

## Maintaining Dams

The following table summarises the strategies that can be implemented to overcome major problems that may be encountered with dams.

Damage	Cause	Remedial action
Erosion (rilling) of embankment	Water flowing over embankment.	Pack grass sods complete with soil into any rills formed.
Settlement	Poor compaction of the embankments of new dams.	Check the amount of freeboard as the dam fills. Top-up the level of the crest or lower the spillway inlet.
Cracks through the embankment	Uneven settlement	Cracks through the wall may lead to major failure. Professional advice should be sought.
Slumping and cracks along the embankment	A combination of poor compaction, excessive seepage and excessive steepness of embankment. Cracks running parallel to the crest length can collect rainwater and potentially activate a slide in the embankment.	Cracks along the length of the wall may point to future slumping and this could lead to major failure. Seek professional advice. Any cracks in the embankment should be moistened, ripped to a depth that penetrates into moist or compacted material, then moistened again if necessary. The ripped area should then be rolled and compacted to the original dam profile.
Seepage from embankment	Water moving through the embankment.	Check the upstream face for points where water may enter. Dig-out and repack seepage points on the upstream face of the embankment.
Tunneling through or under the wall.	Seepage lines in tunnel prone materials such as sand will readily turn into tunnels or 'pipes'.	As an interim measure these may be plugged with carefully compacted soil. A bentonite: sand 1:2 mix is sometimes used as a plug.
Vermin damage	Uncontrolled access of burrowing animals.	Dig out burrows and repack with clay based material. Maintain effective vermin control.
Wheel ruts and damage on the crest	Damage to the crest is often brought about by poor maintenance of the crest surface.	Wheel ruts on the crest interfere with surface runoff patterns and may divert water towards the outer batter. The embankment crest should be constructed with a slight grade to the inside to direct runoff away from the steep outside batter. Occasional re-grading of the crest is recommended to avoid such problems.
Pipelines and Valves	The most common site for dam failures is along pipelines through the embankment.	The outlets of pipelines should be inspected for evidence of seepage along the pipe trench. Valves on pipelines through embankments should be operated periodically to ensure satisfactory performance.
Weeds and Trees	Failure to manage vegetation.	A 150 mm layer of topsoil should be placed over the inner and outer batters to assist in the establishment of grass cover. All deep-rooted weeds, shrubs and trees should be removed as they appear.
By-wash damage	Damage to by-wash from erosion or poorly maintained vegetative cover.	Establish and maintain an actively growing, robust and relatively uniform vegetative cover. Fence off area, if necessary, to protect vegetation. Keep the spillway clear of debris, tall grass etc. Consider the installation of a PVC trickle flow pipe to intercept and divert consistent small flows which lead to difficulties in maintaining by-wash vegetation. Repair erosion as soon as damage appears.
Turbidity (cloudiness)	Erosion in the catchment or dispersive materials in the excavation. Nutrients running into the dam can increase algal growth.	Control sediment moving into the dam. Small quantities of sediment and nutrients in catchment flows can be intercepted by a heavily vegetated filter zone immediately upstream of the dam.
Wind damage to embankment	Wave action causing damage to embankment.	Lay stone or establishing runner grasses on the sides of the storage where damage is occurring and consider strategic location of trees and shrubs to act as a windbreak for prevailing winds.
Leakage	Poor construction or porous base materials.	Clay lining of the dam or treatment with Bentonite, polymer sealants or liners.

There are a number of publications available that give further information on dam maintenance, but it is imperative that the services of a professional geotechnical engineer be sought before any major dam remediation works are attempted.