



**GUIDELINES FOR THE
CONTROL OF SOIL EROSION
AND SEDIMENTATION ON
BUILDING AND
DEVELOPMENT SITES**

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1. INTRODUCTION

Lismore City Council has a commitment to protect our natural environment by ensuring that development activities are conducted in a responsible manner.

At present our natural environment is under threat from increasing urbanisation. One such threat is that from soil erosion and sedimentation which leads to degradation of our land and water environments. To prevent any further damage and to protect our valuable water resources we must act now to implement erosion control practices and to encourage others to be more accountable for their actions.

Development can be undertaken in a responsible manner.

Soil Erosion – the problem:

Soil erosion is a major environmental problem. Some of the problems caused by soil erosion include:

1. A loss of fertile topsoil which limits the growth of vegetation and can encourage the proliferation of weeds;
2. The formation of landslips and gullies which may restrict development or require high remediation costs and generally degrades land;
3. Sedimentation of drains and waterways which restricts the flow of stormwaters and floodwaters; and
4. Turbidity which lowers the recreational and aesthetic value of the waterway and damages the aquatic environment.

In addition water-bodies become polluted when soils contaminated with nutrients and other chemicals enter waterways. Nitrates and phosphates absorbed onto soils often pollute water-bodies leading to eutrophic conditions and algae blooms.¹²

For these reasons it is easy to see why soil erosion and sedimentation is an economic as well as an environmental problem.

Soil Erosion and Sedimentation – North Coast NSW

The North Coast Region of NSW is particularly prone to soil erosion and sedimentation as it is a rapid growth area and is subject to intense rainfall and in many areas steep slopes.

Whilst the erosion from a single site may seem negligible, the accumulative impact of many sites causes significant environmental problems. To illustrate this, Table 1 below compares the erosion levels from different land uses on the North Coast, NSW.

Table 1

Land Use Erosion Rates – North Coast, NSW

Land Use	Tonnes per Hectare
Undisturbed land	1
Cultivated land	10
Urban building block	30
Subdivision (incl road works)	400

(Towler, 1992)³

From this it is easy to see why soil erosion from urban development is recognised as the most widespread form of land degradation.

¹ Quilty, JA et al, 1978. **Urban Erosion & Sediment Control**. Soil Conservation Service Technical Handbook No. 2

² SPCC 1989. **Pollution Control Manual for Urban Stormwater**

³ Towler, R Soil Conservation Service. **Impact of Subdivision & Building on Soil Conservation**. Env Health Conference, Coffs Harbour 1992

2. LEGAL PROVISIONS

Environmental Planning & Assessment Act, 1979

Under Section 90, of the Environmental Planning & Assessment Act, 1979, in determining a development application, the Council shall take into consideration:

- (b) “The impact of that development on the environment and where harm to the environment is likely to be caused, any means that may be employed to protect the environment or to mitigate that harm”; and
- (m) “Whether that development is likely to cause soil erosion”.

Soil Conservation Act, 1938

Under **Section 15A**, if soil erosion or land degradation is likely to be caused and its effects can be mitigated or avoided, the Commissioner may be notice in writing...require the owner, occupier, holder or grantee, to:

- (c) Abstain from doing; or
- (d) Do or permit to be done; such acts and things as may be specified in the notice.

Furthermore, under **Section 21C** of the Soil Conservation Act,
“no tree shall be lopped, damaged or removed on any protected land eg:

- Land within a catchment which has a slope greater than 18 degrees;
- Land within 20m of a river or lake; and
- Land which is of the opinion of the Commissioner is environmentally sensitive or affected or liable to be affected by soil erosion, siltation or land degradation.

Rivers and Foreshores Improvement Act, 1948

States that you require a permit to:

- (a) excavate in a river, estuary or lake or within 40m of it;
- (b) build erosion control works and other structures in a river, estuary or lake; or to
- (c) place any fill material in a river, estuary or lake.

Permits can be obtained from the Department of Water Resources for non-tidal waters or from the Department of Public Works for tidal waters.

3. COUNCIL’S ROLE

Council has an important role as the Local Authority to ensure that any impact on the environment by development is minimised.

To meet this obligation, Council requires that:

1. all developments which may create conditions that facilitate erosion must be provided with suitable erosion and sediment controls; and
2. for developments prone to significant erosion (eg subdivisions and many building developments), a plan of management may be required to accompany the development application or in the case of subdivisions the engineering working plans. This plan must outline the present condition of the site, what changes are proposed and what action will be taken to alleviate or minimise any erosion or sedimentation.

4. COUNCIL'S REQUIREMENTS FOR EROSION AND SEDIMENT CONTROL

Pre-Design Stage:

Prior to designing a subdivision or other major development, it is important that the developer take into account the geological, soil, landform and hydrological limitations of the site. This will facilitate a design that is economically and environmentally feasible.

Design Stage:

Once the limitations of the site are known, the developer can begin to design a development that is compatible with the natural environment. In areas prone to significant soil erosion and/or sedimentation, the developer must implement a soil erosion and sedimentation plan of management. This plan shall be submitted and approved by Council prior to any work commencing.

Note: In some circumstances details will need to be submitted and approved by Council prior to determination of the relevant application by Council.

