2.2 Silt Fence

Plate 2.2 Silt Fence

Definition

A temporary barrier of woven geotextile fabric used to intercept runoff, reduce its velocity and impound sediment laden runoff from small areas of disturbed soil.

Purpose

To detain flows from runoff so that deposition of transported sediment can occur through settlement. Silt fences can only be used to intercept sheet flow. Do not use them as velocity checks in channels or place them where they will intercept concentrated flow.

Application

- On low gradient sites or for confined areas where the contributing catchment is small, such as short steep batter fills and around watercourses.
- To delineate the limit of disturbance on an earthworks site such as riparian areas or bush reserves.
- To store runoff behind the Silt Fence without damaging the fence or the submerged area behind the fence.
- Do not install Silt Fences across watercourses or in areas of concentrated flows.

Design

- Ensure Silt Fence height is a minimum of 400mm above ground level.
- Place supporting posts/waratahs for Silt Fences no more than 2m apart unless additional support is provided by tensioned wire (2.5mm HT) along the top of the Silt Fence. Where a strong woven fabric is used in conjunction with a wire support, the distance between posts can be extended up to 4m. Double the Silt Fence fabric over and fasten to the wire and posts with wire ties or cloth fastening clips at 150mm spacings. Ensure supporting posts/ waratahs are embedded a minimum of 400mm into the ground.

- Always install Silt Fences along the contour. Where this is not possible or where there are long sections of Silt Fence, install short Silt Fence returns projecting upslope from the Silt Fence to minimise concentration of flows. Silt Fence returns are a minimum 2m in length, can incorporate a tie back and are generally constructed by continuing the Silt Fence around the return and doubling back, eliminating joins.
- Join lengths of Silt Fence by doubling over fabric ends around a wooden post or batten or by stapling the fabric ends to a batten and butting the two battens together as shown in Figure 2.2.
- Maximum slope lengths, spacing of returns and angles for Silt Fences are shown in Table 2.2.
- Install Silt Fence wings at either end of the Silt Fence projecting upslope to a sufficient height to prevent outflanking.
- Where impounded flow may overtop the Silt Fence, crossing natural depressions or low points, make provision for a riprap splash pad or other outlet protection device.
- Use of Silt Fences in catchments of more than 0.5ha requires careful consideration of specific site measures, and other control measures maybe better, such as Super Silt Fence.
- Where water may pond behind the Silt Fence, provide extra support for the Silt Fence with tie backs from the Silt Fence to a central stable point on the upward side. Extra support can also be provided by stringing wire between support stakes and connecting the filter fabric to this wire.
- The fabric cloth must meet the following requirements for Geotextile fabric.

Tension Strength:	0.345 pa (minimum)
Tensile Modulus:	0.140 pa (minimum)
Apparent Opening Size	100 mm

Table 2.2 Silt Fence Design Criteria

Slope Steepness %	Slope Length (o) (Maximum)	Spacing of Returns (o)	Silt Fence Length (o) (Maximum)
Flatter than 2%	Unlimited	N/A	Unlimited
2 – 10%	40	60	300
10 – 20%	30	50	230
20 – 33%	20	40	150
33 – 50%	15	30	75
> 50%	6	20	40

Construction Specifications

- Use Silt Fence material appropriate to the site conditions and in accordance with the manufacturer's specifications.
- Excavate a trench a minimum of 100mm wide and 200mm deep along the proposed line of the Silt Fence. Install the support posts on the downslope edge of the trench and Silt Fence fabric on the upslope side of the support posts to the full depth of the trench, then backfill the trench with compacted soil.
- Use supporting posts of tanalised timber a minimum of 50mm square, or steel waratahs at least 1.5m in length.
- Reinforce the top of the Silt Fence fabric with a wire support made of galvanised wire of a minimum diameter of 2.5mm. Tension the wire using permanent wire strainers attached to angled waratahs at the end of the Silt Fence.
- Where ends of Silt Fence fabric come together, ensure they are overlapped, folded and stapled to prevent sediment bypass.

Maintenance

- Inspect Silt Fences at least once a week and after each rainfall. Make any necessary repairs when bulges occur or when sediment accumulation reaches 50% of the fabric height.
- Any areas of collapse, decomposition or ineffectiveness need to be immediately replaced.
- Remove sediment deposits as necessary to continue to allow for adequate sediment storage and reduce pressure on the Silt Fence. Ensure that the sediment is removed to a secure area.
- Do not remove Silt Fence materials and sediment deposition until the catchment area has been appropriately stabilised. Stabilise the area of the removed Silt Fence.

