PRICING OF BACKLOG SEWERAGE

An Issues Paper

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

INDEPENDENT PRICING AND REGULATORY TRIBUNAL
OF NEW SOUTH WALES

PRICING OF BACKLOG SEWERAGE

An Issues Paper

Discussion Paper No. 19 **January 1997**

Enquiries relating to this Issues Paper should be directed to:

Robert Burford (☎ 02 290 8408)
Elsie Choy (☎ 02 290 8488)

Submissions to the review should be sent to the Tribunal at the address below

Please forward submissions by Friday 14 March 1997

Independent Pricing and Regulatory Tribunal of New South Wales
Level 2, 44 Market Street Sydney NSW 2000
Tel: (02) 290 8400 Fax: (02) 290 2061
All correspondence to:PO Box Q290 QVB Post Office, SYDNEY NSW 1230

FOREWORD

This review of pricing principles and charges for the provision of sewerage services in backlog areas will finalise some unresolved matters arising from the Medium Term Price Path Determinations for Sydney Water Corporation and Gosford City Council.

The review considers four backlog projects in Sydney Water's operational area and one project in Gosford.

The provision of sewerage in urban and semi-urban areas is important for the protection of the environment and maintenance of public health. The benefits from these projects are shared by all, not just those in the communities concerned. However, they involve substantial costs.

The focus of this Issues Paper is the fair and reasonable sharing of these costs. The conflicting demands which need resolution may be summarised as *which* customers should pay *what* costs and *how* should current prices be adjusted to reflect these additional costs?

The paper highlights the site-specific nature of many factors involved in this issue. These range from environmental and public health considerations to social and economic issues.

Thomas G Parry
Chairman

January 1997

Table of Contents

1 OVERVIEW

The Independent Pricing and Regulatory Tribunal of NSW (IPART) is conducting an inquiry into the pricing of reticulated sewerage systems in sewer backlog areas. The inquiry will:

(i) establish pricing principles for sewer backlog areas
(ii) determine the maximum price to be charged for some specific locations in the Sydney and Gosford areas, commencing 1 July 1997.

The four sewerage projects within the Sydney Water Corporation (SWC) operational area to be considered as part of this inquiry are:

(i) Picton / Tahmoor / Thirlmere
(ii) Bundeena / Maianbar
(iii) Gerringong / Gerroa
(iv) Winmalee Extension.

The inquiry will also consider the project at Fisherman's Parade which falls within the operational area of Gosford City Council.

The inquiry process involves:

(i) releasing this issues paper
(ii) placing on public record the submissions of the water agencies
(iii) receiving written responses to these submissions from the public
(iv) holding a public hearing
(v) releasing IPART's report and determination.

The timing of these steps is:
1. Following publication of this issues paper, submissions from Sydney Water Corporation and Gosford City Council will be available from 14 February 1997.
2. Public submissions will be received by the Tribunal until 14 March 1997.
3. Public hearings are scheduled to be held in Sydney on 26 March 1997.

All non-confidential submissions received by IPART will be placed in a public register and may be viewed at IPART's offices, Level 2, 44 Market Street, Sydney.

2 SUMMARY OF ISSUES

There are pockets within Sydney and the surrounding region which lack reticulated sewerage services. Residents within these areas rely upon other methods for sewage disposal and treatment. Where it is decided by government that existing means of sewage disposal are inappropriate for health, environmental or other reasons, water suppliers may be required to provide sewerage services.

This paper discusses the pricing principles that could apply to the provision of backlog sewerage services and the key issues affecting the price determination for four priority sewer backlog areas in Sydney Water's Operational Area. It also considers the provision of sewerage to existing unserviced developments at Fisherman's Parade in Gosford City. These are outstanding determinations flowing from previous inquiries into Sydney Water[1] and Gosford City Council[2], respectively. The pricing principles developed in this inquiry may be applied to some remaining sewer backlog areas within the operational areas of both Sydney and Hunter Water Corporations.

In August 1996, an environment assessment report was prepared by the Minister for the Environment in conjunction with the Minister for Planning and Urban Affairs. This report assessed the environmental priority of each possible sewer backlog project area and confirmed that sewerage services would be provided to the specific backlog areas discussed in this paper.

2.1 Key features of this investigation

In previous reports[3], the Tribunal has established pricing principles to apply to the provision of water and sewerage services. The applicability of those pricing principles to the specific issue of backlog sewerage is the subject of this inquiry.

The price determination for the specific areas which are the subject of this inquiry will establish, in part, how these schemes are to be funded. Government policy dictates the proportion of the total cost of each project that will be provided by the Government, as a community service obligation (CSO)[4]. IPART will determine how the balance of the costs of each scheme will be shared among the customers of Sydney Water Corporation and Gosford City Council.

To the extent that project costs are passed through to customers as increased prices, a second objective of this inquiry is to determine the pricing scheme that will raise the additional revenue required.

---

1 *Sydney Water Corporation, Prices of Water Supply, Sewerage and Drainage Services, Medium Term Price Path from 1 July 1996*, Determination No 6, 1996, Independent Pricing and Regulatory Tribunal, June 1996.

2 *Gosford City Council, Prices of Water Supply, Sewerage and Drainage Services, Medium Term Price Path from 1 July 1996*, Determination No 3, 1996, Independent Pricing and Regulatory Tribunal, June 1996.

3 *Inquiry into Water and Related Services*, Government Pricing Tribunal of NSW, October 1993.

4 Community service obligations are those services which are not commercially viable, but which are considered necessary for social and other reasons. Now called Social Programs, these are discussed in Chapter 4.

The options for such a scheme include:

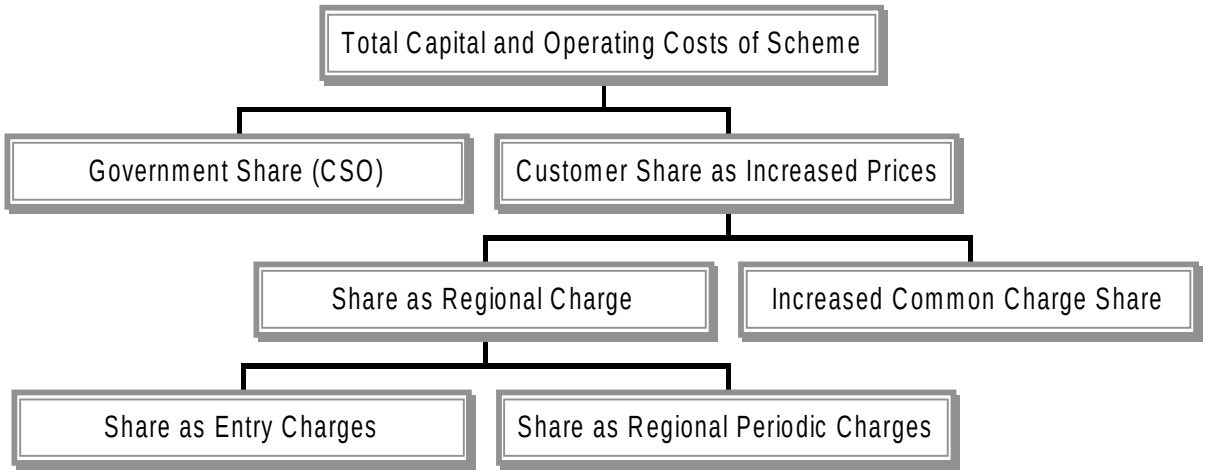
- increasing charges common to all customers, or
- applying region-based charges which impact only on those residents receiving the new reticulated sewerage services, or
- producing a mix of the above two options.

If region-based charges are introduced, the determination will also establish the balance between "up-front" entry costs to the scheme and an on-going regional service charge which differs from the common charges.

The key matters for decision are therefore which customers will pay what costs and how those prices should be adjusted to reflect such costs.

The components of this decision may be represented by the following diagram, with a sharing of costs at each stage between 0 per cent and 100 per cent.

Figure 2.1: Cost apportionment



2.2 Reaching a determination

To reach a determination, the Tribunal must balance the competing interests of various stakeholders. This objective is expressed in the Tribunal's enabling legislation[5] as a requirement to consider twelve separate factors in making determinations and recommendations. The factors listed in the legislation can be grouped into four broad categories:

* Consumer protection
  - inquiring into prices, pricing policies and standards of service
  - exploring impacts on general price inflation
  - considering social impact of decisions
* Economic efficiency
  - seeking greater efficiency in the supply of services
  - reviewing the impact of contracting out functions to some other organisation
  - promoting competition
* Financial stability
  - investigating rate of return on public sector assets
  - canvassing the impact of borrowing, capital and dividend requirements
* Environmental and other standards
  - promoting environment protection by appropriate pricing policies
  - considering demand management
  - maintaining standards of quality, reliability and safety

Many of these factors are pertinent to the provision of reticulated sewerage in sewer backlog areas and are therefore explored in this issues paper.

It is incumbent on IPART to ensure that, whatever costs are incurred by the service provider, only efficient costs are passed on to customers, and the service provider does not abuse its monopoly power.

[5] The Independent Pricing and Regulatory Tribunal Act, 1992, section 15.

3 BACKLOG SEWER PROGRAMS

In the period which followed World War II, the Sydney metropolitan area expanded rapidly. The Sydney Water Board could not meet the servicing requirements of the very high rate of household formation. Since providing a reticulated water service is usually less difficult and less expensive than providing a reticulated sewerage service, and because the construction of Warragamba Dam and associated pipelines was consuming a large proportion of capital funds, the Water Board responded to the demand by providing reticulated water services in advance of reticulated sewerage. Wastewater management and disposal was usually left to local councils and individual households.

This situation created significant potential for health and environmental problems. Several programs were implemented to provide reticulated sewerage systems. Nevertheless, a number of unsewered areas remain, some of which are the subject of this inquiry.

The most common on-site wastewater management systems employed in New South Wales are discussed in Appendix 1. Local councils have the power to approve these systems. Currently, a working group comprising the Environment Protection Authority, NSW Health, the Department of Land and Water Conservation, and the Department of Local Government is finalising guidelines to assist councils with the approval process. The installation and maintenance costs of these systems vary markedly, depending on the type of system employed, difficulties associated with local conditions, and charges levied by the local council or sewerage authority. The unsewered areas in Sydney Water's Operational Area are listed in Appendix 2.

3.1 Backlog Sewer Program in the Sydney Area

The Backlog Sewer Program was established by the Water Board to prioritise the provision of sewerage services to urban properties which were connected to a reticulated water supply, but were not connected to a reticulated sewerage service. The sewerage backlog consists of all works: sub-mains, carriers, pumping stations, reticulation and sewage treatment plants (STPs) required to provide sewerage services to properties. By 1960, less than 70 per cent of properties in the Sydney Metropolitan Area with reticulated water supply had reticulated sewerage as well.

