Submission to the House of Representatives inquiry into the coordination of the science to combat the nation's salinity problem.

I am a freshwater ecologist who has spent a considerable proportion of my professional life researching the effects of salinity and saline water disposal on freshwater biodiversity. I have live in both a rural and urban environment and understand the complexity and sensitivity of issues associated with salinity. I am currently principal investigator on a salinity related project in the National Rivers Contaminates Program (jointly funded by Land and Water Australia and the Murray Darling Basin Commission). I have previously been a principal investigator of project in the National Dryland Salinity Program. I am happy to expand on this submission if requested.

I wish to make the following submission to your inquiry addressing your terms of reference.

1. Use of salinity science base and research data (including the development of new scientific, technical and engineering knowledge) in management, coordination and implementation of salinity programs.
2. Linkages between those conducting research and those implementing salinity solutions, including the coordination and dissemination of research and data across jurisdictions and agencies, and to all relevant decisions makers (including catchment management bodies and land holders).
3. Adequacy of technical and scientific support in applying salinity management options.

Salinity is a major environmental, economic and social problem in Australia and is likely to worsen. Unfortunately there is no magic bullet that will cure salinity and there is therefore a need for wide ranging multidisciplinary research into combating, adapting to live with salinity, predicting its impact and rehabilitating salt affected areas. However, as management and policy decisions cannot be held off until the completion of research programs, a two pronged approach is needed. 1. Assembling the best current knowledge, preferably taking into account uncertainties using a risk based approach, to tackle questions that need immediate answers to facilitate current policy, management and action. 2. Medium- and long- term investigations that will provide improve information for those implementing salinity solutions.

Focusing on my area of research expertise, it is widely stated that increased salinity levels will have major impacts on the freshwater environment. It is accepted that if rise in salinity of waterways can cause major damage to freshwater ecosystems. There is, however, uncertainty as to how much salinity can rise before impacts occur. Some

researchers have even suggested that Australian freshwater biota may be more salt tolerant than those from other continents. There are many different plants and animals that inhabit Australian inland waterways with varying, and in most cases unknown, degrees of salinity tolerance. In addition, there is uncertainty as to the degree to which salinity can affect a species indirectly (by affecting more sensitive species that are its prey, predators or competitors). Greatly complicating the situation further, many changes in salinity co-occur with other environmental changes that may have impacts themselves or alter the impact of salinity. Not to mention, the potential for regional differences, and differences between rivers and wetlands, in the response of freshwater biodiversity to changes in salinity.

It is thus currently impossible to objectively ascertain whether or not a particular change in salinity will, or will not, have adverse effects on freshwater ecosystems. It is even more problematic to consider the environmental effects of proposed management actions that have costs and benefits associated with them. For example, although wide-scale planting of deep-rooted vegetation will have benefits by lower underground saline water tables, such planting will result in reduced flow in rivers. This reduction in flow will have environmental costs. Another example is drainage or pumping of saline water and then disposing of it into waterways. Such management might have benefits to the area where the saline water is removed but there may very well be costs to the waterway that receives this saline water. Evaluating management options and comparing the merits of different options is thus currently largely speculative.

Even where there is nothing that can be feasibly done to stop salinity levels in waterways rising it is still useful to know whether the predicted rises will likely have adverse effects. For example, knowing that a population of an endangered species is likely to be eliminated by rising salinity and that salinity levels could not be reduced in the geographic area where the population resides would indicate to managers that resources to protect this species would be better spent on other populations. Luckily in many cases there are management actions that can be used to alter salinity levels. Without objective information of the affects of changes in salinity on the freshwater environment such management options cannot be optimally deployed.

Stakeholders want answers to these and other questions (see box below) now. Unfortunately, in many situations all that can be given is best guesses. While we will have to use these best guesses for the time being, if we do not conduct significant research, we will still be making the same best guesses in 10 and 20 years. Much of the past research into the effects of salinity on freshwater biodiversity has focused on assembling existing knowledge to aid best guesses. Evidence for this is provided by the many Australian reviews on this topic (Hart *et al.* 1990, 1991; Metzeling *et al.* 1995; Ryan and Davies 1996; Bailey and James 2000; Nielsen and Hillman 2000; Clunie *et al.* 2002; Nielsen *et al.* in press). These eight reviews do not reflect a large amount of research being conducted. While assembling this information is an important task, filling the many knowledge gaps that these reviews identify is more important for the long term management, policy and action.

Some key questions where research data would greatly improve management and policy decisions, include.

- What is the minimal amount that salinity can rise before impacts occur to freshwater environments?
- Do the effects of salinity differ between geographic regions and between different inland aquatic ecosystems?
- What is the effect of different ionic composition on the impact of salinity on aquatic organisms?
- Salinity rarely, if ever, occurs in isolation to other changes in the natural environment. Saline water disposal has been shown to be associated with changes in water quality other than salinity. What is the combined effect on aquatic biota of salinity and other changes in water quality?
- How can saline water disposal schemes be managed so that they do not impact on the aquatic environment or if they do, that their impact is minimal?
- Can aquatic ecosystems that have been damaged by salinity be restored? And if they can, how is this best achieved?

A lot has been said about the need for linkages between those conducting research and those implementing salinity solutions but this is difficult to do in practice. Salinity solutions and projection of biodiversity are implemented by a range of private individuals, all levels of government, non-government groups, etc. While salinity research is conducted mostly from research organizations in government and universities. Coordination across these diverse groups - with their conflicting interests, reward systems, etc. - is always going to be difficult. Good communications, cooperation and collaboration across the various players are very important but difficult.

I am often frustrated by the lack of proper monitoring of the effectiveness of management options. Monitoring is often poorly funded or the first to be cut. Some people may fear that monitoring programs will find that management interventions are not as affective as their proponents claim. Others may feel that resources are best allocated in doing something about the problem rather than monitoring. Such views are short sighted. If we do not properly monitor and report on the effectiveness of management interventions, we cannot know their outcomes and learn what succeeds and what does not.

Salinity research is coordinated and funded by a number of federal and state bodies, CRCs and other institutions. Also, to take in the broad range of hydrological, agricultural, economic, political, sociological, engineering and environmental issues, salinity research is conducted across a number of disciplines. The interdisciplinary collaboration that is needed will be difficult and challenging to coordinate, fund, conduct and optimally aid those implementing salinity solutions. Although difficult, it is essential for the long term economic, environmental and social sustainable of significance parts of Australia.

Given the inherent difficulties associated with interdisciplinary collaboration, resources and energy are not only needed for the research and communication but also for coordination. As no perfect model has emerged so there will be need 'experimentation'

with different approaches. The National Dryland Salinity Program (NDSP) is, however, a useful model to consider. The NDSP not only involved the funding of many worthwhile research projects but also brought together people implementing salinity solutions and researchers with diverse interests. The NDSP also engaged communication consultants to ensure both the findings of research and the needs of those implementing salinity solutions were communicated to a wide audience. One promising point is that in developing models for multidisciplinary salinity research and collaboration with those implementing salinity solutions useful model for other difficult issues facing Australia are likely to emerge.