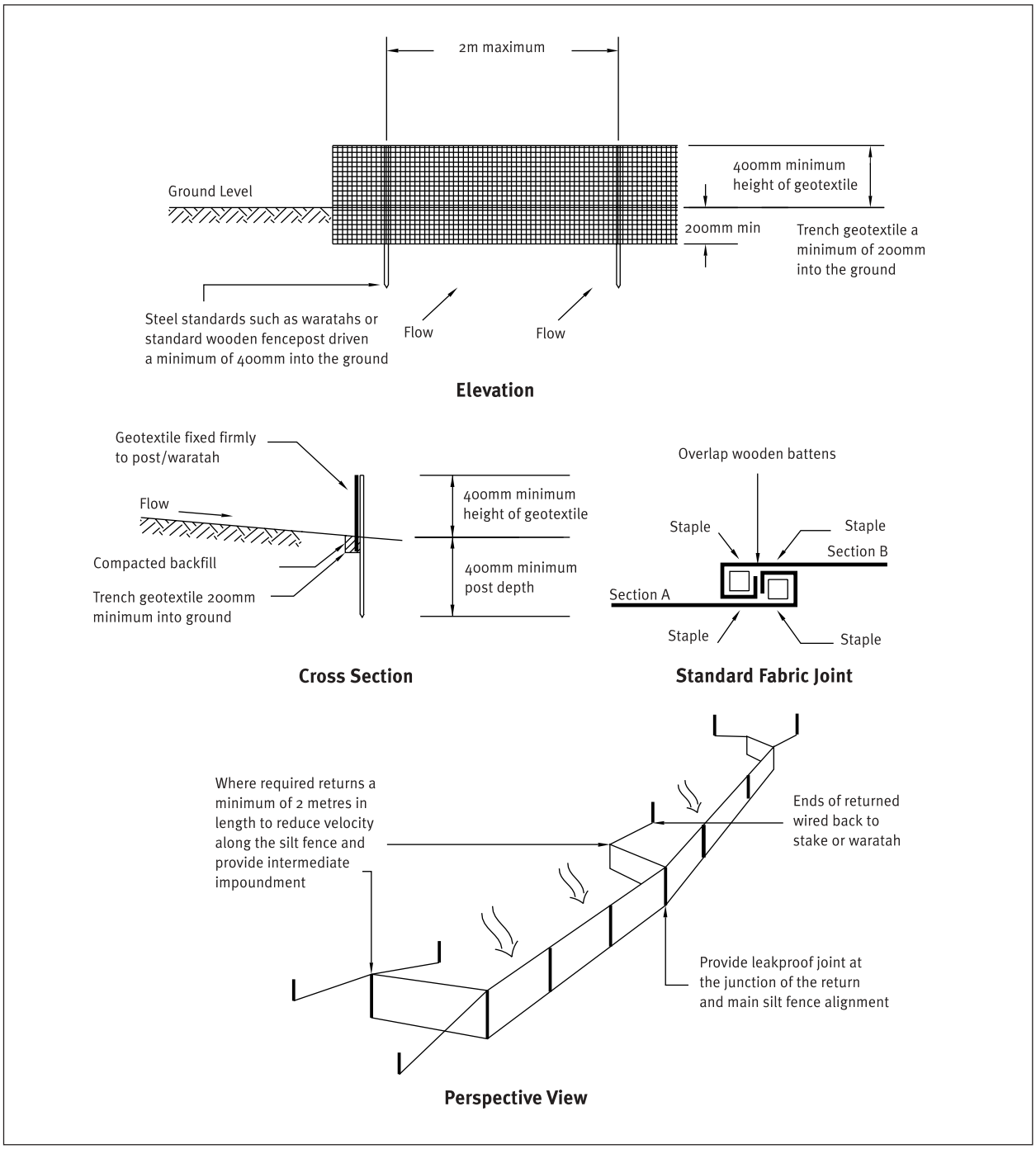


Figure 2.2 Silt Fence

2.3 Super Silt Fence

SSF

Plate 2.3 Super Silt Fence

Definition

A temporary barrier of geotextile fabric over chain link fence that is used to intercept flows, reduce their velocity and impound sediment-laden runoff from small catchment areas.

Purpose

To reduce runoff velocity and allow the deposition of transported sediment to occur.

A Super Silt Fence provides much more robust sediment control than a standard Silt Fence and allows up to four times the catchment area to be treated by an equivalent length of standard Silt Fence.

Application

- Provides a barrier that can collect and hold debris and soil, preventing the material from entering critical areas, watercourses and streets.
- Can be used where the installation of an Earth or Topsoil Bund would destroy sensitive areas such as bush and wetlands.
- Should be placed as close to the contour as possible. No section of the fence should exceed a grade of 5% for a distance of more than 15m.

