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AN EVALUATION OF THE SOILS OF TILLEY SWAMP AND MORELLA BASIN, SOUTH AUSTRALIA

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EXECUTIVE SUMMARY

This report aims to evaluate the soils of Tilley Swamp and the Morella Basin, north-east of Kingston in the south-east of South Australia in order to:

- determine the baseline physical/chemical condition/characteristics of soils/sediments at the Tilley Swamp watercourse prior to water storage
- identify the presence of impermeable subsoil barriers
- predict the possible affects to soil condition as a result of water retention for seasonal and yearly sequential water storage and assess the historical condition of soil materials (eg: watercourse inundated 2 years in 5)
- assess the likely extent and effects of sodicity to the soil as a result of water retention
- assess the potential for acid sulfate soils
- advise the appropriate wetting/drying regime for the Tilley Swamp soil type(s) and the subsequent associated risks to native and productive vegetation
- identify appropriate mitigation strategies for identified risks, and
- advise an appropriate monitoring program to measure impact or change to the Tilley Swamp watercourse as a result of water retention and subsequent changes to soil condition.

Soils were inspected and sampled in some detail at 26 sites and analysed for chemical, mineralogical and some physical properties.

The samples obtained in this survey should provide an adequate baseline for soil condition I the Tilley Swamp watercourse. Recorded locations and long-term storage of the samples will allow for future re-sampling and analysis, if required.

Several kinds of impermeable barriers, or barriers restricting downward movement of water or root development, exist in Tilley Swamp. Massive calcretes occur on the eastern side and around the margins of the potentially inundated areas. However, they can be discontinuous and undulate over distances of tens to hundreds of metres and are almost certainly cracked and not completely confining. Wet, reduced clays, which will restrict downward

water movement, underlie much of Morella Basin and the western side of Tilley Swamp. These features will also restrict root development, as will dense, compacted (dry) subsoils observed in Tilley Swamp.

The soils of the area are already saline and sodic, and have been so for a long period of time. Much of this condition is attributable to the proximity of the water table to the soil surface, and therefore extended inundation is unlikely to have a significant effect on suture soil condition. *The effects of accession of fresher water or water of significantly different ionic composition for different periods, potential soil leaching and evaporative concentration will require geochemical modelling.*

If the cation and anion composition of groundwater and drain water remain approximately the same as at present, a change in soil sodicity would not be expected.

Although there is evidence of some acid production near the top of the reduced water table, the acid is likely to be rapidly neutralised in this highly alkaline, calcareous environment.

Monosulfides in drains may be mobilised by increased flows, and its main effect is likely to be rapid de-oxygenation of the drain waters.

In the natural state, the soils and mature plants of this environment are adapted to inundation. However, the pasture plants of the agricultural areas in Tilley Swamp are not adapted and will not survive any prolonged inundation. A wetland plant specialist should be able to advise on this situation.

The main risks of water storage in Tilley Swamp watercourse (Morella Basin and Tilley Swamp) are:

- increased salination of soils if drain water is stored in the southern portion of Tilley Swamp which is less saline than the northern area
- de-oxygenation of inundated soils that contain a high organic matter content.

Both these risks exist naturally in these environments. To mitigate these risks it is important to manage large areas of standing water during the hotter parts of the year when evaporation rates are high.

A future monitoring program should include"

- confirming the distribution of inundation waters
- occasional re-sampling and analysis of soils
- continuous data logging of redox probes during an inundation event if further understanding of the reducing conditions is required
- checking the composition of salt efflorescences and monosulfidic oozes as indicators of environmental change.