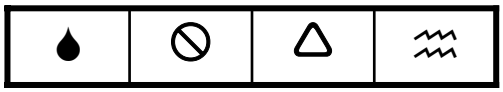
- ✓ Level embankment.
- ✗ No dewatering decants, primary spillway or erosion-proofed emergency spillway.
- ✗ Cleaning out well overdue.

7.2.2 Decanting earth bunds



Note: Photograph taken before spillway fabric fastened.

Description and purpose

A decanting earth bund (DEB) is a temporary ponding area that detains runoff long enough to allow coarser particles of sediment to drop out of suspension before discharge from site construction works. It differs from a sediment retention pond in that it has a smaller contributing catchment and no minimum length to width requirements or level spreader.

DEBs can be constructed from topsoil or clay, but as the bund must be 'waterproof', material that may allow seepage through the bund must not be used. It has a permanent pool of water to reduce re-suspension of retained sediments and an operational volume through which storm flows can be temporarily detained.

A DEB can be almost any shape. It can also be a continuous bund constructed on the contour with returns at the intervals necessary to ensure catchment areas do not exceed the required catchment area/DEB. The returns may need to be extended upslope to achieve this capacity. A decant device is needed, although a snorkel-type decant is usually sufficient.

DEBs are sized in a similar way to sediment retention ponds except that their maximum capacity is limited to 75 cubic metres/DEB.

Where to use it

✓DO use DEBs in preference to sediment fences, as they are much more robust.

✓DO keep DEB capacity at 75 cubic metres or less (catchment area will vary depending on soil type).

✓DO put DEBs as close as possible to the sediment source, with its active length along the contour to allow the required storage capacity to form behind the bund.

✓DO compact the bunds properly to avoid failure of the embankment wall.

✓DO install a right-angled fitting on the inlet end of the pipe to create a permanent 30 percent dead storage volume to minimise re-suspension of retained sediments.

✓DO install an erosion-proof emergency spillway.

×DON'T use perforated drainage pipe through the embankment.

×DON'T discharge to bare land.

×DON'T install DEBs above unstable slopes as seepage may exacerbate land instability.

Limitations

DEBs capture slightly finer soil particles than sediment fences but are not as effective as sediment retention ponds. Short-circuiting through DEBs can occur because they do not usually have a defined inlet – although baffles can overcome this shortcoming. They are usually more effective on flatter land where runoff velocities are less. They can be outflanked unless well constructed.

