies requires reconsideration in the light of the changes suggested in this document.

4. Environmental Values, Objectives and Criteria

4.1 Environmental Values (EV's)

The draft 1999 Peel-Harvey EPP protects the beneficial use of the Policy area. A further draft EPP will declare Environmental Values (EV's) which are to be protected in preference to beneficial uses. This is because beneficial uses is a term that is restricted to a human benefit only. EV's include both human and ecological values. An EV is;

"a particular value or use of the environment that is important for healthy ecosystem or public benefit, welfare, safety or health and which requires protection from the effects of pollution, waste discharges and deposits".

The further draft EPP will need to consider whether the basis for protecting the Estuary should be expanded. The current basis is about nutrient enrichment of the Estuary and this will remain the core issue. However, additional text may now be required to encompass a wider understanding of ecosystem health.

An essential part of the review will be the examination, through the public process, of the environmental values in the Peel-Harvey area that are to be protected, and this will lead to a further definition of the environmental quality objectives.

4.2 Environmental Quality Objectives (EQO's)

An Environmental Quality Objective (EQO) is:

"a specific management goal for a part of the environment and is either ecologically based by describing the desired level of health of the ecosystem or socially based by describing the environmental quality required to maintain specific human use" (EPA 2002b)

The advice provided in the ERC report (refer section 2.3) will assist greatly the discussion with the public on environmental values and objectives.

4.3 Environmental Quality Criteria (EQC's)

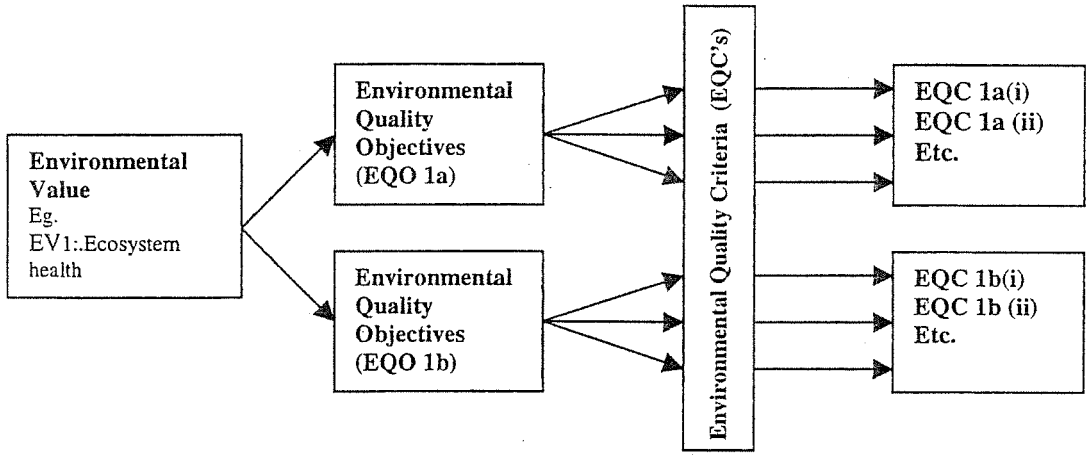
Environmental Quality Criteria (EQC) are:

"the numerical values or narrative statements which, if met, indicate that there is a high probability that the associated environmental quality objectives have been achieved"

There is plenty of guidance within existing national and international documents from which to develop EQC's.

A core criteria for judging the health of the ecosystem is the measure of the phosphorus load entering the Estuary from the Serpentine River, Murray River and Harvey River and drains. The ERC (refer section 2.3) has provided extensive advice on water quality. In its Recommendation M1 (Appendix 4) it has established a table of scaled phosphorus targets for these three rivers. The Recommendation also provides advice on system-wide water balance, estuarine ecosystem health and managing public nuisance.

Figure 1 illustrates how the EQC's might be presented against EV's and EQO's.



5. The Program for Protection

5.1 Environmental Management Plan

The development of an Environmental Management Plan (EMP), under different names, has been given greater attention by the EPA in recent times in the preparation of EPPs. The 1998 EPP for the Swan and Canning Rivers required the EPA, in consultation with relevant parties, to prepare a Comprehensive Management Plan to achieve the environmental quality objectives that specifically referred to water quality of the watercourses within the policy area.

The draft Cockburn Sound EPP that has been submitted to the Minister for the Environment for consideration is also about water quality. The EPP sets out that one of the mechanisms for protecting the environmental values of Cockburn Sound will be an EMP prepared and implemented by a committee established under the EPP and approved by the EPA.

