THIRTEENTH REPORT

OF THE

STANDING COMMITTEE ON CONSTITUTIONAL AFFAIRS AND STATUTES REVISION

IN RELATION TO

A PETITION CONCERNING COMPULSORY CONNECTION TO THE SEWERAGE SYSTEM

Presented by the Hon M D Nixon (Chairman)

13
June 1996

STANDING COMMITTEE ON CONSTITUTIONAL AFFAIRS
AND STATUTES REVISION

Date first appointed:

21 December 1989

Terms of Reference:

The functions of the Committee are to consider and report on -

(a) what written laws of the State and spent or obsolete Acts of Parliament might be repealed from time to time;

(b) what amendments of a technical or drafting nature might be made to the Statute book;

(c) the form and availability of written laws and their publication;

(d) any petition;

(e) any matter of a constitutional or legal nature referred to it by the House.

A petition stands referred to the Committee after presentation.

Members as at the date of this report:

Hon M D Nixon MLC (Chairman)
Hon A J G MacTiernan MLC
Hon B M Scott MLC

Staff as at the date of this report:

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REPORT ON A PETITION CONCERNING COMPULSORY CONNECTION TO THE SEWERAGE SYSTEM

1. INTRODUCTION

The Standing Committee on Constitutional Affairs and Statutes Revision was first appointed on 21 December 1989. Under its Terms of Reference, the Committee is required, *inter alia*, to consider and report on any petition.

1.1 The Petition

On 11 April 1995, Hon John Halden MLC tabled a petition (*TP #259 of 1995*) requesting that the Legislative Council

> *do all in its power to ensure that connection to the sewerage system not be made compulsory and that an annual fee not be payable if one is not so connected.*

The petition further contends:

1. *That there seems to be no scientific proof that septic tanks are a major cause of pollution to Perth's groundwater and waterways, and that there is no urgent necessity to compel those householders past whose dwellings the sewerage system is currently being extended, to be connected to that system.*

2. *That such compulsion is likely to cause great financial hardship to many householders.*

3. *That large numbers of householders will have their homes connected to the sewerage system in any case (to improve the value of their property etc) and without compulsion, so that a considerable reduction in the number of septic tanks will take place anyway.*

4. *That there exists alternatives (such as the composting toilet) to both septic tanks and sewerage which are both non-polluting and well-tried and that householders should be able to use these alternatives without having to also pay for connection to the sewerage system.*

On the basis of the terms of the petition, the Committee has recognised the need to identify, investigate and assess:

1. the social, economic and environmental impact in urban areas of compulsory connection to the community sewerage system;

2. the current state of scientific evidence regarding the pollution of Perth's groundwater

and waterways from septic tanks; and

3. the practical issues, particularly environmental protection, regarding the use of alternative on-site sanitary systems, such as self-composting toilets and aerobic treatment systems.

A list of persons the Committee met with and the written materials considered in reviewing the petition is attached at Appendix 1.

2. OVERVIEW

The Committee resolved to investigate the issues related to compulsory sewerage connection because of its sympathy with the concerns raised in the petition and its desire to explore the new technological developments in waste treatment as an alternative to the conventional sewerage system. However, this issue also impacts upon the protection of existing water resources and the environment, which are of fundamental importance to the community and the continuation of the high standard of living enjoyed by all West Australians.

The Committee notes that approximately one third to one half of Perth's drinking water supply is drawn from two large groundwater mounds, the Gnangara Mound to the north of the city and the Jandakot Mound to the south. The remainder is surface water drawn from the hill dam catchments. These Mounds and catchment areas must be protected in order to maintain the quality of the water supply. The Committee further notes that the groundwater areas that do not form part of the drinking supply also require vigilant nutrient removal and disinfection to allow use for crop irrigation or eventual flow to an established watercourse or the ocean. (*Wastewater 2040*, 1995)

Accordingly, any sanitary or wastewater disposal option that might threaten these precious resources could not be supported by the Committee.

The Committee endorses the production of an "environmentally, socially, economically and technically robust strategy" by the Health Department, the Department of Environmental Protection ("DEP") and the Water Authority of Western Australia ("WAWA") for meeting the long-term sanitation and wastewater disposal needs of Perth.

To this end, the Committee acknowledges the identification of four important community values with respect to waste planning:

- the environment, in particular groundwater, must be protected through ecologically sustainable development;

- there must be equity and feasibility in addressing the social and economic aspects of the communal sanitation system with a fair distribution of costs and benefits;

- the technology for delivery of waste must be safe, effective and the best available, particularly with respect to wastewater quality; and

- the cost to consumers must be tightly controlled and acceptable within the wider context of social, economic and environmental conditions. (*Groundwater Select Committee*, 1994)

3. RECOMMENDATIONS

The Committee appreciates the concerns of residents expressed in the petition. However, after due deliberation, the Committee cannot support the thrust of the petition and accordingly cannot recommend:

1. that connection to the sewerage system not be made compulsory; and

2. that an annual fee not be payable if one is not so connected.

After exhaustive examination of the advantages and disadvantages, including cost, of the alternative technologies, the Committee has determined to support the Government Sewerage Policy as it has been amended over the last fifteen years.

The Committee acknowledges that there is some limited scope for the future use of septic tanks and other on-site alternatives[1] where they are appropriate (see section 4.2.4 below). However, in urban areas, reticulated sewerage is generally the system least likely to be deleterious to both public health and the environment. For this reason, the Committee supports compulsory connection to the sewerage system.

The Committee also supports the continuation of the current charging policy. The annual sewerage charge is only levied on properties in areas where the reticulated sewerage system is avaliable, but is levied regardless of whether a property is connected or not. A communal sanitation and wastewater system which protects the environment should, like health care and education, be acknowledged as a public asset. Furthermore, the availability of reticulated sewerage does enhance the value of property. Accordingly, in areas where reticulated sewerage is provided, the cost of this system should be borne by all residents enjoying the benefits, direct and indirect, of this system.

Furthermore, in relation to the petition, the Committee has not found evidence to support the four contentions raised in the petition:

- The Committee was persuaded by evidence provided by the Health Department and WAWA that septic tanks are a cause of groundwater pollution of sufficient significance to warrant the compulsory connection to the reticulated sewerage system.