5. IMPORTANT POINTS

- 1. Keep land disturbance to a minimum;**
This can be achieved by reducing the amount of cut and fill and by retaining buffer strips of vegetation;
- 2. Where practicable locate the building clear of any watercourses or drainage reserves; and**
- 3. Stage the development so that areas can be quickly revegetated.**

6. SOIL EROSION AND SEDIMENTATION – PLAN OF MANAGEMENT:

The Plan of Management must contain:

1. A site plan showing, the existing features of the site, eg the slope, soil type, vegetation and proximity to any drains, watercourses or other environmentally sensitive areas;
2. the proposed changes, eg location of the proposed lots, stockpiles, vegetated buffer strips, drainage reserves, roads and services and the extent of cut and fill, clearing etc;
3. the measures that will be undertaken to reduce the risk of soil erosion and sedimentation, eg controls on runoff, erosion and sedimentation, and measures to restore/revegetate or preserve areas prone to erosion; and the
4. measures that will be undertaken to maintain the erosion and sedimentation controls eg regular cleaning out of sediment traps etc.

7. SOIL EROSION AND SEDIMENTATION CONTROLS

Methods available to control soil erosion and sedimentation include:

1. Temporary sediment fences;
2. Straw bale sediment fences;
3. Sediment traps;
4. Vegetation buffer zones;
5. Sedimentation basins;
6. Temporary construction exits;
7. Controls on runoff;
8. Controls on stockpiles; and
9. Stabilisation/revegetation works.

7.1 Temporary Sediment Fences:

Temporary sediment fences are a common method used to control soil erosion on development sites. These fences are constructed of a material which is capable of filtering out soil from water. To ensure that soil is removed efficiently, the fence must be adequately supported by posts at approximate two-metre centres and be embedded at least 100mm into the ground. This will ensure that soil does not pass under the fence. (See figure 1 and 2).

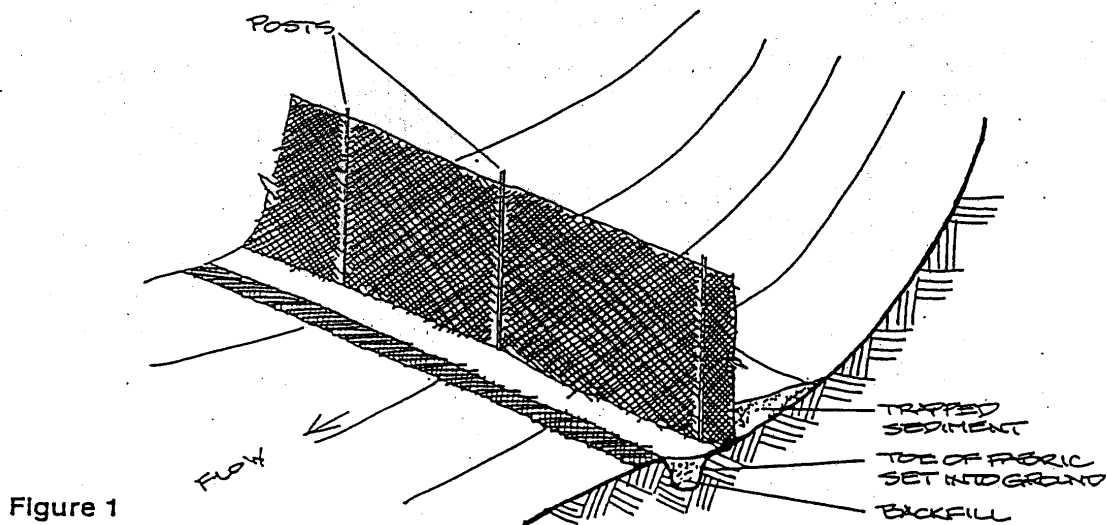


Figure 1

FILTER FENCE

S.P.P.C, 1989. Pollution Control Manual for Urban Stormwater.