The Environmental Condition set down in 1989 for the Peel-Harvey strategy (refer section 2.2) required the proponents to develop an ICMP. This has not yet been

achieved. Thus, following the lead given in more recent EPPs, the EPA needs now to take a more pro-active role in the development of an EMP based on catchment management principles to protect the water quality in the Peel-Harvey system. This should be written into the EPP for implementation by the relevant agencies. The EPA is aware that community-based Natural Resource Management groups have been established to advance catchment management, and one of these is the South West Catchments Council as an NRM Region. A Peel-Harvey Catchment Council has also been formed and is under the umbrella of the South West Catchments Council.

5.2 The Peel-Harvey Catchment Council

The Peel-Harvey Catchment Council is a new entity in the broad approach to the development and implementation of an integrated catchment management plan (ICMP). The establishment of the Council is supported by the EPA. However, its area of interest falls within the policy area covered by the Peel-Harvey EPP. The EPA needs to develop an understanding with the Peel-Harvey Catchment Council in relation to the initiatives to be undertaken by the EPA in the review of the EPP and the development of an EMP to protect water quality. The EMP will take the form of a Water Quality Improvement Plan.

The EPA will be seeking to retain access to the ERC (refer section 2.3) as a source of expert advice in relation to review of the EPA and the development of the Plan.

5.3 Coordinating a whole of Government and community framework

A further draft EPP will expand the whole of Government and community approach to implementation. There will be a need for a coordinating management entity to be established under the EPP that reports to the EPA similar to the style of the Cockburn Management Council outlined in the 2002 Revised Draft Cockburn Sound EPP. This entity will represent the stakeholders including Government and the community and existing bodies need to be considered. The entity will implement the EMP, approved by the EPA. The EPP would set out the responsibilities of this entity.

5.4 Performance monitoring and review

It is intended that the Program for Protection in the EPP will mainly focus around the EMP (refer section 5.1) and will be continuously monitored with regular reviews and status reporting via the coordinating entity to the EPA.

The coordinating entity will report on the performance of the EPP which will be measured in terms of the protection of the EV's via the EQO's which represent them. EQO's will be integrated within the decision making processes affecting the Policy area and will be linked to specific EQC's (refer section 4). Stakeholders will be required to comply with EQC's via the EMP to ensure that the EQO's are being met and the EV's are being protected. Appendix 6 identifies the type of modifications to the Revised Draft EPP which are required in order to incorporate the proposals put forward by the EPA in this discussion paper.

6. The Next Step

Development of the EPP must follow a statutory process in accordance with Part III of the *Environmental Protection Act 1986*. There are several opportunities to contribute to the development of the EPP during this process.

Following the release of this document, the EPA will consider issues raised by the community and will prepare a further draft EPP for public release under Part III of the Environmental Protection Act. This is anticipated around by the second half of 2003 and will provide further opportunity to contribute to development of the Peel Inlet – Harvey Estuary EPP.

The EPA will consider public comment on the further draft EPP and it may be revised accordingly and submitted to the Minister for Environment and Heritage for approval. The Minister must then consult with parties likely to be affected by the EPP before making a final decision. An approved EPP is gazetted then tabled in Parliament. The approved EPP is a whole of Government Policy.

7. Have your say -:

The EPA invites written submissions on any issues raised by this document until **Friday 28 March 2003.**

Please address your written submissions to:	*Or*	e-mail your submission to the EPA via:
Environmental Protection Authority **141 St Georges Tce** **PERTH** **WA 6000**		**julie.tilleke@environ.wa.gov.au** For enquiries contact the Policy and Sustainability Branch, EPA Services Unit
Attention: Julie Tilleke		*tel:* **9222 7000**

8. References:

1.

2.

APPENDIX 1:

ENVIRONMENTAL PROTECTION ACT 1986

ENVIRONMENTAL PROTECTION (PEEL INLET-HARVEY ESTUARY) POLICY APPROVAL ORDER 1999

Made by the Minister under section 31 (d).

Citation

1. This order may be cited as the Environmental Protection (Peel Inlet-Harvey Estuary) Policy Approval Order 1999.

Approval and commencement of environmental protection policy

2. The environmental protection policy set out in the Schedule —

(a) is approved; and

(b) shall have the force of law on and from the day of which this order is published in the Gazette.