- The Committee has compared the respective costs (both initial costs and maintenance and repair costs) associated with different approaches to wastewater treatment. While accepting that compulsory connection to the sewerage system will cause some householders to incur unanticipated costs, the Committee does not consider these to be unreasonable compared with the costs of other systems,

[1] which the Government Sewerage Policy clearly caters for

particularly given the alternative payment options made available by WAWA.

- The Committee does not consider the third contention of the petition to be sufficient grounds for making sewerage connection non-compulsory. As discussed above, the Committee is of the view that the state of Perth groundwater should be of concern to every person in the Perth metropolitan region and that the cost of this protection should be equitable and universal. It is not unreasonable to expect all people to assume responsibility for ensuring that the groundwater resource retains an acceptable quality.

- The Committee is satisfied that, given the costs and limited reliability of alternatives to septic tanks and reticulated sewerage (such as composting toilets and alternative treatment units) and the potential pollutant hazards they represent in built-up, urban environments, reticulated sewerage is the only appropriate alternative for the Perth metropolitan area.

As Perth's suburbs and industrial areas expand and the demand for water resources escalates, it becomes increasingly vital that we protect our groundwater supplies.[2] One of the major dangers to our groundwater is the disposal of sanitary waste, and more particularly, the wastewater that accompanies that disposal. While the terms of the petition concentrates on the important questions of liberty, economic cost and personal choice, the Committee considers that the fundamental issue at stake is really the protection of the quality of our groundwater and the environment generally.

4. REPORT

4.1 Background to the Petition

In April 1981, the State Government announced as part of its Sewerage Policy that, unless special conditions existed, the provision of reticulated sewerage to all new subdivisions in the Perth Metropolitan Region would be mandatory. This decision was arrived at having regard to matters of public health, environmental protection and the efficient use of public funds. This Policy has been supported and extended by successive State Governments.

The goal of waste disposal and wastewater treatment is to ensure that the quality of treated wastewater is satisfactory for release back into the environment, with minimal ecological impact and the greatest regard for public health. It is for these reasons that reticulated sewerage has been used throughout the world to service large cities, and has been adopted as the preferred system in all Australian capital cities. The Committee notes with interest that Perth is the only capital city in Australia with a significant proportion of properties not connected to the sewerage.[3]

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[2] The current demand for water in Perth is about 230 million kL while the amount of water available per year is estimated to be 267 million kL from existing sources. Given the current rates of expansion in Perth, this yield is estimated to be fully utilised by 1997/98.

[3] As at December 1995, approximately 120,000 or 20% of all households in Perth were not connected to reticulated sewerage.

In 1994, the State Government announced the *Infill Sewerage Program* to overcome this problem. Under this program, the Government undertook to spend $800 million to provide reticulated sewerage to 80,000 residential, commercial and industrial properties in the metropolitan region over the next ten years and, as at the date of this Report, the program is progressing well.

Protection of Groundwater from Contamination

From a normal household, there are four sources of wastewater : the toilet (known as "black water"), and the bathroom, laundry and kitchen (known collectively as "grey water"). Scientific evidence acknowledges that both black and grey water are high in pathogens[4] (such as bacterium, protozoans, viruses and parasites) and chemical contaminants (such as nitrogen, ammonia and phosphorous). These contaminants generally derive from faecal and urinal waste, detergents and cleaning agents.

Commercial and industrial premises expel similar sources of wastewater as well as the additional source of industrial wastewater, which is often laden with concentrations of chemical, microbial and other potentially dangerous pollutants.

Any contamination which infects the aquifer (ie. natural water table) will be retained for many years because groundwater travels very slowly. Unfortunately, once an aquifer has been polluted, it may be centuries before the contaminants are completely flushed from the system. The Committee fully supports the warning contained in the *Report of the Legislative Assembly's Select Committee on Metropolitan Development and Groundwater Supplies 1994 (Groundwater Select Committee*,1994*)*, where it was said:

> In many areas of Perth, there is a slow degradation of water quality that is progressively destroying the value of the water to the community. As more instances of groundwater contamination are identified, the technical difficulty and expense involved in clean-up operations have focused attention on the advantages of preventing contamination from occurring in the first place which may be less expensive.

In various areas of Perth, contamination of aquifers by nutrients (eg nitrogen and phosphorous), from sources such as septic tanks, has caused an increase in the number of pathogens present in groundwater. This contamination has resulted in a restricted the use of untreated groundwater due to health concerns. The pollution of Perth's water bodies is further exacerbated because, in general, the major soil types of the metropolitan area (especially the most prevalent *Bassendean* sands) are limited in their capacity to retard the progress of microbes through filtration of water passing through to the aquifer. They also have a very poor capacity to remove chemicals, particularly nutrients, nitrogen and phosphorous, which are the most commonly found pollutants from sanitary waste disposal.

[4] A pathogen is generally defined as an agent that causes disease or aliments in humans. However, their sizes and properties are quite variable.

Reticulated Sewerage and Ocean Waste Disposal

Marine disposal through reticulated sewerage is the most common method worldwide of disposing of treated wastewater effluent from large coastal cities. The wastewater must be first treated to a sufficiently high standard to protect ocean water quality. Provided this occurs, ocean disposal is an environmentally low impact and low cost method that can be used all year round.

The ocean has a large capacity to process organically-based treated wastewater effluent. Salt and sunlight combine to form a natural and effective process for the reduction of bacteria. Dissolved oxygen levels in the open ocean are normally high enough to assist in the decomposition (breaking up) of organic material, while currents and waves provide the energy for the mixing and dispersion of the diluted effluent.[5]

If an outlet is well designed, there are relatively few health and environmental problems. However, poor flushing of the ocean can limit the dilution of the effluent. This depends mainly on the depth of water in which the outlet is located and on the energy (currents and waves) of the ocean at the point of release.

Another major advantage with ocean disposal of wastewater over other methods is the ease with which the appropriate regulatory bodies can monitor the effectiveness and safety of the reticulated sewerage disposal system. Samples may be easily taken at the point of release and any location on the shoreline. Also, pollution often has tell-tale signs, such as discolouration, which is immediately noticeable in the ocean.

