THE MANAGEMENT OF WATER ACROSS LANDSCAPES OF SOUTH-EAST SOUTH AUSTRALIA

Preface to this Interim Report

I agreed to provide an independent assessment of the proposals for further drainage of land in the South-East of South Australia, with respect to their effect on water tables and potential impact on natural wetlands and their biota, at the request of Mrs Pip Rasenberg and associated owners of Parakie Wetlands. This interim report outlines the purpose and procedures of my assessment and my main preliminary conclusions. A final report will be available in October.

Terms of Reference

The following draft terms of reference were circulated before my visit to the area.

"DRAINAGE STRATEGIES FOR SOUTH-EAST SOUTH AUSTRALIA: PROCEDURES & CONSEQUENCES

Terms of Reference

1. To examine current proposals for drainage of selected areas of south-east South Australia with particular reference to objectives, basic assumptions, rationale, implementation-procedures, potential for adverse impacts, and ongoing management following implementation.
2. To review existing information about the soils and landscape hydrology of the regions to be affected by the drainage proposals with respect to sustainable agricultural production.
3. To examine ecological features of potentially affected areas, with particular reference to biodiversity, the presence of endangered species and species likely to be adversely affected by drainage, the extent and distribution of potentially affected wetlands, and the extent and distribution of saline and potentially saline areas.
4. To review and comment on any relevant alternative proposals with respect to their agricultural and ecological costs and benefits.
5. To comment on the likely effects of taking no action.

The Background

The South-East of South Australia is bounded by the Victorian border to the east, the southern ocean to the south and west and extends north to the boundaries of Kingston and Tatiara District Councils. Shallow "valleys" run north south between a series of low hills that are parallel to one another and to the coast. These were formed originally by sand dunes that were established behind a succession of prior coastlines. The soils of

the valleys between the hills were originally formed beneath the sea. Ranging from acid sands to alkaline clays, they are highly variable and therefore require careful management.

Commonly known as “The Limestone Coast”, this region is uniquely well watered for the driest State in Australia, itself the driest vegetated continent in the world. Groundwater occurs in unconfined aquifers throughout the region. Of low salinity (less than 500 mg/L) in the south, salinities then range from 500 to 1500 mg/L through the central and eastern parts, increasing further to even exceed 35,000 mg/L (the salinity of seawater) in the North-West (South East Natural Resource Management Plan, October 2003). Groundwater from a deeper confined aquifer in the southern part of the region ranges from 500 to 800 mg/L and forms an important source for agriculture and municipal needs.

During the wet season, which generally occurs in the winter, widespread surface flooding can occur throughout the remarkably flat topography of the shallow valleys. These floodwaters flow naturally from east to west and then south to north along a series of watercourses within these valleys, giving rise to a sequence of ecologically significant swamps and ephemeral wetlands of potentially high biodiversity, as indicated by those few systems that have been adequately surveyed. Several rare and nationally endangered aquatic species have been recorded and it is possible that more intensive investigation will reveal others.

However, these natural ecological benefits have to be balanced against the potential impediments caused by the presence of the floodwaters at this time of the year to agricultural endeavours, which form the economic basis of many of the landholders in the region. In summary, the main concerns appear to be centred on the impact of flooding on soil conditions. It is generally considered that the high water tables in areas cleared of complex native vegetation promote increase in soil salinity consequent on capillary rise of deeper saline water. Moreover, there is apprehension that water tables across the region have been progressively rising in the past few years, thereby causing further increases in soil salinity. There is also a general conception that the widespread replacement of natural vegetation with crops and pastures that tend to be overgrazed, especially in years of poor rainfall, have initiated various levels of environmental degradation of soil conditions, water quality and native ecosystems.

The Upper South East Dryland Salinity & Flood Management Program (The USE Program) was developed in the early 1990s to address these concerns and is in the final stages of its implementation.

The Issues

The main issues now confronting the authorities who are responsible for completing the Program and for the community they serve are summarised succinctly below.

- *Differing levels of certainty about the effectiveness of deep drainage.*
- *Pressure from some sectors of the community to replace proposals for deep drains with shallow drains, strongly opposed by other members of the community.*
- *General agreement within the community to conserve wetlands but with seemingly little agreement as how to do this.*
- *A propensity for some landholders to carry out extensive independent ecological manipulation within their properties that has limited accordance with the Government's program.*
- *Growing divisions between landholders in the area, leading to distrust and enmity between factions in the local community and between them and Government agencies.*

Consultation Procedures and Field Observations

Since my assessments of the environmental aspects of the situation were requested by about the beginning of September, I put other responsibilities aside and visited the area from 24th to the 29th of August.

This meant that I had little time for prior preparation and therefore did not have any fixed opinions prior to any discussions or observations during my visit to South Australia. However, it is necessary to point out three pre-existing factors that would be likely to influence my conclusions.

- My academic background in environmental matters and consequent concern for the maintenance of dynamic, effective ecosystems will undoubtedly affect my judgements.
- Hopefully this is balanced by a commitment to facilitate management procedures on agricultural landscapes that provide the best possible chance for landholders to establish reliable regular incomes from sustainable management procedures on their properties.
- Both of these are moderated by my training as a scientist and my experience of the value of adopting adaptive management practices ("learning by doing"), which entail a systematic, rigorous approach

to use and management of natural resources. This requires the setting of carefully considered objectives, establishing procedures based on experiences, or assumptions based on experience that are recorded beforehand, and then measuring the outcomes as a means of assessing the validity of the information used to establish the procedures. It is critically important that this procedure is initiated before the selected operation is commenced, so that before and after implementation measurements can be compared.