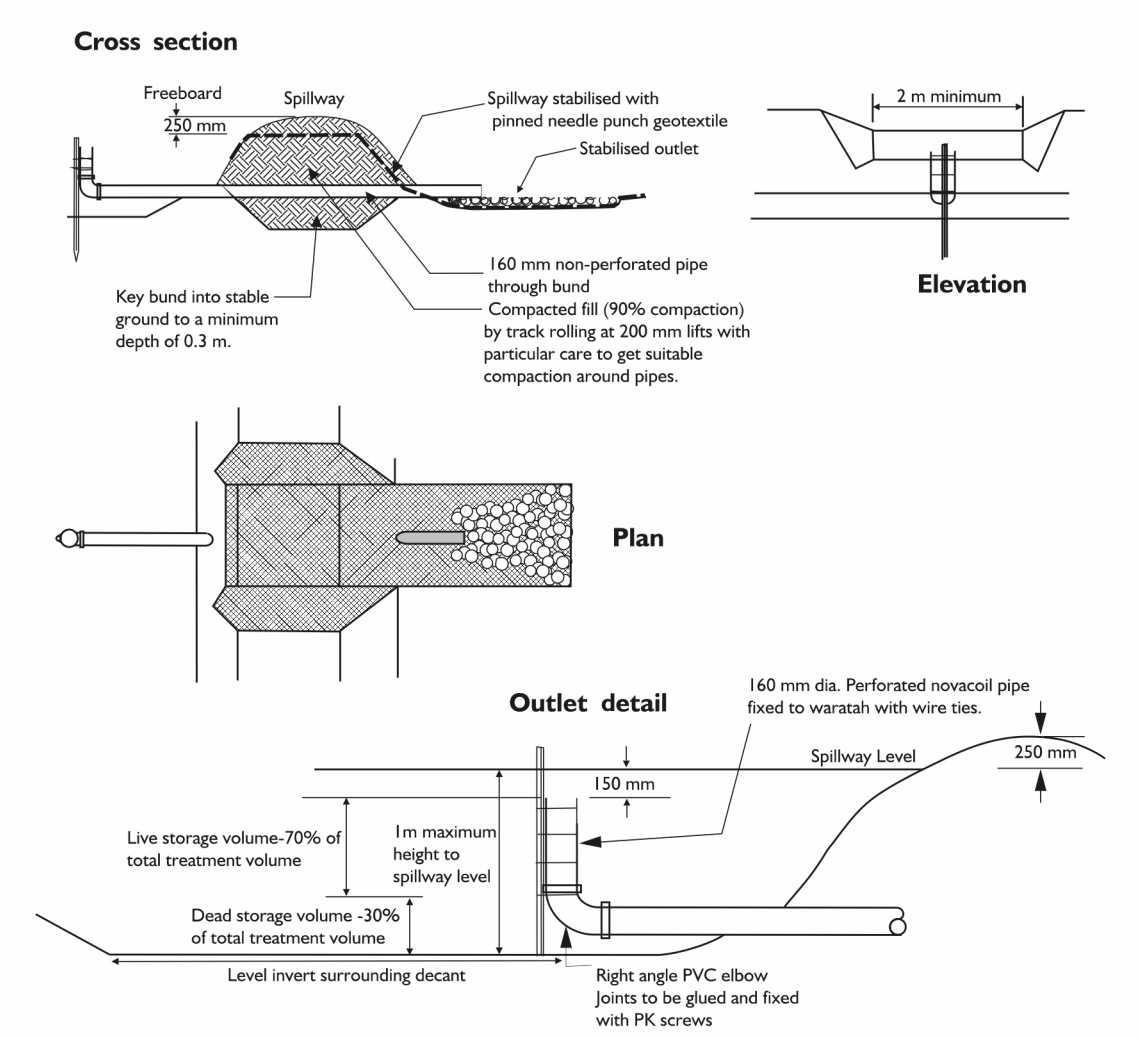
The small drainage holes in the perforated drainage coil often become blocked with floating debris. Regular cleaning of these is usually necessary. Consider placing chicken mesh or similar around the perforated upstand to keep material away from blocking the drainage holes in the upstand.

The upstand is often wrongly constructed higher than the emergency spillway, so review the completed structure carefully and rectify as required.

Like sediment fences, DEBs are usually used to supplement other sediment retention measures on larger sites.

Figure 7.13 Decanting earth bund and snorkel upstand

Source Auckland Regional Council, 1999



Design criteria

DEB sizing criteria

- Work out how the DEB will fit in/work for the site. Identify the catchment area and avoid placing the DEB where damage is likely to occur; for example, from construction machinery.
- Measure the volume of a DEB from the base of the trap to the top of the outlet riser.
- The capacity of a DEB varies with different soil types, rather than design storms. The sizing of DEBs for different soil types and maximum catchment areas is shown in Table 7.9.