This problem was partially addressed in 1963, following amendments to the Water Board's enabling legislation. Up to this time, the Water Board had a commitment to fund, from its own resources, the provision of sewerage facilities for all unsewered blocks. This included both new release areas and "backlog properties" and amounted to approximately 240,000 properties. The amendments to the Water Board's legislation[6] took effect in April 1964. They required the developer to fund water and sewerage facilities for all new subdivisions. This change meant that in new release areas, the Water Board was required to fund only the cost of treatment works, system operations and maintenance costs.

Further control was introduced in 1968 with the adoption of the Sydney Region Outline Plan[7], which effectively prevented any new development from being undertaken without provision of sewerage services. Consequently, the development of new areas did not

[6] Metropolitan Water Sewerage and Drainage Act, section 34.

[7] *Sydney Region Outline Plan*, State Planning Authority of NSW, March 1968

impact on the size of the backlog beyond increased demands on treatment works, system operations and administration.

In the early 1970s, the Federal Government introduced a National Sewerage Strategy[8] to overcome sewer backlogs. The Sydney metropolitan area was a major beneficiary of this scheme. By 1992, , almost 98 per cent of residential properties within the Sydney metropolitan area with reticulated water also had a reticulated sewerage system available.

Within Sydney Water's operational area, approximately 21,700 "urban" lots are supplied with water, but remain unconnected to a sewer system. This total comprises:

- 4,600 lots in existing contiguous areas
- 16,200 lots in village areas
- up to 900 lots in pockets that are isolated and difficult to service.

The total backlog is approximately 1.7 per cent of all residential lots connected to the water reticulation system.

Sydney Water Corporation's operating licence[9] requires it to "provide, construct, operate, manage, and maintain efficient, coordinated and commercially viable systems and services for supplying water, providing sewerage services and disposing of wastewater." For practical purposes, Sydney Water will provide sewerage services only in cases where these are commercially viable. Nevertheless, Sydney Water may be directed by the government to provide sewerage services that are uneconomic. In such cases, Sydney Water is entitled to be reimbursed for the net costs of efficient service provision.

This inquiry must consider where, and under what conditions, the pricing principles it establishes will apply.

3.2 Previous funding policy

As already noted, prior to 1963 the Water Board (now Sydney Water) was required to fund the full capital and operational costs of providing both backlog and new release sewerage reticulation and treatment facilities. The Water Board's 1963 annual report indicates that approximately 240,000 properties were without sewerage facilities.

In 1963, an amendment to the Metropolitan Water Sewerage and Drainage Act gave the Water Board the power to either charge developers, or require them to pay for the provision of sewerage facilities. For all new release properties which have become available since that time, property owners have fully funded the capital cost of sewerage reticulation and applicable amplification costs. In new release areas, the Water Board has met only the cost of treatment works and the operating and maintenance costs of the system.

---

[8] *National Sewerage Strategy*, Urban and Regional Development (Financial Assistance) Act, (C"wealth) 1974.

[9] The Water Board (Corporatisation) Act 1995, requires the formulation of an operating licence which establishes operating standards against which the performance of the Corporation will be measured. The Act also establishes a licence regulator to ensure that these standards are met.

The Water Board has funded the capital and operating components of the backlog program either through special grants such as the National Sewerage Strategy of the 1970s, or from its own funds.

In many cases, the provision of sewerage facilities has been driven more by political considerations than by the financial viability of schemes. Consequently, the Water Board has been required to overcome the sewer backlog through schemes which have not always been based on full cost recovery. This has meant that the Water Board has continued to subsidise both the capital and operating requirements of these schemes.

By the mid 1980s, it was recognised that the funds required to meet the outstanding backlog could not be supplied by the Water Board. At a time when the Water Board was required to operate far more commercially and provide a reasonable rate of return to its shareholder, insufficient funds were available to meet the cost of backlog sewerage projects and other commitments.

In 1987 the Water Board decided that its contribution to the capital cost of providing sewerage services would be limited to $14,000 per property. It was also decided that the local community which benefited from the backlog sewerage project would be required to meet costs over the threshold amount of $14,000. Despite this limitation, the backlog program still involved considerable cost for the Water Board.

In 1993, in response to the government's policy that Government Trading Enterprises (GTEs) should operate on a commercial footing, the Water Board examined its capital investment policy. It undertook to establish the true costs and benefits of providing services, and to adjust its trading policies and practices to reflect more commercial principles. The board decided that, in future, it would provide a reticulated sewerage service only to unsewered urban lots where a commercial return on the investment could be achieved.

3.3 Special environment program

To improve the environment generally and in particular, the quality of the harbour and beaches and rivers in Sydney, Illawarra and the Blue Mountains, a special environment levy (SEL) was introduced by the NSW Government in 1989-90. It was raised and administered by the Water Board.

From 1990 till December 1993, funds collected by the SEL together with accrued interest, were isolated in the Water Board's accounts and spent only on specific environmental improvement projects approved by the NSW Government. These projects were of an operational or capital nature.

Following the introduction of a user pays pricing structure, the raising of monies under the program ceased on 31 December 1993, six months earlier than proposed. The Water Board agreed, however, to fund the SEL program by an amount equivalent to what would have been raised had the levy continued to its conclusion on 30 June 1994. To ensure the accountability and transparency of SEL funding the Water Board established a Special Environmental Levy Trust in May 1994.

Under the terms of a subscription deed between the Trust and the Water Board, outstanding cash balances were transferred to the Trust in the form of capital units. The

Trust reimbursed the Water Board for amounts expended under the SEL Program by redeeming units equivalent to the amount involved. This practice was continued by Sydney Water Corporation. Any interest earned by the Trust is distributed to Sydney Water as reimbursement for environmental expenditure.

At 30 June 1996, the balance of funds in the SEL Trust stood at $64.6 million[10]. This balance will be significantly reduced if current applications to provide funds from the Trust for such projects as the Picton scheme and some sections of the Blue Mountains Sewerage Strategy are approved.

The Tribunal is interested in knowing what funds currently available within Sydney Water could be applied to sewerage backlog projects. It seeks submissions on whether this is the best use of these funds.

3.4 Sewage Management at Fisherman's Parade, Gosford

Gosford City Council established a regional sewerage scheme in the mid 1970's which continued until the early 1990's. Properties serviced by the scheme paid "loan charges" to fund the works. It was Council's intention that only properties inside the area covered by this scheme would be provided with sewerage services from loan scheme funds.

Properties in the Fisherman's Parade area were not included in the loan scheme. Therefore, they were not supplied with reticulated water and sewerage.

More stringent public health and environmental controls for on-site wastewater systems have caused building approval difficulties for some residents of Fisherman's Parade. Requests for Council to provide sewerage have arisen in response to these difficulties.

[10] Sydney Water Head Office.

4 PRICING PRINCIPLES FOR BACKLOG SEWER CHARGES

Where there are several potential suppliers of a service, competition between them creates efficiency and price pressures. For backlog reticulated sewerage services, there is only one potential service provider in any given area. IPART has the task of determining a reasonable price for all parties in these circumstances.

Inappropriate treatment and disposal of sewage has environmental consequences. It may be difficult to cost some of these effects. Any action required to repair or preserve the natural environment involves some expenditure. These costs may be borne either by those who pollute the environment, or by those who benefit from action taken to preserve it. In the latter case the beneficiaries may be the whole community. The relative benefits enjoyed by individuals are difficult to measure and price.

Efficient costs and efficient prices underlie the principles established by IPART to apply to charges for water and related services. These concepts are reinforced by the National Competition Policy and Related Reforms[11] adopted by the Council of Australian Governments (COAG).

Monopoly service providers, such as Sydney Water and Gosford City Council, should not be entitled to charge more than required for efficient service provision. Charges should be structured to reflect efficient costs and provide customers with the correct price signal for resource utilisation.

4.1 COAG

The principles adopted by COAG include[12]:

- taking action to reduce natural resource degradation
- adopting consumption based pricing and full cost recovery, and removing cross subsidies[13] where possible
- making remaining cross subsidies transparent
- arranging for any shortfall to be paid to the service deliverer as a community service obligation
- establishing the aim for supply organisations which are publicly owned to earn a real rate of return on the written down replacement cost of their assets, commensurate with the equity arrangements of their public ownership
- setting aside funds for future asset refurbishment and/or upgrading of government supplied infrastructure where this is not currently the case.

The COAG Expert Group[14] has recommended that the full economic costs of providing services which are attributable to specific, identifiable beneficiaries or impactors be recovered through charges imposed on them.

---

11 *Agreement to Implement the National Competition Policy and Related Reforms*, made between the Commonwealth Government and each State and Territory Government in April 1995.

12 Council of Australian Governments Meeting, 25 February 1994, Communique.

13 Cross-subsidies occur where some customers pay more for the services used than the cost of providing these services while other customers pay less than the cost of the services they consume; ie where part of the costs of supplying one customer is funded from payments by other customers.

The Expert Group recognises that economic costs, rather than accounting costs, should be used as a basis for charges to give accurate signals for infrastructure investment and resource consumption. Table 4.1 compares the economic costs and accounting costs of supplying a service.

Table 4.1 Economic and accounting costs

Economic costs	Accounting costs
Externalities - eg environmental impacts	
Opportunity cost of capital	Finance costs (interest)
Depreciation based on consumption of service capacity of asset base	Depreciation based on accounting standards
Administration costs	Administration costs
Operational and maintenance costs	Operational and maintenance costs

The key pricing issues for the backlog sewer inquiry that arise out of these matters agreed by Australian governments are:

1. What is the role of pricing in protecting and preserving the environment?
2. What does the adoption of full cost recovery imply for those being connected to a reticulated sewerage system?
3. Is it possible to identify cross subsidies associated with the Backlog Sewer Program and what would be the impact of their removal?
4. What is the government's policy on meeting its community service obligations to fund in whole, or in part, the provision of backlog sewerage from taxation revenues?
5. What is the implication of charges including a rate of return on backlog sewerage assets?

It should be noted that the Tribunal is bound by its enabling legislation. The above issues should be considered in addition to matters contained in section 15 of the IPART Act.

IPART seeks comments on how the adoption of COAG pricing principles may affect backlog sewerage customers.

[14] Council of Australian Governments 1995, *Report of the Expert Group on Asset Valuation Methods and Cost-Recovery Definitions for the Australian Water Industry.*

4.2 GTE Reform

Reforms affecting GTEs are designed to provide them with a more defined focus for their operations and greater commercial orientation for their management. The Hilmer report[15] on competition policy provides the impetus for reform through recommendations that GTEs be exposed to competition, and no longer be empowered to force customers to bear the cost of cross subsidies.

