5. Summary of salinity management options in the context of groundwater flow systems

The purpose of this section is to summarise and elaborate on the key salinity control options presented in the previous section. The characteristics of the groundwater flow system is just one of a myriad of factors which determine the most appropriate landuse change to affect salinity and other natural resource management issues. It is beyond the scope of this study to delve into these issues in any great detail. Rather, the discussion below highlights some regional generalities about some of the key management options and provides direction on future activities to ensure salinity control options are appropriately targeted at a local scale, have community support and are integrated with other natural resource management issues.

5.1 Tree planting for recharge control

The characteristics of the groundwater flow systems presented in the previous sections highlights significant opportunities for tree planting to reduce current and future salinity. Many of the saline and high watertable areas are in local groundwater flow systems which provides the opportunity to influence salinity over shorter periods of time than would be possible with intermediate and regional systems. Tree planting can also have significant benefits to other natural resource management issues such as biodiversity, soil erosion and water quality. There is also potential to provide a commercial return from trees through either farm forestry or commercial forestry operations. However, commercial tree growing is likely to be only economic in the higher rainfall areas of South Gippsland and Red Gum Plains.

A regional map (Figure 28) was created of tree planting priorities for recharge control based on the following criteria:

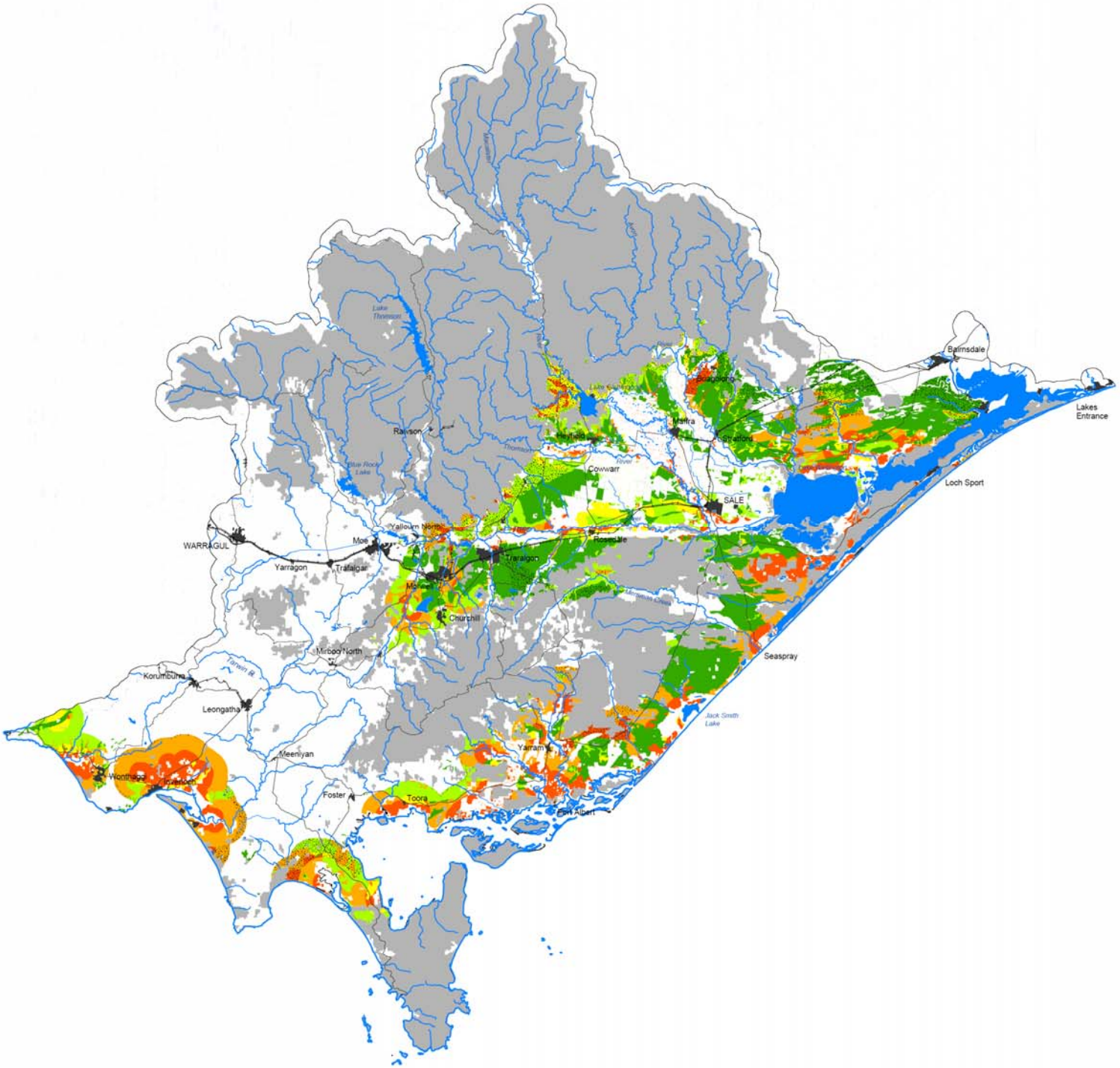
- **Scale of groundwater flow system**. The local scale flow systems were given a higher priority over the intermediate and regional scale systems because they are likely to respond more rapidly to landscape change such as tree planting.
- **Proximity to saline areas or areas of elevated water table**. The areas closest to the saline areas were assigned a high priority for tree planting to address current salinity issues. Similarly, the areas closest to high water table areas (but not currently salinised) were assigned a high priority for tree planting to address future salinity issues.
- **Soil permeability**. The soils with a very high, high and moderate permeability were given a higher priority than the soils with a low, very low and very very low permeability (see Figure 28). This prioritisation is on the premise that trees will have the largest effect on salinity if targeted towards the high recharge areas.
- **Landuse.** The following landuses were assigned a zero priority for tree planting for salinity control:
  - existing forested areas,
  - irrigated areas. (Tree planting is not expected to make any substantial difference to salinity in irrigated areas due to the increased recharge caused by the irrigation. Also, the high value of irrigated land makes tree planting a larger opportunity cost.)
  - urban areas;