Treatment of Wastewater

The WAWA adopts highly sophisticated methods of effluent treatment throughout the metropolitan area and Western Australia in general. This treatment is performed in two distinct phases.

The first, known as primary treatment, involves "screening" or filtrating the effluent to remove all sanitary paper products, which are then burned. The remaining faecal and other solid materials are stored in a sediment form which settles in large tanks.

The secondary biological treatment stage is where about 95% of the solids are removed. Within that biological process, some of the nutrients, especially nitrogen, are also removed. The solid matter is then digested to produce methane gas, which is used for heating purposes at the treatment plants, and fertiliser which is on-sold for gardening purposes.

[5] Wastewater disposed into the ocean undergoes an immediate dilution rate of 100:1 at the disposal source and encounters further dilution as it is dispersed by currents and tides. Wastewater disposed underground, on the other hand, undergoes a dilution rate of only 2:1 with the aquifer and is not subject to rapid change in the dilution ratio.

This secondary process kill off about 99.99% of the pathogens.

As a result, the wastewater is discharged into the ocean after receiving both primary and secondary treatment and is reasonably low in pathogens and other pollutants. The remaining solids have been treated and re-used for community benefit. The waste is highly stabilised, clean to look at and undergoes enormous dilution of 100 to 1 some two to four kilometres off the shore.

The Perth Metropolitan area is presently served by three major ocean outlets. Details are summarised below:

OUTLET LOCATION	PLANT	LENGTH	FLOW	TREATMENT
Ocean Reef	Beenyup	1600/1800m	68ML/d	Secondary
Swanbourne	Subiaco	1000m	51ML/d	Secondary
Cape Peron	Wood. Pt.	4200m	85ML/d	Primary

These outlets were developed based on detailed environmental, engineering and economic studies. Factors considered in the final design were :

- depth of seawater
- strength of ocean currents
- regional ocean flushing
- environmental values of nearby marine environments
- distance to areas of community recreation (swimming, diving etc)
- constraints on engineering
- level of treatment (primary, secondary or tertiary)

Recent studies into the Perth coastal waters undertaken in accordance with DEP criteria suggests there has been no significant change to the ocean and that all outlets are functioning well within performance parameters as set by the DEP. (*Rule*, 1995)

Comparison with the Eastern States

The Committee considers it important to acknowledge the activities of WAWA, the Health department and the DEP in maintaining Western Australia's position as a national leader in the field of sanitary and wastewater treatment procedures.

A comparison of the treatment procedures and standards required in Western Australia and the eastern States illustrates four (4) significant areas of difference:

1. States, such as New South Wales, were until very recently discharging effluent and other wastewater directly on the shoreline;

2. WAWA performs **a** very comprehensive primary and secondary treatment on all effluent, whereas some other States have virtually no levels of treatment or perform only a primary "screening" of wastewater;

3. The industrial waste channelled into Western Australia's reticulated sewerage system is of a much weaker variety than that found in some eastern States systems due to the heavier industry that occurs there; and

4. WAWA maintains a strict policy of prohibiting the disposal of solids into the ocean, whereas some eastern States water authorities do not.

Need for Public Wastewater System

On the basis of the reasoning outlined above, the Committee is convinced that, for urban areas such as Perth, a commitment must be made by the community to a centralised public system to ensure the protection of the environment and the enhancement of public health.

4.2 THE ISSUES RAISED IN THE PETITION

The specific issues raised in the petition are addressed below.

4.2.1 Septic tanks as a cause of pollution

Septic tanks treat wastes by separating the solid and liquid waste, allowing for natural biological degradation and a discharge of wastewater (both black and grey) into the surrounding soil environment. Once the wastewater has permeated the soil, septic tank systems rely on the natural processes in the soil (such as interaction with anaerobic bacteria) to disinfect the effluent through bacteriological decomposition. Properly designed, constructed and maintained, septic tanks can last many years.

Septic tanks were introduced in Western Australia at the turn of the century and were heavily relied on as a means of accelerating Perth's urban expansion in the 1950's and 1960's without having to expend enormous resources on capital works. However, it was even then only considered as a temporary expedient to reticulated sewerage (*Select Committee*, 1988). As at December 1995, there were some 120,000 septic tanks operating in the Perth metropolitan area.

In the past, the septic tank has generally been viewed as an acceptable method of effluent disposal. However, more recent studies have suggested that the appropriateness of septic tanks is confined to rural areas or low density areas and that their use in built-up urban areas can be a major source of pollution. The Committee notes with interest that the septic tank was in fact originally designed for effluent disposal in rural communities (*Select Committee,* 1988)

On-site septic systems treat and dispose of sanitary wastes where the wastes are generated. The on-site systems approved for use in Perth are generally employed wherever communal sewerage collection and treatment systems are neither suitable nor available, and where construction of a new facility or connection to an existing system is **not** economically or technically feasible. Major factors when considering the applicability of septic tanks are sufficient block size, sufficient distance above the watertable and whether local groundwater is to be used for any domestic or industrial purposes.

The advantages of using septic tanks for effluent disposal are their relative inexpensive installation and generally low pollution loadings to groundwater in low density residential areas.

