Building Sites Part 1: General

MISCELLANEOUS TOPICS

Photo 1 – Building site

Photo 2 – Building site

Key Principles

1. Prepare and implement an Erosion and Sediment Control Plan (ESCP) for the site.
2. Allow for the early stabilisation of any areas of disturbance located outside the immediate work area. For example, after the completion of the initial earthworks, it is often possible to stabilise (e.g. turf) the backyard before works commence on the building.
3. Minimise the number of site entry points, preferably to one stabilised rock pad.
4. Expose the smallest possible area of land for the shortest possible time.
5. Save and promptly replace the topsoil.
6. Divert up-slope stormwater runoff around soil disturbances.
7. Connect roof water downpipes to the permanent drainage system immediately the roof and guttering are installed.
8. Actively control wind and rain-induced soil erosion.
9. Firmly compact and stabilise all backfilled service trenches.
10. Minimise the quantity of sediment mobilised off the property.
11. Place all long-term stockpiles of erodible material within the sediment control zone.
12. Fully contain all wash-water from concreting, ceramic cutting, and cleaning operations within an on-site area of grass or open soil.
13. Promptly revegetate or otherwise stabilise all soil disturbances.
14. Maintain all erosion and sediment control measures in proper working order at all times.

Development of Erosion and Sediment Control Plans for Building Sites

The following section provides a procedure for the preparation of Erosion and Sediment Control Plans (ESCPs) for single-dwelling building sites. This procedure has been supplied as a guide only, and does not necessarily address all issues applicable to every site.

This information is not intended to replace the need for site-specific evaluation and design. It is important to ensure that the Erosion and Sediment Control Plan complies with all relevant local, State and Federal legislation, and industry codes of practice.

A suggested procedure for the development of Erosion and Sediment Control Plans for single dwelling building sites is presented below:

Step 1. Evaluate site limitations.

Step 2. Stabilise site entry/exit points.

Step 3. Locate material stockpile areas.

Step 4. Control up-slope stormwater.

Step 5. Control sediment runoff.

Step 6. Control erosion on disturbed areas.

Step 7. Control roof water drainage.

Step 8. Define the installation sequence.

Step 9 Prepare technical notes for the ESCP.

Step 1. Evaluate site limitations

Assess the site constrains and any site-specific concerns, including:

- specific vegetation that may need to be identified and/or isolated from the site disturbance;
- highly erodible soils that may require additional erosion control measures;
- up-slope drainage catchments that may need to be diverted around the work site;
- work space limitations that may require site-specific sediment control measures and/or the extensive use of skips or bins for material storage and waste management.

Photo 3 – Steep sites require appropriate building design

Photo 4 – Poor soils can result in erosion problems even before building works start

Photo 5 – Caution tape used to identify non-disturbance areas and protected vegetation

Photo 6 – Limited site access should not be used as an excuse to move building activities and stockpiles onto the footpath

Step 2. Stabilise site entry/exit points

Wherever reasonable and practicable, restrict site access to just one entry/exit point. A stabilised entry/exit point normally consists of a stabilised rock pad (refer to Figure 1).

Photo 7 – Rock entry/exit pad

Photo 8 – Rock pad showing use of large, uniform rock

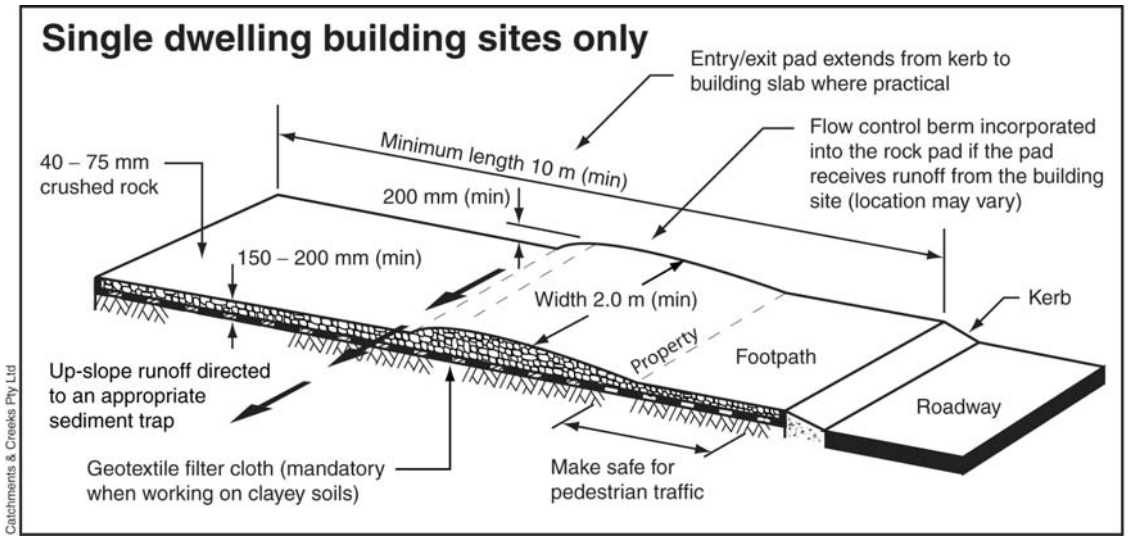

Figure 1 – Entry/exit rock pad for building sites (not construction sites)