Design

When considering Super Silt Fence installation for larger catchments (greater than 0.5ha) as in Table 2.3, carefully consider the specific site conditions and other alternative control measures available. Base the length of the Super Silt Fence is based on the limits shown in Table 2.3.

Limits imposed by ultraviolet light affect the stability of the fabric and will dictate the maximum period that the Super Silt Fence may be used.

Where ends of the geotextile fabric come together, overlap, fold and staple the fabric ends to prevent sediment bypass.

Table 2.3 Super Silt Fence Design Criteria

Slope %	Slope Length (o) (maximum)	Super Silt Fence Length (o) (maximum)
0 – 10	Unlimited	Unlimited
10 –20	60	450
20 – 33	30	300
33 – 50	30	150
> 50	15	75

Construction Specifications

- Use a Silt Fence fabric that is appropriate to the site conditions and fits the manufacturer's specifications.
- Excavate a trench 100mm wide by 200mm deep along the line of the Super Silt Fence.
- Position the posts (No. 3 rounds, No. 2 half rounds or waratahs) at no greater than 3 o centres on the downslope side of the trench. While there is no need to set the posts in concrete, ensure the 1.8m long posts are driven to an appropriate depth (1m minimum).
- Install tensioned galvanised wire (2.5 mmHT) at 400mm and again at 800mm above ground level using permanent wire strainers.
- Secure chain link fence to the fence posts with wire ties or staples, ensuring the chain link fence goes to the base of the trench.
- Fasten two layers of geotextile fabric securely to the Super Silt Fence with ties spaced every 60cm at the top and mid section of the Super Silt Fence.
- Place the two layers of geotextile fabric to the base of the trench (a minimum of 200mm into the ground) and place compacted backfill back to the original ground level.
- When two sections of geotextile fabric adjoin each other, ensure they are doubled over a minimum of 300mm, wrapped around a batten and stapled at 75mm spacings to prevent sediment bypass.
- The geotextile fabric must meet the following requirements:

Tension Strength	0.345 pa (minimum)
Tensile Modulus	0.140 pa (minimum)
Apparent Opening Size	100 – 500 mm

Maintenance

Inspect regularly and before and after storm events.

Undertake maintenance as needed and remove silt buildups when bulges develop in the Super Silt Fence or when sediment deposition reaches 50% of the Super Silt Fence height.