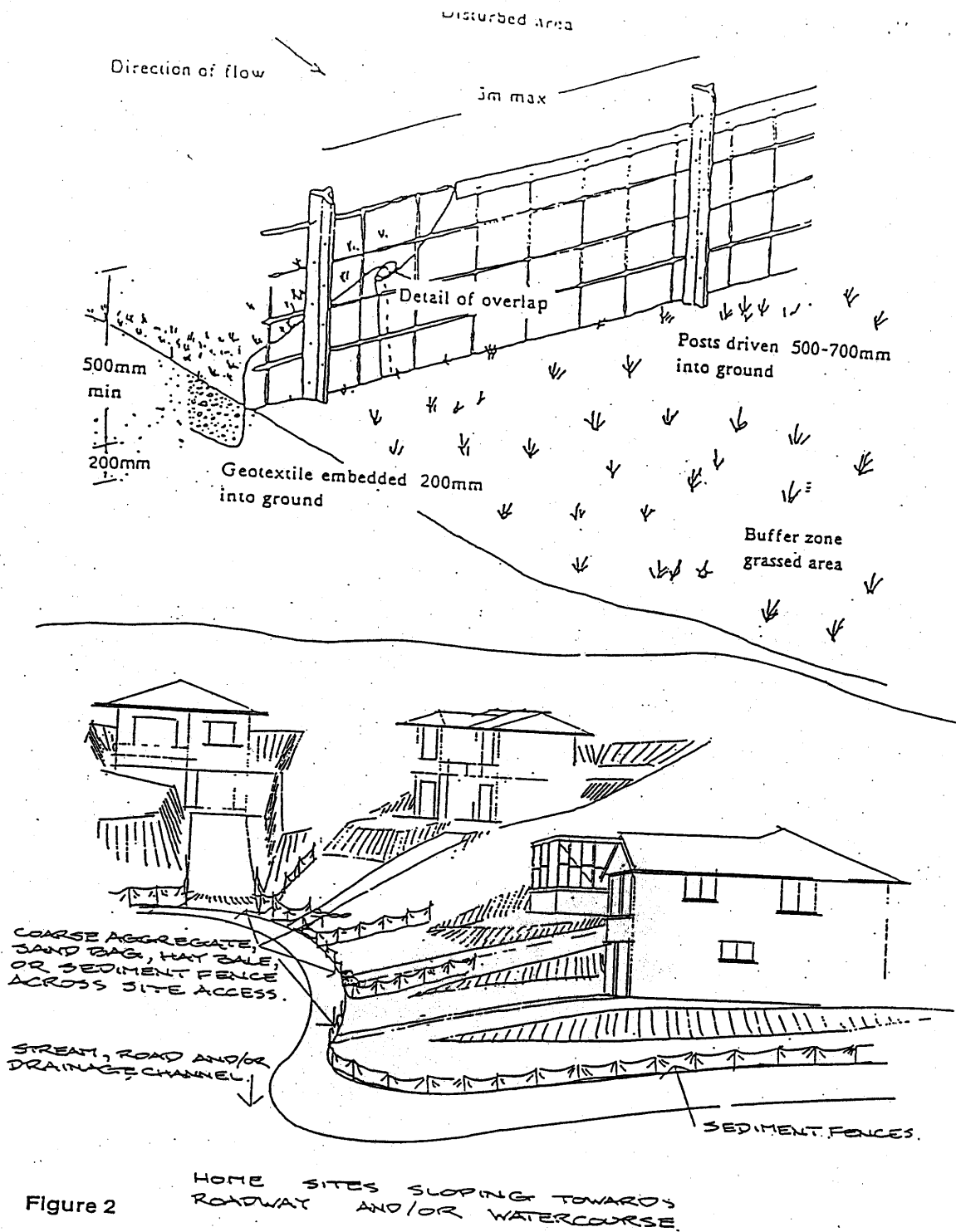


Figure 2

HOME SITES SLOPING TOWARDS
ROADWAY AND/OR WATERCOURSE.

Hicks R.W & Lynch I.F. 1989. Soil Erosion in the Blue Mountains:
Occurrence and Control Strategies. Soil Conservation Service of NSW

7.2 Straw or Hay Bale Sediment Fence:

Straw bale sediment fences also act to prevent sediment leaving sites and may be used in conjunction with or as an alternative to filter fences. Figure 3 below shows how these fences are constructed.