SCHEDULE

(Clause 2)

ENVIRONMENTAL PROTECTION ACT 1986

ENVIRONMENTAL PROTECTION (PEEL INLET-HARVEY ESTUARY) POLICY 1999

Approved by the Minister under section 31 (d)

PART 1 — PRELIMINARY

Citation

1. This policy may be cited as the Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1999.

Purpose of policy

2. The purpose of this policy is —

(a) to set out environmental quality objectives for the Estuary which if achieved will rehabilitate the Estuary and protect the Estuary from further degradation; and

(b) to outline the means by which the environmental quality objectives for the Estuary are to be achieved and maintained.

Interpretation

3. In this policy, unless the contrary intention appears —

"environmental quality objectives" means the environmental quality objectives set out in clause 7;

"Estuary" means Peel Inlet and Harvey Estuary;

"median load (mass) of total phosphorus" means the middle observed phosphorus load in the observed series of measured annual phosphorus loads, measured over the immediately preceding 10-year period;

"Planning Policy" means "Statement of Planning Policy No. 2; The Peel-Harvey Coastal Plain Catchment" prepared by the State Planning Commission under the Town Planning and Development Act 1928 and published in the Gazette of 21 February 1992 at pp. 947–955, and includes any amendments made to the Policy;

"policy area" means the portion of the environment to which this policy applies;

"this policy" means this environmental protection policy.

Application

4. The portion of the environment to which this policy applies is the area of land defined in Schedule 1.

PART 2 — BASIS FOR PROTECTION OF ESTUARY, ENVIRONMENTAL QUALITY OBJECTIVES, AND ACHIEVEMENT AND MAINTENANCE OF THOSE OBJECTIVES

Beneficial uses

5. The following uses of the Estuary are declared to be beneficial uses to be protected under this policy —

(a) use of the Estuary as a resource for studying the natural environment;

(b) use of the Estuary as a habitat for diverse and abundant native flora and fauna communities;

(c) use of the Estuary to support commercial and amateur fisheries;

(d) use of the Estuary for recreation, tourism and landscape amenity;

(e) use of the Estuary as a focus for residential development.

Basis for protection of Estuary

6. (1) Nutrient enrichment of the Estuary has been caused by the clearing of native vegetation in the policy area and by land uses that result in nutrients, especially phosphorus, leaching into waterways in the policy area and then flowing into the Estuary.

(2) Nutrient enrichment in the Estuary has stimulated the excessive growth of algae, causing the degradation of the Estuary and creating a serious public nuisance.

Environmental quality objectives

7. The environmental quality objectives to be achieved and maintained in respect of the Estuary are a median load (mass) of total phosphorous flowing into the Estuary of less than 75 tonnes with —

(a) the median load (mass) of total phosphorous flowing into the Estuary from the Serpentine River being less than 21 tonnes; and

(b) the median load (mass) of total phosphorous flowing into the Estuary from the Murray River being less than 16 tonnes; and

(c) the median load (mass) of total phosphorus flowing to the Estuary from the Harvey River and drains being less than 38 tonnes.

Achievement and maintenance of environmental quality objectives

8. (1) The rehabilitation and protection of the Estuary is to be effected by the achievement and maintenance of the environmental quality objectives, objectives which will prevent excessive growth of algae in the Estuary.

(2) The environmental quality objectives are to be achieved and maintained through —

(a) implementation of the Planning Policy by local authorities through their relevant town planning schemes, and by the State Planning Commission through the Metropolitan Region Scheme:

(b) appropriate land management by landholders and management authorities in the policy area:

(c) government extension services including the provision of advice to landholders in the policy area; and

(d) local authorities and the State ensuring that decisions and actions are compatible with the achievement and maintenance of the environmental quality objectives.

SCHEDULE 1
(Clause 4)

