PUSHING ON-SITE SEWAGE UPHILL

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Abstract

This paper presents an overview of a project where an on-site wastewater management system was developed. The approval process required for this project is discussed and used to illustrate the problems that on-site systems often encounter. While the project was eventually approved, the standards to be met were felt to be excessive, especially when compared to the existing standards and performance of centralised sewage treatment. The discrepancies between on-site approval and centralised sewage treatment are looked at, and recommendations made on how to level the playing field by considering the principles of Ecologically Sustainable Development.

Keywords

approval process, ESD, on-site sewerage, regulations

1 Introduction

Environmental Management was commissioned to design an on-site wastewater management system for a property on the outskirts of Sydney. The property was to host a number of large-scale meetings, where up to 400 people would camp no more than 10 days a year.

The report was produced in accordance with the requirements of AS/NZS1547, the new draft Standard to be published in late 1999, and developed a design that conformed to Environmental Protection Agency (EPA) policy that there be beneficial reuse and that the design should satisfy the principles of ESD. As always, the consultant's approach was to design a sustainable wastewater system that ensured that no pollution left the site.

The report, after submission to Council, was given to various regulatory bodies for comment. It was the nature of the responses from these authorities, and the requirements they felt were needed for this particular project, that raised concerns about the basic approach to approval of on-site wastewater treatment in NSW, especially when compared to the approval of sewage treatment plants (STP). It is this query that forms the basis of this paper.

2 The Project

An initial site investigation was conducted, the Site and Soil Assessment procedures in the draft Standard were followed, Talsma type tests were conducted to ascertain the saturated permeability (K_{sat}), and soil samples taken for later laboratory assessment.

Based on the results of the site assessment, it was decided that the best approach to ensure no pollution left the site was to contain all the wastewater generated by the meetings and have a controlled release in the months when there was no rainfall excess. It should be noted that Dr Robert van der Graaff, whose insights and expertise were of great value, assisted in the development of this approach.

It was proposed that septic tanks would be used to collect the wastewater generated at each amenity buildings, four buildings in all. These tanks would then feed into one large septic tank, sized to accommodate all the wastewater generated, and store it for months.

When the time was right for orchard irrigation (summer months), the effluent from the storage tanks would be filtered and then pumped to a sub-surface irrigation system located in the upper part of a lemon orchard. Importantly, this would occur only in the most suitable months. The impact that the

added nutrients would have in the environment, compared to the usual fertilising regime was considered in the design.

All in all, it was felt that the design was simple and elegant, especially as safety factors were integral to the design, such as:

- The amount of wastewater generated by the campers will be minimised.
- The wastewater would be applied over long periods, ensuring that the treatment capacity of the site will not be exceeded.
- The sub-surface irrigation area is upstream of a large farm dam that captured all runoff from the orchard and the garden areas around the home, as well as from the future camp sites. Should there be any discharge from the dam in times of very high rainfall, the already high dilution and the very high degree of prior treatment would result in only negligible off-site impacts.
- A system of monitoring, agreed to with Council, was to be installed.

It was therefore with some confidence that the design was submitted to Baulkham Hills Shire Council as part of the Development Approval (DA) process.

3 The Approval Process

A series of reports were submitted to Council for the development. The proponent of the development was also able to provide Council with a sound track record for a similar development elsewhere in Sydney.

The DA was placed on exhibition and also submitted to the EPA, Department of Land and Water Conservation (DLWC), Hawkesbury-Nepean Catchment Management Trust (HNCMT) and Cattai Catchment Management Committee (CCMC) for comment.

Council duly received submissions from residents and responses from the various authorities. The nature of the responses is the subject of this paper.

4 The Role of the Council

After the statutory exhibition period, Council provided a list of the 'Issues of Concern' that they developed from the responses received from residents. The residents' concerns were quite focused on the environmental impacts of the system and some were well presented. However, others reflected a lack of trust in the proponent – a natural reaction which is encountered with many developments.

The consultants duly prepared a response to Council, but because many of the issues raised were quite complicated, it was felt that it would be advantageous to have an on-site meeting with residents to explain the concepts and information to them. The community meeting was held, with representatives of the CCMC present as well. Ultimately, the residents and the CCMC agreed to the proposal, albeit grudgingly.