Some of the more important barriers to economic efficiency in GTE operation have arisen from government directions that GTEs pursue social objectives and fund these internally through cross subsidisation. Social objectives include the provision of rebates for pensioners and the performance of services for which the income received does not provide an adequate return. In the past, economic inefficiencies arose because cross subsidies often distorted production and investment decisions by GTEs, and consumption decisions by the public. At the same time, the benefits of social objectives pursued by GTEs were often poorly targeted and monitored and, in some cases, accompanied by undesirable environmental impacts.

Effective implementation of GTE reform requires alternative methods of funding social objectives to be identified. The Social Program Policy has been developed by government to define GTE activities which have social rather than commercial objectives. It funds and implements social programs. Social objectives include environmental and economic development outcomes as well as those usually associated with social policy.

The separation of commercial and social objectives in GTE operations has allowed management to focus on, and be held accountable for organisational efficiency and commercial performance. This separation permits government to directly address the objectives of each social program. The inclusion of social program expenditure in the budget makes it more transparent and accountable. The specification of social programs means that services may be better targeted and delivery systems improved. The evaluation and review processes established within the policy ensure that social programs continue to fulfil their intended functions.

A central component of the Social Program Policy is separation of the roles of purchaser and provider. The policy requires that a “purchaser” Minister assume policy and funding responsibility for the program. This Minister will consider such matters as the needs of the target group and the objectives of the social policy, priorities and portfolio implementation strategies. The organisation that is contracted to provide the service is termed the “provider”.

When these principles are applied to the sewer backlog issue, the service provider should be permitted either to provide the service on a commercial basis through increased prices, or government should make up any shortfall by recovering the costs of capital works or on-going operation, thereby permitting a continuation of the common service charge.

---

[15] *The Report of the Independent Committee of Inquiry on a National Competition Policy*, October 1992.

4.3 Community Service Obligations (CSOs)

Government may direct a GTE to provide a service that is uneconomic, and may decide to fund such a service as a Community Service Obligation (CSO). Where government decides not to provide CSO funding, the Tribunal is required to determine the sharing of costs between the relevant beneficiaries of the service.

Sydney Water has applied to the NSW Government to be reimbursed for costs incurred on backlog sewerage projects, based on the proposition that these projects will not provide an economic return. Following the Tribunal's determination, Sydney Water will implement a charging regime to recover costs to the extent permitted by the Tribunal's decision, and will return the equivalent value of reimbursements already received from Treasury.

4.4 Full cost recovery issues

Table 4.1 illustrates that economic costs differ from accounting costs in two important respects:

- economic costs include external costs, accounting costs do not
- the economic costs of infrastructure assets differ from the conventional accounting charges for those assets.

These differences are discussed in the following sections.

4.4.1 External costs: environmental impacts

External costs are costs imposed on downstream water users or the environment that are not recovered by existing charges. Typically, as these costs are not charged for, consumption of the relevant resource is higher than it would be otherwise. Failure to include these costs in charges means that consumption and investment decisions are made without considering the full economic costs of using resources.

Under the government's water reform process, water quality and river flow objectives are being developed for all NSW catchments. Some Land and Water Management Plans have already been prepared. Others will be developed by government agencies and Catchment Management Committees to implement the government's environmental objectives. Environmental management in priority catchments, including the Hawkesbury-Nepean and the Georges River catchments, will soon be scrutinised by the Healthy Rivers Commission. Increasingly, such initiatives are being viewed as a key process for reducing external costs on the environment.

The provision of sewerage infrastructure represents an important community investment in the protection of the environment and the maintenance of public health. Environment-related expenditure is likely to grow significantly in the Sydney Region. To the extent that these costs can be identified and attributed to specific groups or beneficiaries, should they be included in sewerage charges?

This inquiry needs to address the issue of how costs associated with the investment in backlog sewerage should be shared between various groups.

4.4.2 Capital costs

Reticulated sewerage systems, including sewage treatment plants, are long-lived infrastructure assets. Capital charges for such assets commonly take the form of *depreciation* to recover the capital value of the infrastructure over time and a *rate of return* to compensate the provider for the use of those funds and any risk involved in underwriting the investment. Capital charges for an asset should be met by those who derive a benefit from the service capacity of that asset.

Increasingly, the ability to provide adequate returns to the community is seen as an important requirement for investment of public funds in new assets. An internal rate of return on the funds employed and the broader social opportunity cost of capital must be calculated.

The internal rate of return applies only to the costs and revenues related to the services provided. Where capital charges are appropriate, they should provide this internal rate of return as a minimum. The broader social rate of return quantifies all costs and benefits generated by the project, including social and environmental costs and benefits.

The cost of capital charges discussed above do not include asset maintenance, so this item needs to be accounted for separately.

The Tribunal seeks submissions on appropriate financing arrangements for sewerage projects.

Given that the provision of sewerage in backlog areas is likely to be financed by some mix of government CSO funds, environmental SEL funds, and commercial Sydney Water funds, the Tribunal seeks submissions on an adequate rate of return to the community for these investments.

4.5 Efficient costs

The Tribunal has stressed that only the costs of providing services efficiently should be recovered from users and other beneficiaries. There are two aspects of efficient costs:

Firstly, the Tribunal is interested in considering only the most cost effective method of providing sewage management services to the community.

The second aspect of efficient costs concerns the principle of competitive neutrality. This dictates that the advantages available to Sydney Water by virtue of its status as a public enterprise, such as exemption from income taxes, should not prejudice a private sector competitor. To account for such advantages, a tax equivalent is now included as part of Sydney Water's efficient costs.

When considering least cost planning, the Tribunal does not accept that the lowest priced option is always appropriate. Least cost planning for sewerage systems in backlog areas requires that the net environmental and public health benefits of a reticulated sewage system need to be assessed in a "whole of system" context, including the use of water and energy, and the reuse of sewage byproducts. Large scale, centralised systems are not always the best means of sewage management. The Tribunal will ensure that smaller scale, local systems and alternative technology options have been thoroughly evaluated.

4.6 Private sector involvement

Many backlog sewerage schemes have the potential for private sector involvement. Provided that only efficient costs are considered, the operation of the scheme should not be dependent on the status or the ownership of the operator.

Private sector sewerage schemes may be appropriate for backlog areas which are located some distance from the established Sydney Water sewerage reticulation system. Such schemes could be developed on the basis of build, own, operate (BOO) or they could involve a separate operator with its own operating licence and, therefore, no involvement of Sydney Water.

The Tribunal seeks comments on the appropriateness of private sector participation in backlog sewerage projects.

4.7 Public good

It may be argued that many of the environmental and public health benefits of providing reticulated sewerage to backlog areas are for the good of the entire community, thus constituting a 'public good'. Sewage effluent from the Picton and Blue Mountains communities currently flows into the Hawkesbury-Nepean river system, and even into Warragamba Dam. Effluent from Bundeena flows into Port Hacking. The urgent need for a backlog program recognises vital environmental and public health criteria.

Households in many of the backlog sewerage areas were established before Sydney Water changed its policy regarding the provision and funding of sewerage. The status of these areas as backlog areas is the result of Sydney Water's prioritisation of its sewerage programs. Areas that were easier to sewer were provided with this service entirely at government expense. Households in other, more difficult areas have had to pay sewerage project costs that exceeded the $14,000 threshold established by the Water Board in 1987.

Some people who live in backlog sewerage areas have had to fund their own systems in the meantime, as well as contributing through their taxation charges to the provision of sewerage for others.

Backlog areas are often communities which are relatively isolated in the Sydney Metropolitan Area. Provision of sewerage services for some of these communities does not involve simple extension of the reticulation system to the isolated area, but the provision of a self contained sewage management system within a self contained catchment. This is true for Picton and Gerringong, but not true for Bundeena, Blue Mountains and Fisherman's Parade.

Since self-contained catchments are well defined, it is interesting to consider whether a regional price structure could be implemented. A difficulty with this proposition arises where these self contained communities experience rapid growth (especially once they have reticulated sewerage) and merge with the metropolitan area in a relatively short space of time. If such growth occurs, inequity arises from neighbours paying different rates because they are connected to different sewerage systems. Such a situation could well occur in Picton.

It is sometimes suggested that the cost of providing sewerage infrastructure should be spread over the entire community as a CSO, similar to other government public health and environmental initiatives. It should be noted, however, that provision of government funding either as a direct CSO or as reduced dividends from Sydney Water limits the funds available for other government purposes. Furthermore, this approach requires NSW taxpayers to subsidise the provision of sewerage infrastructure to sewerage backlog areas.

4.8 Polluter vs beneficiary pays

Against the 'public good' argument is the principle that users should pay for systems which provide the services which they consume. 'User pays' funding schemes are designed to make all users aware of, and responsible for, the true cost of the resources they consume. Clearly, this principle cannot be achieved if government subsidies are used to fund projects which provide services that are consumed.

The 'user pays' approach may be considered from two different perspectives. Firstly, that polluters should meet the cost of processes that mitigate the environmental damage caused by their actions. Secondly, that beneficiaries of public services should bear the cost of providing the benefits they receive, and those who benefit more should pay more.

The 'polluter pays' principle is often cited as providing incentives to encourage less pollution. In the case of sewerage backlog areas, the provision of a reticulated sewerage system may be seen as preventing further pollution from on site systems. The polluter pays principle, therefore, involves recovering costs necessary to prevent future pollution. Pollution from the reticulated system, for example from sewer overflows and the ultimate discharge of wastewater to the environment, complicates the exclusive application of this principle.

However, while it is well recognised that on site sewage management systems often contribute to environmental degradation and pose public health risks, this is not always the case. Some on site sewage management systems are operated in a socially and environmentally responsible manner. Further, even in areas where environmental problems are known, the available evidence is inconclusive about the degree to which on-site sewage systems are responsible for these problems, compared with other pollutant sources, especially general urban run-off. Thus, it may be difficult to positively identify 'polluters'.

Consideration of a 'beneficiary pays' approach also leads to difficulties. As noted above, the environmental and public health benefits of reduced land and water pollution provide an advantage to a large proportion of the entire community. This is particularly true in cases, such as Picton, where significant populations are located in downstream areas. Application of the beneficiary pays principle in such cases constitutes an argument for the costs to be shared across the whole community, as either a subsidy or a cost sharing among all Sydney Water customers. It should be conceded, however, that the local community is the primary beneficiary of sewerage projects.

