A CRITICAL LOOK AT CURRENT GUIDELINES FOR EFFLUENT DISPOSAL: A PRACTISING SOIL SCIENTIST'S PERSPECTIVE

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Abstract

This paper examines the requirements for effluent disposal and discusses these together with the need for accurate parameters for assessment of individual sites and the impact of Government Guidelines.

Keywords

Assessment, disposal system, effluent, impact, soil, parameters

1 Introduction

It is essential that all developments, in the application of sound science and technology, are formed on the basis of sound technology and science. This paper will develop the effects of a specific mis-interpretation of soil science in the area of disposal of effluent waters.

There have been numerous examples throughout the world, where failure to use these principles has resulted in off-site effects on a large range of people and land systems. A classic example is the failure by animal, crop and pasture production specialists to manage lands in such a way that a balance is maintained. In NSW alone, this has resulted in the acidification of over 5.85 million hectares of land.

2 The 1990's Example

In 1998, the Department of Local Government released the *"Environment and Health Protection Guidelines - On-site Sewage Management for Single Households"* (DLG, 1998). The intention of this document was to provide a complete operational guide to the development, by individual Councils, of on-site sewage management for their own area.

However, the document is "compleat" with a range of errors which make it unusable by either the professional using this as a "Guideline", or the Council staffer, who is trying to use the "Guidelines" to assist people who are applying for Development Applications or even trying to put in a small "weekender".

3 Major Problems with the Guidelines

The guidelines (DLG, 1998) revolve around the correctness of Table 6 (page 68), which is filled with errors that even a first year University student would be able to perceive. These are errors from the most obvious to extremely obscure. In most cases, there is no basis for the items, which appear to be a "single" unit or a unit that has been "invented" for the exercise. Even when a unit "exists", the application is incorrect, misleading or likely to cause confusion.

In each case, there is no reference to the text as to an explanation of the soil feature or to a reasonable reference source.

4 Examples

4.1 Modified Emerson aggregate test

The classifications, as shown are incorrect, as Class 1 is the most severe limitation, whereas it is shown as minor.

4.2 Phosphorus sorption

Should be shown as kg/tonne (or mg/kg) of soil, as all soils have different specific gravities. All soils have the ability to fix phosphorus to some degree, and this should be measured as routine. Using units of hectares, when the areas used are in square metres, just further adds to confusion.

4.3 Cation exchange

This section is completely misleading, as few Australian soils would be > 15, with the majority of soils being between 5 and 10. There is no allowance for correction or changes in management systems of cation exchange capacity (CEC). Further, the depths for measurement are inappropriate.

4.4 Sodicity and exchangeable sodium percentage (ESP)

The use of sodicity on its own would be appropriate, but without any allowance for correction and the mis-defining of ESP as the predominant category is not valid. The use of ESP values in this manner is not clear.

4.5 Electrical conductivity

The units used are inappropriate.

4.6 pH

The units used are inappropriate (pH Ca). The International standard is pHw and the levels used are mis-leading.

4.7 Bulk Density

The ranges used are inappropriate and incorrect.

4.8 Coarse Fragments

There is no explicit method or rationale for these numbers.

4.9 Soil permeability category

This is an inappropriate method for this type of assessment and only causes confusion.

4.10 Depth to Watertable

There is no technical basis for these values. In fact, a very permeable soil with over 1 m to the water table would indeed be a problem!!!!

4.11 Depth to bedrock

Mixed with 4.12 and can be amended by the use of extra soil or larger areas.

4.12 Depth to Hardpan

See 4.11

5 General Comments

The water balance model only uses a 5 mm/week percolation rate (permeability). This rate allows virtually no deep infiltration through the soil into the subsurface watertable. A more realistic rate is required for this permeability. A rate of 25 mm/week has been adopted. This level was chosen after experimenting with the model. At this rate of percolation, acceptable levels of wet weather storage were achievable. This model

also includes the different and more appropriate rainfall data to that recommended in the guidelines.

Definitive interpretation of rainfall data indicates that 7th Decile rainfall data and the median evaporation data would provide a conservative estimate of wet weather storage requirements and reduce the probability of system failure due to soil saturation. With the lower permeability, soils would become saturated during wet months and losses due to evaporation would be lower. Assuming that there is little runoff or subsurface flow, then a much higher rate of percolation would occur simply because of the greater water potential near the soil surface, due to gravity and the lower pore pressure deeper in the soil.

Since there are no exact answers and all modelling achieves is an estimate, our methods have been designed so as to err on the side of caution; that is not provided in the guidelines.

The soil permeability categories are inadequate for determining the limitations of the soil in regard to waterlogging, percolation and runoff. The infiltration rate test is used to measure the capillarity of the soil. High capillarity allows vertical movement in the soil of water at much faster rates. Low capillarity will allow slow movement of water which will result in surface runoff or waterlogging.

Soil texture and structure do not give an indication of factors affecting water movement (capillarity). More important are pore space, pore size and water holding capacity which are determined by the infiltration test.

The percentage of course fragments in the soil will affect the rate of the infiltration test and is not necessary. Infiltration is greater affected by % course fragments with regards to limitations than would be determined from Table 6 (DLG, 1998). Bulk density has been incorrectly stated as per Table 6.

6 Basis for Comments

Reme Pty Ltd has been undertaking assessments for these types of applications for over 10 years and with little basic information that has been available for the local Municipal officer to use to assist in any "over seeing" role. We deal with over 20 Councils in the Eastern sector of NSW and undertake analysis for a further 10 to 20 Councils. There is a huge disparity in the application of the "Guidelines".

This is well shown with the errors in AS1547-1994, which are large. These errors have been brought to the attention of Standards Australia, but with no response to either facsimiles or letters over five years.

The errors in AS1547, just in one equation (B7.1) are over a factor of 1440 times, in just one equation.

7 Conclusion

The "guidelines" should be immediately withdrawn and a professional panel be assembled to correct errors, with all Municipal Councils advised of the errors. The professional panel must include practising soil scientists, with extensive practical and industry experience.

These types of documents, which are imposed on industry, with little or no consultation with practising technicians are to be deplored and are resulting in major imposed costs on industry and individual owners of property.

References

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