POLICY AREA

PEEL HARVEY CATCHMENT AREA

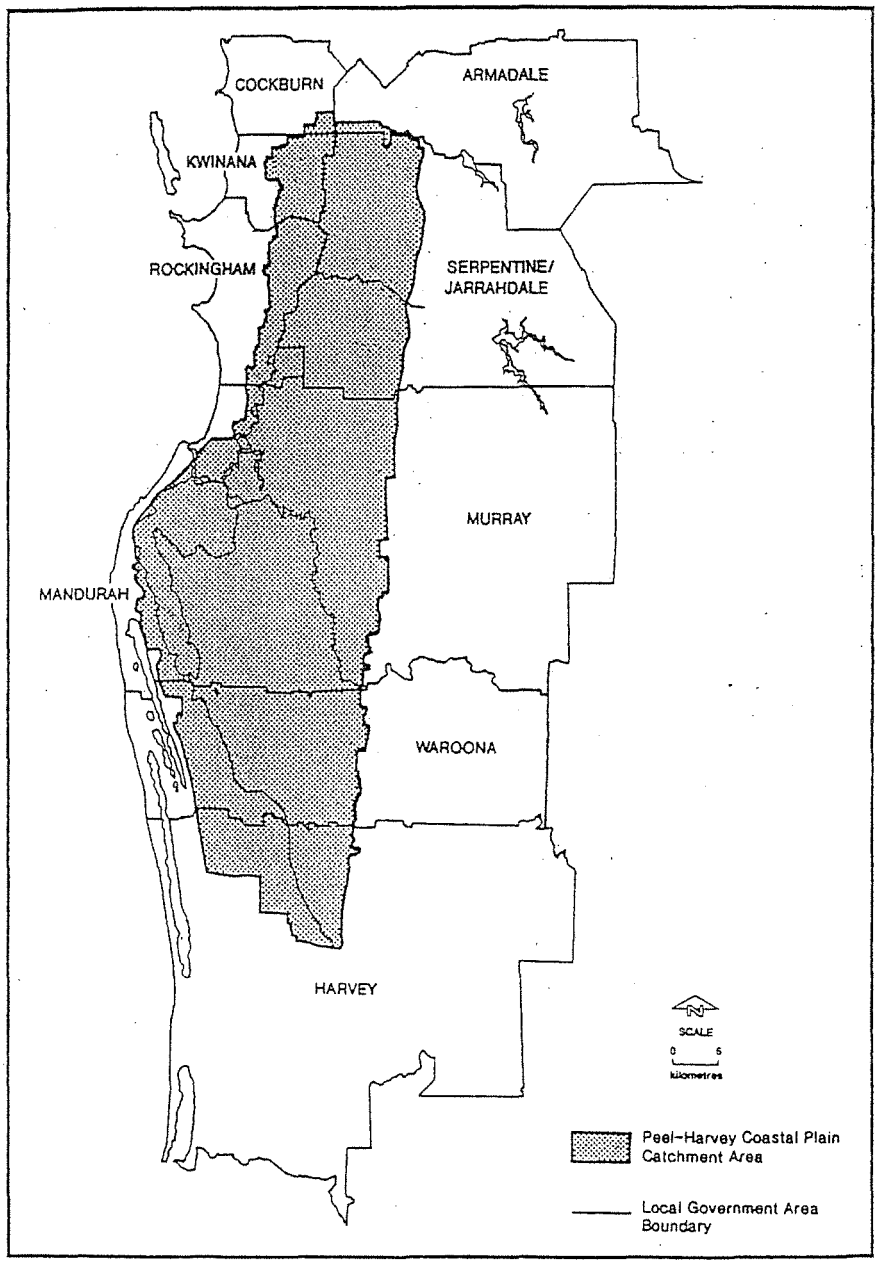


Figure 1: Boundary of the Peel-Harvey coastal catchment plan

APPENDIX 2

Summary of submissions and EPA response for the Draft Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1999 December 1999

The draft Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1999, was released on 11 November 1999 for a 3 week public comment period. Late submissions were accepted, provided they could be considered by the EPA prior to transmittal of the revised draft EPP to the Minister by the statutory deadline (11 December 1999).

A total of 24 submissions were received. All submissions have been summarised and the EPA's response to the matters raised has been provided (Table 1).

Notice of the release was published in the Government Gazette on 12 November 1999. Following the release of the draft policy, advertisements were placed in *The West Australian* and the local newspapers inviting submissions.

The draft policy was distributed to State Government departments, Local Government departments in the region, local Members of the Legislative Assembly and Legislative Council, industries in the region, numerous individuals who expressed interest, local groups and conservation groups. Copies of the draft policy were available at the head office of the Department of Environmental Protection and at its regional offices.

The number and place of origin of submissions are listed below.

	Number
Individuals	6
Local groups	2
Conservation groups	8
Government: State	3
Government: Local	5
Total	24

Key to abbreviations

WRC	Waters and Rivers Commission	LMPS	Lake Mealup Preservation Society Inc
DOME	Dept. Minerals and Energy		
HDWA	Health Dept. WA	RREC	Naragebup Rockingham Regional Environment Centre
WCG	Waterbird Conservation group		
WSWA	Wildflower Society WA	GS	Goodale Sanctuary Pty Ltd
CCWA	Conservation Council WA	NCE	Nyungah Circle of Elders
MCG	Melville Conservation Group	TK	Town of Kwinana
PPG	Peel Preservation Group	CAR	City of Armadale
UBCWA	Urban Bushland Council of WA	CR	City of Rockingham
		MP-CS	Christine Sharp - Member for South West

Table 1. Summary of submissions to the draft Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1999 and the response of the Environmental Protection Authority, December 1999.