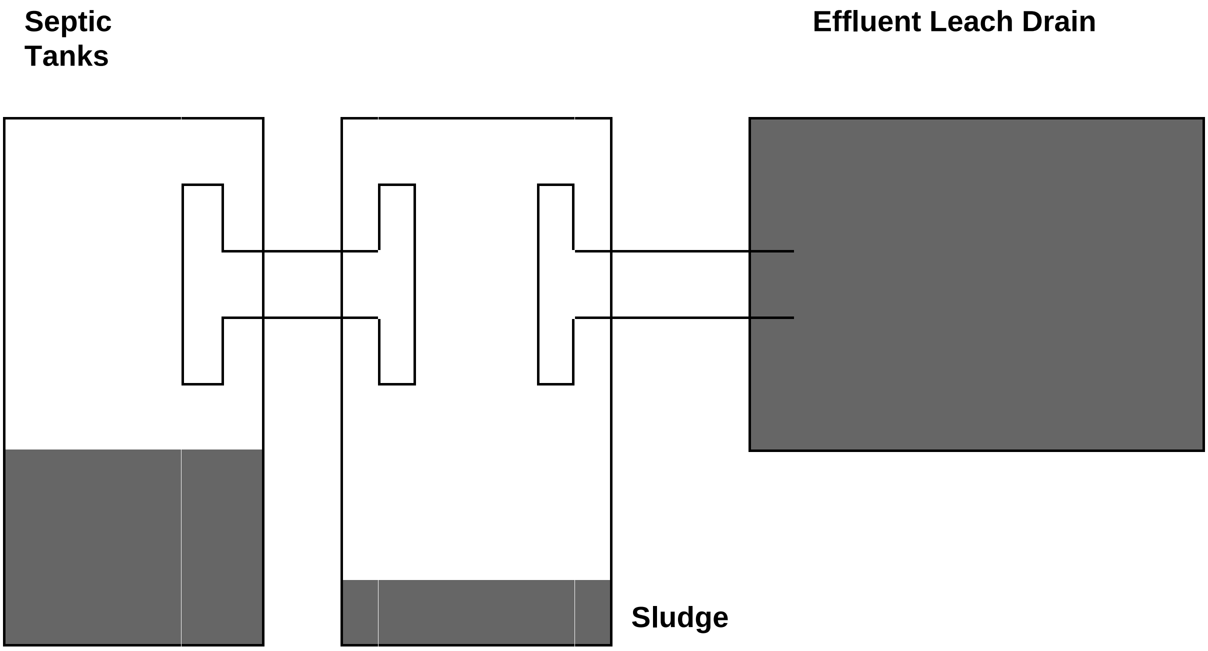

Figure One: Side View of Septic Tank and Leach Drain

However, it is the opinion of the Committee that the disadvantages of septic tanks, and the disastrous consequences for the environment and water resources that can result from their improper use, clearly outweigh their positive attributes. The disadvantages include:

1. the infusion of nitrate, phosphorous and other pollutant contributions to groundwater and nearby surface waters;

2. unsatisfactory performance in areas with a high water table or poor soil conditions, such as is found throughout most of the Perth Metropolitan Area;

3. the need for regular maintenance to ensure proper functioning;

4. public health problems associated with chronic system failure; and

5. the need to periodically dispose of remnant waste and the resultant system failure if this removal is not performed with sufficient regularity.

Pollution of Groundwater

The contamination from septic tanks can be divided into two broad categories:

1. biological pollutants, such as parasites, bacteria and other pathogenetic organisms; and

2. chemical pollutants, particularly nitrogen, phosphorous nutrients and toxic metals.

Traditional septic tank/soil absorption systems have no inherent mechanism for the removal of contaminants and so these can end up in the groundwater. This can be a problem when the groundwater eventually reaches a water body, such as a lake, stream or drinking water mound, or where local bore water is used for irrigation.

The risk of biological contamination increases with the mobility of pathogens through soil. Mobility is affected by several factors, including soil moisture, water velocities and distance, pathogen properties, and soil properties. The coarse, sandy soils of the Swan Coastal Plain have very little ability to halt the progress of pathogens (*Parker*, 1983).

The chemical contaminants of most concern are nitrogen and phosphate. The former is both an environmental and health risk, while the latter is of environmental significance only. Elevated levels of nitrate in the environment can cause a condition known as methaemoglobinaemia, a condition in infants known as “blue babies”. Alternatively, high levels of phosphorous are associated with eutrophication or “algal bloom”. In 1992, a Geological Survey of Western Australian ("GSWA") report estimated that approximately 160 tonnes of nitrogen and 5 tonnes of phosphorous could be discharged direct from the groundwater into the Swan-Canning estuary each year (*Appelyard*, 1992).

The removal of nitrogen by septic tanks is very ineffective and relies on natural processes occurring in the soil. Many of the coastal sands around the Perth Metropolitan Area do little to retard nitrate movement. Elevated nitrate levels in the groundwater in the Perth region have been associated with urbanisation. Although this is not entirely due to septic tanks, they have been shown to be a significant contributor (*WAWA*, 1987). Septic tanks also have the potential to contribute to phosphate contamination. An expected output concentration for phosphate from a septic tank leach drain is 15mg/l (*Canter and Knox*, 1985). Algal blooms, such as has already been experienced in the Swan River and Peel Estuary, can be experienced at 0.1 - 0.01mg/l (*EPA*, 1993).

The table below identifies the most significant known contaminants associated with on-site systems (both black and grey water) and the resulting groundwater and surface water problem.

	CONSTITUENT	GROUNDWATER
1.	Nitrate-Nitrogen	High concentration of nitrate have been known to produce a bitter taste. Water containing nitrogen in excess of 10mgl has been reported to cause methemoglobinemia (a reduction in the oxygen carrying capacity of the blood) in infants.
2.	High Phosphate Concentrations	Phosphorous levels have no direct adverse effect on groundwater but can cause problems where run-off to wetlands occurs.
3.	Lead, Tin, Copper, Zinc	These constituents are toxic in excessive concentrations.
4.	Chloride, Sulfate	These constituents can present health hazards to some individuals ranging from laxative effects to aggravated cardio-vascular or renal disease if concentrations exceed recommended limits.
5.	Foaming agent	A nonbiological detergent constituent and an indicator of contamination. Appearance and taste of water may be unacceptable.
6.	Synthetic organic chemicals, including 1,1,1,-tricholoethande, tetrachloroethylene, trichloroethylene and chloroform (halogenated hydrocarbons)	These constituents found in septic tank additives and through incorrect disposal are suspected carcinogens.
7.	Bacteria and Viruses associated with the presence of faecal coliform	Some private wells may contain significant amounts of pathogens.