If the building site is elevated above the road, then it is likely that stormwater runoff from the building site will wash sediment from the entry/exit pad onto the roadway. To avoid this, it is usually necessary to construct a raised flow diversion berm across the rock pad (Figures 1 & 2) to direct stormwater runoff into an adjacent sediment trap such as a sediment fence.

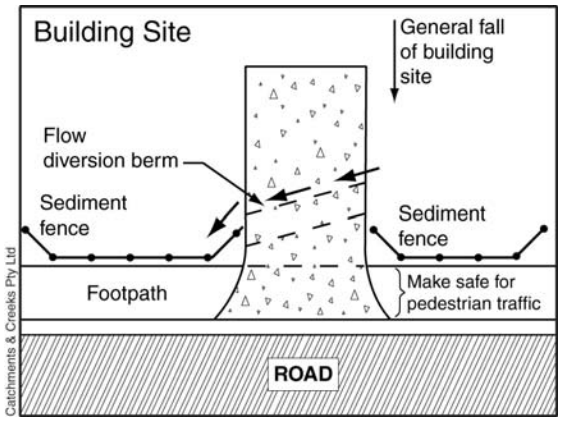

Figure 2 – Stormwater runoff being directed off an entry/exit pad

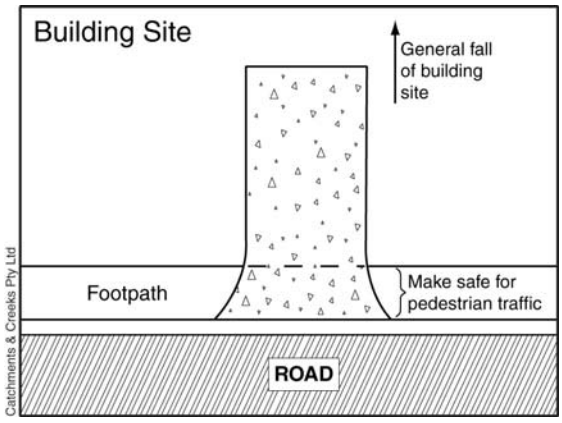

Figure 3 – Example of an entry/exit pad that drains back into the site

Step 3. Locate material stockpile areas

Suitable material storage areas need to be located up-slope of the main sediment barrier (e.g. sediment fence). The building layout should allow sufficient room on the site for the storage of all building materials. No materials should be stored outside the property boundaries.

On steep sites and sites with limited available space, erodible materials may need to be stored in commercial-sized bins or mini-skips. The extensive use of mini-skips can be beneficial within the older commercial and residential areas of cities where there is usually limited space between the building frontage and the property boundary.

Photo 9 – Note earth stockpile behind sediment fence (left), and covered stockpile (right)

Photo 10 – Stockpiles of sand and other erodible materials must not be placed on the road verge or near stormwater inlets

Step 4. Control up-slope stormwater

During those periods when the monthly rainfall is expected to exceed 45mm, the runoff from any up-slope catchment area exceeding 1500m^2 should, wherever reasonable and practicable, be diverted around the work site or a soil disturbance. However, this runoff must not be diverted in a manner that causes inconvenience to neighbouring properties, or results in the stormwater being unlawfully discharged from the property.

Up-slope stormwater may be collected and moved across the site by constructing either 'catch drains' (Photo 11) or 'flow diversion banks' (Photo 12). If the site is steep, then a temporary drainage 'chute' (Photo 17) may be needed to carry the runoff down the slope.

Photo 11 – Catch drain up-slope of a soil disturbance

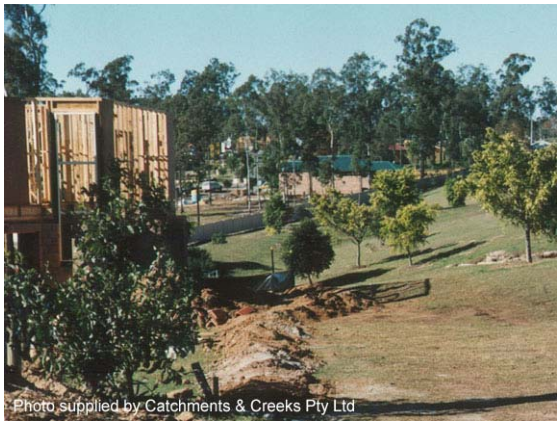

Photo 12 – Flow diversion bank up-slope of a building site

It is good commercial practice to closely link the site's temporary drainage requirements with the site's permanent drainage network. This means that the drainage systems can immediately be stabilised with the proposed final surface treatment, such as turfing, rock lining, or concrete.