Key to abbreviations

WRC	Waters and Rivers Commission
DOME	Dept. Minerals and Energy
HDWA	Health Dept. WA
WCG	Waterbird Conservation group
WSWA	Wildflower Society WA
CCWA	Conservation Council WA
MCG	Melville Conservation Group
PPG	Peel Preservation Group
UBCWA	Urban Bushland Council of WA
LMPS	Lake Mealup Preservation Society Inc
RREC	Naragebup Rockingham Regional Environment Centre
GS	Goodale Sanctuary Pty Ltd
NCE	Nyungah Circle of Elders
TK	Town of Kwinana
CAR	City of Armadale
CR	City of Rockingham
MP-CS	Christine Sharp - Member for South West

	General issue	Specific issue and comment (submittor number)	Action and response
WCG, WSWA, CR, UBCWA	Scope	The scope of the 1992 EPP inadequate. (WCG, WSWA) Roll-over supported. (CR) The use of the Seniors Officers Group is recommended for the review. (CR) Review the SPP. (CR) EPP too narrowly focused. (UBCWA)	The EPA notes these comments but does not consider it appropriate to respond at this stage as it is necessary to consider the outcome of the Review of the Progress and Compliance Report.
CM	Educate	Organise some workshops to educate and make public aware of the policy. (CM)	
CCWA, PPG, 23, CM	Policy area-Catchment	Extend the policy area to the whole catchment. (CCWA, PPG, CM, 23)	
WCG, LMPS	Monitor	Monitor waterbird usage, numbers, breeding, feeding, which occurred prior to the Dawesville Channel and afterwards. (WCG) Needs to be an adequate monitoring and compliance program. (LMPS)	
CCWA, GS, WCG, UBCWA, TK, WSWA, LMPS, 23, PPG	EQO	No net increase of phosphorus and nitrogen into rivers resulting from developments. (CCWA) Address the water quality problems of the lower reaches of the rivers. (CCWA) Total water quality protection is needed. (GS) Expand on the Environmental Quality Objectives to include phosphorus concentrations, nitrogen concentrations, condition and extent of remnant vegetation, condition and extent of saltmarsh, dissolved organic carbons and total dissolved solids. (WCG, CCWA, UBCWA, TK, WSWA, LMPS, 23) Moratorium on nutrient producing industries within policy area. (PPG) Examine the source of nitrogen and phosphorus and limit impact. (PPG)	
UBCWA, WCG, RREC, WSWA, TK, 10, 23, NCE	Vegetation	Include tight restrictions on clearing. (UBCWA) All remnant vegetation in the Policy area be protected (WCG, WSWA, RREC) Moratorium on clearing vegetation should be altered to achieve the objective of reversing the amount of clearing and encouraging retention. (TK, 10, 23) The EPP should mention the protection of Nyungah Cultural and Religious	

	General issue	Specific issue and comment (submittor number)	Action and response
		Sites and all Aboriginal Sites in their own right not just through the native vegetation and wetlands. (NCE) Planting along the drains to result in "living streams" should be promoted. (TK)	
WCG	Resources	Government to provided sufficient resources for monitoring, policing and investigation. (WCG)	
MP-CS, CCWA, WCG, TK, LMPS, RREC, DOME, GS, CAR, NCE, CR, LCDC	Consultation	Allow further comment after Review of Progress and Compliance Report. (MP-CS, CCWA, WCG, TK, LMPS, RREC, DOME, GS, CAR) Consult the Nyungah Elders and Native Title Claimants. (NCE) Three weeks consultation is too short (CR, LCDC - COOLUP)	
MP-CS, CCWA, UBCWA, PPG, 10, LMPS, 23	Beneficial use about residential	Concerned about beneficial use "use of the estuary as a focus for residential development." (MP-CS, CCWA, UBCWA, PPG, 10, LMPS, 23)	
CM, MP-CS	5e	Remove 5 (e) Reconsider the word focus in 5(e) (CM) Clause 5(e) should be completely removed from the policy. (MP-CS)	
LMPS, RREC	Residential pollution	Residential developments must be prevented from contributing high levels of nutrient to the estuary. (LMPS, RREC)	
MP-CS, MCG	Canal development	No further canal development considered within the estuary and its catchment. (MP-CS, MCG)	
PPG, 24, 23, GS	Dawesville Cut	Revise high water mark. (PPG) Dawesville Cut has now causing flooding. (24) "little effect in fringing vegetation has been observed from the Dawesville Cut" is disputed. (PPG, 23) Changes in migratory birds are already being observed. (GS)	
PPG	Greenhouse	Consider Greenhouse implications on estuary. (PPG)	
PPG, HDWA, MP-CS,	General	All wetlands should be protected like the "lakes" policy. (PPG) Length and width of Estuary is	

