



# EFFLUENT IRRIGATION OF LAND

Increasingly, water authorities are recognising the benefits of properly managed effluent irrigation. At the same time, treatment and discharge (load-based licensing) costs are steadily rising, driven by the need to mitigate the effects of effluent discharge on surface water and groundwater, together with ever-tightening water quality standards. This trend has encouraged a move towards land-based treatment of wastewater. In a well-designed system, the overall impacts on groundwater quality are generally small, but the potential remains for by-products of effluent irrigation to compromise groundwater quality.

Assessment of the diverse impacts of effluent irrigation on underlying groundwater resources demands a broader approach than that employed in conventional contaminant hydrogeology practice. C. M. Jewell & Associates Pty Ltd (CMJA) has a considerable depth of expertise in investigations of land effluent irrigation sites. Our wide range of innovative investigative tools include electromagnetic, aeromagnetic and DC groundwater geophysics, aerial-photogrammetric analysis, soil/sub-soil surveys, drilling investigations and specialised water sampling methods. Analysis of field data is planned at a level appropriate to the project goals, but may include estimation of infiltration rates, calculation of groundwater velocities, contaminant mass balances, geographic analysis (using digital GIS technology), groundwater modelling or contaminant transport modelling.

Each project is tailored to the requirements of the client, and takes into account the need to provide supporting information to regulatory authorities or project management.

CMJA's hydrogeologists offer an impressive range of project experience in the field. Completed projects cover a number of industries such as feedlots, sewage discharges, milk-processing facilities, dewatering re-injection and landfill leachate discharge. Several of the more interesting examples are given below.

## ***Impact of expanded effluent irrigation, Gooloogong, NSW***

Moxey Farms' proposals to expand dairy effluent irrigation were assessed in relation to their potential to impact on underlying groundwater. An alluvial sequence hosting a multi-layer aquifer system was somewhat vulnerable to groundwater quality alteration following the irrigation of dairy effluent over areas of pasture and land used for fodder production. Investigative work comprised extensive electromagnetic surveys to identify higher permeability sand lenses, DC resistivity soundings to enhance depth resolution, backhoe test pit examination, soil permeability testing, drilling of boreholes into the unconfined aquifers and delineation of pre-irrigation groundwater quality. Using the results of these investigations, CMJA identified pasture areas with greater sensitivity and developed a program to monitor shallow groundwater quality.

## ***Wastewater storage and irrigation scheme, Bannockburn, Victoria***

CMJA was asked to assess the likely impact on groundwater of a proposal to store and irrigate sewage wastewater on land. A geological and electromagnetic survey of the site indicated that once excess fluid passed through residual soils and subsoils, groundwater would move laterally in alluvial sands towards a local creek. It was recommended that the storage basin be relocated, and shallow groundwater quality monitored.

***Potential effluent re-use sites, Dubbo, NSW***

In the Dubbo area, much of the effluent produced by the sewage plants is disposed of via effluent irrigation. Expected future increases in the amount of effluent generated by the sewage plants prompted Dubbo City Council to identify additional sites suitable for effluent irrigation. CMJA was commissioned to review hydrogeological conditions of the proposed sites, and to make a preliminary assessment of the potential impact of effluent irrigation on groundwater resources at each site.

***Small-scale on-site effluent disposal systems, City of Blue Mountains, NSW***

CMJA has conducted numerous site suitability assessments for on-site effluent disposal systems within the Blue Mountains. Such a process involves assessing the regional and local topography and hydrogeology, and also identifying key soil characteristics of the site, including geology, soil profile and permeability, as well as soil pH and electrical conductivity. Assessments of this type help prevent risks to public health, prevent adverse impacts on the water quality of local watercourses and groundwater systems, and prevent the degradation of soils and native vegetation. Such studies ensure that the proposed effluent disposal system is functional and environmentally sound in the long term.

**How CMJA can help you**

We have the expert capability to deal with the complexity of issues and factors related to effluent irrigation assessments. Whether the project's requirement is to unravel complicated hydrogeological settings, to demonstrate nutrient cycling and geochemical processes, or to make reliable predictions of water quality impacts, CMJA hydrogeologists can meet that requirement.

The company also offers a full service consultancy in this field, from water sampling to expert testimony.