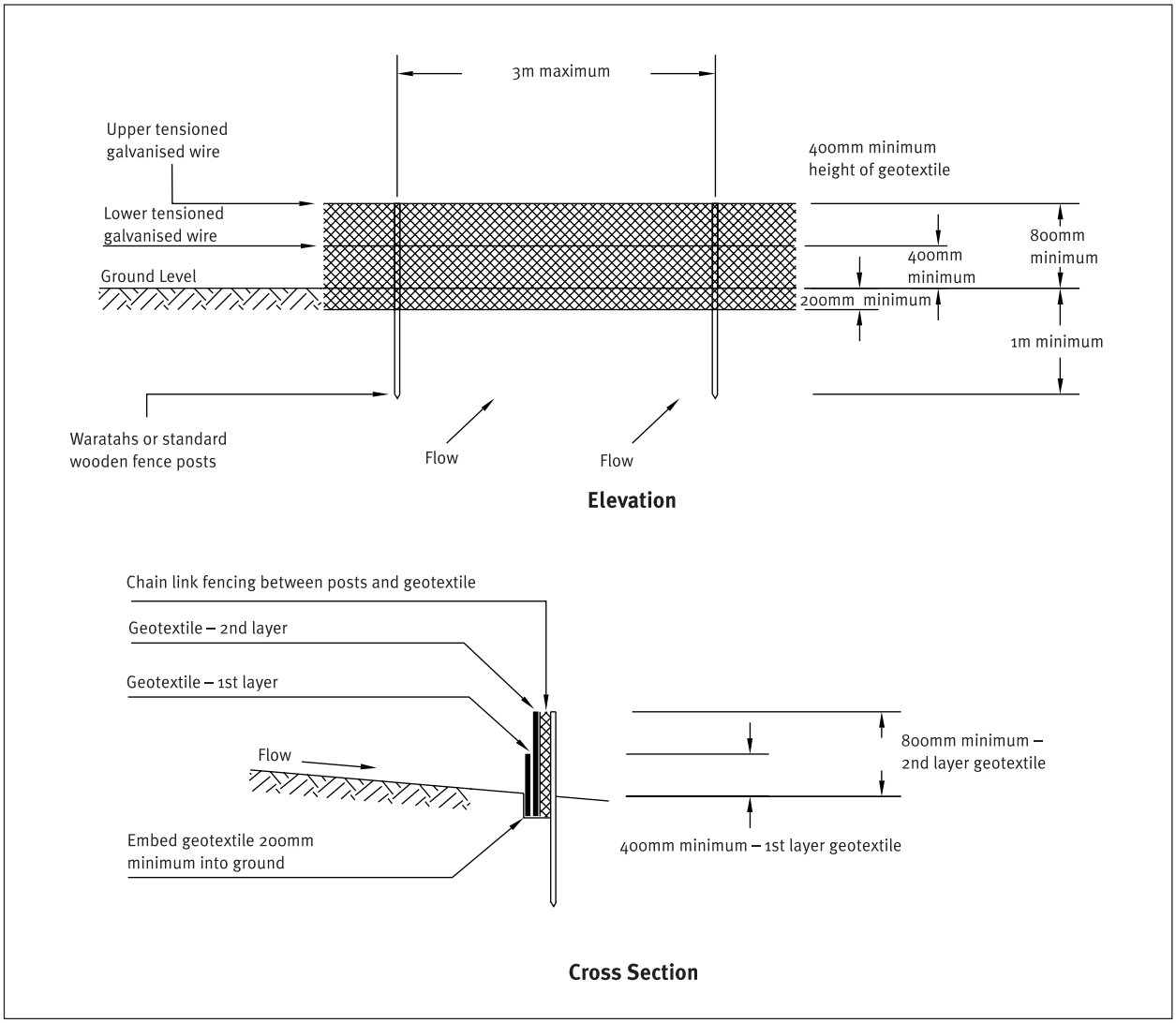


Figure 2.3 Super Silt Fence

2.4 Hay Bale Barrier →HB→

Plate 2.4 Hay Bale Barrier

Definition

Temporary barriers of hay bales used to intercept and direct surface runoff from small areas.

Purpose

To intercept or direct sediment laden runoff from small areas to a sediment retention facility so that deposition of transported sediment can occur. Hay Bale Barriers do not filter sediment.

Application

- Hay Bale Barriers are not primary sediment control measures. They easily deteriorate and require frequent maintenance.
- Only use Hay Bale Barriers to meet short term needs of less than one month duration.
- Only use Hay Bale Barriers to intercept sheet flow. Do not use them as velocity checks in channels or place them where they will intercept concentrated flow. They do not act as filters and are easily overtopped or scoured out.
- Do not use with a catchment area of more than 0.2ha per 100 o length of haybales.
- Do not use Hay Bale Barriers on slopes exceeding 20%.

Design

Not Applicable.

Construction Specifications

- Place Hay Bale Barriers along the contour with bales in a row with the ends tightly abutting adjacent bales.
- Dig each bale into the ground 100mm and place so the bale bindings are horizontal.
- Do not place bales more than one bale high.
- Secure bales in place by two stakes driven through the bale 300 to 400mm into the ground. Drive the first stake toward the previously laid bale at an angle to force the bales together. Drive stakes flush with the top of the bale.

Maintenance

Inspect Hay Bale Barriers frequently and after each rain event. Undertake maintenance as necessary.

Remove all bales when the site has been fully stabilised. Stabilise the trench where the bales were located and grade flush.