	General issue	Specific issue and comment (submittor number)	Action and response
MCG		underestimated. (PPG) Erosion survey - funding. (PPG) The review of the EPP should reconfirm whether the validity of the environmental assumptions about nutrient impact from on-site wastewater disposal systems is real or in need of reconsideration. (HDWA) State needs a population policy. (MCG) List "uses" in order of importance. (MP-CS)	
HDWA	Resources	Implementation of the EPP should consider reimbursement to local government and others to encourage compliance with environmental objects. (HDWA)	
9	Acid Sulphate Soils	Incorporate extent and effect of Acid Sulphate Soils in policy . (9)	
MCG	Peel Region Scheme	Consider Draft Peel Region Scheme in conservation values. (MCG)	
MP-CS, PPG, 23, 10, WCG, MCG	Buffers	Buffer zone should be 100 m. (MP-CS, PPG, 23) Large tracts of bushland should be retained as a buffer. (10) Reduction of foreshore buffers is condemned. (WCG, MCG) No development of buffers zones. (10)	
CCWA, UBCWA , WSWA	Conservation	Support need for protection of conservation values of the Peel Harvey system. (CCWA, UBCWA, WSWA)	
CCWA	Review EPP	The EPA needs to review effectiveness of the 1992 EPP, this has not occurred yet. (CCWA)	
CCWA	EPP process	Set down a procedure or process for ensuring that all EPP's are reviewed in a timely manner. (CCWA)	
24	Government agencies	Public authorities need to abide by the requirements of the policy. (24)	

APPENDIX 3:

Ministerial Conditions for the Peel Inlet-Harvey Estuary Management Strategy

Insert conditions here

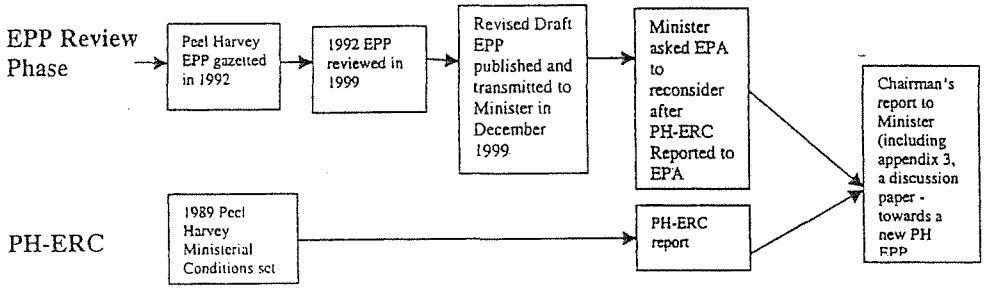
APPENDIX 4:

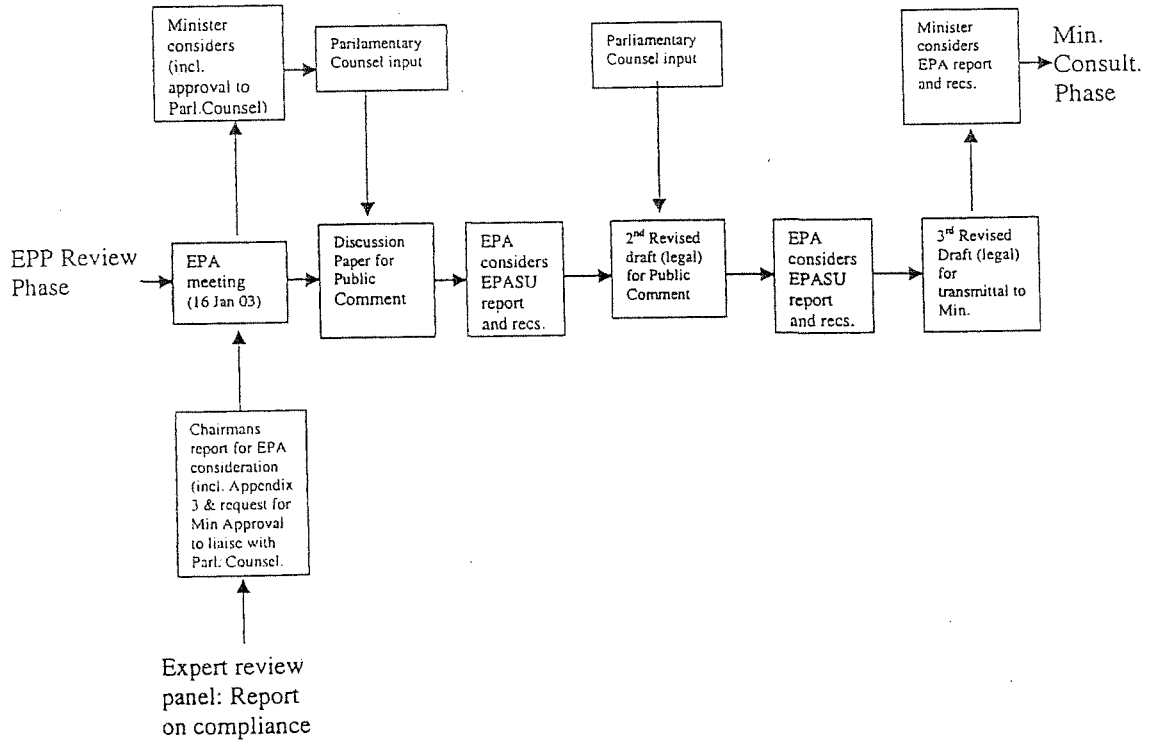
Summary of the EPA's advice in its review of the Report on Compliance for the Peel Inlet-Harvey Estuary Management Strategy