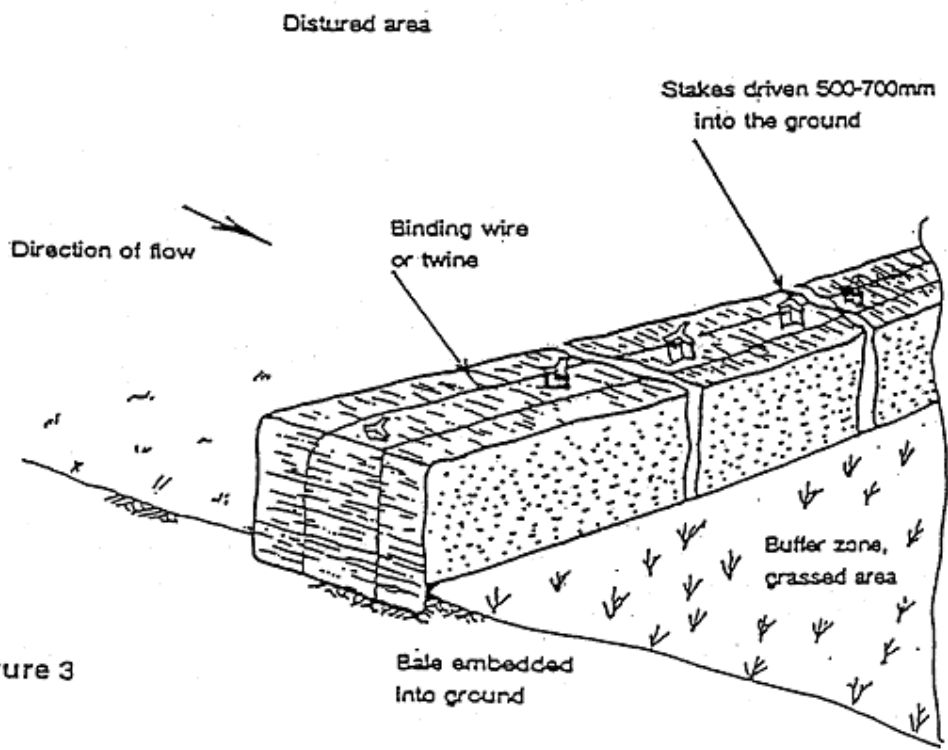
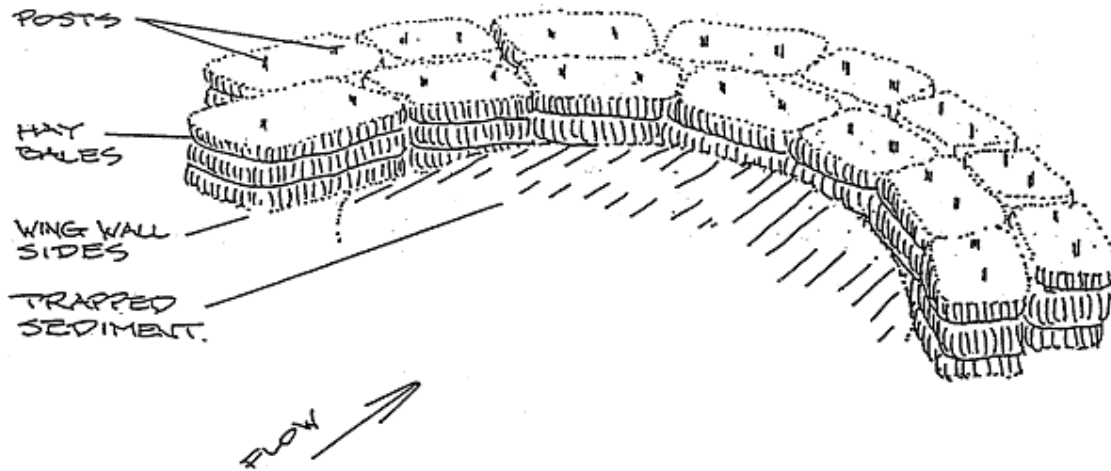
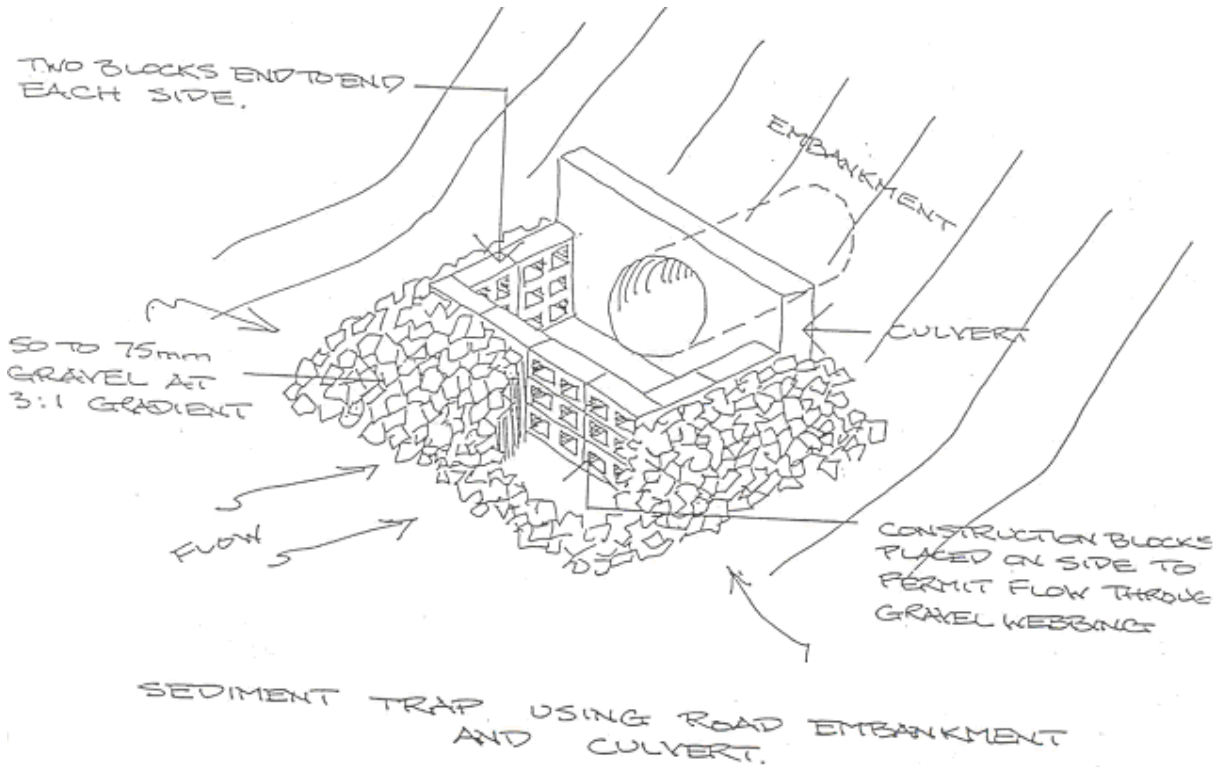


Figure 3

Hicks R.W. & Lynch I.F. 1989. Soil Erosion in the Blue Mountains: Occurrence and Control Strategies. Soil Conservation Service of NSW.

