# Saving water on Sports Ovals in Canberra

Dr Richard Stirzaker
CSIRO Land and Water
PO Box 1666
ACT

# Executive summary

## Background

In the 1980s, the then Technical Services Unit (TSU) of the ACT Parks and Conservation Service embarked on a comprehensive program to save water on ovals and public places in the ACT. Their most notable achievement was to translate their considerable research experience into a computer based irrigation control system, called Comtrol. When Comtrol was launched in the early 90s it brought about large savings in water.

Ten years later Canberra Urban Parks and Places decided to review the operation of Comtrol, to see if it was still delivering up to expectations. The project was carried out in two phases. During Phase One, detailed soil water monitoring was carried out at O'Connor oval for a six month period to establish if and how further water saving could be made. Monitoring was extended to two further ovals during Phase Two, whilst the work at O'Connor was continued. The data were compared with precision measurements of cool season turf water use in Canberra conducted by CSIRO Land and Water.

## Main findings

Comtrol is a management tool, a fault reporting system and an irrigation scheduling package. This study only evaluates the third aspect, that of irrigation scheduling.

The study showed that there is still more water to be saved on Canberra ovals, probably exceeding 20%. These savings can be captured by three strategies. First, the study has identified the Comtrol settings that need to be adjusted to achieve greater efficiency of water use. Second, a program of simple monitoring is required to manage the risk involved in change. Third, benchmarking of performance will enable the worst ovals to be targeted first and will provide an assessment of which changes are yielding the most impact.

### *1. Changing Comtrol settings*

The changes required to the setup of Comtrol relate to the irrigation frequency, active root zone depth and the way potential evaporation is calculated. Central to the Comtrol philosophy is the idea that each watering should rewet the entire root zone and the interval between irrigations should be as long as possible without stressing the turf. This aim is not being achieved.

The data showed that the 'little and often' irrigation strategy employed at O'Connor over summer only wet the top few cm of soil, while maximizing the potential water lost to direct evaporation. Irrigation requirements tended to be over-estimated in autumn, causing substantial wastage of water.

The use of a shallow rooting depth makes it extremely difficult to make good use of rainfall, because Comtrol keeps 'topping up' a small storage reservoir. The data showed

how poorly rainfall was utilized. Monitoring at Hawker and Garran ovals showed that turf used water in the 100 – 300 mm zone, a zone ignored by the current Comtrol setup.

Crop factors were developed for Canberra using an evaporation pan in Fyshwick. An evaporation pan at Canberra airport is now used for calculation of turf water requirements. Being situated in an open and windy position, it may not be representative of most ovals in Canberra. Cumulative Epan measured at the Canberra Airport was considerably greater than that measured at the CSIRO Ginninderra experimental station and this bias is propagated to every oval in Canberra. The change should be made to using reference evaporation, data easily obtainable from weather stations.

There may also scope to reduce the Comtrol crop factor from 0.65, particularly in the autumn and spring periods, as the soil was generally maintained too wet.

***2. Simple monitoring***

Adjustments to rooting depths, crop factors and potential evaporation required to save water would also increase the risk to the irrigation managers. Simple soil water monitoring is needed to assist irrigation managers to make decisions that could, if things went wrong, have serious consequence for the quality of the turf.

Continuous soil water monitoring, such as that carried out at O'Connor oval, provides more information than is necessary for routine irrigation management. The cost of installation and data collection across all ovals would be prohibitive. The task is to come up with a minimal set of measurements that would offer maximum value to the manager.

During the study the Wetting Front Detector performed the task of providing simple feedback extremely well. However there are other inexpensive sensors that could fulfill this role of simple monitoring.

***3. Benchmarking***

Savings in water use will be captured incrementally as change to Comtrol settings are introduced step by step. Incremental improvement requires benchmarking of performance. Comtrol reports the irrigation run times and flow meter readings but only stores the data for a few weeks before discarding it. We have no way of knowing, for example, whether more or less water was used at O'Connor in 2004, compared to 2003 or if Hawker oval received more water than O'Connor.

All that is required is a weekly or monthly printout of irrigation run times and flow meter readings from each oval. It is much more cost effective to identify 'outlier ovals' and fix big problems, than it is to squeeze the last 10% efficiency from an oval that is adequately managed.

There has been recent discussion about a complete upgrade of Comtrol. In my view this is unnecessary for the purpose of benchmarking. In order to calculate the potential water

savings to O'Connor oval during Phase One, a simple daily time step spreadsheet model was developed. The model uses rainfall and evaporation pan data for Canberra from the Bureau of Meteorology and requires only the daily (or weekly) flow meter readings as an input from Comtrol. The model then predicts how much water should have been applied at each oval and predicts which adjustments to Comtrol settings (e.g. crop factor, rooting depth) have the potential to produce the greatest savings.

# Recommendations

Water savings on Canberra ovals of around 20% could be achieved by action on the following three recommendations.

**Recommendation 1:**

*Change to Comtrol settings and input data*

There is scope to increase the active rooting depth beyond 100 mm and to reduce the crop factor from 0.65 during spring and autumn. This will serve to lengthen the irrigation interval and therefore improve the efficiency with which rainfall is used. Consideration should be given to using reference evaporation calculated from weather station data instead of pan evaporation (Allen et al. 1998).

**Recommendation 2:**

*Monitoring of soil water storage*

Some form of simple soil water monitoring is required to mitigate risk and to bridge the gap between the Comtrol prediction and what is actually happening on the ground. The choice of the tool used would depend on available budget.

**Recommendation 3:**

*Benchmarking performance*

Savings in water use will be captured incrementally as change to Comtrol settings are introduced step by step. It is essential to know how much water is applied to each oval, how this changes over time, and which management changes yield the greatest benefits. A complete upgrade of Comtrol is not required for this.