Insert here:

APPENDIX 5:

The inter-relationship of the processes for the review of the Peel Harvey Management Strategy and the development of the further draft EPP





APPENDIX 6:

Proposed modifications to the Revised Draft EPP 1999: an annotated format.

The text of the current EPP is re-stated and this is annotated by boxed text in relation to further consideration required.

ENVIRONMENTAL PROTECTION ACT 1986

ENVIRONMENTAL PROTECTION (PEEL INLET-HARVEY ESTUARY) POLICY APPROVAL ORDER 1999

The title of a further draft EPP would need to be considered in light of proposed changes, whether it would refer to only the Peel Inlet – Harvey Estuary

Made by the Minister under section 31 (d).

Citation

1. This order may be cited as the Environmental Protection (Peel Inlet-Harvey Estuary) Policy Approval Order 1999.

The title of a further draft EPP would need to be considered in light of proposed changes, whether it would refer to only the Peel Inlet – Harvey Estuary

Approval and commencement of environmental protection policy

2. The environmental protection policy set out in the Schedule —

   (a) is approved; and

   (b) shall have the force of law on and from the day of which this order is published in the Gazette.

SCHEDULE

(Clause 2)

ENVIRONMENTAL PROTECTION ACT 1986

ENVIRONMENTAL PROTECTION (PEEL INLET-HARVEY ESTUARY) POLICY 1999

The title of a further draft EPP would need to be considered in light of proposed changes, whether it would refer to only the Peel Inlet – Harvey Estuary

Approved by the Minister under section 31 (d)

PART 1 — PRELIMINARY

Citation

1. This policy may be cited as the Environmental Protection (Peel Inlet-Harvey Estuary) Policy 1999.

The title of a further draft EPP would need to be considered in light of proposed changes, whether it would refer to only the Peel Inlet – Harvey Estuary

Purpose of policy

2. The purpose of this policy is —

(a) to set out environmental quality objectives for the Estuary which if achieved will rehabilitate the Estuary and protect the Estuary from further degradation; and

(b) to outline the means by which the environmental quality objectives for the Estuary are to be achieved and maintained.

The purpose of the policy will need to be amended to include, possible expanded ecosystem health, environmental values and the development of an Environmental Management Plan.

Interpretation

3. In this policy, unless the contrary intention appears —

"environmental quality objectives" means the environmental quality objectives set out in clause 7;

"Estuary" means Peel Inlet and Harvey Estuary;

"median load (mass) of total phosphorus" means the middle observed phosphorus load in the observed series of measured annual phosphorus loads, measured over the immediately preceding 10-year period;

"Planning Policy" means "Statement of Planning Policy No. 2; The Peel-Harvey Coastal Plain Catchment" prepared by the State Planning Commission under the Town Planning and Development Act 1928 and published in the Gazette of 21 February 1992 at pp. 947–955, and includes any amendments made to the Policy;

"policy area" means the portion of the environment to which this policy applies;

"this policy" means this environmental protection policy.

These definitions may be required to be amended in light of proposed changes.