7.3 Sediment Traps:

Sediment traps are temporary de-silting structures that are designed to trap sediment in runoff before it enters stormwater pipes or channels. They function effectively to prevent sedimentation of drains in areas receiving runoff from a small catchment. (See Figure 4).

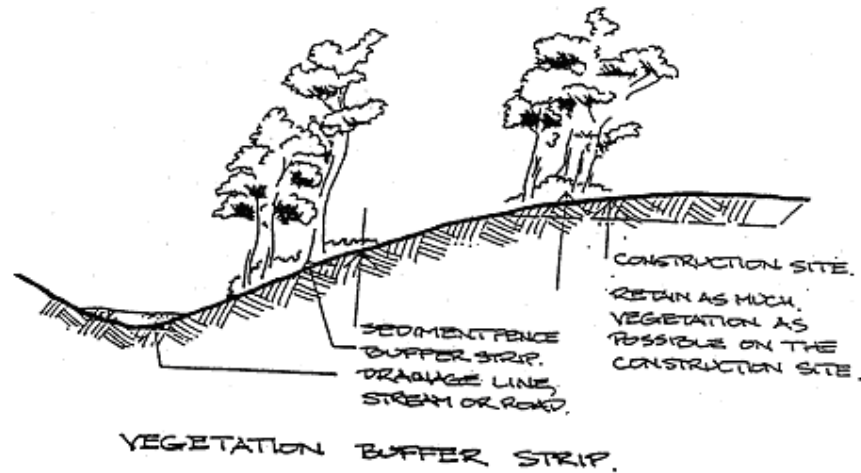


Lynch LG & Clarke AH (ed) 1990. **Preparing Soil & Water Management Plan for Urban, Industrial and Resort Developments.** Lake Illawarra Catchment Management Committee

Figure 4

7.4 Vegetation Buffer Areas:

Filter strips of vegetation or buffer zones (Figure 5) are effective at both trapping sediment and preventing erosion. Tall, dense grass is an efficient sediment trap which can be used around stormwater inlets, waterways or in areas required to intercept high water flows.

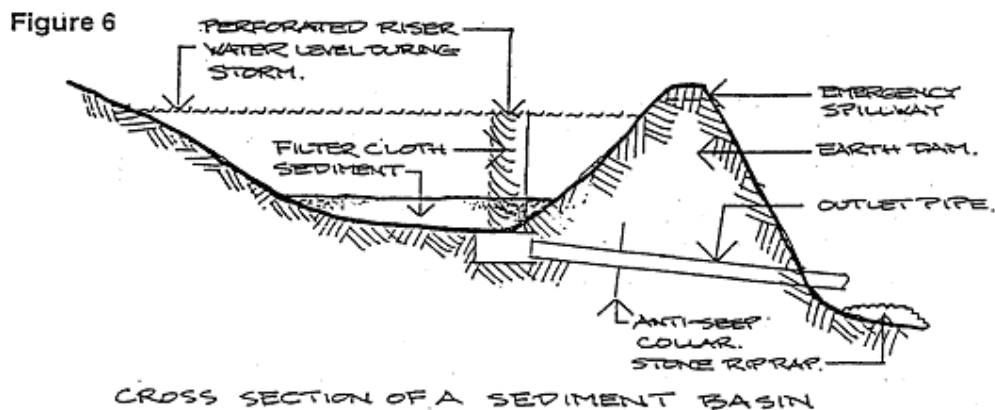


Lynch L.G & Clarke A.H (ed.) 1990. Preparing Soil & Water Management Plans for Urban, Industrial and Resort Developments. Lake Illawarra Catchment Management Committee.

Figure 5

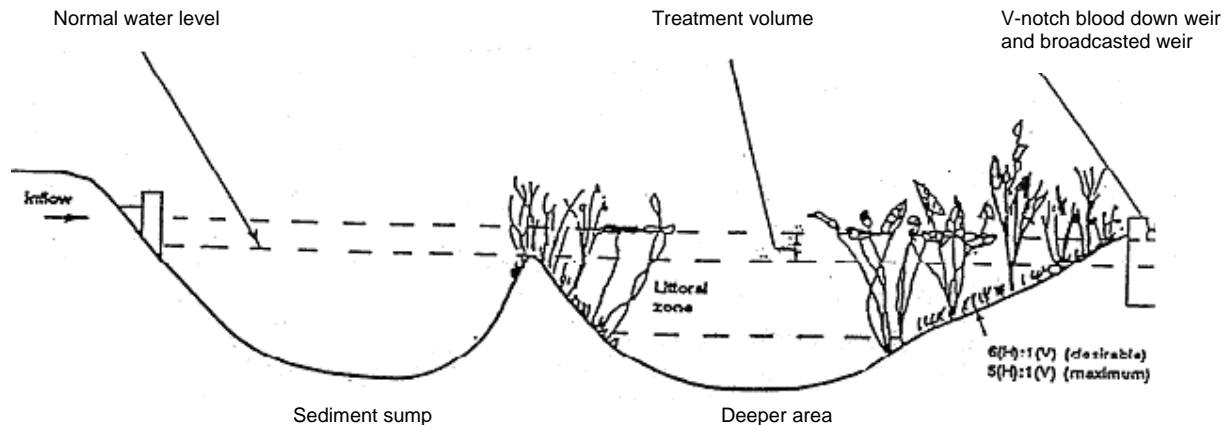
7.5 Sedimentation Basin:

A sediment basin (Figure 6 & 7) is a temporary barrier or dam designed to intercept sediment laden runoff and remove the sediment. Sediment basins do not replace on-site control measures such as sediment traps or fences, instead they act as a final control measure especially on large developments where considerable loads of sediment laden runoff is experienced. Sedimentation basins are not recommended for areas with clay soils as clay particles have long settling rates.