The point is often made that large increases in property value will accompany the introduction of a reticulated sewerage system in an area and that local residents are substantial beneficiaries. While some people will receive windfall gains, the extent of these gains is dependent on the particular circumstances involved. For long established

residents, these gains will be offset to a large degree by the past costs of their own sewage management. For other residents, the gains which resulted from the provision of sewerage were already factored into real estate prices before they purchased, so the windfall gains have been realised by previous owners. Recent experience in the Hunter Region[16] has highlighted the difficulties involved in establishing a cut-off date after which new pricing arrangements apply.

The Tribunal seeks submissions on the funding of sewer backlog projects. Specifically, it seeks community views on "public good" issues, the user pays principle and an appropriate sharing of costs between the general community and residents within each of the areas considered in this inquiry.

4.9 Pricing issues

4.9.1 Previous Tribunal Determinations

In its determinations to date, the Tribunal has worked consistently to remove cross subsidies. To achieve this, the Tribunal has supported the general pricing principle that each user should pay for the services consumed. In its *Inquiry into Water and Related Services*[17] the Tribunal expresses support, in principle, for this concept of cost-reflective pricing for sewerage services. This requires that:

- the price for the marginal kilolitre of sewage discharged to a sewage treatment authority mirror the marginal costs of transporting, treating and disposing of the sewage
- differences in the total costs of providing sewerage services in different locations be fully reflected in the total bill.

The first of these requirements signals to the customer the costs of treating and disposing of their discharges, given their location. The second signals to customers the costs of providing services in different locations.

However, in its *Inquiry into Water and Related Services*, the Tribunal notes that application of these principles to the household sector is particularly difficult. Discharges are difficult to measure and households have limited opportunities to respond to usage prices. After considering usage-based pricing options, the Tribunal concludes that a uniform access charge is an administratively efficient and equitable means of charging for sewerage services to residential customers in the same service area.

In respect of region-based charges, the Tribunal notes that the imposition of uniform sewerage charges across residential customers results in some customers cross subsidising others. It is conceded that uniform charging is inconsistent with a 'user pays' view of equity; that each person should pay the full costs of services consumed.

The Tribunal is concerned about the potential impact of regional variations in charges on existing customers who have already made housing decisions in the expectation of uniform charges across the supplier's area of operation. Changes of the magnitude indicated by cost variations were seen as having the potential to have a significant effect on house prices and future bills faced by current owners. Large windfall losses or gains were envisaged for

---

[16] see discussion of the Hunter Sewerage Scheme in section 6.5 of Chapter 6.

[17] *Inquiry into Water and Related Services,* Government Pricing Tribunal of NSW, October 1993.

some customers. The Tribunal has expressed doubt that the relatively small efficiency gains which may flow from region-based charges will outweigh the adjustment costs.

The Tribunal, therefore, proposes that annual sewerage charges for residential customers remain common across the area of service for each authority. Differences in costs for new developments should be signalled through developer charges.

4.9.2 Postage stamp pricing

The principle which underpins the above-mentioned concepts is termed 'postage stamp' pricing, ie the practice of charging uniform prices for similar services to similar customers. As noted above, the Tribunal has acknowledged that postage stamp pricing involves geographical cross subsidies. To illustrate the cross subsidisation inherent in postage stamp pricing, consider the cost to provide sewerage service to a property near Malabar sewage treatment plant (STP), which is Sydney's largest sewage treatment plant with huge economies of scale, compared to the costs involved in providing sewerage services to a property some distance from a small inland STP, such as Warragamba. Under the postage stamp pricing scheme, both these properties would be charged for sewerage services on the same basis.

Continued application of the postage stamp scheme would mean that residents in backlog sewerage areas would be charged no more for sewerage services than other Sydney Water customers. The efficient costs of Sydney Water are likely to increase with the connection of backlog areas to the reticulated system. A determination applying the postage stamp pricing policy would allow for the costs to be recovered by increasing general sewerage charges for all customers.

4.9.3 Developer charges

Developer Charges are costs imposed on the developers of new estates and sub-divisions by water agencies. These charges reflect the true efficient costs of extending and, where appropriate, augmenting the sewerage reticulation system to include the capacity requirements of a new area. The higher land costs resulting from developer charges are known to prospective purchasers in advance of their purchase.

The Tribunal has previously stated that the relative benefits of signalling cost differences are much greater for new development areas, where locational decisions may be more sensitive to pricing signals, than they are in established areas. The Tribunal has further stated its preference that cost differences for new developments be signalled through developer charges, which are 'up-front' service connection charges, rather than through regionally based service charges.

In new release areas, prospective purchasers may choose the location of their new home. Conversely, many residents of backlog sewerage areas are likely to have moved into the area long before reticulated sewerage was proposed. These people have made their own sewage management arrangements.

4.9.4 The Rouse Hill Development

In 1993, the Tribunal has determined maximum prices for special water, sewerage and drainage services to be provided to the Rouse Hill Development Area by the Water Board.[18] This development sought to balance the need for housing and the need to protect the environment. The Water Board's decision to proceed with the Rouse Hill development was based on the expectation that all necessary environmental and infrastructure costs would be fully recovered. The Rouse Hill development incorporates integrated water management comprising water recycling, a "soft" engineering approach to drainage, state-of-the-art wastewater treatment, and artificial wetlands.

The determination for water and sewerage charges within this area sanctions the recovery of capital costs for the relevant infrastructure through developer charges. In recognition of the higher operational costs of the sewerage system, a once off, buy in charge is included in the determination, being the shortfall between future operating costs and the common sewerage service charge.

The preferred proposals for some backlog areas would result in large operating costs. These may not be capable of recovery through the standard sewerage service charge.

4.9.5 Hunter Sewerage Project

The Hunter Sewerage Project was initiated by the NSW Government, relevant local government councils and Hunter Water in the late 1980s to address environmental problems arising from the sewerage backlog on the fringe of Hunter Water's Operational Area. The government decided that a community service obligation would fund 50 per cent of the capital costs and the remaining 50 per cent would funded by Hunter Water.

In June 1996, the Tribunal determined that Hunter Water's share should be funded equally by an annual 'environmental improvement charge', or premium over the common service charge to be levied from 1989 to 2009, and a sewer service access charge, to be levied on land that was vacant as at February 1989 and that would be serviced by the scheme. Owners of existing properties within the backlog area were exempted from this access charge.

In its determination, the Tribunal noted that residents who built after February 1989, but before the sewer was made available, were disadvantaged because they had to fund their own sewage management arrangements and pay the access fee.

The Tribunal seeks submissions on the recovery of those costs not provided by CSO funding. Should these be recovered from all Sydney Water customers through an increase in the general sewerage charge, or should some regional charges be introduced for backlog areas?

In the event that the Tribunal decides on some form of regional charging scheme, should vacant land be treated differently from developed properties?

Given that a new service is being provided, under what circumstances should a developer charge, or its equivalent, apply in backlog areas?

---

[18] *Prices for Special Water, Sewerage and Drainage Services for the Rouse Hill Development Area*, Government Pricing Tribunal, Determination No7, December, 1993.

5 PRICES FOR SPECIFIC BACKLOG SEWERAGE AREAS

Four sewerage projects within the Sydney Water Operational Area and one sewerage project in Gosford Council are being considered in this determination. These are discussed in this chapter.

5.1 Picton/Tahmoor/Thirlmere

5.1.1 Background and progress

The three towns of Picton, Tahmoor and Thirlmere house 7,000 people on 1966 residential lots. There are also 122 commercial and 18 industrial water connections in the area. Residential, commercial and industrial water demand is 5.27 ML/day. The distribution of existing sewage management systems is shown in Table 5.1. This area was announced to be part of the sewer backlog program in August 1988 by the then Premier.

Table 5.1 Distribution of various on site wastewater management systems in Picton Area

Treatment System	Proportion of Total
Septic tank with on-site disposal	56 per cent
Septic tank with pump-out	22 per cent
Aerated wastewater systems	22 per cent

Source: ERM Mitchell McCotter

Property owners pay up to $1,200 in annual costs for the operation of on-site wastewater management systems, depending upon the type of system employed.

The majority of soils in the Picton region have low permeability and are poorly suited for on-site effluent disposal. For this reason, Wollondilly Council does not permit septic tanks with absorption trenches to be installed in any new development, nor does it permit them as replacements for existing systems. Council only permits aerated wastewater treatment systems to be installed where adequate land is available for effluent disposal. All other developments must use septic systems with pump-outs.

The lack of reticulated sewerage has discouraged the development of industries, especially those industries that produce large volumes of wastewater, since they would be required to operate their own liquid waste treatment and disposal facilities.

The Metropolitan Strategy[19] has identified the Macarthur Region, which includes these three towns, as a region which will accommodate a substantial proportion of Sydney's future growth, with Tahmoor as the future district centre. Current population projections[20] for the region provide for increases in the residential population and the number of dwellings of more than 50 per cent over the period 1995 - 2010. Over this same projection period, the

[19] *Sydney Metropolitan Strategy*, NSW Department of Environment and Planning, May 1987.

[20] Projections developed by Sydney Water and cited in *Picton Regional Sewerage Scheme, Environmental Impact Statement*, ERM Mitchell McCotter, January 1996, p5.3.

Picton Industrial Estate, an industrial area with a variety of small to medium commercial and industrial enterprises, is expected to grow from 29 hectares to 33 hectares.

5.1.2 EIS process and public consultation

The Picton scheme has been the subject of three Environmental Impact Studies. The first was prepared in August 1990, the second in February 1994, and the third in January 1996.

The 1990 proposal was for an STP to discharge treated effluent to Stonequarry Creek. Conditions of the 1990 approval include requests for further documentation, monitoring, and provision of certain environmental safeguards. Regulatory amendments passed in 1994[21] allow sewerage systems from the existing urban areas of Picton, Tahmoor and Thirlmere to discharge or overflow, provided that the discharges have been approved by the EPA and are in accordance with conditions set out by the EPA. This permission cleared a major obstacle to the progress of the Picton scheme.

A supplementary study was undertaken to consider the conditions of approval and to give the community an opportunity to comment on the additional requirements. Submissions to this supplementary EIS sought:

- further community consultation and the establishment of the Picton Community Working Group to liaise with Sydney Water
- clearly defined environmental objectives, and a commitment to reuse and tertiary treatment
- enhanced water quality in Stonequarry Creek
- service availability charges no higher than residential charges elsewhere in Sydney
- investigation of alternative sewage treatment technologies.

The community has been involved in the current EIS through workshops and on-going liaison with the Picton Community Working Party. The EIS was exhibited during February / March 1996 and is awaiting determination under the provisions of the Environmental Planning and Assessment Act.

5.1.3 Options proposed, technologies and costs

Various options were examined as part of the environmental impact assessment process. These included centralised, decentralised and on-site sewage management systems. Following community consultation and further analysis by Sydney Water, six options were selected for detailed economic evaluation.