If the soils are known to be highly dispersive, then it is usually unadvisable to cut open drains into the soil, instead preference should be given to the use of flow diversion banks (Photo 12) or piped drainage systems.

Table 1 – Low gradient flow diversion techniques

Technique	Symbol	Description and usage
Catch Drains (Photo 11)	→ CD →	• A shallow spoon drain cut into soil up-slope of earthworks. • Used for the diversion of stormwater runoff around a soil disturbance.
Flow Diversion Banks (Photo 12)	→ DB →	• Small earth embankment constructed with a slight fall to encourage water movement. • Used for the diversion of stormwater when the subsoils are dispersive or highly erodible.

Table 2 – Steep gradient flow diversion techniques

Technique	Symbol	Description and usage
Chutes (Photo 17)	→ CH →	• A shallow drain cut straight down a slope. • Used to move stormwater down steep slopes.
Level Spreaders (Photo 18)	LS	• Used to convert minor concentrated flows back to 'sheet' flow before being released down a stable grassed slope.

If flow velocities within a constructed drain are expected to cause erosion, then the options are to either line the drain with 'turf', 'filter cloth', or 'erosion control mats'; or to place temporary 'check dams' in the drain to reduce the flow velocity. Check dams are most effective when used within drains that have a gradient less than 10% (1 in 10). All rock-based check dams should be removed once a good grass cover is established within the drain.

Photo 13 – Stormwater drain lined with a 'jute' erosion control mat

Photo 14 – 'Thick' jute mat

Photo 15 – Stormwater drain lined with jute mesh

Photo 16 – Jute mesh

Photo 17 – Geotextile filter cloth used as a temporary lining within a chute

Photo 18 – Recessed log used as a level spreader to release runoff as 'sheet' flow

The use of check dams on building sites is very rare. In most cases the best solution is to protect high velocity drains with a channel lining that is appropriate for the site conditions.

Photo 19 – Sandbag check dam

Photo 20 – Rock check dam used to reduce flow velocities in drains

Sandbag check dams (Photo 19) are generally used in drains that are less than 500mm deep. Rock check dams (Photo 20) should only be used in deep drains at least 500mm deep.

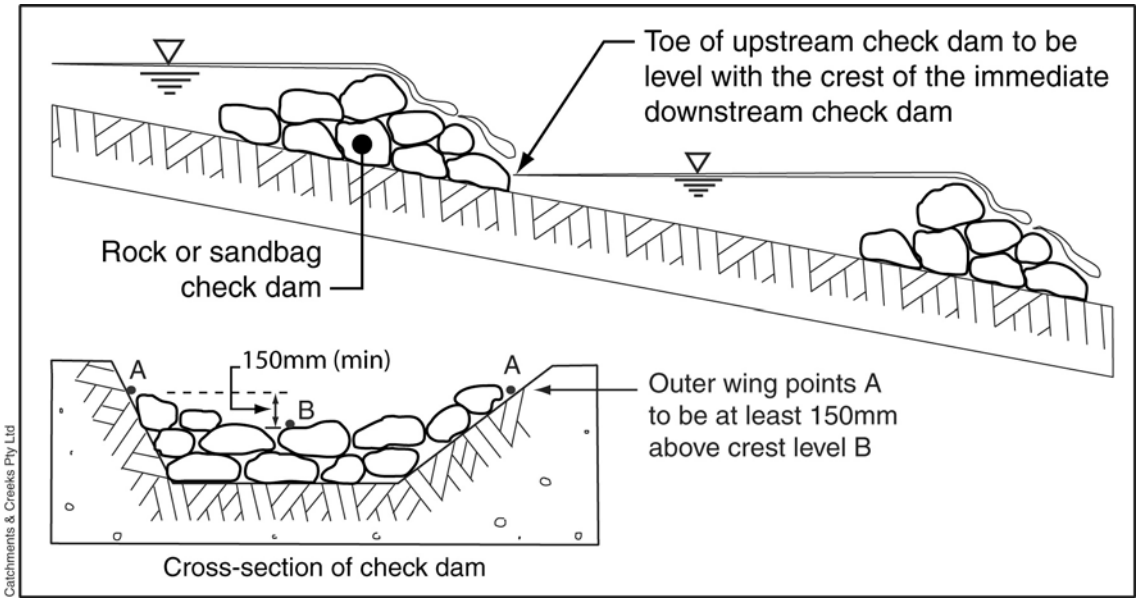

Figure 4 – Placement of check dams down an open drain

Step 5. Control sediment runoff

On building sites, the control of sediment runoff is normally achieved through the use of sediment fences. However, wherever practical the sediment fence should be supplemented by the retention and/or establishment of grassed areas to further filter any runoff.