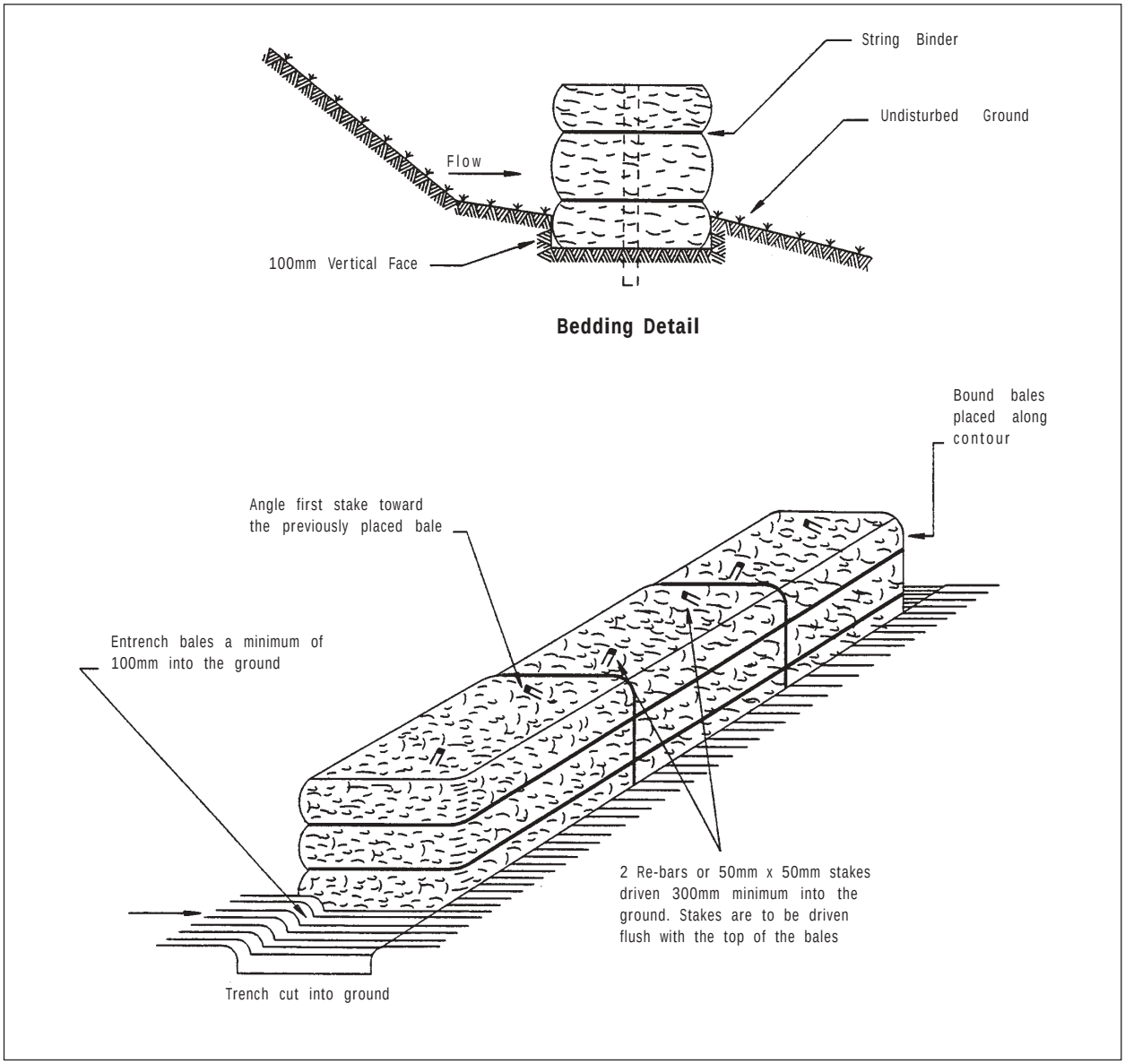


Figure 2.4 Hay Bale Barrier

2.5 Stormwater Inlet Protection

Plate 2.5 Stormwater Inlet Protection

Definition

A barrier across or around a cesspit (stormwater inlet).

Purpose

To intercept and filter sediment-laden runoff before it enters a reticulated stormwater system via a cesspit, thereby preventing sediment-laden flows from entering receiving environments. The protection may take various forms depending upon the type of inlet to be protected. Stormwater Protection is a secondary sediment control device. It must only be used in conjunction with other erosion and sediment control measures.

If good erosion and sediment control measures are in place on the site, then Stormwater Inlet Protection will not be required.

Application

- Do not use Stormwater Inlet Protection as a primary method of treatment instead of other sediment retention facilities.
- Use only in small catchments of less than 0.5 ha.
- Use only where the catchment area to an inlet is disturbed and it is not possible to temporarily divert the storm drain outfall into a sediment retention facility.

Stormwater Inlet Protection only offers limited treatment of sediment-laden water, because of the concentrated flows arriving at them. Stormwater systems are, by design, very efficient at conducting flows away from inlets, and therefore, once any sediment reaches the stormwater system, it will be discharged directly to the receiving environment.

Therefore, the need to use Stormwater Inlet Protection can indicate poor erosion and sediment control and/or inadequate stabilisation on the site.

Design

There are various design options for reducing sediment inputs to the stormwater cesspits.

Silt Fence Design

A Silt Fence can be erected around the inlet (see Part B Section 2.2). This method is appropriate where cesspits have been connected to a stormwater system and are collecting runoff from disturbed soil surfaces.

Filter Media Design

Two common methods use geotextile and scoria or gravel to treat sediment laden flows. All points where runoff can enter the cesspit must be protected with suitable geotextile fabric.

- Wrap geotextile fabric around the cesspit grate as a barrier to flow directly from the roadside gutter. Pay special attention to the inlet above the grate back of the cesspit where a geotextile fabric sock filled with gravel must be placed to intercept runoff.
- Lay coarse geotextile fabric over the cesspit and up onto the kerb with a layer of aggregate material to act as a primary filter and to hold the fabric in

place.

