Australian Government
Bureau of Rural Sciences

Salinity Inquiry
Submission No. 72.1

The Secretary
House of Representatives
Standing Committee on Science and Innovation
Suite R1-116
Parliament House
Canberra ACT 2600

Dear Mr Brown

In keeping with our undertaking to provide further information to the HORSCSIN Committee as requested following the joint Departments' of Environment and Heritage and Agriculture, Fisheries and Forestry/ Bureau of Rural Sciences' (BRS) presentation on 7th November, BRS has prepared the attached additional material for consideration by the Committee.

BRS has now brought together the results of salinity mapping for 10 catchments in eastern Australia. These results change the way we view and manage salinity by demonstrating that:

- salt is much more localised in the landscape than previously thought and only represents a salinity risk if it is likely to be mobilised
- airborne electro magnetic mapping (AEM) can be used in conjunction with other information to define the location and quantity of salt in the landscape and how it moves
- specific management interventions can be tailored to individual situations, substantially reducing the cost of managing salinity and minimising potential disruption to agriculture
- priority areas for AEM can be most effectively be established by compiling existing data and undertaking rapid community based stream surveys to identify sub catchments contributing major salt loads. This information will enable catchment management authorities to target areas where detailed AEM data collection are needed, identify sources of freshwater for protection and make well informed investment decisions for National Action Plan implementation strategies.

I trust this additional material will be useful in Committee deliberations.

Yours sincerely

P. N. O'Brien

Dr Peter O'Brien
Executive Director
Bureau of Rural Sciences
24 November 2003

Australian Government
Bureau of Rural Sciences

Additional submission by the

Australian Government
Department of Agriculture, Fisheries & Forestry
Bureau of Rural Sciences

To the

House of Representatives Standing Committee on Science and Innovation Inquiry into:

The Australian Government's role in coordinating the application of the best science in relation to Australia's salinity programs

November 2003

Salinity management strategy – the way forward

Salt is localised in the landscape
Airborne Geophysics, specifically AEM, has clearly demonstrated that salt is generally stored in quite well defined subsurface locations. Studies undertaken in 10 catchments in eastern Australia (Attachment 1) demonstrate that comparatively small areas store salt (Attachment 2). In all the localities examined, except the coastal Angas Bremer Plains, 35% or less of the area studied is underlain by salt stores.

Not all salt stores will be mobilised
Airborne electromagnetic mapping enables 3 dimensional mapping of locations of salt stores. Confirmation of the nature of these salt stores by calibration using new bore hole data allows hydrogeological modelling using the FLOWTUBE process to determine whether the salt stores will, or are currently being mobilised. Only 5-20% of the area of each locality investigated is underlain by salt stores that are likely to be mobilised.

Cost effective use of AEM resources
AEM provides a unique insight into the location and quantity of salt in the landscape and the conduits along which it moves. Survey of key areas, as demonstrated in the Billabung study (Attachment 3) can be extended to whole catchments using existing data, to substantially reduce the cost of the information needed to develop salinity management options. In the Billabung, flying 10% of the catchment and combining this with previously collected landform, soils, regolith and groundwater data provided farm scale salinity management options for the catchment at a cost of about 60 cents per hectare. However, containing the AEM costs requires careful selection of the key areas to be flown. An approach developed for the Mid Macquarie (Attachment 4) is a rapid, cost effective way to define the locations of the salt stores contributing to stream salinisation. This approach involves:

1. Compiling existing datasets

This involves bringing together existing climate, bore and other relevant biophysical data. These data are analysed to determine groundwater level trends to indicate areas where groundwater may be close to the surface or intersecting drainage features.

2. Conducting rapid stream Electrical Conductivity (EC) surveys

Rapid stream EC surveys are a cheap and quick method for locating salty "hot spots" in streams and rivers, and identifying sources of freshwater. The surveys can take advantage of existing infrastructure (bridges roads etc) from which to conduct survey measurements. With community involvement, costs can be kept low and surveys can be readily conducted on private land to give a more comprehensive coverage.

3. Determining likely extent of salt stores using the Groundwater Flow Systems framework

Stream EC data are overlain with the BRS Groundwater Flow System (GFS) framework to locate those sub catchments contributing significant salt.

4. Prioritisation of sub catchments for further work

Identification of salt stores and freshwater resources will provide catchment managers with enough information to determine the most significant assets to be protected and key areas where finer resolution data need to be collected using AEM and other airborne geophysical techniques. In the Mid Macquarie, this approach identified that about half the salt load was coming from catchments above the Burrendong Dam (outside the Mid Macquarie region), and that the remaining salt was stored in parts of the Little and Talbragar sub catchments. These areas have now been targeted for AEM data collection. Additionally, the Bell River catchment and the granitic areas of the Little catchment provide substantial fresh water flows. Extensive tree planting proposed for these areas will now not go ahead.

5. Design mitigation/remediation/interception activities

Combining the results from AEM and other airborne geophysical techniques, with hydrogeological modelling provides the information needed to develop specific management interventions for individual situations. These may include:

- land use change –rainfall recharge to the groundwater can be reduced by increasing the amount of evapotranspiration by planting perennial vegetation. This may mean adding a perennial pasture phase to annual cropping systems, or replacing annual with perennial pasture species. Tree planting may be an appropriate option on more rugged terrain or where additional benefits such as biodiversity are available.

- engineering solutions – such options may be required where large volumes of saline water are entering drainage systems and/or where the time scale of responses expected from land use change are too long.

In the Billabung (Attachment 3), land use change over 17% of the catchment (tree planting over 6000 hectares in the highlands, and conversion of 10,000 hectares of crops and annual pastures to perennial pastures) is expected achieve a 50% reduction in salt export to the Murrumbidgee, with limited impact on agricultural productivity.

Conclusions

Triaging of catchments' salinity problems through this method provides practical information to catchment managers for detailed planning of Implementation Strategies being funded through the National Action Plan. Engaging communities in stream sampling to measure salt levels builds community understanding of the nature of the problem in their catchment and will provide valuable data which can be used in strategic decision making at catchment, State and national levels and will contribute to the monitoring and evaluation framework currently being developed by governments.