Appendix C: Future depth to watertable

Future depth to watertable maps were created for key areas assuming the continuation of current salinity control works but no additional investment through the salinity program. The key areas chosen to determine future depth to watertable maps were based on the availability of bore monitoring information and the proximity to saline discharge areas and include:

- The Salinity Management Areas covering the Macalister Irrigation District and surrounds;
- Areas around observation bores in the southern regions of the Port Albert and Foster Salinity Management Areas;
- Areas around observation bores in the southern regions of the Bengworden Salinity Management Area.

There is no shallow aquifer bore monitoring data for the other Salinity Management Areas, so future depth to watertable maps could not be created.

C1 Future depth to watertable in the Macalister Irrigation District and surrounds

Existing calibrated groundwater models for Nambrok, Clydebank, Maffra and Heyfield Salinity Management Areas were used to predict the watertable depth in 2020 and 2032 under the base case scenario of:

- average rainfall;
- the current Groundwater Control Pumps installed under the Lake Wellington Catchment SMP groundwater pumping program and earlier, operating at full levels;
- private groundwater pumps operating at average levels;
- conversion from flood to spray irrigation of 515 hectares per year across the Macalister Irrigation District which is the expected future rate of conversion (see Section 6.4.3 for further details)

Further information on the groundwater modelling in the irrigated Salinity Management Areas is given in Sinclair Knight Merz (2004a in prep). The future depth to watertable for the Boisdale Salinity Management Area was not determined due to the absence of a groundwater model for the area. The Boisdale Salinity Management Area contains less salinity than the other irrigated Salinity Management Areas and the capital cost of compiling a groundwater model for the area could not be justified.

The predicted depth to watertable map for the Heyfield, Maffra, Nambrok and Clydebank Salinity Management Areas in 2032 is given in Figure 15. A summary of the current and future areas of less than 2 metres depth to watertable for each of the modelled sub-regions is given in Table 80.

- **Table 80: Current and predicted future depth to watertable from modelling results. Future depth to watertable assumes average rainfall and continuation of current salinity control works (eg private and public pumping and conversion from flood to spray irrigation)**

Salinity Management Area	Year	Area of less than 2 metres depth to watertable (Ha)	Percentage increase in area of less than 2 metres depth to watertable from 2003 levels
Nambrok	2003	5110	NA
	2020	5760	13%
	2032	6410	25%
Clydebank	2003	9290	NA
	2020	10270	11%
	2032	10210	10%
Heyfield	2003	3310	NA
	2020	3420	3%
	2032	3270	-1%
Maffra	2003	2050	NA
	2020	2040	0%
	2032	1810	-12%
Boisdale	2003	1530	NA

It is important to note that there is a large degree of uncertainty in the modelling results presented in Table 80 (estimated $\pm$20%) and care should be exercised when interpreting the results. The modelling assumes average rainfall conditions over the next 28 years and there is likely to be a large deviation from the results presented in Table 80 and Figure 15 if the long term rainfall is significantly greater or lesser than average.

The modelling results indicate that the future change in depth to watertable across the irrigated Salinity Management Areas is likely to vary spatially. Some areas are likely to increase while others are expected to decrease. The degree of change also varies so that there may be a large increase in one area and only a small increase in another. The spatial distribution of flood and spray irrigation and the varying soil permeabilities will affect the impact of flood to spray irrigation conversion.

The figures in Table 80 show that despite the salinity control measures already in place in the irrigated areas and the continuing conversion of land from flood to spray irrigation, the watertable will continue to rise in the Nambrok and Clydebank Salinity Management Areas assuming a return to average rainfall conditions. The watertable is likely to remain steady in Heyfield. In Maffra, the existing salinity control measures and continued conversion of land from flood to spray irrigation are likely to result in a decrease in area with a high watertable.

The significant investment into public groundwater control pumping and the free flowing bore network through the Lake Wellington SMP and even as far back as the 1960s has reduced the water levels in many parts of Nambrok and Clydebank. Without public groundwater control pumping and the free flowing bores, the area affected by a high watertable in these areas would have been significantly larger. These programs have also alleviated the salinity problems around the pumps.

C2 Future depth to watertable in the Bengworden Salinity Management Area

An investigation into salinity in the Bengworden region predicted an average future trend of increasing groundwater levels of approximately 24mm per year assuming a return to average rainfall (Sinclair Knight Merz, 2002b). This trend was applied to the 2003 groundwater levels in each of the monitored observation bores to determine the expected levels in 2020 and 2032. Figure 16 shows the predicted depth to watertable in Bengworden in 2032 assuming average conditions. The predicted changes in area of less than 2 metres depth to watertable are given in Table 81.

Table 81: Predicted change in area of less than 2 metres depth to watertable in the Bengworden Salinity Management Area assuming a return to average rainfall.

Year	Area of less than 2 metres depth to watertable (Ha)	Percentage increase in area of less than 2 metres depth to watertable from 2003 levels
2003	6000	NA
2020	6090	2%
2032	6290	5%

The results in Table 81 suggest that if no action is taken, by 2032 the area of less than 2 metres depth to watertable is likely to increase by about 5% assuming a return to average rainfall conditions.

C3 Future depth to watertable in the Port Albert and Foster Salinity Management Areas

A trend analysis on the bore monitoring network in South Gippsland was undertaken as part of a review of the bore network (SKM, 2004b). This analysis found the trends differed geographically ranging from steady at Sandy Point to average increases of 45mm/year in the Won Wron area. A predicted 2032 depth to watertable map was compiled (Figure 17) assuming a return to average rainfall. The percentage change in depth to watertable across the Salinity Management Areas is shown in Table 82.

Table 82: Predicted change in area of less than 2 metres depth to watertable in the Port Albert and Foster Salinity Management Areas assuming a return to average rainfall*

Salinity Management Area	Year	Area of less than 2 metres depth to watertable (Ha)*	Percentage increase in area of less than 2 metres depth to watertable from 2003 levels
Port Albert	2002	20110	NA
Port Albert	2020	24590	22%
Port Albert	2032	25840	28%
Foster	2002	5990	NA
Foster	2020	6040	0.8%
Foster	2032	6050	1%

* The limited monitoring bore network in the South Gippsland region restricted the creation of depth to watertable maps. There are a number of areas on the South Gippsland depth to watertable maps for which no data was available so these figures should be taken to be an underestimate of the area of less than two metres depth to watertable.

The results in Table 82 indicate that in the dryland areas of the Foster and Port Albert Salinity Management Areas the watertable is expected to continue to rise assuming a return to average conditions and landuse remains essentially unchanged.