Filter Ponds

DE-WATERING SEDIMENT CONTROL TECHNIQUE

Low Flow Rates	✓	Low Filtration	✓	Sandy Soils	✓
Medium Flow Rates	✓	Medium Filtration	✓	Clayey Soils	[1]
High Flow Rates		High Filtration		Polluted Soils	

[1] Capture rate of fine clay-sized particles may be poor, but can be improved through the use of high standard (thicker) filter cloth and/or incorporation of a *Grassed Filter Bed* or *Buffer Zone*.

Symbol

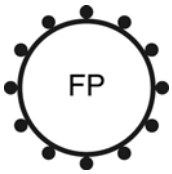

Photo 1 – Filter pond

Photo 2 – Compost-filled sock used to form a filter pond

Key Principles

1. Treatment of sediment-laden water is by the action of *filtration,* rather than gravity-induced settlement—thus its operation is different from a traditional Sediment fence.
2. The critical design parameters for the filtration process are the design flow rate per unit width of the sidewall (which is related to the make-up of the sidewall filter and depth of water), and the circumference of the pond.
3. Fabric should ideally be a non-woven geotextile suitable for *filtration*. For compost-filled socks (Photo 2) the sock can be manufactured from woven or sewn fabric.
4. Processes based on *filtration* generally vary in their treatment standard from 'low' for filtration through simple filter cloth, to 'medium' for filtration through sandbags and composite-filled socks.
5. The main purpose of the aggregate is to separate the settled sediment from the filter fabric. Only after the partial blockage of the aggregate with sediment will the aggregate help to contribute to the filtration process.

Design Information

The design of filter ponds is based the determination of the circumference of the pond based on the design inflow rate and the sidewall discharge rate per unit length. The sidewall discharge rate depends on the allowable depth of water within the filter pond and the material make-up of the sidewalls.

Figures 3 to 8 provide example of various sidewall configurations.

The maximum recommended sidewall discharge rate is 7 L/s/m^2.

Wherever practical, the filter pond should be located:

- up-slope of a significant grassed filter bed;
- at least 50m from a watercourse (Figure 2).