5 The Role of the EPA

Council had given a copy of the DA to the EPA for their comment. The first response to the on-site wastewater design was that "The EPA is of the view that a pump-out system for wastewater….should be considered as an appropriate method of disposal." This recommendation of the EPA was made despite the fact it is meant to "protect, restore and enhance the quality of the environment in NSW, having regard to the need to maintain ecologically sustainable development" (Baulkham Hills Shire Council, 1999), and despite the fact that it would be contrary to the NSW Guidelines (Department of

Local Government, 1998). It should also be noted that Sydney Water was not enthusiastic about receiving the extra load from such pump-out.

The consultants replied to the EPA, that the pump-out "would be taken to a sewage treatment plant. The conditions of operation allowed in an EPA licence for a sewage treatment plant permit some pollutants to be discharged to the waterway. In contrast, our system will discharge no pollutants." An Environmental Plan of Management was proposed for the development to address the concerns of the EPA.

The response was that pump-out was still the preferred option of the EPA.

The EPA gave the proposal to the Department of Health for their comment. It was at this point that the extraordinary issue of the lemon trees in the orchard was encountered.

6 The Risk of Viruses in Lemons

The Western Sector Public Health Unit (WSPHU) replied to the EPA that it too preferred a pump-out system for the project. The reasons given centered around the fact that the proposed system did not "demonstrate that there is no risk to human health.", and that there was a need for tertiary treatment. The consultants were initially unaware of the objections of the WSPHU, and were not provided with a copy of their letter for 7 weeks.

Once aware of the letter, a reply was prepared that dealt primarily with the question of likely contamination of the lemons through sub-surface irrigation, and the risk to human health. It was pointed out that it is impossible to demonstrate that there would be no risk to human health, as we are all subject to risk from when we are born. We can only ensure that the risk is slight or not significant.

In addition to asking for "no risk", the WSPHU then said the proposal needed to conform to the Australian and New Zealand Environment and Conservation Council (ANZECC, 1996) 'National Water Quality Management Strategy, Draft Guidelines for Sewerage Systems – Use of Reclaimed Water'. Specifically Table 4 in that document specifies that, for crops not in direct contact with reclaimed water, a level of <1000 thermotolerant coliforms/100ml is acceptable. It was pointed out that this level would mean there would be a risk to human health, as less than 1000 does not mean zero. Also, Table 4 referred primarily to flood or furrow irrigation, not sub-surface irrigation.

The WSPHU response did not change.

Fortunately, the doctorate of one of the authors (Rababah, 1998) had focused on the translocation of pathogens into the edible parts of lettuce plants via the root systems. His research found that there was no evidence that the edible part of the lettuces absorbed viruses through the root system. The distance from the root of a lettuce to the edible part is a matter of millimetres. For a lemon tree, a virus would have to travel several metres up a woody cambium to the leaves. It would then have to travel from the leaves to the fruit. During this travel, a virus would encounter so many cells, membranes and electronically charged surfaces, that it is inconceivable that the virus would not be immobilised. In Rababah's opinion therefore, the probability of lemons absorbing viruses was negligibly small. This was supported by research in other parts of the world (Bontoux & Courtois, 1998; Oron, 1998).

The EPA subsequently found the argument satisfactory and gave a licence without seeking further comment from NSW Health. The Department of Health (DoH) however, required us to meet the guidelines in 'Water Conservation by Reuse – Guidelines of the use of Recycled Water in NSW' (also known as Environmental Design Guide WP-7 of the former State Pollution Control Commission, and no longer used by the EPA).

The guidelines recommended were again for furrow or trickle irrigation, and required disinfection prior to reuse. The DoH were informed that as the proposal was for sub-surface irrigation, the system should not need disinfection as the travel path of the wastewater through the soil would remove most pathogens. This argument was not accepted.

Fortunately, Council took a common-sense view and negotiated with DoH on our behalf. DoH agreed to the proposal – with the requirement that there must be chlorination.

The consultants were not eager to include the use of chlorination, as this would harm both the lemon trees and the environment (Feachem *et al*, 1980). Ultravoilet radiation was suggested, but DoH was not sure about this new technology. Ultimately, however, approval was granted.