Base Case	Upgrade absorption trenches to either AWTS[22] or pump-out
Option 2	Upgrade all systems to AWTS
Option 7	Provide secondary treatment and creek discharge through a centralised STP
Option 8a	Option 7 with 80 per cent reuse at Carlton Stud near Picton
Option 8b	Option 7 with 100 per cent reuse at Carlton Stud and other land near Picton
Option 15	Option 7 with reverse osmosis and creek discharge
Option 23	Option 7 with 100 per cent reuse at other locations in the Picton Area.

[21] Amendments to the Clean Waters Regulations 1972, Regulation 10, Gaz 53, 31 March 1994.

[22] AWTS refers to Aerated Wastewater Treatment System. These devices are explained in Appendix 2.

The results of this evaluation, expressed in present values, are presented in the following table.

Table 5.2 Evaluation of Picton Options

Item	Base Case	Option 2	Option 7	Option 8a	Option 8b	Option 15	Option 23
($ m at January 1996)							
Capital Costs	n/a	n/a	43.2	46.1	49.4	53.3	49.5
Operating Costs	0.2	0.l	13.9	14.4	14.7	22.3	13.9
Less Residual Values	n/a	n/a	n/a	0.9	1.5	n/a	n/a
Net Costs	0.2	0.1	57.1	59.6	62.6	75.6	63.4
Revenues	0.4	0.2	10.7	12.6	13.9	10.7	10.7
Net Present Value	0.4	0.2	(46.4)	(47.0)	(48.7)	(64.9)	(52.7)
Average Cost per lot based on NPV ($)	n/a	n/a	10,311	10,444	10,822	14,422	11,711

Source: ERM Mitchell McCotter, January 1996[23]

The EIS prepared on behalf of Sydney Water nominates a preferred option (8a), a centralised STP near Picton, to serve the townships of Picton, Tahmoor and Thirlmere. This scheme will provide facilities for the existing 7,000 residents and has a capacity to service 18,000 equivalent population (EP). It comprises a conventional sewerage reticulation system, including sewage pumping stations, and a sewage treatment plant located near Picton, with innovative reuse of treated effluent from dry weather flow in a mix of agricultural, silvicultural[24], commercial and parkland applications.

The most recent capital cost estimates for Stage 1 of this scheme is $63 million. This will meet the needs of existing residents. A submission to partly fund the scheme through $21 million of Special Environment Levy (SEL) funds is being considered. Table 5.3 illustrates the impact of this funding scheme. Stage 2 amplification costs to serve an additional 1,500 lots (if required) will be met by developer contributions.

Table 5.3 Funding Scheme for Picton Preferred Option

	To 30/6/98	1998/99	1999/2000	TOTAL
($million)				
Capital	36.977	24.825	1.311	63.11
SEL	8.343	12.094	0.546	20.98
Required	28.634	12.731	0.765	42.13

Source: Sydney Water Head Office, December 1996. Values in nominal, undiscounted dollars.

As at 30 June 1996, expenditure on the scheme totalled $6.9 million, of which $2.1 million was reimbursed to Sydney Water as Government Social Program funds. The project is scheduled for completion in 2000.

[23] *Picton Regional Sewerage Scheme EIS*, ERM Mitchell McCotter, January 1996.

[24] Silviculture refers to the development of tree plantations.

5.2 Bundeena/Maianbar

5.2.1 Background and progress

The villages of Bundeena and Maianbar are located on the southern shore of Port Hacking, adjoining the Royal National Park, approximately 36 km south of the Sydney CBD. There are 1,180 backlog blocks in this area. The permanent population of Bundeena and Maianbar is estimated at 2,700, which increases to over 4,000 during peak holiday periods when visitors boost the population.

The current water supply satisfies existing demand, but is near capacity. Very high local system pressures are considered to be responsible for fairly frequent mains breaks. Sydney Water estimates that losses from these failures in the pipeline may be as high as 24 per cent, exacerbating the current shortage of water. While remediation of supply mains failures could postpone the need to augment supply, Sydney Water predicts that peak day demand will outstrip current supply capacity before the year 2000.

Increased supply capacity for Bundeena will be required because increased usage of water will result from connection to a reticulated sewerage scheme and expected population growth. Bundeena/Maianbar therefore requires potable water supply and wastewater management.

The wastewater management systems employed in these villages are set out in Table 5.4.[25]

Table 5.4 Wastewater management at Bundeena/Maianbar

Treatment System	Approx Number of Lots
Absorption Septic System	925
Pump-Out Septic System	175
Aerated Wastewater System	80

Most of the 175 pump-out septic systems are located in Bundeena, where local geology and space restrictions do not permit absorption septic systems. Previously, limited tanker access to Maianbar dictated the installation of aerated systems or absorption septic systems rather than pump-outs, even where local conditions were not favourable for these systems. Absorption septic tanks are particularly inappropriate for this area because of small lot sizes, undulating terrain, high water tables, and generally shallow soils. Flooding resulting from local drainage difficulties exacerbates problems with septic tank operation.

The removal of effluent from pump-out systems is managed by Sutherland Shire Council and represents approximately 80 per cent of Council's total pump-out service. Current charges recover only $17.50/1,000 L of the cost of effluent removal. Annual charges for residential properties are typically in the range $1,000 - $3,000 per property. Removal of sludge is left to the discretion of the owner and is carried out by contractors. Council can serve notice on the owner to have a malfunctioning system serviced.

Sutherland Shire Council[26] found that seepage and overflow from septic tanks are a significant source of pollution in the area. Sydney Water[27] states that dry weather overflows

[25] Data and discussion from *Bundeena and Maianbar Watercycle Management Strategy, EIS*, August 1996. Sinclair Knight Merz.

and percolation from septic systems are contaminating water in stormwater drains and affecting groundwater and surface water quality. After a rainfall, water quality standards for the maintenance of aquatic ecosystems and both primary and secondary recreational usage are not met. Urban runoff contributes to the water quality problems. Groundwater testing by Sinclair Knight Merz in 1993[28] reported evidence of contamination by septic effluents with *E coli* found at levels typical of raw sewage. The existing wastewater management regime in Bundeena and Maianbar clearly presents significant environmental and public health risks.

5.2.2 EIS process and public consultation

An EIS for sewage management in Bundeena/Maianbar was released on 19 August 1996, with the preferred option being the transfer of sewage under Port Hacking to Cronulla STP for treatment. The Bundeena - Maianbar EIS will remain on display for two-three months, with a determination by the end of 1996. Construction could commence in early 1997.

5.2.3 Options proposed, technologies and costs

In spite of the challenges posed by high water tables and shallow soils in the area, the proximity of the adjoining National Park and the primary contact recreation at nearby swimming beaches, various options were canvassed. Six were selected for detailed economic evaluation:

Base Case	Retain existing mix of on-site systems
Option A2a	Local STP with high level treatment, effluent reuse and disposal of excess effluent to ocean via new shoreline ocean outfall
Option A2b	Local STP with high level treatment, effluent reuse and disposal of excess effluent to Port Hacking via new outfall
Option A2c	Local STP with high level treatment, effluent reuse and disposal of excess effluent in Marley Beach dunes
Option A2d	Local STP with high level treatment, effluent reuse and disposal of excess effluent to Port Hacking via wetlands
Option B	Transfer of sewage to existing Cronulla STP for treatment and disposal

The results of this evaluation, detailing the present values of costs are presented in Table 5.5.

---

[26] Noted as Sutherland Shire Council 1991 in Sinclair Knight Merz EIS p2.19, to be further identified.

[27] Noted as Water Board 1992 in Sinclair Knight Merz EIS p2.20, to be further identified.

[28] *Bundeena and Maianbar Watercycle Management Strategy Environmental Impact Statement*. Sinclair Knight Merz, August 1996. Page 2.26.

Table 5.5 Financial analysis for Bundeena options

$1996 million	Base Case	Option A2a	Option A2b	Option A2c	Option A2d	Option B
Capital Costs	6.14	24.75	21.14	21.76	21.31	19.00
Operating Costs	4.36	7.50	7.50	7.52	7.47	3.23
Total Costs	10.50	32.25	28.64	29.28	28.78	22.23
Incremental Costs		21.75	18.14	18.77	18.28	11.73

Source: Sinclair Knight Merz, August 1996.

In the above table, the recurrent costs covering operations and maintenance are based on the assumption that demand will rise from 2,600 EP in 1996 to 5,000 EP within 15 years. During this evaluation, it was found that the least cost scheme, upgrading of on-site systems, yielded the least benefits, had the lowest community support and performed poorly against evaluation criteria, particularly environmental requirements. The preferred scheme involves collection of sewage and transfer under Port Hacking to Cronulla STP for treatment. This option has received strong endorsement from residents. The most recent cost estimates for this option are presented in Table 5.6.

Table 5.6 Funding scheme for Bundeena/Maianbar preferred option

	To 30/6/94	1998/99	1999/2000	TOTAL
Total Capital	4.532	8.063	3.387	15.982

Source: Sydney Water, December, 1996. Values in nominal, undiscounted dollars.

As previously discussed, anticipated population increases together with increased demand for water due to the provision of reticulated sewerage at Bundeena and Maianbar will necessitate the existing water supply being upgraded. Sydney Water had planned to spend in the order of $2 million in the next three - five years to meet increasing local demand and to ensure that service standards are met, irrespective of the outcome for the sewage management scheme.

Table 5.6 presents the most recent estimate of total project cost as $15.982 million, of which $0.4 million had been spent to 30 June 1996. The Government Social Program Reimbursement to 30 June 1996 amounted to $0.2 million. The project is scheduled for completion in 2001.

5.3 Gerringong/Gerroa

5.3.1 Background and progress

Located in a rural area, the towns of Gerringong and Gerroa occupy the lower slopes of the coastal ranges south of Kiama. The area is drained by Ooaree Creek and Crooked River. Within the catchment of these watercourses, the main land uses are dairy and beef cattle farming, urban residential and retail/commercial, caravan parks and the Seven Mile Beach National Park. Coastal development in the area has spread along Werri Beach to the north of Gerringong, and the northern shores of the Crooked River Estuary to the south. in Gerringong include light or automotive services industries.

There are 1,580 backlog blocks in this area. Of these, about 1,130 (72 per cent of the total) are permanently occupied. The permanent population to be served by the project is currently approximately 3,300. However, this population reaches 7,000 at the peak of holiday season.

The existing water supply to Gerringong and Gerroa is adequate with the capacity to supply 3.8 ML/day, whereas present maximum water demand is 1.8 ML/day. Existing wastewater management systems were assessed by the then Water Board in 1988. The results are presented in Table 5.7.