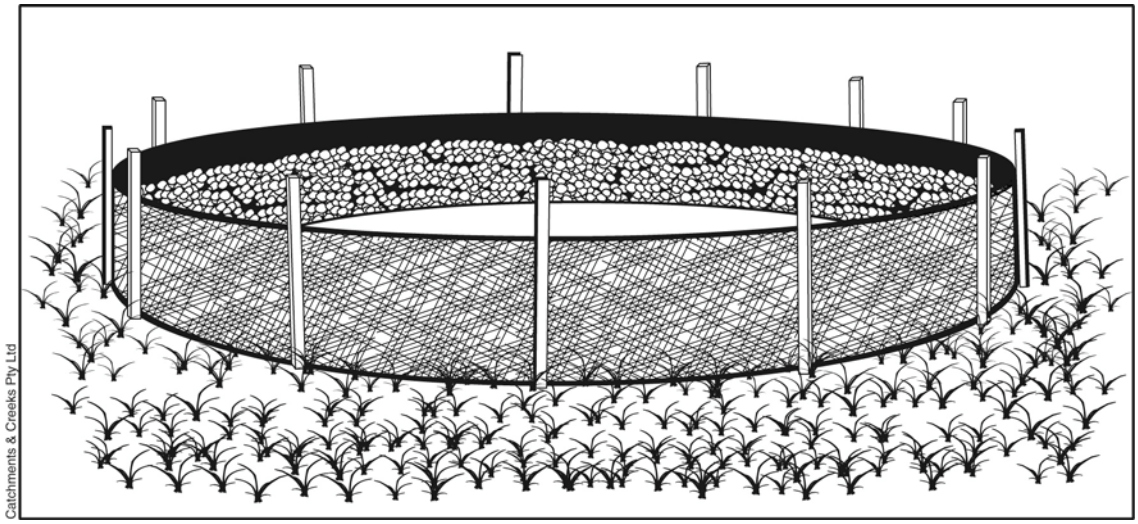

Figure 1 – Typical layout of a filter pond

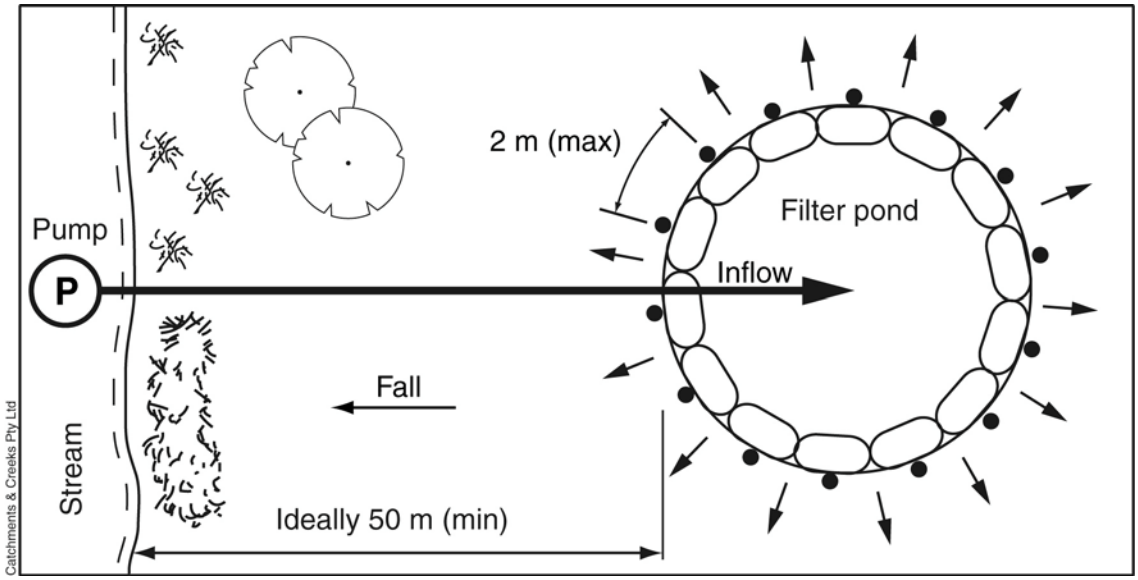

Figure 2 – Ideal placement of filter pond away for the edge of a watercourse

Example filter barriers:

