TECHNICAL NOTE

Vegetation Monitoring for Proposed Drainage Project in the Yarra Yarra Catchment

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The Yarra Yarra Catchment Management Group (YYCMG) is a community-based landcare organisation, with offices in Kalannie and Perenjori. At present, there are four full-time employees, four part-timers, several casuals and numerous volunteers. The group was formed in 1997 from the Kalannie-Goodlands Landcare District Committee to co-ordinate projects on a regional, catchment-wide scale.

Drainage in the Yarra Yarra catchment (Basin 618 in the Southwest Drainage Division; Fig. 1) is internal. There are no permanent waterbodies. Intermittent surface runoff makes its way along streamlines in some 60 subcatchments to a chain of ephemeral saltlakes. Some of these lakes, like the 60km-long Lake Mongers, are clear landscape features; in other parts of the chain, such as the 40 km section between Morawa and Three Springs, there is a broad expanse of depressions and saline flats, loosely connected in flood times by poorly defined migrating channels.

Fig 1. Location of the agricultural portion of the Yarra Yarra basin and the Northern Agricultural Region (NAR).

The entire lake system extends about 300 km from saline wetlands near Kalannie to Yarra Yarra Lake near Carnamah. The fall along this length is only about 40 m, which gives an average gradient of 0.013%. There is a weak connection downstream with the Moore River system, but this appears to be confined to a deep aquifer in the palaeochannel. No continuous flow of surface water has been reported in historical times.

From a landcare perspective, the problem is that many of the streamlines, which should be conducting water across the landscape, are blocked. Instead of discharging to the saltlake chain, runoff is being ponded along valley floors, and in lower- and mid-slope depressions. Because there is little deep-rooted vegetation to take up and transpire this water, it seeps down through salty horizons in the subsoil, and causes the groundwater table to rise. Wherever this groundwater comes to within a metre or two of the surface, crops and remnant vegetation are severely affected. Only a few specialist plants, such as saltbush and samphire, are able to tolerate this combination of waterlogging and salinity. Many valley floors, which once supported native vegetation or productive farmland, have now been abandoned as samphire flats or salt scalds (Figs 2 and 3).

Fig. 2 Samphire flat

Fig. 3 Salt scald

Eventually, if nothing is done to relieve the problem, agriculture will be confined to topographic highs. The only native vegetation to survive, apart from communities of specialised plants, will be upland scrubs. Tall eucalypt woodlands might remain at a few mid-slope locations, but they will almost certainly be under intense pressure.

The proposal by YYCMG is to rehabilitate the major streamlines by excavating deep drains or by de-silting existing channels. The newly excavated banks or levees would be revegetated with herbs and low shrubs. This entire earthworks complex would then become the axis of a bushland corridor – nominally 100 m wide but, after negotiations with the landowner, considerably wider than that on uncropped samphire flats and somewhat narrower across productive paddocks.

Most importantly, a governance system will be established to manage the drains in perpetuity. This will involve a rigorous schedule of monitoring and maintenance.

The excavation that YYCMG envisages is a double-leveed deep drain, with shallow drains on either side (outside the spoil banks) to carry surface water (Fig. 4).

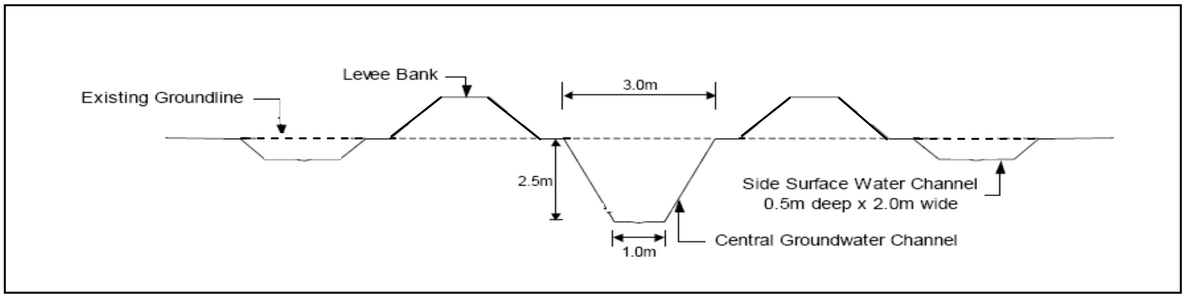

Fig. 4. Cross section of proposed drain, showing the separation of groundwater and surface water.