Table 1: Impacts from Pollutants From On-Site Systems Upon Groundwater
(Source: Based on data from CSIRO and the Long Island Regional Planning Board and taken from page 67 of *Groundwater Select Committee Report*, 1994

Health can be severely affected by pollution of groundwater from septic tanks. Contamination of water supplies can occur if bores or wells are located too close to the septic tank leach system. Health regulation require that septic tanks be located at least 30 metres away from wells used to supply drinking water. However, a further problem can arise with septic tanks in densely populated urban areas because of a build up of nutrients (eg nitrogen and phosphorous) in groundwater. While these nutrients can be beneficial where the groundwater is used to irrigate crops and gardens, their presence can add exponentially to nitrate loadings in local groundwater causing problems if the water is used as a supply of drinking water or leads to accelerated growth of algae in lakes and drains.

Unsatisfactory Conditions

Septic tank system failure can often occur because of unsatisfactory conditions, such as improper siting, inadequate distance to groundwater, steep slopes, poor site management and maintenance problems.

The preponderance around the Perth Metropolitan Area of sandy soils, such as the Bassendean sands, contributes greatly to the risk of contamination from pathogens and chemicals due to the soil's inability to retard infusion to the groundwater aquifer.

Improper Maintenance

The performance of septic tanks relies heavily on them being properly maintained. Maintenance mainly involves having the remnant sludge periodically removed to prevent excessive build-up which can result in overflows into the leach drain and releases pollutants into the soil environment.

In 1988, the *Legislative Assembly's Select Committee on Effluent Disposal ("Effluent Select Committee,* 1988*")* found that many owners of on-site systems do not follow a preventive maintenance program. More often than not, homeowners do not have septic tanks pumped out as frequently as they should, thus allowing the sludge and the scum to flow to the leach drain where it clogs the infiltrative surface of the drain. As a result, the system begins to malfunction and the surrounding environment is subject to contamination.

Health Problems

Some health problems have been encountered in areas where infiltration is poor and surface ponding and run-off occurs, in areas where the groundwater is close to the surface and in areas of porous sandy soils when groundwater is being extracted from bores located close to the septic systems. This is especially so when the bore water is used for drinking water or for above-ground garden irrigation.

Previous studies have documented the contribution of septic tank pollution to disease outbreaks (*Effluent Select Committee,* 1988). Septic tank systems are used by one-quarter of households in the Perth metropolitan area to dispose of domestic effluent, discharging waste leachate filled with pathogens and nitrates, as well as organic solvents and oils. This leachate has caused extensive contamination of the superficial aquifer in parts of metropolitan Perth with resultant effects on the public health. For example, a 1992 GSWA study found that septic tank distribution was the cause of high nitrate concentrations found near the Swan-Canning Estuary between Applecross and Bicton.

Periodical Disposal of Remnant Waste

The Committee notes that, contrary to popular belief, septic tanks do not have an indefinite lifespan nor are they a self-sustaining unit. Septic tanks are liable to fail and cause groundwater contamination if the sludge and scum layers are allowed to build-up. The result is that the retention time of the groundwater is reduced and correspondingly so is the effluent quality. Excessive amounts of solids will be carried over in the effluent thereby accelerating the clogging of the soil absorption system (*Effluent Select Committee*, 1988).

The Committee's Perspective on Septic Tanks

On the basis of the evidence placed before it and summarised above, the Committee rejects the contention that there is no scientific proof that septic tanks are a cause of pollution. In the view of the Committee, there is ample proof that septic tanks, even properly maintained, are a source of contamination to our groundwater and a danger to the public health. Furthermore, the Committee is persuaded that it is preferable that communal wastewater treatment systems, such as reticulated sewerage, replace septic tanks within the Perth metropolitan area as soon as possible.

4.2.2 Financial hardship incurred by compulsory sewerage connection

The Committee has been advised that connection to the sewerage system will cost the average household between $750-$2000 for installation and $300-350 annual charge for sewerage rates (*Edmunds and Rule,* 1995)

Connection is required within five years for all properties within sewered areas except those in the Gwelup Public Water Supply Area (connection within two years) and for properties that are sold (one year from sale). Financial loans to cover the connection cost are available from the Water Authority. The loans will be repayable by monthly instalments of principal and interest over a period not exceeding 10 years. Interest will be fixed at the Commonwealth Savings Bank home loan rate current at the time of the loan. The WAWA will place a caveat on the property while the loan is being repaid. The cost of the title search, registration of caveat, stamp duty, and a service fee (approximately $190.00) will be added to the amount borrowed. Removal of the caveat after the repayment of the loan will be the owner’s responsibility.

Pensioners may be entitled to pay interest only, with the principal payable when they cease to be a pensioner or cease to own the property. In addition, special arrangements are available for residential customers, other than pensioners, experiencing financial hardship.

The Committee has compared the costs of sewerage connection with septic tanks and alternative treatment systems (See Appendix III). Reticulated sewerage connection appears to be the alternative which incurs the least financial cost for individual householders. In addition, the payment alternatives made available by WAWA appear to the Committee to be reasonable. The Committee is satisfied that, while a compulsory change from septic tank to reticulated sewer will cause some households to incur unanticipated costs, given the environmental imperative for minimising groundwater pollution and the payment options available, the costs to be incurred are not unreasonable.

4.2.3 Reduction in septic tank numbers

The *Wastewater 2040 Strategy* (WAWA, 1995) states that there are currently some 120,000 individual treatment/disposal systems in the Perth-Mandurah region. It is noted above that the Sewerage Infill Policy aims to connect 80,000 homes to the sewerage system within the next ten years.

Naturally, there are no available statistics of the number of homes that would be connected to the sewerage system under a non-compulsory regime. The Committee is not, however, persuaded by the argument that a large number of voluntary connections would obviate the need for connection of the remainder of households. The Committee considers the quality of the groundwater to be a concern and responsibility of every household which utilises the water supply, and views compulsory connection as an equitable sharing of that responsibility.

4.2.4 Septic tank and sewer alternatives

The last fifteen years has seen the development of a number of alternative on-site treatment systems which attempt to provide many of the advantages of a traditional septic tank and leach drain system without the associated problems. These systems range from modified septic tanks and leach drains to self-composting toilets. These alternatives are only viable if they conform to public health and environmental specifications. The removal of pathogens, phosphorous, and nitrogen by the alternative systems is critical to their effectiveness.

Socially, these systems present both advantages and disadvantages.