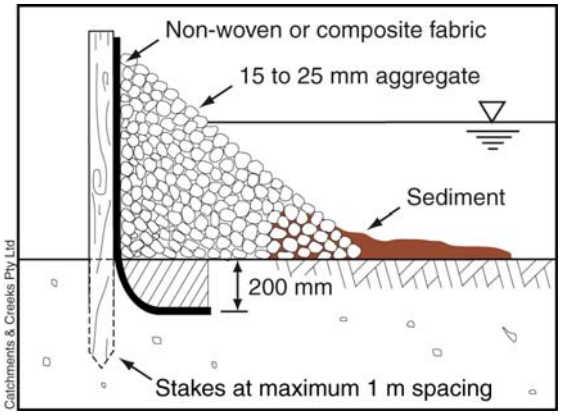

Figure 3 – Fabric and aggregate sidewall filter

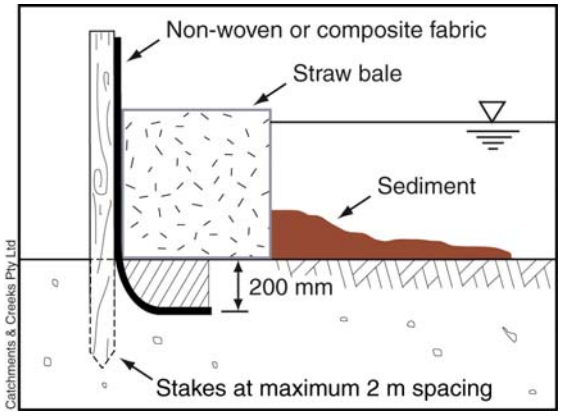

Figure 4 – Fabric and straw bale sidewall filter

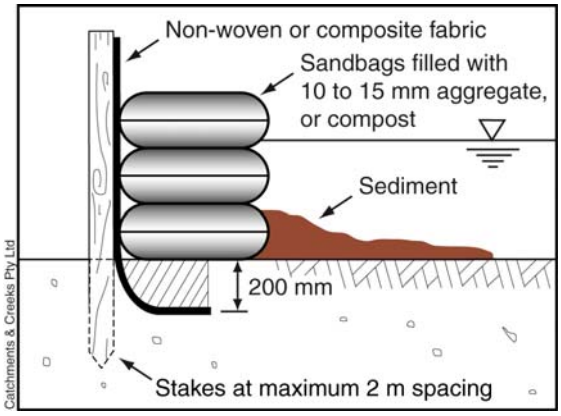

Figure 5 – Fabric and sandbag sidewall filter

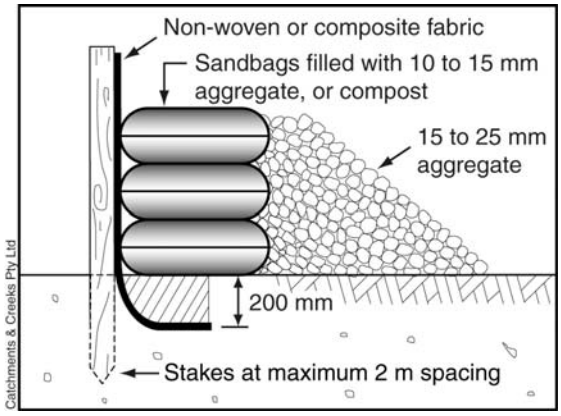

Figure 6 – Fabric, sandbag and aggregate sidewall filter

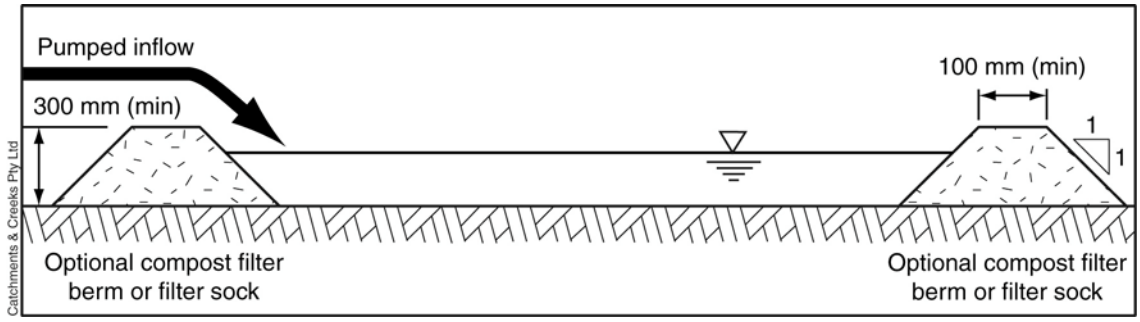

Figure 7 – Filter pond formed using a compost berm enclosure

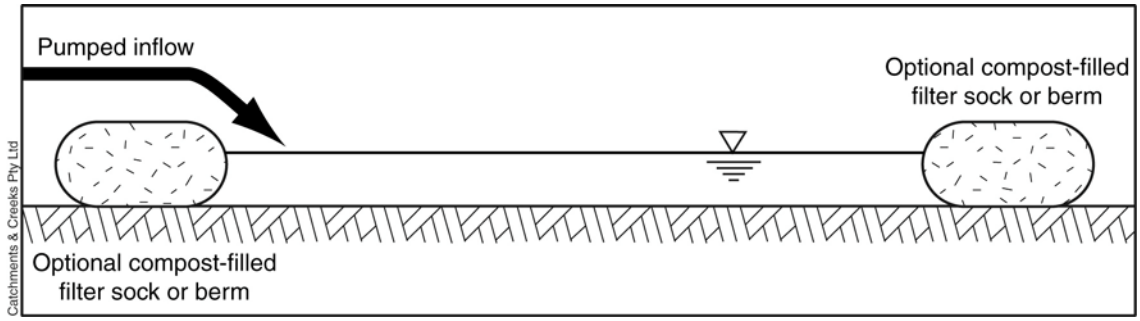

Figure 8 – Filter pond formed using a compost filter sock enclosure (Photo 2)

Description

An enclosed sediment trap into which sediment-laden water is pumped.