Ideally, sediment fences should be installed along a line of constant elevation to allow stormwater to pass evenly through the fence. On most building sites, however, it is common practice to install the sediment fence along the lower property boundary, even if the boundary lies along a slope. In such cases, regular returns (i.e. fence turned at least 1m up the slope) at a maximum 10m spacing are required to allow stormwater to pass through the fence at regular intervals (Photo 22).

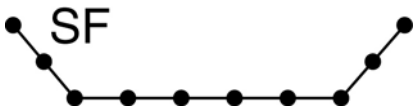

Figure 5 – Standard symbol for a sediment fence

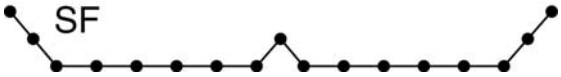

Figure 6 – Sediment fence symbol shown with intermediate fence return

Photo 21 – Sediment fence placed along the contour down-slope of a building site

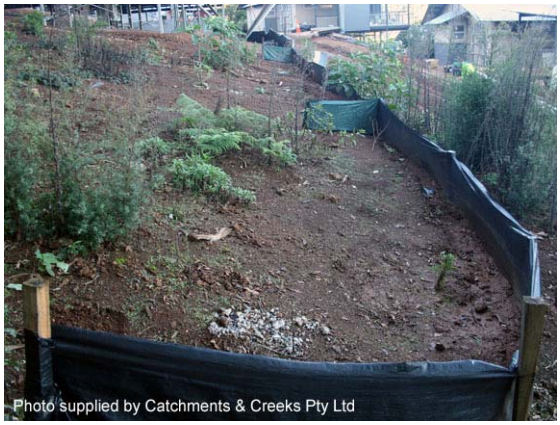

Photo 22 – Sediment fence showing use of regular 'returns'

Photo 23 – Poorly installed sediment fence directing sediment-laden runoff directly into a stormwater inlet

Photo 24 – Shade cloth must NOT be used to form a sediment fence

A sediment fence should **not** be viewed as a filtration system. It is best to consider a sediment fence as a porous dam wall. Its primary job is to temporarily pond water during a storm, thus allowing the gravitational settlement of sediments within the resulting up-slope settling pond.

Therefore, a sediment fence must be constructed in a manner that allows the temporary ponding of water at regular intervals along the fence. It is therefore essential for the lower end(s) of the fence to be turned up the slope to prevent stormwater bypassing around the fence (refer to Figures 7 to 13).

Step 6. Control erosion of disturbed areas

Appropriate erosion control measures should be employed to limit soil erosion as soon as practical on the site. The use of erosion control measures is best identified on Erosion and Sediment Control Plans through the use of technical notes (refer to Step 9).

The application of erosion control measures greatly depends on the likelihood and intensity of expected rainfall. If building activities occur during dry months when the monthly rainfall is expected to be less than 45mm, then erosion control requirements are likely to be significantly less than if building works were to occur during the wetter months.

In addition to a down-slope sediment fence, long-term stockpiles of clayey soil may require an impervious cover to minimise the release of turbid runoff. On the other hand, stockpiles of clean sand that are located behind a sediment fence, will only need a protective cover if the stockpiles are likely to be exposed to strong winds.

On cut and fill sites, newly formed earth batters should be covered with topsoil and stabilised as soon as reasonable and practicable. If the earth batters are to be grass seeded, then the application of light mulch (<50mm) will help is stabilise the slope. If the batter is to be vegetated with trees and shrubs, then the slope can be stabilised with a heavy mulch layer (50–100mm) or covered with erosion control blankets (Photos 27 & 28).

Wherever practicable, the site should be turfed as soon as building activities are completed, and a heavy mulch layer should be placed on exposed garden beds to control soil erosion. Builders are encouraged to take the opportunity to include such items within the building contract.

Photo 25 – Light mulching

Photo 26 – Heavy mulching

Photo 27 – Erosion control blankets

Photo 28 – Thick 'jute' blanket

In areas experiencing strong winds or significant overland flow, commercial erosion control blankets can be used as an alternative to loose mulch. Both 'thick' and 'thin' blankets are available (Photo 27). The thin blankets perform a task similar to light mulching, while thick blankets perform a task similar to that of heavy mulching, thus thick blankets (Photo 28) can also be used as 'temporary' weed control blankets.

Step 7. Control roof water drainage

To reduce soil erosion and site wetness, roof water should be discharged away from the active work area and other disturbed soil surfaces. During periods when there is a reasonable likelihood of rainfall, permanent or temporary downpipes need to be installed to suitably manage roof water as soon as the roof and guttering are laid.

The permanent site drainage system should be installed and ready to receive roof water prior to the framing inspection.

Roof water drainage controls are best identified on building plans through the use of technical notes (refer to Step 9). The use of such controls can significantly reduce down-time and clean-up costs following extended periods of wet weather.