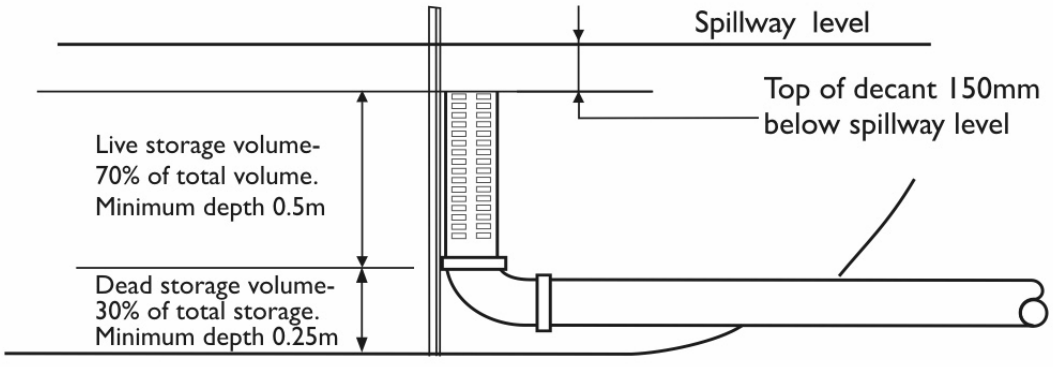
Table 7.9 DEB sizing and maximum catchment areas

Soil type	Required minimum capacity (m^3)/100m^2 catchment	Maximum catchment (hectares)
Flat gravel	0.5m^3/100m^2	1.5
Flat – moderately sloping silt loam/loess (0–20%)	1m^3/100m^2	0.75
Steep silt loam/loess (>20%)	1.5m^3/100m^2	0.5
Clay (<20%)	2m^3/100m^2	0.4

- Depending on the catchment, more than one DEB may be needed. Separate DEBs may be constructed, or returns installed along the length of the bund to isolate individual sections.
- A DEB should have a minimum compacted earth bund height of 1.15 metres at the lowest point. This is made up of 0.75 metres for the height of the riser, 0.15 metres elevation to the spillway and a further 0.25 metres spillway depth.
- Inlet points must be located as far as possible away from the outlet to optimise sediment deposition. Ideally, the DEB should be three times longer than it is wide with inflow at one end and the outlet at the other. A baffle may be able to be installed to achieve this (see sediment retention ponds, section 7.2.1).
- Put a 150 millimetre diameter non-perforated drainage pipe through the bund at the low point and compact soil firmly around the pipe.
- The pipe needs to discharge to an erosion-proof outlet such as a natural depression or watercourse. Do not discharge over bare land, fill or unstable ground. If necessary, flume the outflow to an erosion-proof outlet.
- Install a decanting upstand as shown in Figure 7.14.

Figure 7.14 Snorkel upstand

Source Auckland Regional Council, 1999



Build a one metre-wide trapezoidal spillway over the DEB embankment (preferably to spill to undisturbed land). The spillway must always be at the lowest point of the bund. It must be level across its width, 150 millimetres above the invert of the upstand and at least 250 millimetres deep. Stabilise the surface of the spillway against erosion if the downslope is more than 2 percent; for example, with needle-punched geotextile fabric, 150-300 millimetre-diameter rock or concrete.

Figure 7.15 Decanting earth bund and returns

Source Auckland Regional Council, 1999

Construction specifications

- Build DEBs along the contour to obtain the required capacity.
- Diversion channels/bunds (section 6.3.1) may be necessary to intercept and direct site runoff to the DEB.
- Excavate a sump or pit in flow paths upslope of the DEB – if cleaned out regularly they will greatly reduce cleaning out of the DEB.
- Remove all vegetation and organic matter before construction. Embankments may need to be keyed in on steep slopes.
- Subsoil is the preferred material to construct embankments. The embankment is to be a minimum of three metres wide with 1:1 side batters. Soil must be well compacted with rubber-tyred machinery in layers 150-200 millimetres thick. If topsoil is used, the embankment is to be a minimum of 4 metres wide and well compacted.
- Install a 150 millimetre-diameter non-perforated drainage pipe through the bund at the low point; install an anti-seep collar and compact thoroughly around the collar and pipe to avoid seepage and potential failure of the DEB.
- Connect a right-angled fitting to the inlet of the drainage pipe and insert perforated drainage coil into the top of this right-angled bend for decant purposes. Cut the drainage coil 150 millimetres below the invert of the emergency spillway.
- Glue the pipe connections and tape the perforated drainage coil to the right-angled fitting. Fasten the perforated drainage coil to a stake to keep it secure.