Sediment is filtered from the water as it passes through the sidewalls of the pond.

The sidewalls can be formed from many different types of the filter mediums, such as:

- Composite *Sediment Fence* fabric.
- Filter cloth lined (internally) with straw bales.
- Filter cloth lined (internally) with aggregate-filled sand bags.
- Filter cloth lined (internally) with aggregate.
- Compost berms or compost-filled socks.

Purpose

Filtration of medium to coarse sediments from pumped waters.

Limitations

Generally only suitable for low to medium flow rates depending on the sediment concentration of the water and the total surface area of the filter.

Advantages

Wide flexibility in the make-up of the sidewalls, and therefore efficiency, of the filter pond.

Disadvantages

Generally limited to relatively flat areas.

These traps can be subject to frequent sediment blockages.

Common Problems

Highly susceptible to sediment blockage of the filter, and maintenance/cleaning can be difficult.

Special Requirements

Generally requires an area of relatively flat land in order to allow an even flow of water through all sides of the filter pond.

Site Inspection

Check for tears or damage to the filter that may allow untreated water to pass through the filter.

Materials

- Geotextile fabric: either (i) composite sediment fence fabric manufactured from a non-woven, polyester or polypropylene geotextile reinforced with a UV-stabilised, woven fabric or polypropylene mesh, or (ii) non-woven filter cloth (minimum 'bidim' A34 or the equivalent).
- Support posts/stakes: 1500mm^2 (min) hardwood, 2500mm^2 (min) softwood, or 1.5kg/m (min) steel star pickets suitable for attaching fabric.
- Geotextile backing mesh: wire or steel mesh minimum 14-gauge with a maximum mesh spacing of 200mm.
- Additional internal filter: may consist of tightly packed straw bales, 25–75mm clean aggregate, gravel-filled bags, or other material sufficient to provide adequate filtration and/or separation of sediment from the outer geotextile filter layer.

Installation

1. Refer to approved plans for location, and construction details. If there are questions or problems with the location or method of installation, contact the engineer or responsible on-site officer for assistance.
2. Install the filter pond as a completely enclosed structure on flat or mildly sloping ground.
3. Wherever practicable, locate the filter pond at least 50m from the edge of a water body. Where not practicable, locate the filter pond as far as practicable from any water body.
4. Unless otherwise directed by the responsible on-site officer, excavate a 200mm wide by 200mm deep trench along the alignment of the outer filter barrier, placing the excavated material on the inside of the enclosure.
5. Around the outside of the trench adequately secure the support posts into the ground at a spacing no greater than 2m.
6. If non-reinforced filter cloth is to be used as the main filter barrier, then securely attach a backing mesh to the inside of the support posts from a continuous length of mesh. Extend the mesh from normal ground level to the maximum height of the filter barrier.

7. Using a continuous length of geotextile fabric, securely attach the fabric to the inside of the support posts using 25mm staples or tie wire at maximum 300mm spacing with the fabric extended at least 200mm into the trench. The completed filter barrier should be at least 450mm but not more than 700mm high.
8. Backfill the trench and tamp the fill to firmly anchor the bottom of the fabric to prevent displacement of the fabric and to prevent the free movement of water under the fabric.
9. If an internal filter is specified, place the filter against the inside the main filter barrier as directed or as indicated in the approved plans. The internal filter material should abut firmly up against the geotextile fabric and should form a continuous filter system with no measurable gaps that may allow water to bypass the filter.

Maintenance

1. Inspect the filter pond regularly and at least daily during de-watering operations.
2. Make repairs as needed to the filter barrier and support frame.
3. Inspect the filter medium for obvious leaks resulting from holes, tears or joint failure in the fabric.
4. Repair any torn sections with a continuous piece of fabric placed inside the old fabric, extending at least from support post to support post.
5. Dispose of all sediment in a manner that will not create an erosion or pollution hazard.

Removal

1. Remove all accumulated sediment and dispose of it in a suitable manner that will not cause an erosion or pollution hazard.
2. Remove all materials and repair damage to the ground surface as necessary.
3. Re-seed or turf the disturbed ground as necessary to minimise the risk of an ongoing erosion hazard.