Their advantages are they allow low density development without the additional cost of reticulated sewerage connection, in some cases they may be cheaper than traditional systems and they can result in beneficial reuse at the local area provided they are properly maintained and operated.

The main social and environmental disadvantages with these alternative on-site systems include:

1. the potential health and groundwater risks due to the release of nitrogen and phosphorous, particularly where wastewater from alternative systems is re-used on-site for irrigation purposes in urban areas;

2 the humus or sludge produced by most of these systems must be removed periodically and transported to the Health Department's Septage Treatment Plant for treatment and disposal;

3. inflexibility in terms of changing land use patterns, increases in the density of urban development and changes in the health and environmental requirements;

4. if a change in the on-site system is required due to any of the above, any cost advantage is completely lost; and

5. these alternative on-site systems take up useful space in the property and can be a constraint to redevelopment within the property (for example, an extension, swimming pool etc.).

Under the Government's *Sewerage Policy and Infill Sewerage Program*, such systems are considered suitable for permanent use where all the following conditions apply:

- in areas not requiring a net removal of water from the area (ie in areas not potentially subject to winter inundation and therefore requiring a stormwater drainage system);

- in areas where there is an adequate distance (preferably at least 3 metres) to the maximum groundwater level so that any water percolating to the groundwater receives adequate natural treatment through the soil;

- where minimum residential block sizes are large (2000m squared minimum); and

- where there is no existing sewerage system.

Accordingly, these systems are not considered generally suitable in major urban areas, except on a temporary basis.[6]

The two major forms of these alternative systems are discussed in brief below and a more

[6] The conditions attached to the temporary use of septic tanks are:

- in areas not requiring a net removal of water;

- in areas where there is an adequate distance (preferably at least 3 metres) to the maximum groundwater level;and

- where minimum residential block sizes are large (700 m squared minimum);

- in areas where high density development will not occur within 15 years; and

- where there is no existing sewerage system.

general summary appears in Appendices II and III.

Composting Toilets.

Composting toilets, which aerobically treat toilet waste, or “black water” include the Clivus Multrum System, Rotaloo, and the Downmus Composting Toilet. Waste directly enters a compost container without flushing. The container is divided into 2-4 compartments which separately treat fresh waste and mature compost. The end product is a humus which can be utilised in gardens. Composting toilets can be used for small to medium sized residences and cost between $2700 and $3900. This compares with $2000-6000 for the cost of a septic tank.

The major benefit with composting toilets is the fact that they are "dry" systems, thereby saving large quantities of water.

Composting toilet systems are currently only approved for use in rural zones, special rural zones or for intermittent holiday house use. They are not approved by the Health Department for use in urban areas. All systems must have local government approval and conform with the *Health Act Sewerage (Light, Ventilation, and Construction) Regulations 1971* as well as the *Treatment of Sewerage and Disposal of Effluent and Liquid Waste Regulations.*

The major drawback with composting toilets is they do not treat the grey water from the kitchen, bathroom or laundry. These must still be treated by a separate unit or system. The Committee notes from consultation with representatives from WAWA that, contrary to popular belief, the treatment of grey water is of particular environmental concern. Grey water has been shown to contain high levels of pathogens, which can reach 100,000,000 coliforms/100ml. This compares with the accepted level for Perth beaches of 150 coliforms/100ml.

Another problem with composting toilets is the relatively high degree of maintenance that is required. The Clivus Multrum System, for example, requires weekly addition of a carbon-rich bulking agent and the compost pile levelled every three months and removed yearly. Monthly inspections are required to ensure correct moisture conditions and proper effluent drainage. Health Department regulations require the compost to be resident in the compost chamber for a minimum of twelve months with the resultant humus to be covered with a 30cm layer of top soil and not used for the cultivation of human food for a period of six months after removal.

In the context of an urban environment, other problems associated with composting toilets are:

- small urban block sizes, particularly in infill areas, would limit the amount of humus by-product that could be applied to gardens, suggesting the need for regular contract removal of excess humus; and

- composting toilets are not odourless and may constitute a nuisance in urban areas.

Accordingly, the Committee does not support the introduction of composting toilets in urban areas.

Alternative Domestic Aerobic Treatment Units.

Apart from composting toilets, there are a variety of more sophisticated units, known as Aerobic Treatment Units ("ATUs") which are basically very small scale secondary treatment systems, with effluent disinfection through chlorination. Testing has shown that these meet effluent requirements and the Health Department has approved a number of these for use. Properly sited, designed, operated and maintained, these units provide a source of water for use within the property. The water is suitable for sub-surface irrigation without restriction, and for above ground irrigation but with restrictions on access. For above ground irrigation, 150 square metres of dedicated space is required.

Domestic ATU's can roughly be classified into two groups:

- those that use alternative septic tank designs, and

- those that utilise modified leach drain systems.

The domestic ATU's considered by the Committee include Biomax, Envirocycle, Taylex Clearwater 90, the All Water Treatment System, Aquarius 180FB, the RUCK System, and Ecomax. These vary in the amount of nutrient-rich effluent produced and their consequent suitability across soil types. As of January 1996, prices of alternative domestic aerobic treatment units range from $5000-$10,000.

All systems connect directly to the conventional toilet. Units that use highly modified septic tanks, such as the Biomix system, are compartmentalised and allow the primary settling and the secondary treatment (separation and chlorination) of the effluent before using the water in some form of irrigation on the household garden. Unfortunately, the irrigation for all systems, except the Aquarius system, must occur onto red-mud amended soil to absorb phosphates. Some denitrification and phosphate absorption is possible with the unit but the system relies heavily on soil absorption and retardation during irrigation with the treated effluent. The potential for groundwater pollution in Western Australia is therefore significantly increased because of the preponderance in the Perth Metropolitan Area of very sandy soils which are unable to absorb pollutants.

In other units, the traditional leach drain system is modified to reduce the potential for pollution of soil, groundwater, and waterways/ wetlands. The RUCK system, for example, uses a septic tank for primary treatment (settlement) of black water and a series of sand filters to allow the removal of phosphorus and nitrogen from the effluent. Effluent passing through the sand filter is then directed into a second septic tank and mixed with grey water. This provides conditions that allow denitrification and some further phosphorus reductions. As the conditions for optimum phosphorus and pathogen removal are pH dependent, regular cleaning of the sand filters is required to maintain efficient removal. The resulting effluent is of relatively high quality and suitable for ecologically stable areas. Unlike the modified septic tank systems, no power source or chemical additions are necessary, with only periodic de-sludging and inspection required.