- Surround the perforated upstand with chicken mesh to keep floating debris from blocking the drainage holes in the upstand.
- The emergency spillway must always be the lowest point of the embankment. This should be level, 250 millimetres in depth, a minimum of 1 metre wide and 150 millimetres above the primary spillway. It needs to be protected against erosion, e.g. with needle-punched geotextile.
- The pipe and emergency spillway needs to discharge to stable outfalls such as an undisturbed natural depression or watercourse. Do not discharge over bare land, fill or unstable ground. If necessary, the outflow may need to be flumed to an erosion-proof discharge point (section 6.3.3).

Performance inspection and maintenance

Inspect regularly, and before and after every major storm, to look for any changes in the structure. Important details to check on are:

- that runoff is not outflanking the DEB;
- that the spillway is the lowest point over the embankment wall, that it is functional and protected against erosion. Repair any damage;
- whether there is erosion at the outfall and remedy if required; for example, by redirecting flow to a new outlet or installing a flume;
- whether there is any damage to the pipe drainage systems and repair as necessary;
- whether there is seepage through the embankment, or along the outlet pipe and remedy as necessary;
- repair any blockages, such as to the holes in the upstand, etc.;
- remove accumulated sediment when the DEB is 20 percent full. Place the material so it can't wash back into the DEB or into water; and
- that the DEB is repaired immediately where damaged by construction.

Decommissioning

- Remove DEBs only when the contributing catchment has been stabilised.
- Refer to section 7.2.3 for information on dewatering.
- Remove and correctly dispose of all accumulated sediment where it cannot wash back to natural water, stormwater systems and other receiving environments.
- Remove pipes, fabric and other construction materials.
- Backfill any excavations and compact the soil. Re-grade and smooth as required.
- Stabilise all areas disturbed as part of the removal process with topsoil, grass, mulch or aggregate, etc. as required.

Useful tips

- ✓ Good perimeter diversion bund height and width leading to DEB.
- ✓ Rock-protected spillway placed on fabric.
- ✓ Good dead storage/live storage division.
- ✓ Good DEB capacity.
- ✗ Drain or baffle could be used on the upslope side of the DEB to direct runoff to the end, in order to increase length: width ratios and sediment retention.

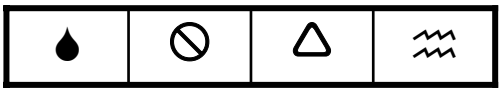
- ✓ The DEB is at the lowest point of the construction site.
- ✓ The snorkel decant has been positioned at a height that allows a permanent pool of water to form and sedimentation to occur.
- ✓ The spillway is slightly higher than the height of the snorkel.
- ✓ The embankment and bund leading to the DEB is well shaped and constructed.
- ✗ The spillway needs to be protected against erosion, e.g. with fabric.

Common problems

- ✓ Spillway well dug in and at the lowest point.
- ✓ Catchment has been stabilised.
- ✓ Spillway stabilised with fabric.
- ✗ Poor compaction of embankment which could result in eventual failure of the embankment.

- Poor embankment construction and compaction.
- Spillway has blown out and needs to be repaired urgently.
- Holes are blocked in decant upstand and need cleaning.
- No evidence of stabilisation of embankment by hydroseed and/or mulch.

7.2.3 Dewatering



Description and purpose

Dewatering is the removal of water from low-lying areas, excavations, trenches and so on. It is often done by pumping. Sediment retention ponds and DEBs often need to be dewatered before they can be maintained or decommissioned. Dewatering can generate very fine-textured material that is difficult to retain onsite through best, practical sediment control facilities (such as those in this guideline) and can, therefore, have significant adverse environmental effects.