Application

4. The portion of the environment to which this policy applies is the area of land defined in Schedule 1.

The area to which the policy applies will need to be considered in light of changes proposed.

PART 2 — BASIS FOR PROTECTION OF ESTUARY, ENVIRONMENTAL QUALITY OBJECTIVES, AND ACHIEVEMENT AND MAINTENANCE OF THOSE OBJECTIVES

Beneficial uses

5. The following uses of the Estuary are declared to be beneficial uses to be protected under this policy —

(a) use of the Estuary as a resource for studying the natural environment;

(b) use of the Estuary as a habitat for diverse and abundant native flora and fauna communities;

(c) use of the Estuary to support commercial and amateur fisheries;

(d) use of the Estuary for recreation, tourism and landscape amenity;

(e) use of the Estuary as a focus for residential development.

The *Environmental Protection Act* amendment now refers to Environmental Values rather then Beneficial uses. A set of draft environmental values (to replace the beneficial uses) will be initially drawn from the ERC findings. This advice from the ERC will greatly assist with the discussion with the public and stakeholders on environmental values. This will be achieved by way of the release of a discussion paper.

Basis for protection of Estuary

6. (1) Nutrient enrichment of the Estuary has been caused by the clearing of native vegetation in the policy area and by land uses that result in nutrients, especially phosphorus, leaching into waterways in the policy area and then flowing into the Estuary.

(2) Nutrient enrichment in the Estuary has stimulated the excessive growth of algae, causing the degradation of the Estuary and creating a serious public nuisance.

Consideration will need to given whether the basis for protection of the estuary should be expanded in light of the ERC findings.

Environmental quality objectives

Environmental quality objectives

7. The environmental quality objectives to be achieved and maintained in respect of the Estuary are a median load (mass) of total phosphorous flowing into the Estuary of less than 75 tonnes with —

(a) the median load (mass) of total phosphorous flowing into the Estuary from the Serpentine River being less than 21 tonnes; and

(b) the median load (mass) of total phosphorous flowing into the Estuary from the Murray River being less than 16 tonnes; and

(c) the median load (mass) of total phosphorus flowing to the Estuary from the Harvey River and drains being less than 38 tonnes.

As with the environmental values, a draft set of environmental quality objectives will be initially drawn from the ERC findings. The ERC has proposed a table of scaled phosphorus targets for the three main rivers. This advice from the ERC will greatly assist with the discussion with the public and stakeholders on environmental quality objectives. This will be achieved by way of the release of a discussion paper.

Achievement and maintenance of environmental quality objectives

8. (1) The rehabilitation and protection of the Estuary is to be effected by the achievement and maintenance of the environmental quality objectives, objectives which will prevent excessive growth of algae in the Estuary.

(2) The environmental quality objectives are to be achieved and maintained through —

(a) implementation of the Planning Policy by local authorities through their relevant town planning schemes, and by the State Planning Commission through the Metropolitan Region Scheme:

(b) appropriate land management by landholders and management authorities in the policy area:

(c) government extension services including the provision of advice to landholders in the policy area; and

(d) local authorities and the State ensuring that decisions and actions are compatible with the achievement and maintenance of the environmental quality objectives.

As the environmental quality objectives (EQO) may be amended and environmental quality criteria developed, this section may be completely revamped based on the 2002 Revised Draft Cockburn Sound EPP model. Achievement and maintenance of the EQO's may be through application of the Environmental Quality Criteria.

The following new sections of the policy may be considered during consultation of the discussion paper.

Environmental Quality Criteria

Environmental Quality Criteria will need to be established based on the environmental values and environmental quality objectives. A core criteria for judging health of the ecosystem is the measure of the phosphorus load entering the Serpentine River, Murray River and Harvey River and drains. The ERC have provided phosphorus targets for the three rivers and advice on a system wide water balance, estuarine ecosystem health and managing public nuisance. These will form a basis for public discussion.

Program to protect environmental values and achieve environmental quality objectives

A framework and management program should be developed to outline how the EV's and EQO's will be protected and achieved.

Establishment of an Environmental Management Plan

The EPA now needs to take a more pro-active role in the development of the Environmental Management Plan which would include a catchment management plan in the form of a Water Quality Improvement Plan for the Peel-Harvey system.

Need for a Coordinating Management Entity

Need for a Coordinating Management Entity to be established under the EPP that reports to the EPA similar to the style of the Cockburn Management Council outlined in the 2002 Revised Draft Cockburn Sound EPP. Existing bodies need to be considered. This entity will implement the Environmental Management Plan, approved by the EPA. The EPP would set out the responsibilities of this entity.