Table 5.7 Sewage Management at Gerringong/Gerroa

System	Number	Percentage
Septic with absorption Trench	835	63.3
Septic with pump-out	446	40.0
Pan collection	25	1.9
Aerated Wastewater Treatment	6	0.5

Since 1988, Council has required all new households to install pump-out septic systems. It is, therefore expected that the current proportion of pump-out systems will have increased beyond the levels indicated in this table. Pump-out systems are serviced by Council contractors at a charge of $8.00 - $10.00 per 1,000 L. The annual operating expense per household ranges up to $700.

A random sample of pump-out and absorption trench septic systems, surveyed by Sydney Water in 1992, found no evidence of contamination from absorption trench systems. Residents commented that pollution from cow dung and fertiliser was of more concern than sewage seepage from septic systems. None of the pump-out systems presented a problem. However, evidence was found of illegal connections to overflow pipes to permit discharge to lawns. Water quality assessments undertaken by Sydney Water and Kiama Council indicate that urban development and local agricultural practices are likely to be responsible for more adverse water quality impacts than septic tank discharge.

The Illawarra Urban Development Program has identified a potential release area between Gerringong and Gerroa. If developed, this area could provide a further 2,650 residential lots accommodating 5,000 people. This proposal has generated much controversy since many residents originally moved to the area to escape further urbanisation and live in a coastal village setting. The community response[29] to further urbanisation was to seek assurances from Council that such development would be tightly controlled, would include a mix of block sizes, and would be subject to strict environmental scrutiny. A further request was that no development proceed until a wastewater system was in place with disposal methods agreed by the community.

5.3.2 EIS process and public consultation

Sydney Water has undertaken a program of environmental, technical and economic evaluation of this area, and has proposed five core options for further investigation.

[29] Attributed to Brykim 1990 in Managing Wastewater in Gerringong and Gerroa Sydney Water October 1995, p10.

5.3.3 Options proposed, technologies and costs

Between 1988 to 1992 Sydney Water developed eleven options from a variety of local studies and community consultations. These involved retaining or improving on-site systems, transporting treated or untreated effluent to Bombo for centralised treatment with ocean disposal, wetland disposal or irrigating farms, forests or villages.

A financial comparison of a selection of these options was done by Sydney Water in 1995 and is presented in the following table.

Table 5.8 Financial Analysis for Gerringong Options

$1995 million	Forest/ Dune	Forest/ Wetland	Ocean Outfall	Forest/Ocean Outfall	Dune/Ocean Outfall	Trial Forest/ Ocean Outfall[30]
Capital Cost	26.948	26.844	21.307	24.636	24.369	22.427
Operating Cost	1.286	1.336	0.656	0.756	1.226	0.750

Source: Sydney Water, October, 1995

Total project cost is currently estimated at $25.3 million, of which $0.6 million had been spent to 30 June 1996. The Government Social Program Reimbursement to 30 June 1996 amounted to $0.5 million. The project is scheduled for completion in 2000. The capital expenditure schedule is presented in table 5.9.

Table 5.9 Capital Schedule for Gerringong Option

	1997/98	1998/99	1999/2000	Total
Capital Expenditure	$ 8.858 m	$ 9.230 m	$ 7.212 m	$ 25.300 m

Source: Sydney Water, values in nominal dollars (undiscounted).

5.4 Winmalee extension

5.4.1 Background and progress

Between 1934 and 1977, the Blue Mountains City Council constructed a sewerage system to serve a population of about 70,000 people. Effluent from the treatment plants was discharged to mountain creeks which flow into the Nepean, Grose and Cox's River. In July 1980, responsibility for water supply and sewerage was transferred from the Council to Sydney Water. In 1984, Sydney Water constructed an additional treatment plant at Winmalee, referred to as Winmalee Stage 1, with capacity to treat sewage for 10,000 equivalent population (EP).

Increasingly, the community has expressed concern about effluent discharge into mountain streams, sewage overflows and urban runoff. Sydney Water has been concerned that the Blue Mountains infrastructure it had inherited required significant capital and recurrent expenditure. Of particular concern were the number and design of pumping stations, the

[30] This option involves a smaller forest plantation than that in options 1 and 2. If found to be successful, this plantation may be enlarged at a later date.

age and capacity of the reticulation system and sewer mains, and the level of treatment provided.

Sydney Water developed a Blue Mountains Wastewater Strategy to address the diverse issues that it faced. This strategy involves three major schemes:

1 Lower Blue Mountains Scheme

- Amplifying Winmalee STP with a new stage 2, completed in 1992.
- Constructing of a 21 km sewage transfer tunnel from Hazelbrook to Winmalee, completed in 1993.
- Decommissioning STPs at North Springwood, Springwood, Valley Heights, and Hazelbrook.

The lower Blue Mountains Scheme has included the provision of reticulated sewerage services to 6,440 backlog blocks since 1980.

2 Hazelbrook to North Katoomba Sewerage Scheme

- Continuing the Sewage Transfer Tunnel from Hazelbrook to North Katoomba, completed in 1996.
- Amplifying Winmalee STP with a new stage 3, commissioning of the upgraded STP is expected in 1997.
- Decommissioning Wentworth Falls, South Katoomba and North Katoomba STPs.
- Providing sewerage infrastructure and connection of 1842 unsewered lots in the Wentworth Falls, Leura and Katoomba areas.

This component is the subject of the current Tribunal determination.

3 Medlow Bath, Blackheath and Mount Victoria Sewerage Scheme

Options for servicing Medlow Bath and amplifying the Blackheath and Mount Victoria systems are still being investigated. Completion of the North Katoomba tunnel will provide the option of transferring sewage from Blackheath and Mount Victoria sewer catchments to Winmalee as an alternative to the option of amplifying the existing plants. There are approximately 1,700 backlog blocks in these areas.

Completion of stage 3 will increase the capacity of the Winmalee plant by 35,000 EP. The 1,852 backlog blocks comprise an estimated 7,000 EP, or 20 per cent of total capacity.

5.4.2 EIS process and public consultation

As indicated above, the community has been widely consulted about this project, both as part of the various EIS processes and through independent consultation by Sydney Water. The entire Blue Mountains Wastewater Strategy was revised following public comments to Sydney Water in 1987.

5.4.3 Options proposed, technologies and costs

Central to Sydney Water's Blue Mountains Wastewater Strategy is the upgrading of the Winmalee STP. Construction of this project is underway and scheduled for completion in

1997. Completion of Winmalee Stage 3 will increase the capacity of the Winmalee plant by 35,000 EP. The 1,852 Blue Mountain backlog blocks comprise an estimated 7,000 EP. Sydney Water has attributed $ 6.6 million to the Blue Mountains backlog areas associated with the Winmalee stage 3 extension. This sum is 20 per cent (7,000 EP of 35,000 EP) of the total estimated stage 3 project cost of $ 33.1 million (in undiscounted dollar terms).

Of the $ 6.6 million attributed to the backlog sewer program, $ 2.4 million had been spent to 30 June 1996. The Government Social Program Reimbursement to 30 June 1996 amounted to $ 2.0 million. The project is scheduled for completion in 1999.

5.5 Fisherman's Parade, Gosford

5.5.1 Background and progress

Within the operational area of Gosford Council, this area and is located adjacent to the northern shore of Brisbane Waters. In many cases these lots are separated from Brisbane Water by a waterfront reserve of approximately 50 metres. The original subdivision, 46 lots ranging in size from 300 m^2 to 1400 m^2, was released in 1912, when there was minimal consideration of waste water disposal. Premises discharged household waste water off-site, often into Brisbane Water. Under the provision of the Gosford Planning Scheme Ordinance. The area is zoned 9C, restricted development steep slope.

The area is located outside Council's previously defined water loan and sewer loan rate area and is serviced by neither water supply nor sewerage reticulation system. The nearest available sewerage services are located approximately 500 metres to the north, near the junction of Fisherman's Parade and Daly Avenue.

Currently, 21 occupied dwellings managing their own sewage. According to Gosford Council, only four of the 21 households are disposing of their effluent in a satisfactory manner. Council considers the current situation to be unacceptable, not only from the perspective of environmental and public health risks, but also from the risk of landslide deriving from the destabilising effect of water from septic systems infiltrating steep slopes.

Further, any form of building approval on many of the remaining vacant allotments is complicated by difficulties in achieving minimum standards for the disposal of effluent on-site[31]. As a result, some owners have land on which they may never be able to develop without a sewerage system to remove waste water safely off the site.

5.5.2 EIS process and public consultation

Provision of reticulated sewerage to Fisherman's Parade involves a minor extension to the Gosford Regional Sewerage Scheme. As such, an EIS is not required. However, a review of environmental factors will be completed after the type of sewerage reticulation has been determined.

---

[31] *On-Site Wastewater Management Systems for Domestic Households - Draft Environment and Health Protection Guidelines*, NSW Department of Health, NSW Department of Land and Water Conservation, NSW Department of Local Government, NSW Environment Protection Authority, February 1996.

This review process is defined by the Environmental Planning and Assessment Act 1979. Council intends to include the following points:

- Many existing onsite disposal systems will eventually fail. Some properties do not have sufficient area to install a system that complies with the relevant Australian Standard (AS 1547).

- Eighteen properties cannot comply with current standards for wastewater systems. These properties, therefore, cannot have a dwelling approved for construction.

- Effluent is currently discharged from existing properties onto a Reserve and, potentially, to Brisbane Water. Oyster leases are located in the vicinity.

In 1992, Council sought property owners' interest in funding an extension of the town water supply. The majority view in this survey was that water supply not be extended to Fisherman's Parade.

The issue of the provision of sewerage initially arose from difficulties in obtaining building approvals for dwellings.

Council invited all property owners to a public meeting on 18 December 1996 to provide information on the provision of water and/or reticulated sewerage to Fisherman's Parade. Prior to this meeting, an information kit was provided to all property owners which outlined the problems and set out options for sewerage reticulation and associated costs. The reaction of this meeting was mixed because owners have different views about the development and use of their properties. A written survey is to be sent to all property owners in January 1997 to obtain specific preferences for water and sewerage reticulation and funding options.

5.5.3 Options proposed, technologies and costs

Council commissioned consultants to investigate the potential for servicing the area with a sewerage reticulation system. Council does not supply the Fisherman's Parade area with reticulated water. However, the extension of town water to these properties is considered by the consultants to be necessary for the satisfactory operation and maintenance of pumping stations associated with sewerage services.