- existing saline areas and areas of less than 2metres depth to water table. (Trees in these areas are either not likely to survive and/or may actually promote land salinisation);
- areas of less than 2m AHD elevation. (These low lying areas tend to have an elevated water table and are therefore, not particularly suitable for tree planting and/or are in coastal areas dominated by primary salinity. The focus of tree planting is to address secondary (induced) salinity rather than primary (natural) salinity).

The resultant map shows priority areas to address current and future salinity. The map is intended for use at a regional scale only and is not intended for use at a local scale to plan particular tree planting activities. For instance, the regional map does not take into account the following:

- the groundwater flow directions and the need to plant trees in areas up-gradient of saline discharge or high water table areas;
- the likely magnitude and timing of the impact (although the prioritisation of local scale flow systems above intermediate and regional scale flow systems partly addresses this issue);
- the capability of the land and climate for growing trees;
- the environmental, social and economic costs and benefits of tree planting (including the multi-benefits to farm forestry and biodiversity); and
- the other potential landuse changes that can reduce salinity (eg perennial pasture establishment).

There are a number of additional steps required before local scale maps can be produced for use in planning specific tree planting activities for salinity control. These steps are shown in Figure 4 and described in Section 6.



Department of Primary Industries

West Gippsland shallow groundwater flow systems

TREE PLANTING PRIORITIES FOR SALINITY CONTROL

0 10 20 30 40 50 Kilometres

Existing Forest Cover (1995)

Tree Planting Priority

Current Salinity

- Very High to address current salinity
- High to address current salinity
- Medium to address current salinity
- Low to address current salinity
- Very Low to address current salinity

Future Salinity

- Very High to address future salinity
- High to address future salinity
- Medium to address future salinity
- Low to address future salinity
- Very Low to address future salinity

No Priority

Note
White areas are too far from saline or high water table zones to have an appreciable salinity effect, saline areas, areas of less than 2m depth to water table, urban areas, areas of less than 2m AHD or irrigated areas.