Check Dams

Place a series of low sandbag check dams up the gutter from cesspits to act as a series of sediment traps. The checkdams require a spillway lower than the kerb to ensure that runoff does not encroach onto the berm area and cause scouring. Construct checkdams out of up to six sandbags laid end to end with no gaps in an arc away from the kerb and up the road to create a series of impoundment areas.

Excavated Inlet Protection

Excavating around a stormwater inlet creates storage capacity where suspended material can settle out. Ensure that seepage holes allow for filtered dewatering, and that the capacity provided around the inlet for storage is a minimum of 1% of the catchment (1m^3 of capacity per 100 m^2 of contributing catchment).

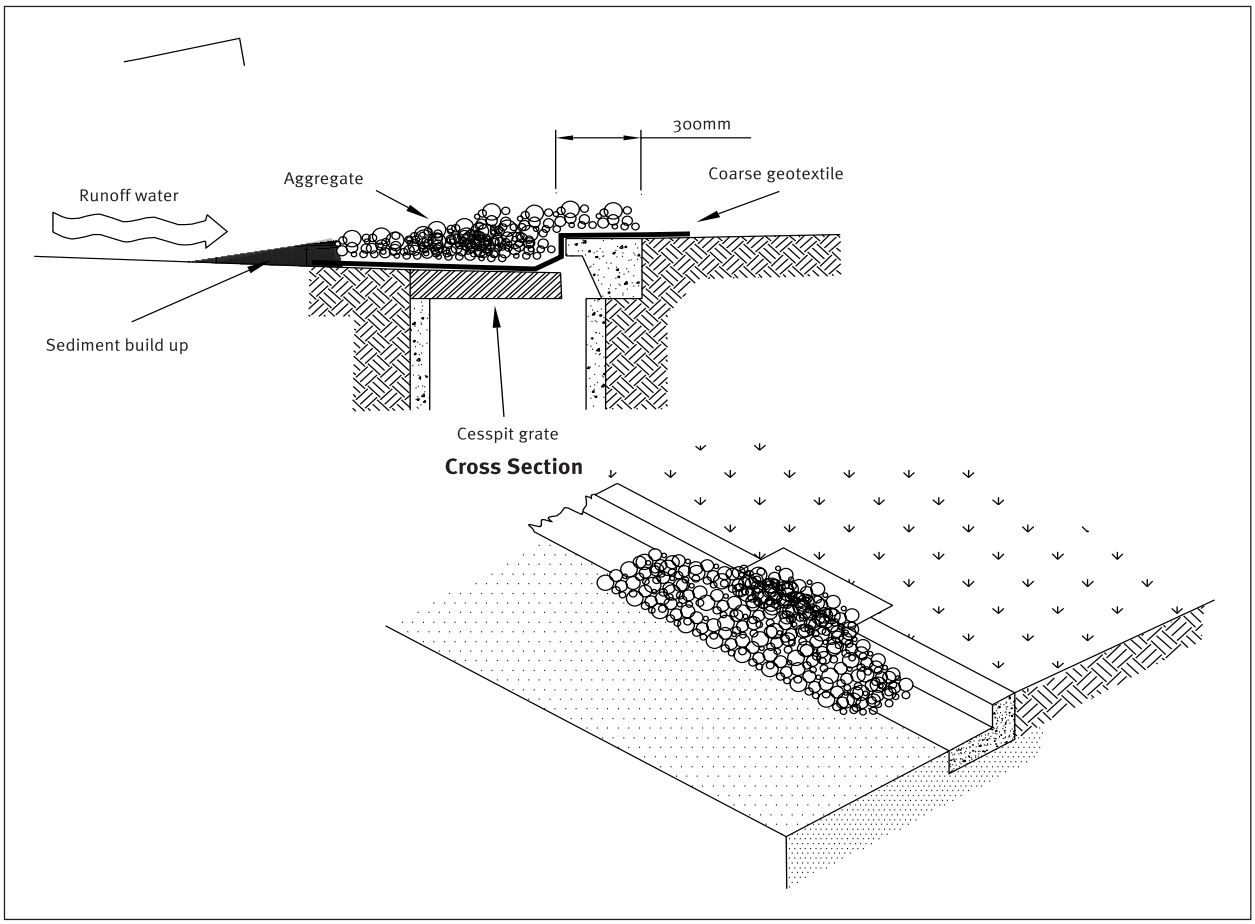
Maintenance

Maintenance requirements for cesspit protection measures are high because they clog easily. When clogging occurs, remove accumulated sediment and clean or replace the geotextile fabric and aggregate.

Inspect all Stormwater Inlet Protection measures following any rainfall event and maintain as necessary to ensure they operate effectively.