Council previously identified the cost of extending the water main to the Fisherman's Parade area to be approximately $105,000. Construction costs could be reduced by constructing the water main in conjunction with the sewerage main. Property owners would be responsible for the full cost of providing this main in addition to the payment of contributions for water headworks and augmentation. Anticipated costs for the provision of water are $5,975 per lot.

Council's consultants identified four options for the provision of sewerage:

Option 1	Conventional Gravity Sewerage System
Option 2	Pumped Common Effluent System
Option 3	Pumped Common Sewerage System
Option 4	Vacuum System

These results are summarised in table 5.11 below.

Table 5.11 Costs of Option for Gosford

Costs ($m)	Option 1	Option 2	Option 3	Option 4
Council Capital Costs		200,000	200,000	
Residents Capital Costs		232,000	252,000	
Total Capital Costs	469,000	432,000	452,000	767,000
NPV of Operation & Maintenance	149,000	187,000	222,000	180,000
TOTAL COST	**618,000**	**619,000**	**674,000**	**947,000**

Source: Gosford City Council

The Tribunal seeks comment on:

- ***current conditions in the areas considered***
- ***problems posed by existing sewage management systems and the degree to which these problems require a solution - whether a new system is required***
- ***the likely difficulty entailed in implementing the preferred solution, together with discussion of any alternative solutions***
- ***the extent of community consultation that has been conducted as part of the development of these schemes.***

The Tribunal welcomes comments on the appropriateness of classifying the areas discussed as 'backlog sewer' areas, since provision of sewerage services would be uneconomic for Sydney Water, Gosford City Council or any other service provider.

6 PRICE STRUCTURE OPTIONS

6.1 The SWC proposal

Sydney Water Corporation is constrained by its enabling legislation and operating licence to engage only in activities which provide a commercial return. It may undertake an uncommercial activity only if it is directed by the government to do so and is reimbursed. The Sydney Water submission to the Tribunal's 1996 Medium Term Price Path Determination for Sydney Water set out the government's preferred funding arrangements as follows:

- the capital cost of each scheme is to be funded initially by the government and Sydney Water
- the government is to provide up to $3.8 million for the four projects in 1995/96
- Sydney Water is to seek full recovery of each project's capital and operating costs through periodic charges.

This submission notes that each project is in a different stage of planning and investigation.

6.2 The Picton Working Group submission

The EIS process has provided the Picton Working Group with adequate avenues to express its views on the design and environmental aspects of the proposed scheme. The Working Group has provided a submission to the Tribunal's Medium Term Price Path Determination for Sydney Water.

The Working Party emphasised that the regionally based estimated charge of $2,000 per lot per year for some 10 years would be beyond the reach of most residents. If this option were chosen, the Working Group warns that the scheme would be likely to collapse since very few residents would choose to be connected.

The Group points to repeated government commitment to funding of sewer backlog schemes and the moral responsibility of government to deliver on previous promises.

The Group supports the spread of costs over the entire Sydney Water customer base as an increase in the General Sewer Charge. It should be noted that the increment to the general sewer charge would be greater than the $2.00 quoted by the Working Group if all sewer backlog areas were funded in this fashion. This point is developed in section 6.5 below.

6.3 Impact of Cost Pass Through as an Increase to the General Sewerage Charge

The implications of an increase in the general service charge payable by all Sydney Water customers are presented in Table 6.2. This table details the impact of the increments to this general service charge resultant from each of the schemes discussed in this document. It also details the cumulative impact of these four schemes.

There are ramifications for future pricing in this determination. The total capital costs of these four projects, ignoring any on-going operational or maintenance costs, is $ 111.1 million. Appendix 2 provides details of all sewer backlog areas in the operational

area of Sydney Water. IPART has estimated the order of capital costs for these projects. These results are presented in Table 6.1. These costs total $190 million, which should be compared with $111.1 million total capital costs for the Sydney Water projects to be addressed in this determination.

Table 6.1 Order of Capital Costs for Other Sewer Backlog Projects

Category	Description	Order of Capital Costs
1	High Priority Areas	$ 73 million
2	Sensitive Ecosystems, but Lower Environmental and Health Impacts	$ 91 million
3	Low Environmental Impacts	$ 17 million
4	Low Population, Pollution unrelated to sewage	$ 19 million
TOTAL CAPITAL COST FOR OTHER BACKLOG PROJECTS		**$190 million**
TOTAL FOR PROJECTS IN THIS DETERMINATION		**$111.1 million**

Table 6.1 illustrates that capital costs of sewerage systems in other areas, which will remain on the backlog after this determination is finalised, amount to more than twice the total capital costs for the four Sydney Water projects to be considered in this determination. Thus, a pass through of sewer backlog costs to all Sydney Water customers in this determination represents a substantial current financial impost on Sydney Water customers, with a precedent set for even more substantial imposts in the future, as pricing for other backlog areas is determined.

Alternatively, however, very high regional based charges would impact on the residents of backlog areas, if the costs of the schemes are borne by the residents alone. The extent of this impact is illustrated in Table 6.3.

The Tribunal seeks comments on the question of pricing for sewer backlog areas. Specifically, if the costs of sewer backlog projects are to be funded through an increase in Sydney Water's charges, should the increase impact on all Sydney Water customers, backlog residents, or both.

Table 6.2 Impact on SWC common charge if the costs of the 4 sewer backlog areas were passed through to all SWC customers

Year	Common Charge	Picton Increment	Gerringong Increment	Bundeena Increment	Winmalee Increment	Total Increment	Increased Charge
	$	$	$	$	$	$	$
1998	280.40	3.84	2.13	1.07	0.52	7.56	287.96
1999	285.60	3.89	2.15	1.08	0.52	7.64	293.24
2000	290.40	3.96	2.19	1.09	0.54	7.88	298.18
2001	299.11	4.02	2.22	1.11	0.54	7.89	307.00
2002	308.09	4.07	2.25	1.12	0.54	7.98	316.07
2003	317.32	4.13	2.29	1.15	0.55	8.12	325.44
2004	326.84	4.19	2.32	1.17	0.57	8.25	335.09
2005	336.65	4.26	2.36	1.18	0.57	8.37	345.02
2006	346.74	4.32	2.39	1.20	0.57	8.48	355.22
2007	357.12	4.38	2.42	1.21	0.59	8.60	365.72
2008	367.83	4.44	2.46	1.23	0.60	8.73	376.56
2009	378.88	4.51	2.50	1.25	0.60	8.86	387.74
2010	390.25	4.57	2.53	1.26	0.62	8.98	399.23

Source: Sydney Water

The common charge will be subject to future pricing determinations. The data in this table have been prepared using the following assumptions:

- an inflation rate of 3 per cent per annum
- the common charge will increase by the inflation rate at the end of the current medium term price path
- full cost recovery of both capital and operating costs over 25 years at a real discount rate of 7 per cent. Only the period to 2010 has been shown.

Table 6.3 Regional Charges

	Picton	Gerringong	Bundeena	Winmalee
1998				502.64
1999	2087.85			509.23
2000	2118.80			517.95
2001	2149.72	2543.65	1440.65	524.49
2002	2180.59	2580.54	1461.84	532.11
2003	2212.58	2617.36	1483.01	540.91
2004	2244.52	2655.30	1504.14	548.52
2005	2277.65	2694.42	1526.46	556.11
2006	2310.75	2733.50	1548.77	563.66
2007	2343.79	2773.84	1571.04	572.51
2008	2378.11	2814.15	1594.64	581.38
2009	2412.39	2854.37	1616.81	588.84
2010	2448.05	2895.95	1640.35	597.69

The blank entries in the above table indicate years prior to the provision of reticulated sewerage in the respective areas. The data have been prepared using the same assumptions as those for Table 6.2.

Table 6.4 Gosford Impacts

Residents of Fisherman's Parade would be required to pay a one off charge of $ 8,029.00 to provide sewerage.

APPENDIX 1 ENVIRONMENTAL ISSUES

A1.1 Introduction

The purpose of this appendix is to outline some details of on-site wastewater management systems and explore associated environmental and public health issues. This provides a context for much of the discussion in this report.

A1.2 On-site wastewater systems

Areas without a reticulated sewerage system usually employ some form of on-site wastewater management. The most common of these are:

- septic tank with on-site disposal, usually an absorption bed
- septic tank with effluent pumped out to a road tanker for disposal, often to an STP
- aerated wastewater treatment units with on-site disposal.

The operation of these systems is discussed in the following sections, together with associated environmental and public health issues.

A1.2.1 Septic tanks

A septic tank provides a very basic form of wastewater treatment comprising sedimentation of settleable solids, flotation of oils and fats and anaerobic bacterial digestion (stabilisation) of the stored sludge. The liquid stream is then disposed of to the ground by a gravel absorption trench which assists the percolation of effluent into the soil. The solids portion of the waste stream remains in the septic tank where it is stabilised by anaerobic digestion.

These systems cost approximately $3,000 to install. Maintenance generally costs less than $50 per year.

In spite of the low operational costs, septic tanks need careful operation and regular maintenance. Householders must ensure that materials detrimental to the operation of the system, such as fats, oils, and bleaches are not introduced into the septic system. In any event, accumulated sludge and scum need to be removed periodically, approximately every three years. If these solids are not removed, they will be carried into the absorption trench where they will clog the gravel drain and surrounding soil. If this happens, effluent will overflow from the disposal trench to the surface instead of percolating into the soil. This problem is accentuated in areas of clay soils.

The efficiency of septic systems which dispose to on-site absorption trenches is determined by how well the effluent percolates into the soil at the site. A permeable soil type is required for this system to operate most effectively. Areas which are rocky or have a high water table have limited capacity to absorb the effluent effectively. The septic tank does not remove bacteria, viruses or nutrients to any significant extent, as illustrated in Table A2.1.

During wet periods, localised waterlogging may occur, impeding percolation. In these circumstances, the effluent rises to the surface and creates potential risks to public health and the environment. Contaminated runoff and seepage may escape to properties downslope of poorly operating absorption fields, causing more widespread problems.

Table A1.1 Expected Quality of Wastewater after Treatment in a Septic Tank

Parameter	Concentration
Biochemical Oxygen Demand	150 mg/L
Suspended Solids	50 mg/L
Total Nitrogen	50 - 60 mg/L
Total Phosphorus	10 - 15 mg/L
Faecal Coliforms	10^5 - 10^7 cfu/100mL

A1.2.2 Pump-out septic systems

Pump-out septic systems have a septic tank similar to that used for absorption systems, but the effluent is collected in a holding tank for storage prior to collection by a pump-out contractor. The holding tank is pumped out on a regular basis and transported to an appropriate disposal site. Like the absorption system, the pump-out septic tank needs to be desludged every three years to maintain efficient operation of the system.