7 But What If The Property Was Connected To The Sewer?

The proposal was based on a wastewater system that reused water in a way that would have minimal health risk and maximum environmental benefits. International and domestic research supported the claims that such a system would have slight risks to human health. This was not enough! The consultants had to show that there was no risk to human health. When it was pointed out that this was not possible, answers were not forthcoming, rather the direction was given to proceed with pump-out. Logic would then dictate that pump-out is somehow better than the proposed system.

As a result, the consultants conducted an investigation on what pump-out for this development would have meant. The wastewater would have been collected and transported to the nearest STP. Would this result in no risk to human health? Such treatment would not provide better treatment, and in fact there would be a greater risk to public health from pump-out from the following sources:

- Accidents resulting in spillage from tankers;
- The sewage treatment plant, which would receive the pumped out material from the property, would discharge it either to Cattai Creek or to the Hawkesbury River.
- STPs in the Sydney Region regularly discharge pathogens to waterways, particularly during wet weather;

Sydney Water's EPA licenses permit finite discharges of pollutants and pathogens into waterways. For instance, Round Corner STP has a limit of faecal coliforms levels of 200 cfu/100 mL. It is argued that these limits do not constitute the "no risk to human health" that the proposal was required to achieve.

According to the ANZECC 'National Water Quality Management Strategy, Australian Water Quality Guidelines for Fresh and Marine Waters', the water quality guidelines for recreational waters indicate the following microbiological limits are allowed:

Table 1: Microbial Parameters for recreational waters

Parameter	Guideline
Primary contact	The median bacterial content in fresh and marine waters taken over the bathing season should not exceed 150 faecal coliform organsims/100 mL or 35 enterococci organims/100 mL. Pathogenic free-living protozoans should be absent from bodies of fresh water
Secondary contact	The median value in fresh and marine waters should not exceed 1,000 faecal coliform organisms/100 mL or 230 enterococci organims/100 mL

Moreover, details of Sydney Water's discharges from its STPs at Rouse Hill, Castle Hill and Round Corner were obtained. These plants are in the catchment of Cattai Creek.

Table 2. Faecal coliforms in discharges from STPs in the Cattai Catchment for 1996/7

STP	**Median** (cfu/100 mL)	**Maximum** (cfu/100 mL)
Castle Hill	6	22,000
Round Corner	1	590,000
Rouse Hill	4	6,200

From Table 2 it is clear that there are discharges contaminated with significant levels of faecal coliforms from these plants, placing the public at significant risk when compared with the ANZECC Guidelines. There is no monitoring of viruses but we can be quite confident that their concentrations would also have significant variation..

Sydney Water itself has acknowledged that sewage overflows "can be directly harmful to human health" (Sydney Water, 1999).

It is cleat that because the regulators use different standards for centralised sewage treatment, these systems are preferred over on-site alternatives in many cases, to the detriment of the environment, public health and the public purse.

8 How to level the playing field?

Two options are readily available to level the playing field:

1. Make on-site sewage systems meet the requirements for STPs;

2. Make STPs meet the performance standards required for on-site wastewater systems;

Councils, through Agenda 21, are already meant to "incorporate ecologically sustainable development principles into Council policy, planning and administration" (Baulkham Hills Council, 1999). Government Authorities and Departments are also meant to consider ESD in their policies and planning. Thus government must ensure the principles of ESD are applied.

Taking ESD into account, the authors propose that the standards for STPs should be raised to those required for on-site wastewater system. That is, the performance standards in the Local Government (Approvals) Amendment (Sewage Management) Regulation 1998, which on-site systems must now meet, should be applied to STPs with the same vigour.

The performance standards are as follows (DLG, 1998):

- the prevention of the spread of disease by micro-organisms
- the prevention of the spread of foul odours
- the prevention of the contamination of water
- the prevention of the degradation of soil and vegetation
- the discouragement of insects and vermin
- ensuring that persons do not come into contact with untreated sewage or effluent in their ordinary activities on the premises concerned
- the minimisation of adverse impacts on the amenity of the premises and surrounding lands, and
- if appropriate, provision for the re-use of resources (including nutrients, organic matter, and water).

9 Conclusion

The authors have shown that, by examining the approval process for a particular on-site wastewater system, the standards for approving on-site systems differ from the standards for licensing STPs. That is, the approvals system is predisposed towards centralised sewage treatment, at the expense of ESD.

It is further suggested that the performance standards in the Local Government (Approvals) Amendment (Sewage Management) Regulation 1998 should apply to both on-site systems and STPs.

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