Photo 29 – Temporary downpipe

Photo 30 – Installation of permanent drainage system before roof framing

Step 8. Define the installation sequence

Whether temporary or permanent, there are usually several critical drainage, erosion, and sediment control measures that need to be installed before building works commence. To help achieve this outcome, an erosion and sediment control installation or construction sequence should be developed which incorporates all specified drainage, erosion, and sediment control measures. A typical construction sequence is presented below.

1. Obtain all necessary permits, licences and approvals before site establishment.
2. Establish a single, stabilised entry/exit point (e.g. rock pad).
3. Install sediment fence(s) down-slope of the site.
4. Divert up-slope water around the work site and stabilise any drainage channels.
5. Clear only those areas necessary for building works to occur.
6. Strip and stockpile the topsoil before commencing earthworks or excavations.
7. Stockpile erodible materials within the sediment control zone.
8. Stabilise exposed earth banks (e.g. mulch, turf, erosion control blankets).
9. Install on-site waste receptors (e.g. mini-skips, bins, wind-proof litter receptors).
10. Commence building activities.
11. Establish the site's underground drainage system (if any).
12. Connect roof water downpipes to the permanent underground drainage system as soon as the roof and guttering are laid.
13. Regularly inspect all drainage, erosion and sediment control measures and maintain all measures in proper working order at all times.
14. Progressively revegetate/stabilise the site.
15. Remove any remaining temporary drainage, erosion and sediment control measures upon complete stabilisation of the site.

Step 9 Prepare technical notes for the ESCP

Technical notes should be attached to the Erosion and Sediment Control Plan, or other building plans, to highlight site-specific issues and to detail maintenance requirements of the various erosion and sediment control measures. Example technical notes are provided below. Only those technical notes relevant to a given site should be incorporated into the plans.

Example technical notes:

- All sediment fences to be installed prior to commencement of earthworks if rain is possible while earthworks are occurring.
- Prior to commencing excavations, topsoil must be stripped from the designated area and stockpiled on site for later use.
- Immediately following the completion of bulk earthworks, all disturbed areas outside the footprint of the base slab (if used, otherwise all disturbed areas) to be mulched (minimum 50mm) or otherwise stabilised against erosion.
- Designated earth batters to be stabilised, as directed on the plans, immediately after bulk earthworks have been completed on the site.
- Appropriate building waste receptors must be located on the site and suitably maintained during the building phase.
- All ground-cover vegetation outside the immediate building area to be preserved during the building phase.
- Damage to the road reserve (i.e. footpath) vegetation to be minimised and repaired as soon as reasonable and practicable at the builder's expense.
- No materials to be stockpiled outside the property boundaries beyond the end of a working day.
- Soil and sand stockpiles to be covered if strong winds are forecast that could displace the material from the site.
- Stockpiles of earth are to be covered with an impervious cover if rain is forecast.
- The site's underground stormwater drainage system to be installed and operational prior to roof installation.
- Roof water downpipes (temporary or permanent) are to be connected to the stormwater drainage system immediately after the roof and guttering are laid.
- All temporary drainage and sediment control measures to remain functional during the building phase.
- All erosion and sediment control structures to be inspected each working day and maintained in proper working order at all times.
- Sediment to be removed from up-slope of each sediment trap (e.g. sediment fence) immediately after rainfall if the depth of sediment exceeds 200mm.
- Excessive sediment deposition on the rock entry/exit pad to be removed.
- Additional rock to be applied to the rock entry/exit pad as necessary to maintain its function.
- All sediment deposited off the site as a result of work-related activities is to be collected and disposed of in a manner that will prevent any safety or erosion hazard.
- Brick, tile and masonry cutting must be carried out on a pervious surface, such as grass, or open soil, or in such a manner that all sediment-laden runoff is prevented from discharging into a gutter, drain, or water body.
- Washing/flushing of sealed roadways must only occur where sweeping has failed to remove sufficient sediment and there is a compelling need to remove the remaining sediment (e.g. for safety reasons). In such circumstances, all reasonable and practicable sediment control measures must be used to prevent, or at least minimise, the release of sediment into receiving waters. Only those measures that will not cause safety and property flooding issues shall be employed. Sediment removed from roadways must be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm.

Adequate waste collection bins must be provided on-site and maintained such that potential and actual environmental harm resulting from such material waste is minimised.

Photo 31 – Site rubbish pit protected from wind through the use of a 'sediment fence' wind break

Photo 32 – Mini-skin used for waste collection

Sediment control systems must not be installed outside the property boundary unless specifically approved by the relevant regulatory authority.

Photo 33 – Sediment barriers must only be placed within the road reserve upon the approval of the road authority

Photo 34 – Sediment barriers must not extend onto the road verge unless appropriate approval is obtained

Brick, tile and masonry cutting must not occur outside the property. Such building activities must be carried out on a pervious surface, such as grass or open soil, or in such a manner that all sediment-laden runoff is prevented from discharging into a gutter, drain, or water body.