SPPC 1989. Pollution Control Manual for Urban Stormwater

SEDIMENT BASIN AND ARTIFICIAL WETLAND IN SERIES



Department of Housing 1990. **Guidelines for Soil & Water Management for Urban Development**

Figure 7

7.6 Temporary Construction Exit:

A temporary construction exit made of coarse gravel is used to prevent or reduce the transport of sediment off development sites which is carried by vehicles. The exit is constructed of coarse gravel (25mm to 75mm) of minimum 200mm thickness and a minimum of 15m in length. The construction exit functions by removing soil which is attached to the wheels of vehicles. During wet weather, the wheels need to be hosed down to remove the sediment. If this is undertaken, the runoff will need to be collected in a sediment basin, prior to disposal.

7.7 Controls on Stockpiles:

To ensure that stockpiles of materials such as sand, gravel and soil:

- i) do no spill onto the road pavement;
- ii) are not placed in drainage lines or watercourses and
- iii) cannot be washed into these areas,

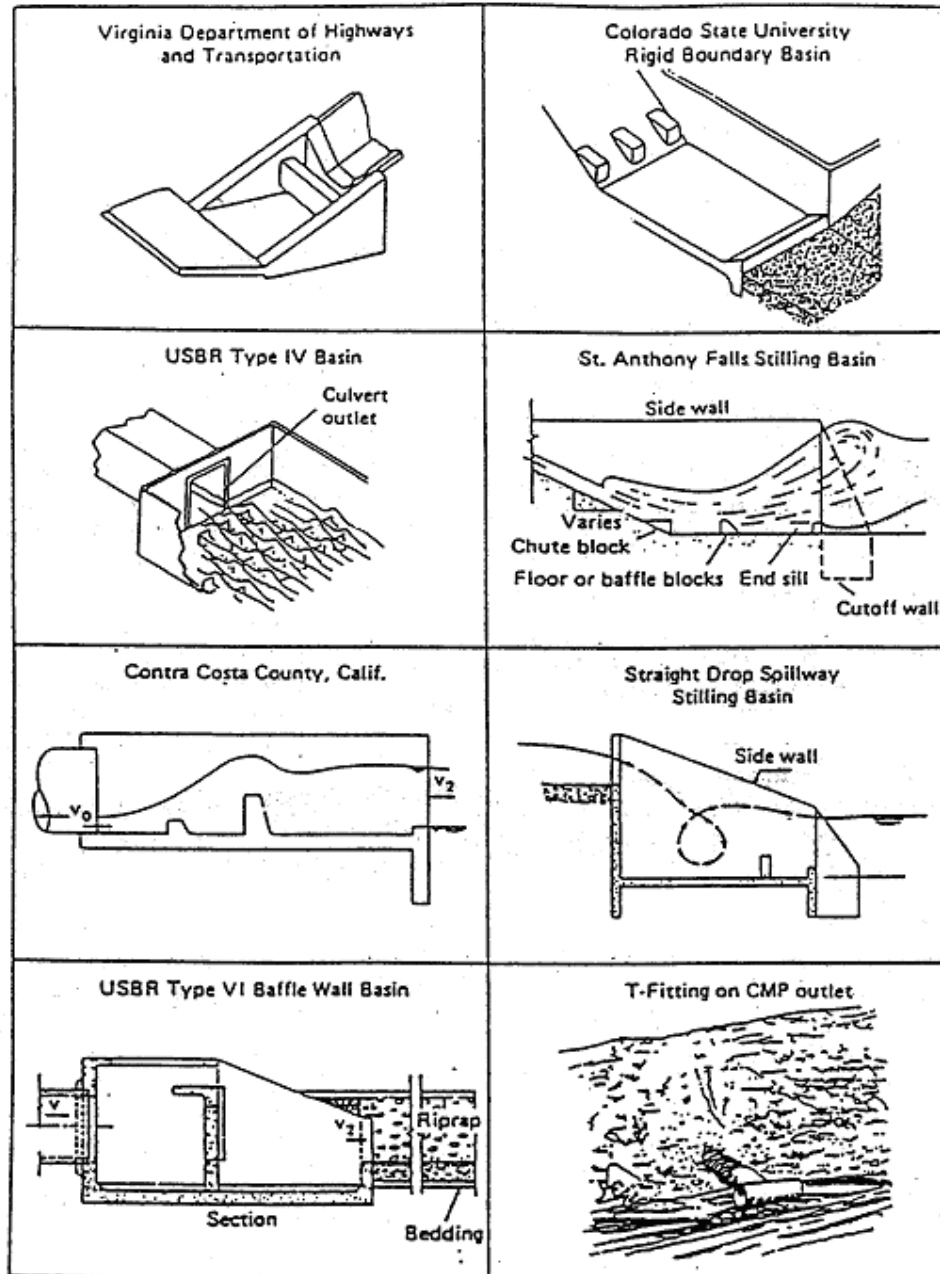
particular attention must be given to the location and protection of the stockpiles.