As mentioned above, ATU's rely on chlorination to disinfect the final wastewater to meet a performance standard. While previous monitoring of these systems has shown compliance with the standard, recent monitoring has shown quite high bacteriological counts. As these units often rely on above ground irrigation, this is of public health significance and the manufacturers have been requested to identify the reason for this failure.

Serious concerns have also been raised about the siting of disposal areas too close to habitable areas. This is particularly evident where these units have been used on very small allotments. As a consequence, the Government has reviewed its Sewerage Policy for the Perth Metropolitan Region and no longer permits the use of these units on small allotments.

ATU's were first introduced into the eastern States of Australia approximately 13 years ago. In NSW there are some 25,000 units in use and a recent survey by health authorities has found that approximately 70% fail to comply with discharge standards (*Edmunds and Rule,* 1995). This situation has also been identified in other States.

Given the poor record of private owners in the eastern States and the potential heath and environmental risks posed by ATU's, the Committee does not support their introduction into urban areas in Western Australia.

4.2.5 Annual Sewerage Charge

The petition also requests that the Legislative Council ensure that, where a property is not connected to the reticulated sewerage system, no annual sewerage charge is payable.

Currently, the sewerage charge is levied as part of the annual water rates on all properties in areas where the reticulated sewerage system is available. Furthermore, this charge is imposed regardless of whether a property is actually connected to the system or not.

It has been suggested to the Committee that this charging policy is unfair because it is not based on the actual use of the sewerage system, but on its availability to properties within delineated areas. As a result, some rate-payers who do not use the system are still required to contribute to its operational expenses.

While the Committee appreciates this concern, there are two over-riding considerations that persuade the Committee to support the maintenance of the current charging policy.

Firstly, as described in section 4.1 above, a major contibution of the communal sewerage system, apart from the disposal of waste, is to ensure the satisfactory quality of wastewater released back into the environment, with minimal ecological impact and the greatest regard for public health. In particular, one of the paramount functions of the communal sewerage system is the protection of local groundwater resources and the environment generally. Therefore, the Committee is of the opinion that the sewerage system must, like health care and education, be regarded as a public amenity which provides benefits, directly and indirectly, to all residents of Western Australia.

Secondly, the Committee considers that any perceived inequity in the current charging policy is offset by the accepted fact that the availability of reticulated sewerage will enhance the value of all properties within areas where connection to the reticulated sewerage system is available.

Accordingly, the Committee has concluded that it is not appropriate for the Legislative Council to recommend any alteration of the current policy with regard to the annual sewerage charge.

5. CONCLUSION

The Committee has been asked to consider the question of whether connection to the reticulated sewerage system should be compulsory and whether annual sewer fees which form part of water rates should be charged if one is not connected to this system. Prima facie, this petition raises questions of personal choice and expense.

While the Committee acknowledges the importance of these concerns, there is a much greater concern at stake in relation to the sewerage system. The protection of Perth's groundwater resources and the environment must take precedence over economic questions.

Therefore, all sanitary and wastewater systems designated for use in urban areas must protect the environment and enhance the public health. They must be flexible enough to accommodate changing land use, increases in the density of urban development and changes in the health and environmental requirements. In addition, the Committee notes that only septic tanks are cheaper than the reticulated sewerage system for initial installation.

The Committee is persuaded by the available scientific evidence that septic tanks are a cause of pollution and that the threat they pose to Perth groundwater supplies will only increase in the future as current tanks become older and less efficient.

With respect to household on-site systems other than septic tanks, the Committee notes that there has been considerable research undertaken over the last decade and that improvements have been made. Indeed, the Health Department has approved some of these for use under certain conditions.

However, in the developed areas of Perth, the potential for septic tank alternatives is very low. They are only appropriate in limited circumstances as outlined in the Government Sewerage Policy. Nonetheless, the Health Department still has grave doubts - which the Committee shares - over the level of health protection offered by septic tank alternatives.

As a result, the Committee considers that reticulated sewerage is the only viable system to effectively and safely service the sanitary needs of the community.

Another important rationale in relation to the need for a communal reticulated sewerage system is the requirement for on-going operation and maintenance of waste systems. The operation of sophisticated wastewater treatment systems needs properly qualified and trained operators. To expect each householder perform these technical operations with precision is demanding and it is not surprising that there is a high number of failures.

Reticulated sewerage systems are designed, constructed and operated by suitably qualified experts. They are continually monitored and improved by WAWA and the Health Department. When potential adverse health or environmental effects are noted, a quick informed response can be made. It is also far easier to up-date a community treatment plant than thousands of individually privately owned systems. Comprehensive monitoring has shown that both public health and the environment are better protected by a communal sewerage system.

In the course of its deliberations, the Committee carefully considered the arguments raised in the petition, but ultimately the Committee is unable to accept their validity. The Sewerage Policy is as much about environmental protection as it is about sewerage and the Committee is in full support of the Policy's aim to protect groundwater through use of a reticulated sewerage system relying on marine disposal of wastewater.

Accordingly, the Committee supports to compulsory connection to the sewerage system and the maintenance of the annual sewerage charge contained in water rates in areas connected to the system. These measures are vital to ensure an equitable distribution of the community's responsibility to protect our environment and our precious groundwater supplies.

APPENDIX I

The Committee met or corresponded with the following persons to discuss the issues raised in the petition regarding the sewerage system and alternative on-site system:

Mr Lindsay Edmunds, Planning and Policy Officer, Bulk Water and Wastewater Division, Water Authority of Western Australia

Mr Hugh Rule,Manager,Wastewater Treatment and Industrial Water Branch, Water Authority of Western Australia

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APPENDIX II

GOVERNMENT SEWERAGE POLICY:
Site Requirements for On-site Wastewater Disposal Based on Health Criteria

1. The Executive Director, Public Health, may require the applicant to provide evidence demonstrating that the disposal site is capable of achieving effective long-term on-site wastewater disposal including evidence of depth to groundwater, soil profiles, percolation rates, and surface contours.

