

Chapter 9 **Constructed wetlands**



Constructed wetland in Lynbrook, Victoria.

9.1 **Introduction**

Constructed wetland systems are shallow, extensively vegetated water bodies that use **enhanced sedimentation**, fine filtration and pollutant uptake processes to remove pollutants from **stormwater**. Water levels rise during rainfall events and outlets are configured to slowly release flows, typically over three days, back to dry weather water levels.

Wetlands generally consist of an **inlet zone** (**sediment basin** to remove coarse sediments), a **macrophyte** zone (a shallow, heavily vegetated area to remove fine particulates and uptake of soluble pollutants) and a high flow bypass channel (to protect the **macrophyte zone**) (e.g. Figure 9.1). They are designed primarily to remove stormwater pollutants associated with fine to colloidal particulates and dissolved contaminants.

Simulations using computer models are often undertaken to optimise the relationship between **detention time**, wetland volume and the **hydrologic effectiveness** of the constructed wetland to maximise treatment given the volume constraints of the wetland site. The relationship between detention time and pollutant removal efficiency is largely influenced by the settling velocity of the target particulate, although defining the settling velocity of fine to colloidal particulates is not a straight-forward exercise. Standard equations for settling velocities often do not apply for such fine particulates owing to the influence of external factors such as wind and water turbulence. Detention periods should notionally be about 72 hours to effectively remove nutrients in urban stormwater in Victoria.

The key operational design criteria for constructed wetlands may be summarised as to:

- promote **sedimentation** of particles larger than 125 μm within the inlet zone
- discharge water from the inlet zone into the macrophyte zone for removal of fine particulates and dissolved contaminants through the processes of enhanced sedimentation, filtration, adhesion and **biological uptake**
- ensure that the required detention period is achieved for all flow through the wetland system through the incorporation of a **riser outlet** system