Stormwater Inlet Protection provides at best limited sediment retention. Do not use it as a primary method of sediment control. Use additional measures up-slope, such as topsoil bunds and cut-off drains, to minimise the volume of sediment reaching any stormwater inlets. Cesspits must at all times remain able to convey flow from the site to prevent large concentrated highly erosive flows from building up and causing washouts in secondary overland paths.

Construction Specifications



Construct Silt Fences for Stormwater Inlet Protection as outlined in Part B Section 2.2 of these Guidelines.

Figure 2.5 Stormwater Inlet Protection – Filter Media Design

2.6 Earth Bund

Plate 2.6 Earth Bund

Definition

A temporary berm or ridge of compacted soil (including topsoil) constructed to create impoundment areas where ponding of runoff can occur and suspended material can settle before runoff is discharged.

Purpose

Used to intercept sediment-laden runoff and reduce the amount of sediment leaving the site by detaining sediment-laden runoff.

Application

Earth Bunds can be constructed across disturbed areas and around construction sites and subdivisions. Keep them in place until the disturbed areas are permanently stabilised or adequately replaced by other means. Earth Bunds can assist the settling of sediment-laden runoff.

Earth Bunds are particularly useful for controlling runoff after topsoiling and grassing before vegetation becomes established. Where works are occurring within the berm area, compact the topsoil over the berm area as a bund adjacent and parallel to the berm. This will act as an impoundment area while also keeping overland flow away from the construction area.

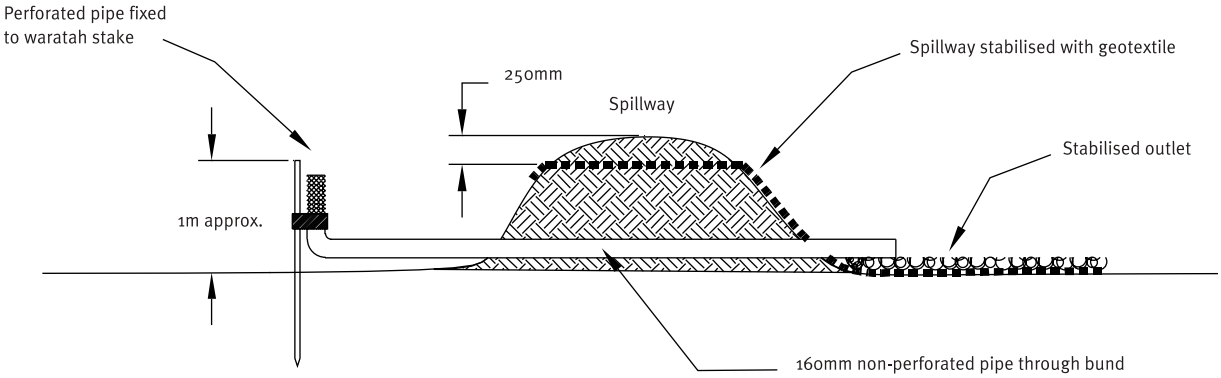
Design

- Earth Bunds need a constructed outlet structure and spillway as designed for Sediment Retention Ponds (Part B, Section 2.1 of these Guidelines). Alternatively, construct an outlet of perforated pipe connected to a non-perforated pipe that passes through the Earth Bund and either discharges to the gutter or directly to a stormwater inlet. Ensure that the section of pipe within the impoundment area is supported by means of a rigid post, allowing filtration to occur.

- Ensure the top opening of the perforated pipe is 100 mm lower than the stabilised spillway.
- Ensure the section of pipe leading through the Earth Bund and continuing downslope below the Earth Bund is non-perforated.
- Construct the Earth Bund such that the maximum contributing catchment does not exceed 0.3 ha.

Maintenance

Inspect and maintain Earth Bunds regularly and after each rainfall event to check for accumulated sediment



Cross Section

which may cause overtopping. Check any discharge points for signs of scouring and install further armouring or other

stabilisation if scouring is evident.

Figure 2.6 Earth Bund

2.7 Sump / Sediment Pit

Plate 2.7 Sump / Sediment Pit

Definition

A temporary pit which is constructed to trap and filter water before it is pumped to a suitable discharge area.

Purpose

To treat sediment-laden water that has been removed from areas of excavation, or areas where ponded sediment laden-water can not drain by other means.

Application

- When water collects during the excavation phase of construction.
- Particularly useful in urban areas during excavation for building foundations.
- May also be used to de-water sediment retention measures.

Design

The design is based on a perforated vertical standpipe placed in the centre of a pit which is then backfilled with aggregate.