7.8 Runoff Controls:

Runoff controls function by reducing the flow and/or velocity of water on erosion prone areas. They are used in addition to sediment traps and fences on sites experiencing large flows of water runoff and act by reducing the erosion potential of the site. Catch drains, diversion drains, level spreaders and energy dissipators are common methods used to control erosion.

- (a) **Catch Drains** – Catch drains are located at the top of proposed cuttings where the natural run-off drains towards the cutting. They are designed to direct the run-off to diversion drains which outlet away from the work area or to the inlets of cross-drainage culverts thus avoiding the addition of sediment-laden run-off from outside the construction area.
- (b) **Diversion Drains** – Diversion drains are designed to protect slopes by intercepting surface water and diverting it to a stable outlet at a non-erosive velocity. They generally consist of a channel constructed across a slope with a minor ridge on its lower side.
- (c) **Batter Toe Drains** – Batter toe drains are located at the toe of fill batters and are designed to collect run-off from batter slopes and direct it to drainage culverts or natural watercourses.

- (d) **Energy Dissipators** – Energy dissipators are used to reduce flow velocity and therefore the erosion potential by interrupting the passage of surface water in a channel. This may be achieved by directing flow onto drop structures or baffles, inducing the formation of hydraulic jumps, dissipating flow over riprap basins or constructing level spreaders etc (See Figure 8).



Department of Housing 1990. **Guidelines for Soil & Water Management for Urban Development.**

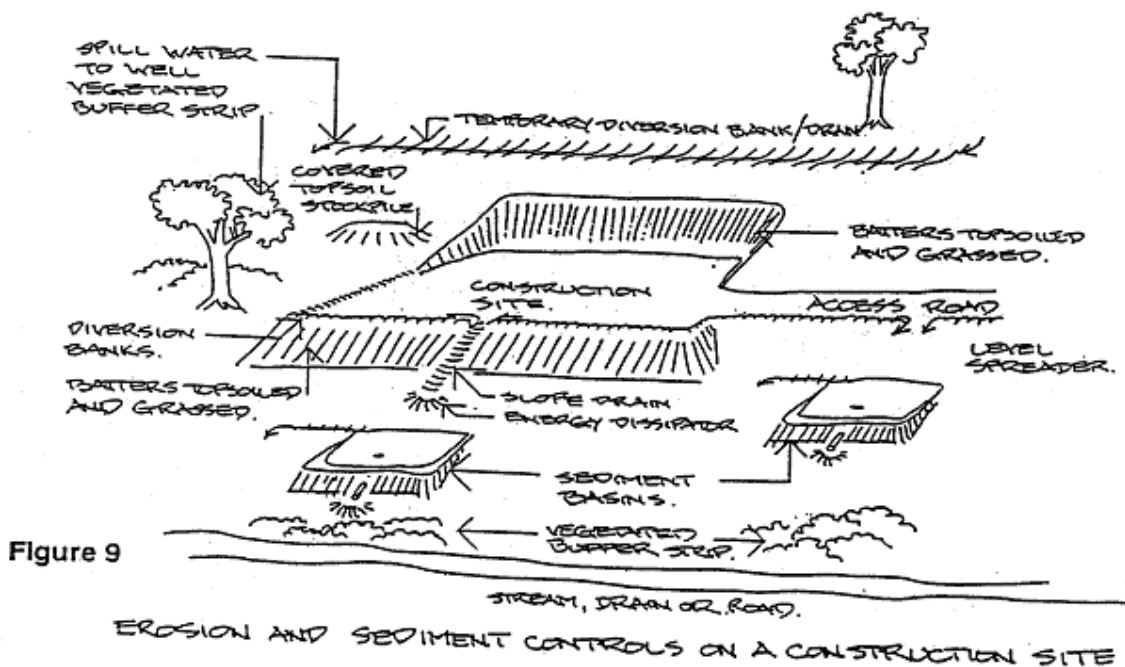
Figure 8

7.9 Stabilisation Works:

Before the erosion controls can be removed, disturbed areas must be stabilised. This includes stabilisation of drainage lines and batters during construction as well as revegetation of disturbed areas when earthworks are completed.

- (a) **Stabilisation of drainage lines** – Drains should be stabilised to prevent scour and channel erosion. This may be undertaken using vegetation, stone pitching, riprap, concrete lining, synthetic woven fabric or jute mesh and bitumen. Although under high flow conditions, it is recommended that either stone pitching, riprap or concrete casing be used.
- (b) **Stabilisation of batters and disturbed areas** – Revegetation of disturbed areas including batters is essential in order to prevent further erosion and sedimentation. Revegetation is able to stabilise disturbed areas by:
 - Retaining soil particles;
 - Increasing the infiltration of water;
 - Reducing the velocity of runoff water; and
 - Reducing the impact of rain.