A system of buried pipes and flow-on areas will ensure that groundwater and surface water can be kept separate until the final discharge. There are a number of advantages with this design.

- Peak flows after storms are reduced, which means that there is less erosion and decreased maintenance requirements.
- Road crossings, which are an expensive component of drain construction, do not need to be so elaborate.
- Groundwater is likely to be hypersaline and might also become acidic and moderately toxic. If a requirement develops for pre-disposal treatment, then it would be easier to deal with a discrete and steady flow.
- Surface water, which is relatively fresh, can be redirected as required to revegetation plantings on the valley floor.

Other distinguishing features of our design are that the spoil-heaps will be draped-over with topsoil and will be closely revegetated with grass and shrubs. The entire drain complex (deep drain and shallow drains) will become the core of a 100 m-wide revegetation corridor (Fig. 5). This is expected to provide biodiversity benefits to the landscape by creating new habitat and linkages between existing remnants. From a distance, the earthworks themselves will be barely visible. In ecological terms, however, the complex will function as a rehabilitated waterway.

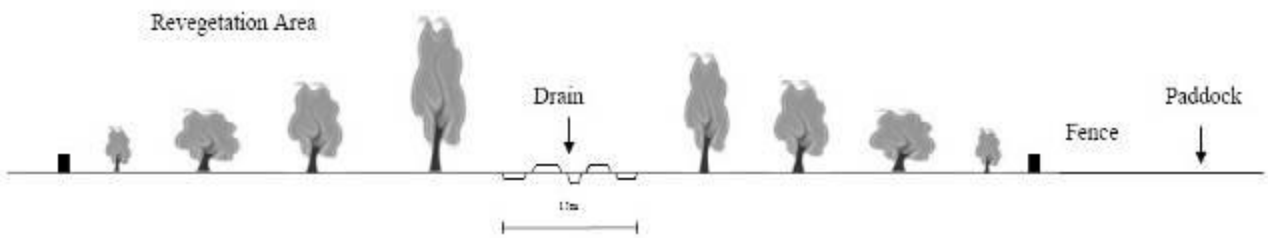

Fig. 5 Idealised cross section of a rehabilitated waterway.

These are no ordinary farm drains. Nevertheless, they share an important feature with many farm drains in the Southwest: groundwater is discharged into the environment. Many of the drains proposed by YYMCG discharge directly into playas and saline wetlands in the Yarra Yarra saltlake chain.

At least some of the groundwater is likely to be of poor quality – low pH, high titratable acidity, high salinity, and high concentrations of iron and aluminium. In certain situations, acid groundwater might also be associated with high concentrations of heavy metals (such as Cu, Pb, Cd, Hg), rare earths (e.g. La, Ce) and radio-elements (e.g. U, Th). We believe that many of these elements are locked up in stable or semi-stable minerals deposited in the drains themselves. Little is known, however, about the chemistry of drain environment or of saline wetlands.

The monitoring system being set up by YYCMG includes the usual array of flumes, observation bores and piezometers to measure hydrological/hydraulic performance. It also includes a substantial program (together with the Department of Water, Department of Agriculture & Food, and CRC-LEME) to examine the geochemistry and mineralogy of the drains, the disposal area, and adjacent soils. A glaring absence is the biological component – tracking impacts on the ecology of the downstream environment.

There are no guidelines that prescribe exactly how biotic monitoring should be carried out in drainage projects. In fact, it may be impractical or otherwise undesirable to set up inflexible procedures. Nevertheless, we would like to devise a set of minimum standards, at least for the Yarra Yarra, so that future staff can set up and (more importantly) persevere with monitoring programs. A consultant (yet to be appointed) will monitor aquatic invertebrates at discharge and control sites throughout the region.

It seems intuitively likely that deep drains will change the vegetation in many of the discharge areas by altering the period of inundation and waterlogging. Whether water quality also has a significant impact, will surely depend on the local situation. The accompanying map shows where we would like to see sites established to monitor vegetation impacts.