During my visit I had the opportunity to meet with the following people:

Charlie Bruce, Frank Burden, Chris England, Tony Gardner, Brenton Grear, Claire Harding, Dan Harley, Ian James, Jonas Kasauskas, Rob Kemp, Michael Leak, Keith McBride, Linton and Maureen McInnes, Kent and Rose Martin, Annie Moorehouse, Dean and Susan Prosser, John Ratcliff, David Rasheed, Alan Richardson, Pip Rosenberg, Patrick, Meg and Alec Ross, Peter Symonds.

In addition to discussions that covered a wide range of sometimes conflicting matters, I was able to examine environmental conditions in the areas covered with natural vegetation around the Parakie wetlands and on farmlands belonging to Patrick Ross, Keith McBride and Linton McInnes. These isolated ground level examinations were complemented by an aerial survey in a small aircraft piloted by Ian James and accompanied by Patrick Ross and Pip Rosenberg from about 1000 ft above the ground. The survey commenced from the airstrip in Ian James' property, "Cooranga", at Woolumbool to the Coorong and back, flying over Tatiara Swamp, Fairview Drain, Marcollat Watercourse, Bimbimbi Swamp, Jip Jip, Bakers Range Watercourse, the Cortina Lakes, Pitlochry Station, the large deep drain flowing into Morella Basin, Salt Creek, the Coorong, Tilleys Swamp Watercourse, Mandina Welands, Henry Creek, Big Telowie Swamp, Double Swamps, Grey Teal Swamp, Rocky's Swamp, Tee Tree Swamp, Smith Swamp, Par Hill Wetlands, Bakers Range Drain.

During and subsequent to my visit to South Australia, I have been consulting various papers, reports and documents relating to the management of the South East of the State. The large number of these is indicative of the interest in the area and of the concern to manage its resources as effectively and as responsibly as possible.

Preliminary Conclusions

In spite of the large quantity of information, which I still want to examine, I feel able to draw some preliminary conclusions with a high degree of confidence largely based on my discussions in South Australia and on my experience over the last 6 or 7 years of the Natural Sequence Farming technology developed initially by Peter Andrews, to which allusion was made in a recent, 2-episode account of his experiences in the ABC television program, “Australian Story”.

I have no doubt that the relatively less saline, low density water derived from recent rainfall and stormwater run-off can accumulate in the upper strata of permeable soils, especially where the prevailing topography is very flat. This water then ‘floats’ on the more saline, higher density water derived from pre-existing ground water, which may have been derived from deeper percolation of earlier rainfall events, or from lateral percolation through the soil.

This water is then available to plants which have roots penetrating into this part of the water table. Where these plants comprise complex, species rich stands of native vegetation growing in soil, which is covered with leaf litter and decomposing vegetation, a significant proportion of the water vapour lost through plant stomata during the day is recycled back into the plants and the soil. This contrasts markedly with agricultural soils covered with crops or pastures.

Stable, multi-species stands of vegetation also decrease radiant heat loss from the surface of the earth with consequent beneficial impact on plant productivity. (W. Ripl, J Pokorny, pers.comm.)

I have so far found relatively little evidence of consistent, well designed collection of data measuring the impact on soil hydrology of the drains that have already been constructed. Objective 7 in the *Upper South East Dryland Salinity and Flood Management Program – NAP Prioroty Project Proposal* produced by the Upper South East Dryland Salinity and Flood Management Program Board for the Funding period: March 2003 to June 2007, provides an excellent example of what is required. This identifies the requirement for “An Adaptive Management System (is developed), and an Integrated Ecosystem Monitoring Program and Integrated Environmental Management Plan.” I believe it is important to implement this objective as a matter of urgency.

I accept that there is clear evidence of increase in soil salinity being caused by rising water tables in dryland areas from which woodland communities have been cleared. However, I have serious doubts that this phenomenon is widely manifest in the South East of South Australia. Indeed I have found no hard evidence to demonstrate the phenomenon,

though there are a number of statements assuming it to be the case. The assumption should be clearly stated in scientifically rigorous terms and investigated at a number of suitable sites in the area before further drainage based on this assumption proceeds.

In the meanwhile, in view of the uncertainty, now being expressed by a significant number of landholders, it would seem sensible to delay further implementation of the planned program, until hard data confirming effectiveness of deep drains have been obtained, particularly in light of Peter Andrews' demonstrations to the contrary.

For all these reasons, I see merit in placing an embargo on current proposals to construct the proposed Didicoolum and Bald Hill drains. This would then provide an exceptional opportunity to compare areas in which deep drains have been installed with adjacent areas that have not been so drained in a rigorously designed and adequately funded trial.

However, there is no apparent evidence of any adverse consequences of shallow drains and no evident opposition to their installation. It would therefore also be sensible to continue to design such drains and to locate them in consultation with landholders.

References

South East Natural Resource Consultative Committee (SENRCC). 2003. *South east natural resources management plan.* Mount Gambier. 263pp + App.

Upper South East Dryland Salinity and Flood Management Program Board. 2003? *Upper South East Dryland Salinity and Flood Management Program – NAP Priority Project Proposal.* 76pp.

David S. Mitchell
Adjunct Professor,
Faculty of Science and Agriculture,
Charles Sturt University,
ALBURY

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