Photo 35 – Building works should not occur on the road verge

Photo 36 – Building works should not occur on the road verge

Example Erosion and Sediment Control Plans

Figures 7 to 12 provide examples of how drainage and sediment control measures can be applied to various types of building sites. Figure 13 provides an example Erosion and Sediment Control Plan for a building site.

(a) Property that falls diagonally towards the road:

- The sediment fence may require occasional returns (zigzags) installed to prevent stormwater simply flowing down the fence to the lowest corner of the property. Fence returns are normally installed at a maximum spacing of 10m. These returns should extend at least 1m up the slope.
- Catch drains or flow diversion banks placed along the up-slope edges of the property are generally required only if there is more than 1500m^2 of catchment area up-slope of the building, and the monthly rainfall is expected to exceed 45mm.
- A flow diversion bund may or may not be required on the entry/exit pad of building sites depending on the expected quantity of sediment and surface runoff discharging down the rock pad.

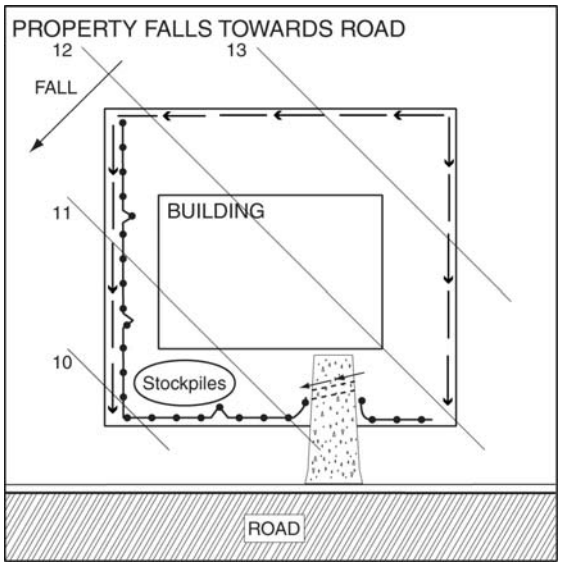

Figure 7 – Example site plan

(b) Property that falls away the road:

- In Figure 8 the entry/exit pad does not require a raised flow diversion bund because sediment-laden runoff from the rock pad will not flow towards the road.
- Placing a sediment fence or safety fence along the front of the property can help to restrict traffic movement to the entry/exit pad.
- The sediment fence may be fixed to the back fence (if available).
- Stormwater runoff from stockpiles must drain to the sediment fence or other suitable sediment trap.

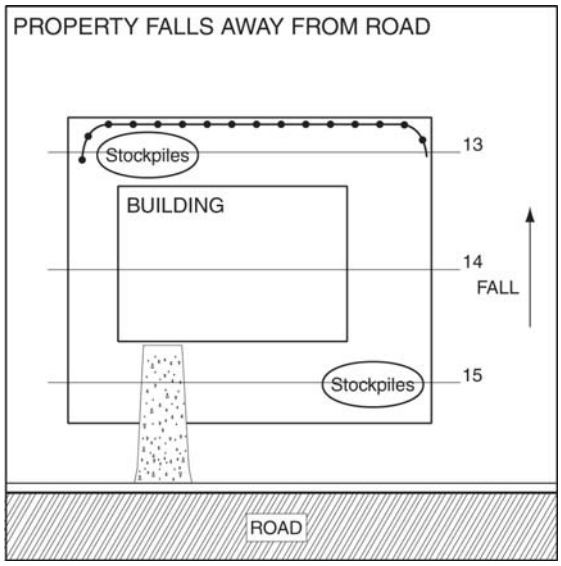

Figure 8 – Example site plan

(c) Property that falls parallel to the road:

- If property fencing already exists, then the sediment fence may be fixed to the fence for support.
- Extending the sediment fence along the front of the property can help to control vehicular movement onto the site.
- Intermediate sediment fence returns are not required if the fence is installed along level ground.
- The entry/exit pad may or may not require a raised flow diversion bund to prevent sediment-laden water flowing off the rock pad onto the road.
- Catch drains or flow diversion banks placed along the up-slope edges of the property are generally required only if there is more than 1500m^2 of catchment area up-slope of the building, and the monthly rainfall is expected to exceed 45mm.