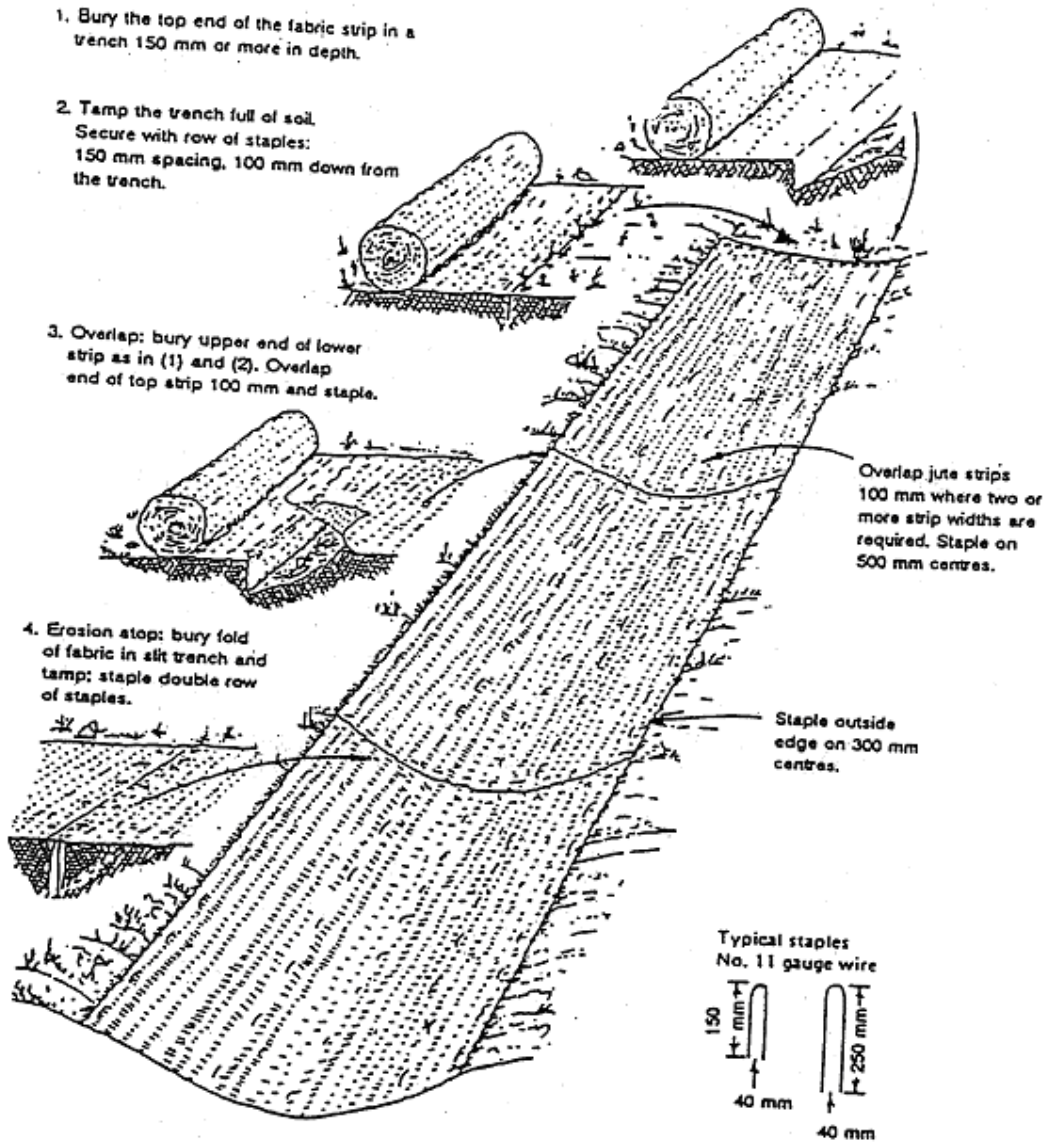
It is important that the topsoil from the site is preserved during earthworks and later re-spread prior to site revegetation.



SPPC 1989. Pollution Control Manual for Urban Stormwater.

(i:plandev:misch&b.guidelines for control of soil erosion)

STABILISING GRASSED WATERWAYS WITH FABRIC



Quilty, JA et al 1978. *Urban Erosion & Sediment Control*
Soil Conservation Service Technical Handbook No. 2

Figure 10

Don't Forget To

1. **Protect stockpiles of sand, gravel, soil** etc from being washed into drains, watercourses or onto adjoining land;
2. **Stabilise areas of disturbance as soon** as possible by mulching or revegetation;
3. **Minimise the movement of vehicles on site during wet weather;** and
4. **Remove an material accidentally spilled onto the road or gutter immediately.**

**Remember....It is an offence to pollute any watercourse, so
keep your soil on your land!!**

FOR FURTHER INFORMATION

Contact:

1. Department of Conservation and Land Management (Soil Conservation Service of NSW).
2. The Environment Protection Agency
3. Lismore City Council

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