These systems are relatively inexpensive to install (approximately $2,000), and are pumped out by contractors. The annual operating expenses depend on the number of times pump-out is required. For large volumes, pump-out costs can be very high. In 1992, four schools in the Picton area paid more than $31,000 for effluent pump-out.

The collection of effluent in a holding tank eliminates many of the contamination problems associated with absorption bed systems. However, it is essential that pump-out be arranged on a timely basis to avoid overflow of the holding tank. During inspections, some pump-out systems have been observed to have illegal effluent removal systems which have been installed to reduce the volume of pump-out required, and thereby the cost of this service.

A1.2.3 Aerated wastewater treatment systems (AWTS)

Aerated wastewater treatment systems produce an effluent of similar quality to secondary treated effluent. These systems are sometimes better known by their brand names, such as *Envirocycle*, *Biocycle*, etc. The effluent produced by these systems is applied via a sprinkler system to an irrigation area. It is then evaporated, transpired by plants or percolates through the soil. In NSW, AWTS were first approved in 1983. Since then, nine manufacturers have been involved in making more than 20 approved designs. By mid-1988 there were more than 2,000 installations in NSW. The treatment units are designed to maintain effluent quality that complies with the Health Department's bacteriological and chlorination standards listed in Table A2.2 below.

Aerated wastewater treatment systems rely on vegetation to utilise effluent. The irrigated area needs to be sized carefully and the vegetation selected to ensure uptake of water and nutrients is balanced with the output of the system. Otherwise run-off will occur.

Table A1.2 Expected Quality of Wastewater after Treatment in an AWTS

Parameter	Concentration
Biochemical oxygen demand	< 20 mg/L
Suspended Solids	< 30 mg/L
Total Nitrogen	25 - 50 mg/L
Total Phosphorus	10 - 15 mg/L
Faecal Coliforms	No disinfection - up to 10^4 cfu/100mL Disinfection - < 30 cfu/100mL

The percolation of effluent into soils is efficient in regions with an arid to semi-arid climate. Most areas within the Sydney Basin do not fall into either of these categories. During wet weather and in the cooler months when evaporation potential is very low, soil moisture levels are elevated. At these times effluent from an on-site system will not percolate through the soil efficiently and surface flows of effluent may occur. These may enter creeks, causing environmental problems from the influx of nutrients, and public health hazards from the pathogens micro-organisms contained within the effluent. For similar reasons, these systems, like septic tanks, are unsuitable for areas with water tables close to the surface.

AWTS units can cost up to $7,000 to install and have operating costs of approximately $500 per year. The majority of manufacturers recommend that customers enter into a service agreement to ensure on-going operational maintenance.

Even when they are sized appropriately for local conditions and correctly installed, maintenance of these units is important. Mechanical or electrical failures in aerated systems need to be rectified promptly, otherwise untreated wastewater can leave the system. Regular de-sludging is also necessary. Like septic tanks, these systems need to be protected from bleaches and other household chemicals that are toxic to the micro-organisms employed within the system.

A1.2.4 Operational performance of on site wastewater systems

Studies have shown the variable performance of on-site wastewater management systems[32]. In a study of effluent quality from a variety of such systems at The Oaks, the results shown in Table A2.3 were obtained.

Table A1.3 Results of Effluent Sampling at The Oaks, July 1992

System Type	Sample Point	Faecal Coliform Count (CPU)
AWTS Sample 1	Final Effluent	18,000
AWTS Sample 2	Final Effluent	24,000
AWTS Sample 3	Final Effluent	300
AWTS Sample 4	Final Effluent	<100
Septic Pump out	Outlet	6,000

These results not only illustrate the wide variations in performance that are observed among operational units, but also the fact that extremes of bad performance may be worse than totally untreated septic pump-out effluent.

[32] A study by Sydney Water quoted in ERM Mitchell McCotter, *Picton Regional Sewerage Scheme - Environmental Impact Statement*, January 1996

Other studies have shown that during random inspections of "operational" systems, as many as 40 per cent of septic tanks with absorption trenches and 70 per cent of aerated systems failed to operate effectively[33]. These failures result in adverse environmental and health conditions, including:

- spread of diseases, such as diarrhoea, hepatitis, dysentery, giardiasis and nitrate poisoning
- surface and groundwater contamination
- vegetation and soil degradation
- odour problems.

To illustrate the effect of poor operation of on-site wastewater management systems, Martens and Warner[34] investigated 12 small catchments in Wollondilly Shire over a period of 18 months. The 12 catchments are: three relatively undeveloped catchments used as experimental controls, a catchment containing urban development serviced by reticulated sewerage, three developed catchments containing only septic tank/soil absorption units; three developed catchments with aerated wastewater treatment systems, two developed catchments with a mix of septic and aerated wastewater treatment system inputs. The catchments were similar except for the type of sewage disposal used and contained a range of urban densities. Differences in water quality were attributed to sewage disposal options.

The undeveloped catchments were assigned a value of one and results for the other catchments were presented as a multiple of the value observed in the undeveloped catchment. For example, a value of 9 indicates a pollutant concentration of nine times the value observed in an undeveloped catchment.

Table A1.4 Comparison Between Sewerage Systems

Parameter	Control	Sewered	AWTS	Septic Tanks
Faecal Coliforms	1	9	10	16
Total Coliforms	1	9	11	25
Faecal Streptococci	1	2	1	1
Ammonia Nitrogen	1	2	10	28
Oxidised Nitrogen	1	3	5	6
Kjeldahl Nitrogen	1	2	4	7
Total Nitrogen	1	2	4	7
Total Phosphorus	1	3	7	20

The results presented in this table illustrate the typical extent of pollution associated with on-site water-water systems. These results also indicate that provision of a reticulated sewerage system does not solve all environmental problems. The table provides confirmation of the polluting effects of urban run-off.

[33] Hawkesbury Nepean Catchment Management Trust, *Domestic on-site sewerage storage, treatment and disposal.* Discussion Paper August 1995. Also NSW EPA Paper on on-site sewage management.

[34] Martens, DM and Warner RF, *Evaluation of the environmental impacts of Aerated Wastewater Treatment Systems*, Teaching Company Scheme Mid-Project Report, Department of Geography, University of Sydney. Quoted in ERM Mitchell McCotter, *Picton Regional Sewerage Scheme - EIS*, January 1996.

APPENDIX 2

DETAILS OF THE UNSEWERED AREAS IN THE SYDNEY REGION

Sewer Backlog Areas

	No of Lots	Planning Stage	Comments
Unallocated at present, likely under construction or complete			
Woodford/Linden			
Faulconbridge			
Terrey Hills			
McCarrs Creek			
Wheeler Creek			
Grays Point			
Lugarno			
Bungan Beach			
Lane Cove			
Prince Edward Park			
This Determination			
Picton/Tahmoor/Thirlmere	3000		
Bundeena/Maianbar	1200		
Gerringong/Gerroa	1580		
Wentworth Falls	300-1000	Final	Blue Mtns Sewerage Strategy
Hazelbrook	300-1000	Final	Blue Mtns Sewerage Strategy
North Katoomba	300-1000	Final	Blue Mtns Sewerage Strategy
South Katoomba	300-1000	Final	Blue Mtns Sewerage Strategy
High Priority Areas			
The Oaks/Oakdale/Belimba Park	1000 +	Initial	drains to Warragamba
Stanwell Park/Stanwell Tops/Otford/Coalcliff	300-1000	Initial	drains to Class P Waters, Faecal Coliform contamination from Otford, community discontent
Jamberoo	300-1000	Initial	drains to Primary Contact Waters
Brooklyn/Dangar Island	300-1000	Investig'n	Water Quality-OK; drains to Fish & Oyster Prod'n Areas
Mulgoa/Wallacia/Silverdale	1000 +	Investig'n	drains to Class P Waters, Drinking
Mt Victoria	300-1000	Initial	Part of Blue Mtns Strategy
Medlow Bath	300-1000	Initial	Part of Blue Mtns Strategy
Blackheath	300-1000	Initial	Part of Blue Mtns Strategy
Heather Glen			
Sensitive Ecosystems, but Lower Environmental and Health Impacts			
Appin	300-1000	Investig'n	drains to Class P Waters
Bargo	300-1000	Investig'n	drains to Class P Waters
Buxton	300-1000	Identified	drains to Class P Waters
Cobbity	< 300	Identified	drains to Class P Waters, impacted catchment
Cowan	< 300	Identified	drains to estuary in National Park
Douglas Park	< 300	Identified	drains to Class S Waters, High TN in receiving waters
Glossodia/Wilberforce	1000 +	Initial	
Kurrajong/Kurmond	300-1000	Investig'n	drains to Class C Waters, impacted
Wilton	< 300	Identified	drains to Class P Waters
Low Environmental Impacts			
Galston/Glenorie	< 600	Identified	Occasional high nutrients, FC in rec waters
Pollution Unrelated to Sewage, Low Population			
Kenthurst	75	Identified	Highly impacted catchment
Londonderry/Agnes Banks	< 600	Identified	Mixed Land use in catchment
Luddenham/Badgery's Creek	< 600	Identified	Impacted catchment, high FCs in rec waters
Austral/Hoxton Park	< 300	Identified	Impacted catchment, high FCs

DETAILS OF THE UNSEWERED AREAS IN THE SYDNEY REGION

Non Sewer Backlog Areas

	No of Lots	Planning Stage	Comments
High Priority Areas			
Berowra	100	Approved	Drains to estuary in National Park
Bowen Mountain			
Menangle	n/a	Not shown	High FCs and N in high flows of rec waters
Mt Kuringai Industrial Area	86	Not shown	High N,P,FC to Nat Pk in receiving waters
Sensitive Ecosystems, but Lower Environmental and Health Impacts			
Bell/Mount Wilson			
Nattai			
Mount Hunter			
Clifton			
Kurrajong Heights			
Pittwater (various locations)	509	Not shown	drains to estuary, primary contact area
Pleasure Point			
Cottage Point	57	Not shown	drains to estuary in National Park
St Albans	n/a	Not shown	High Total N to Hawkesbury/Nepean
Wisemans Ferry	< 50	Not shown	High N in Macdonald River
Scotland Island	380	Not shown	drains to estuary, primary contact area
Wombarra	< 50	Not shown	drains to marine waters
Yanderra	220	Not shown	
Yellow Rock/ Hawkesbury Heights			
Arcadia			
Rooty Hill			
Unanderra	n/a	Not shown	Drains through BHP, Pt Kembla
Yallah	10	Not shown	drains to Lake Illawarra
Pitt Town	n/a	Not shown	Impacted catchment
Rosehill	17	Not shown	drains to Duck Ck, P'matta River
Dural			
Dural Business Zone			
Lower Portland			