2. The gradient of any land on which wastewater disposal is to occur shall not exceed one in five and shall be engineered to prevent run-off from the site (*e.g.* bunding and terracing).

3. The site should not be subject to inundation or flooding at a probability greater than one in every ten years.

4. Irrespective of the type of on-site wastewater disposal system proposed, the land should have a minimum depth to the seasonal or permanent water table from the natural ground surface of at least 0.5 metres.

5. a) The depth to highest seasonal or permanent water table from the underside of a wastewater disposal system prescribed under Regulation 49 of the *Treatment of Sewerage and Disposal of Effluent and Liquid Waste Regulations*, shall be a minimum of 1.2 metres.

   b) For existing areas or infill areas where the requirement of 5(a) cannot be met, the depth to the highest seasonal or permanent water table from the underside of the wastewater disposal system shall not be less than that in the surrounding development, but in any case not less than 0.3 metres.

6. Where a technology for the on-site disposal of sewerage, other than as prescribed under Regulation 49 of the *Treatment of Sewerage and Disposal of Effluent and Liquid Waste Regulations*, has been approved by the Executive Director, Public Health, the clearance to highest known water table shall comply with the condition set by the Executive Director, Public Health, for that technology.

7. An unencumbered area of at least 150 square metres, or such other area as an approved system may require, must be set aside for the disposal of the wastewater (not including the area for septic tanks, etc) for each dwelling unit.

APPENDIX III

SUMMARY OF ALTERNATIVE TREATMENT SYSTEMS

Treatment System	Advantages	Disadvantages
Reticulated Sewerage $1500-2000	- No user maintenance - No pollution at source	- Pollution at ocean outfall - Annual connection fee - Initial connection fee
Septic Tanks $2000-6000	- Cheap	- Potential for groundwater Wetland or stream pollution - De-sludging every 3-4yrs
Clivus Multrum composting toilet $2670-3910	- No water use - Provides humus - No pollution	- Power required - Regular compost removal - Regular inspections - Weekly addition of bulking agent - No grey water treatment
Rotaloo composting toilet approx $3000	- As for other composting units	- As for other composting units
Downmus Composting Toilet Price not known	- As for other composting units	- As for other composting units
Biolet $3000	- As for other composting units	- As for other composting units
Lectrolav Price not known	- As for other composting units	- As for other composting units
Biomax $7000 incl installation + $56.25 quarterly maintenance	- Provides clean effluent for garden irrigation - Inspections provided by the manufacturer	- Quarterly inspections - De-sludging every 3-4yrs - Power required - Some potential for pollution
Envirocycle $3000-5000	- Provides clean effluent for garden irrigations - Alarm system in case of failure	- Quarterly inspections - De-sludging every 1-2yrs - Power required - No removal of N and P
All-water system Price not known	- Can treat effluent from 30 people - Some water conservation	- Quarterly inspections - De-sludging required
Taylex Clearwater 90 $5400 fully installed	- Provides clean effluent for garden irrigation - Alarm system in case of failure	- Quarterly inspections - De-sludging every 3-4yrs - Power required - No removal of N and P
Aquarius 180FB $10,980 + 11% sales tax	- Phosphorus and nitrogen removal - No amended soil required - Water saving	- Expensive with high power use - Annual service fee - De-sludging required
RUCK System $5000-10,000	- Produces high quality effluent - Ecologically sensitive	- De-sludging every 3-4yrs - Regular cleaning of sand filter
Ecomax $6500 fully installed	- Removes P, N, heavy metals and pathogens - Ecologically sensitive	- De-sludging every 3-4yrs - Amended soil needs replacing every 15-20 yrs

APPENDIX IV

COMPARISON OF EFFLUENT QUALITY FROM DIFFERENT TREATMENT SYSTEMS

System	**BOD** mg/l	**SS** mg/l	**Total P** mg/l	**Total N** mg/l	**Coliforms**
Raw Sewerage	225	225	10	35	$5x10^7$/100ml
Reticulated Sewerage		20	30	<10	4
	0.01/100ml				
Biocycle	20	30	2.1	7.2	0.01/100ml
Envirocycle	20	30	***	***	0.01/100ml
RUCK system	20	13	5	11	***
Ecomax	30	<0.5	<0.1	6	0/100ml
Clivus Multrum	***	3	8.5	<1.3	<50 for 1st 3yrs then 0/100ml
Aquarius 180FB	20	30	1	10	<10/100ml

BOD: Biological Oxygen Demand is defined as the amount of oxygen used by micro-organisms feeding on organic material over a given period of time;

SS: Suspended Solids refers to the amount of solid material (not dissolved) in a waste stream;

Raw sewerage is the waste stream before treatment and reticulated sewerage is the waste stream after secondary treatment at a waste-water treatment plant.

Source: Giduili *et. Al.* (1992) - averages were used where original data gave ranges.
Note: No data for Biolet, Rotaloo, Downmus, Lectrolav, and Taylex Clearwater 90.

APPENDIX V

LIST OF REPORTS

1. Report regarding a petition seeking legislation on various aspects of substantive law and procedural law relating to sex offences against children.

2. Interim report into links between Government agencies and the failed Western Women Group.

3. Second interim report into links between Government agencies and the failed Western Women Group.

4. Report regarding a petition requesting the Legislative Council to investigate whether the proposed dissolution of the City of Perth contravenes the Constitution Act 1889 or any other Act or Statute.

5. Report in relation to a petition requesting the ban on the use of fishing nets (other than prawn drag nets and throw nets) for recreational fishing in the Pilbara region and the phasing out of certain professional licence endorsements.

6. Report in relation to a petition concerning the export of iron ore through Esperance.

7. Report in relation to a petition concerning the town of Wittenoom.

8. Overview of Petitions: April 1993 - March 1994.

9. Overview of Petitions: May 1994 - December 1994.

10. Report in relation to a petition regarding the Port Kennedy Development.

11. Report in relation to the Electronic Availability of Statutes.

12. Report in relation to a petition regarding the Swan valley and Whiteman Park