SKM

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Refer to Sinclair Knight Merz document
WCMS\wc03157\techincal\spatial\arcmap\
WC03157_treeplanting2_A4.mxd

Figure 28

5.2 Perennial pasture establishment

The opportunities for new improved perennial pasture establishment are limited by:

- The lack of recharge reduction resulting from the replacement of perennial for annual pastures in high rainfall areas (say, greater than 600mm/year);
- The existing predominance of improved perennial pastures in many of the local groundwater flow systems containing salinity (eg Inverloch and Yarram saline areas); and
- The lack of areas suitable for lucerne establishment due to inappropriate soils and water logging in some areas.

In addition to improved perennial pastures, there are likely to be substantial areas of existing native perennials. The disturbance or replacement of these native perennials should be discouraged from a salinity control perspective.

Although the quantification of perennial pasture effects on salinity has yet to be undertaken, information from other areas suggest that perennial pastures alone are unlikely to have a substantial effect on salinity without the use of other measures such as tree planting or engineering options. Based on the rainfall map (Figure 30), perennial pastures are only likely to be suitable as a salinity control measure in the lower rainfall areas of:

- The Giffard Plains and Loch Sport areas of GFS10 and GFS11. Lucerne is unlikely to be applicable due to waterlogged soils and the predominance of summer rainfall. Native perennials or other sown perennials are likely to be more suitable (eg cocksfoot/phalaris).
- The Bengworden and Red Gum Plains areas of GFS 7, 8 and 12. There is currently a dominance of annual pasture, capeweed and bracken on the sandy dunal systems of GFS 7 in the Bengworden region that could potentially be replaced by lucerne or woody perennials such as tagasaste.

5.3 Engineering options

Although engineering options tend to have a relatively rapid effect on salinity, they are generally expensive and can only be economically justified when protecting high value assets. Also, their technical feasibility can often be limited. Sometimes they can be justified in the intermediate and regional groundwater flow systems where recharge control methods may take too long to have an effect. The high value irrigated dairy and beef enterprises in the Macalister Irrigation District (GFS 9) is an excellent example where groundwater pumping is both technically feasible and can be economically justified.

Other areas where engineering options may be potentially applicable include:

- Protection of urban salinity areas (eg Rosedale) – a study is currently underway to investigate the extent and significance of urban salinity in the region;
- Protection of key wetlands and lakes – there are a number of existing engineering structures to reduce the saline inflow from the Gippsland Lakes to fringing wetlands;
- Protection of coastal tidal flats from the ocean ingress in the South Gippsland region – there are already approximately 65 kms of sea walls in place along the South Gippsland coast although there is a question on their overall environmental benefits given they have radically changed the tidal ecology of these areas;

- Potential for groundwater pumping in the areas of secondary salinity in the Yarram, Inverloch and Bengworden regions. The shallow groundwater aquifers in these regions are yet to be investigated to any great extent so the technical feasibility of groundwater pumping in these areas is yet to be proven.

5.4 Living with salt

In areas of secondary salinity, where recharge control measures cannot be justified or will take too long to have an effect (eg intermediate or regional systems), there is a strong argument for treating the symptoms through the planting of salt tolerant crops and pastures. There may also be an argument for use of salt tolerant crops and pastures in areas of primary coastal salinity where agricultural production is a local asset and an economic driver for the region.

From the analysis in Section 4, the key areas for the planting of salt tolerant crops and pastures include:

- The irrigation induced salinity in the dryland fringe areas of the Macalister Irrigation District (GFS 9);
- The saline areas of the Red Gum Plains and Bengworden regions (GFS 10 and 11);
- The saline agricultural land around Lake Coleman (GFS 10, 11 and 13); and
- The saline agricultural land around Yarram (GFS 11).