- Determine the number of Sump/Sediment Pits and their locations on site in accordance with the required dewatering facilities and procedures outlined below.
- Pump water from the centre of the pipe to a suitable discharge area.
- Direct the discharge to an appropriate outlet.
- If the water is pumped directly to a receiving environment, then wrap a geotextile fabric around the standpipe to help achieve a clean water discharge. When a geotextile fabric is used, the surface area of the standpipe will need to be increased and the pumping rate decreased to prevent the geotextile becoming rapidly blocked.
- Sump/Sediment Pit dimensions are variable, but require a minimum depth of 1m and a minimum volume of $2m^3$.
- Construct the standpipe from 300 – 600mm

diameter pipe with a grid of 10 mm diameter perforations at 60mm spacings along the standpipe.

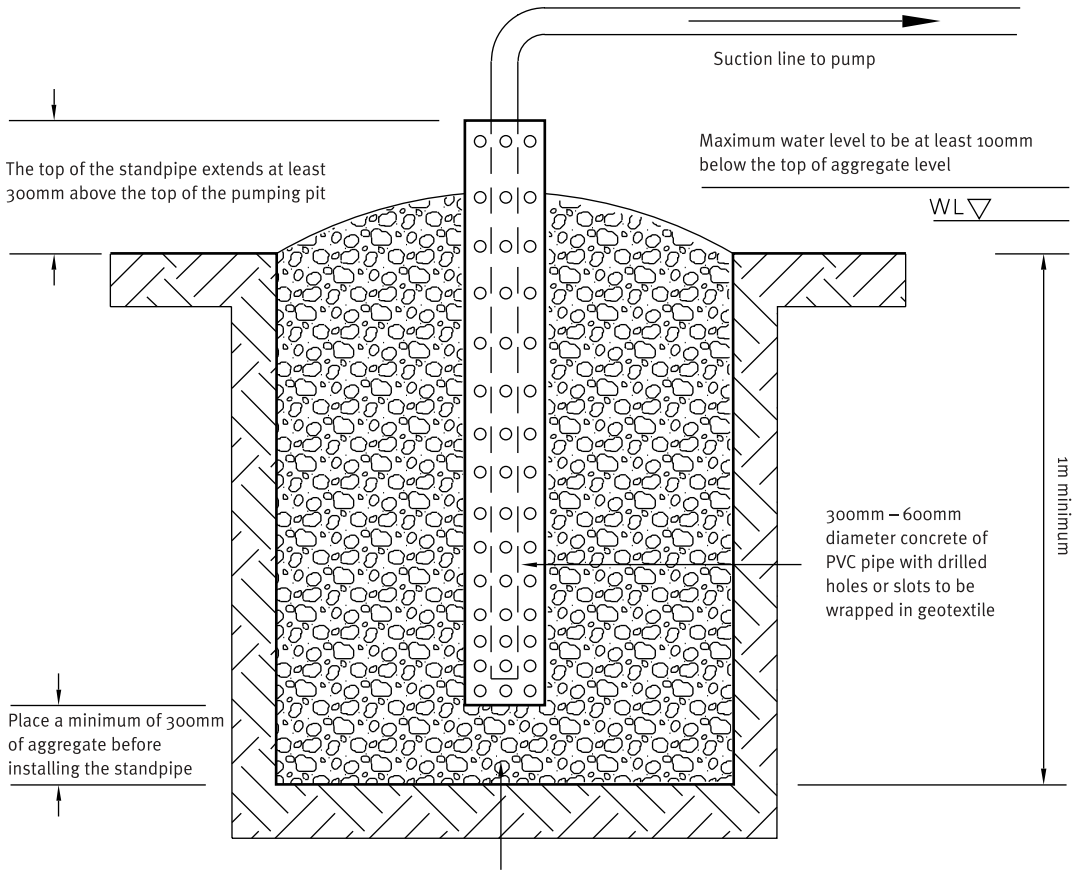
- Place a base of 50mm aggregate in the Sump/ Sediment Pit to a depth of 300mm.
- After placing the standpipe in position, backfill the area with 50mm aggregate.
- Extend the standpipe 300mm above the lip of the Sump / Sediment Pit with the aggregate extended 100 mm above the anticipated standing water elevation.

Maintenance

Undertake ongoing checks throughout the use of the Sump/Sediment Pit to ensure effective operation.

For isolated areas where dewatering must occur to facilitate progress, other methods may be appropriate. These alternatives include the following.

- Pumping accumulated sediment-laden water to a sediment retention pond.
- Constructing a Silt Fence and pumping water to behind the Silt Fence to be retained for treatment. Do not let water to be treated enter the Silt Fence as a concentrated flow or outflank the Silt Fence.
- Discharge accumulated sediment laden water to



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land where soakage may occur. Ensure that this untreated sediment-laden runoff cannot enter to a stormwater system or any watercourse.