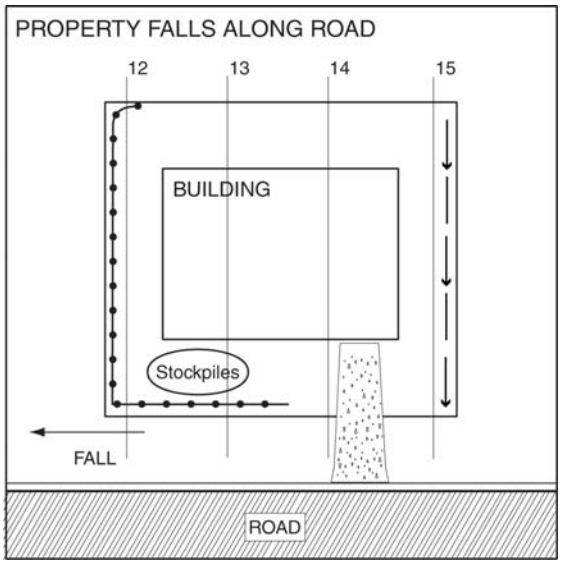

Figure 9 – Example site plan

(d) Property with a building face along one boundary line (zero lot alignment):

- Initially a sediment fence should be located along the full length of the lower property boundaries. Sections of this sediment fence may be removed to allow foundations and building works to be completed, but it must remain in place and in proper working order for as long a practical.
- Catch drains or flow diversion banks placed along the up-slope edges of the property are generally required only if there is more than 1500m^2 of catchment area up-slope of the building, and the monthly rainfall is expected to exceed 45mm.
- A flow diversion bund may or may not be required on the entry/exit pad of building sites depending on the expected quantity of sediment and surface runoff discharging down the rock pad.

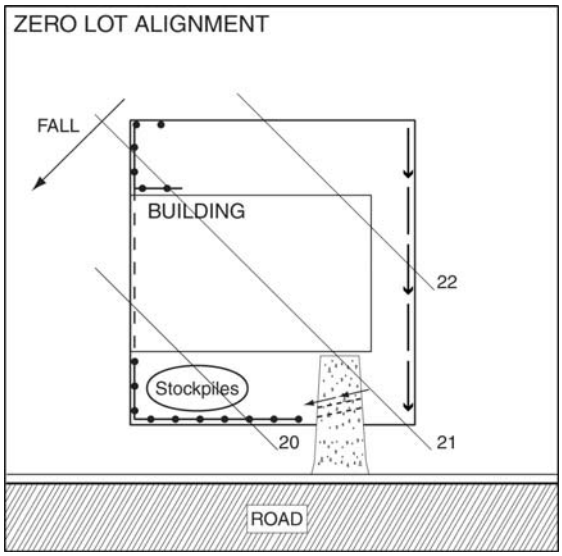

Figure 10 – Example site plan

(e) Property that falls towards the road:

- Catch drains or flow diversion banks placed along the up-slope edges of the property are generally required only if there is more than 1500m^2 of catchment area up-slope of the building, and the monthly rainfall is expected to exceed 45mm.
- Catch drains located along the side of the property are only required if it is necessary to either permanently direct stormwater away from adjacent properties, or to temporarily direct sediment-laden water to the sediment fences.
- If the catch drains carry only 'clean' stormwater runoff, then they should be directed around the sediment fence as shown on the right-hand-side of the diagram.
- A flow diversion bund may or may not be required on the entry/exit pad of building sites depending on the expected quantity of sediment and surface runoff discharging down the rock pad.

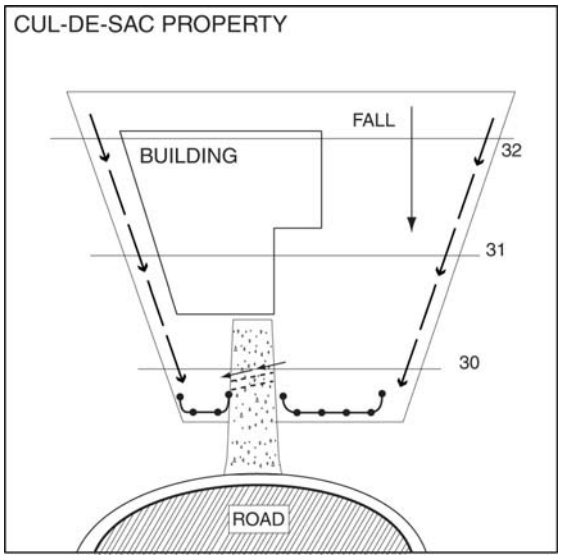

Figure 11 – Example site plan

(f) Narrow lots:

- In most cases drainage and sediment controls on narrow lots should be as per larger building sites.
- The sediment fence may need to be located across the full width of the lower property boundary. In such cases, the fence may be lowered during working works to allow access, but must be raised at the end of each working day and while rain is occurring.
- A flow diversion bund may or may not be required on the entry/exit pad of building sites depending on the expected quantity of sediment and surface runoff discharging down the rock pad.

