Multiple Analysis Profile

CLIENT: **House Account**
PO Box 357
Pennant Hills NSW 1715
Attn: Simon Leake

PROJECT: Name: **Mobbs Effluent Disposal**
Location:
SESL Quote N°: Client Job N°:
Order N°: Date Received: **22/01/2010**

SAMPLE:

Batch N°: **12957** Sample N°: **1**
Name: **Control 800-1000**
Test Type: **MC, FSC, TP, TN**

Certified System TM
Quality
ISO 9001

Sydney Environmental and Soil Laboratory

Specialists in Soil Chemistry, Agronomy and Contamination Assessments

Tests are performed under a quality system certified as complying with ISO 9001: 2000. Results and conclusions assume that sampling is representative. This document shall not be reproduced except in full.

Sydney Environmental & Soil Laboratory Pty Ltd
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Thornleigh NSW 2120
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Pennant Hills NSW 1715
Tel: 02 9980 6554
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Analysis	Control Subsoil	Effluent Subsoil	Analysis	Effluent Water
pH (H2O)	5.42	6.63	pH	6.65
pH ($CaCl_2$)	4.92	6.12	EC dS/m	0.59
EC (dS/m)	0.33	0.12	Sodium mg/l	63.6
Units	**% of CEC**	**% of CEC**	Potassium mg/l	1.2
Sodium	9.5	3.3	Calcium mg/l	29.6
Potassium	2	5.9	Magnesium mg/l	6.7
Calcium	61.5	79.4	Phosphorus mg/l	16.4
Magnesium	25.6	11.4	Nitrate mg/l	<0.1
Aluminium	1.5	na	Sulphur mg/l	12.5
Phosphorus mg/kg	3.7	156	Chloride mg/l	80
Ammonium mg/kg	4.3	3.3	Total Dissolved Salts	378 mg/l
Nitrate mg/kg	2.3	14.6	Sodium Abs Ratio	2.75
Sulphate mg/kg	275	13.2		
Chloride mg/kg	98	<10		
Iron mg/kg	381	435		
Manganese mg/kg	3.6	10.5		
Zinc mg/kg	2.7	26.7		
Copper mg/kg	1.8	3.7		
Total Nitrogen %	0.02	0.03		
Total Phosphorus %	0.01	0.05		
Moisture Content %	14.6	17.0		

The most significant aspect of the water is the phosphate level. This level represents an unusually high level for most household effluent. The source is likely to be the sewage component as few household washing powders contain phosphate these days. Sodium and salinity is not an issue. Sodium Absorption Ratio is an indicator of the likelihood of a water causing clay dispersion and sodicity. The low SAR is a result of the water containing significant calcium levels which prevents socium accumulating. As a result the treated soil is actually lower in sodium than the control.

The control clay subsoil unaffected by effluent is strongly acidic, slightly saline and moderately sodic. It is possible that the soil has in fact been affected by the presence of concrete structures for many years since the calcium content is higher than would normally be expected for clay subsoils in this type of geology. The presence of an elevated sulphate may be natural but could also be a result of urban development.

The effluent treated area shows elevated phosphorus, nitrogen and zinc. Salinity is lower and the pH has risen as a result of the use of effluent which is near pH neutral.

Consultant: Simon Leake

Authorised Signatory: Murray Fraser

Date of Report 02/02/2010

END OF REPORT

Results Summary Profile

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Michael:

These results are very interesting and show basically that the only environmental consequence of the subsoil disposal system you are employing is a slow accumulation of nitrogen and phosphorus. The other soil properties of salinity, sodicity and pH are not an issue which demonstrates clearly that the levels of washing and dishwasher chemicals being used (mainly alkaline forms of sodium) are not having a long term detrimental effect on soil properties.

The issue of nitrogen and phosphorus accumulation are not yet so high as to cause great concern. The increase in zinc and to a lesser extent copper content is a result of the fact that our plumbing is made of brass and copper and that the modern human diet is quite high in zinc.

The reason that nitrogen and phosphorus are accumulating is clearly that input exceeds output. That is, at this depth of 800-900mm there is limited root activity and plants are not able to access the nutrients at a sufficient rate to match the input. In this sense your method is a water disposal method and not a reuse method.

There are basically two types of effluent management methods. water disposal where the water is disposed of subsurface and water reuse where water is applied to the surface topsoil so that plant roots can take up the nutrients and in turn produce either food or carbon storage. Effluent disposal often has a longevity which we as effluent managers try to estimate for clients often in the context of a council application. Soils can store phosphorus by “fixation” which is where the soil minerals can lock up phosphorus in insoluble form that will not leach. Soils cannot store nitrate however and the only mechanism for management is either dilution to a point where no harm occurs to the environment, of to rely upon plant uptake.

As a rough estimate it would appear that you current system may start to product undesirable contamination of water tables with phosphorus and nitrogen in about another 10-15 years. All up the longevity will have been around 25-30 years which is not bad!

There are several things that can be done to increase the longevity perhaps indefinitely.

Firstly, you would be strongly encouraged to use more water in the garden. That is, increase the amount of above ground use in vegetable production and gardening. Increased use and extension of your hydroponic system would also help. If you don't have the time then plant lush ornamentals and water them liberally perhaps using a completely automatic system over the whole garden. Water the front garden and the median strip as well and plant lush food crops. You have plenty of water, use it, even when its raining so that the subsoil system gets as little as possible. The idea is to turn as much N and P into plant growth as possible.

Secondly, you could introduce minerals into your filter than can lock up phosphorus. There are many minerals that lock up P. A commercially available product is “Phoslock” that may be appropriate. Such minerals do have to be replaced regularly as, once saturated with phosphorus they will no longer be capable of locking it up.

Another method is to introduce aluminium or iron sulphate into the system. Iron and aluminium phosphates are insoluble and will precipitate in the storage tank where they can be removed occasionally as sludge builds up.

Unfortunately there is no chemical method of removing nitrogen. The only method is plant removal or denitrification which occurs in stagnant water where nitrate is turned back into nitrogen gas and sent back to the atmosphere from where it came. A bog garden for example will remove large amounts of nitrogen by both plant removal and denitrification. Your present bog garden could be extended and integrated into the water treatment system so that water is only disposed of after it has had a period in the bog garden and not straight from the water tank.

Happy to discuss these issues further but basically all is well with a caveat over N and P in the longer term. This is the best data I have seen from a very intensive effluent disposal system over 10 years of operation.

Consultant	Authorised Signatory	Date of Report
Simon Leake	Murray Fraser	02/02/2010