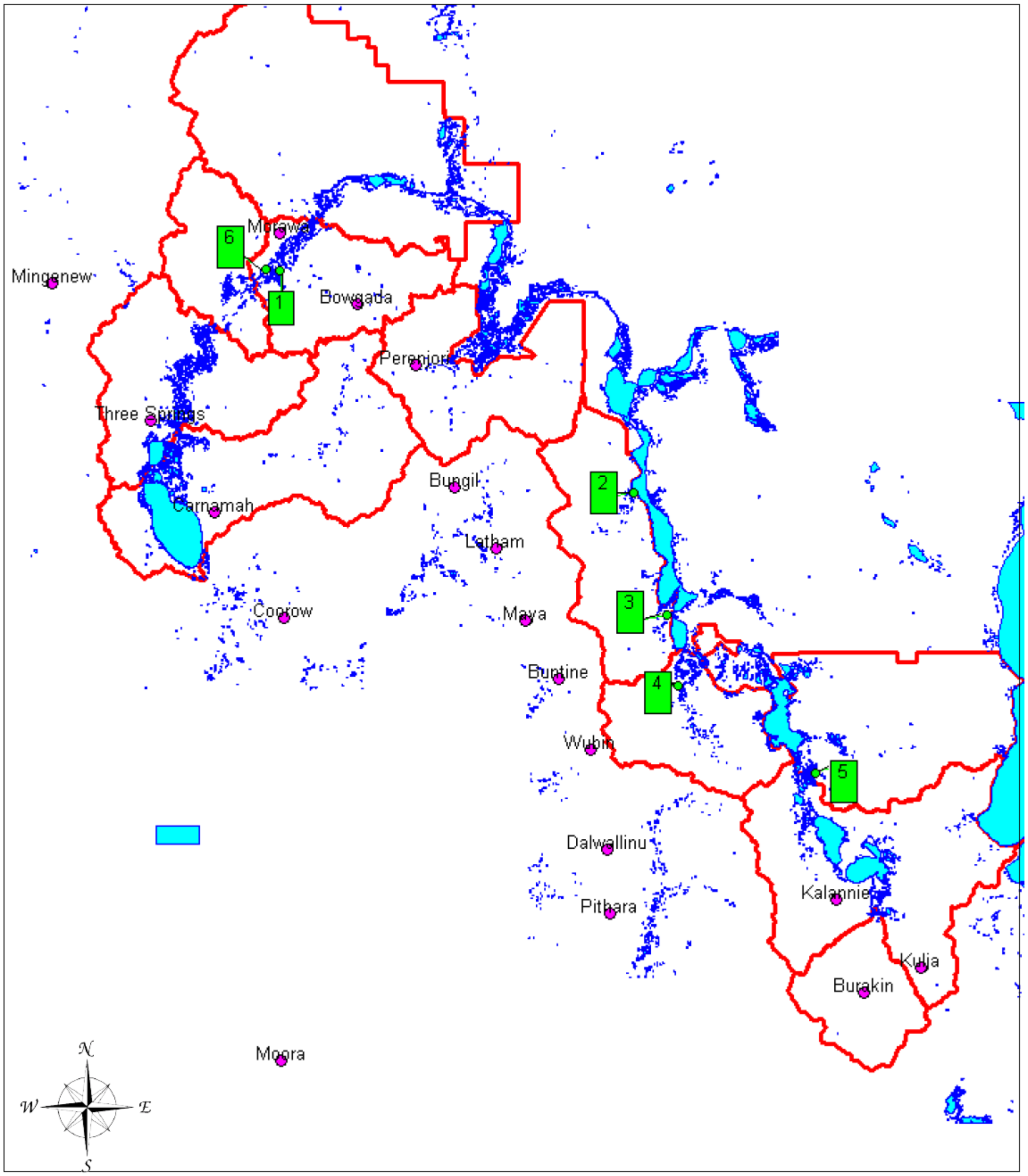

Fig. 6. Location of proposed vegetation-monitoring sites, numbered in order of priority. The areas outlined in red are sub-catchments in the Yarra Yarra basin.