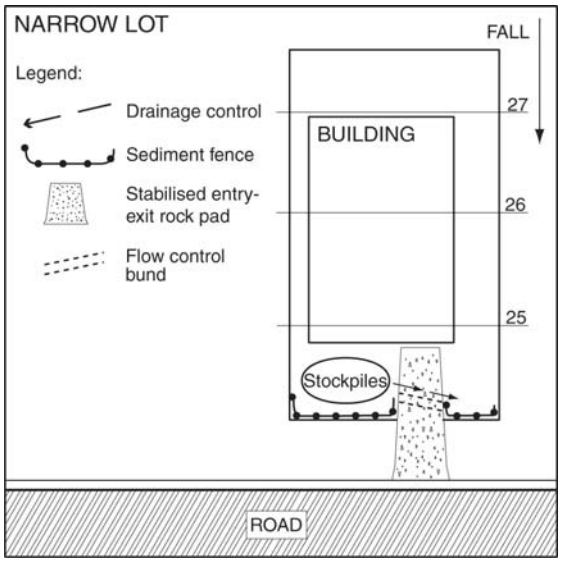

Figure 12 – Example site plan

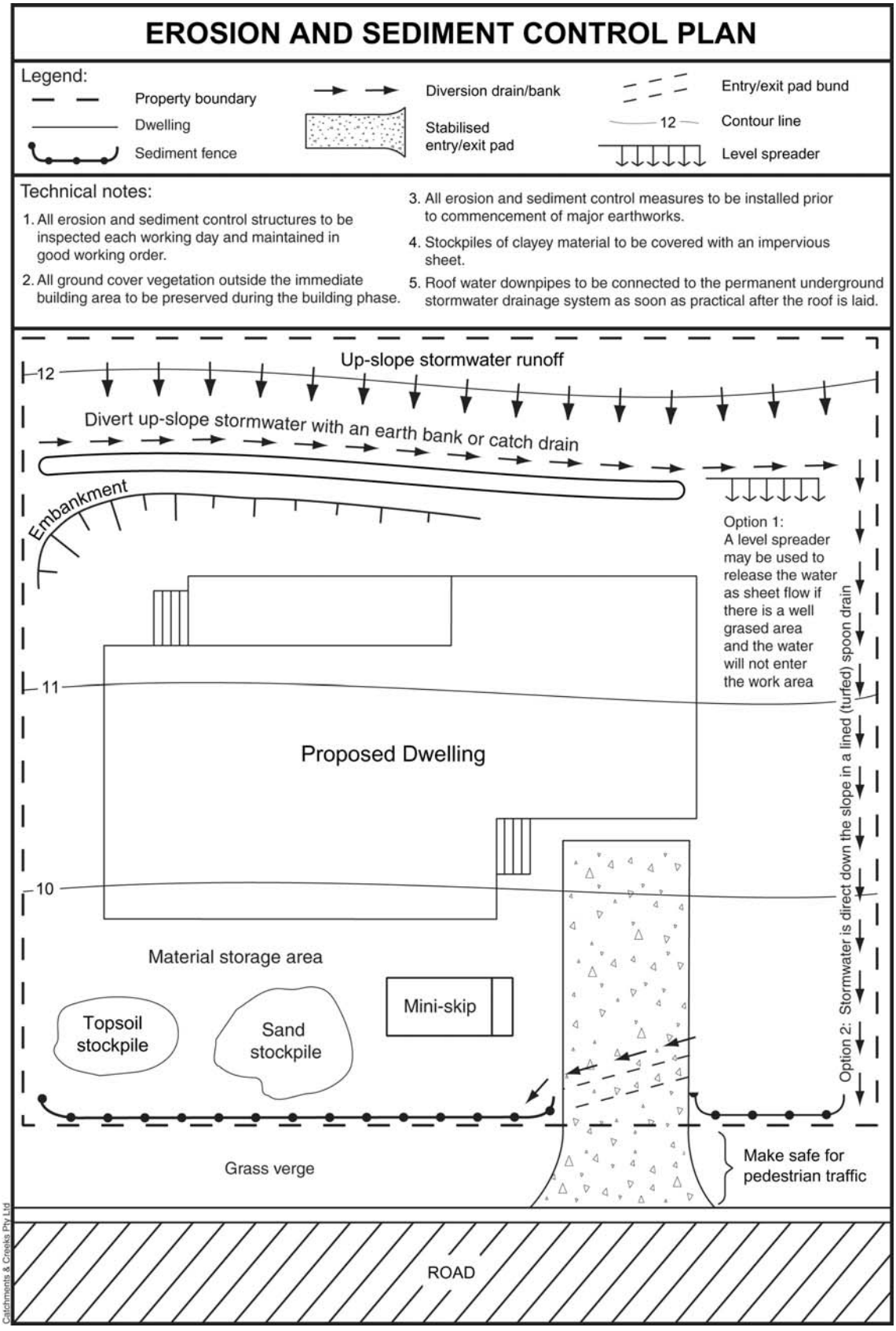

Figure 13 – Example Erosion and Sediment Control Plan