Why worry about earthworks?

Bare soil is picked up by rainstorms and carried away. A certain amount of erosion is natural, but an exposed earthworks site can generate a thousand times more silt than an undisturbed site. A single rainstorm can erode up to four truckloads of soil from your house site. New Zealand weather is changeable and difficult to forecast, and many of the clay soils of Waitakere City – especially on steeper sites – are unusually vulnerable to erosion.

The larger sediments may settle out in stormwater cesspits or streams, where they contribute to ongoing flooding problems. The finer clay particles common in Waitakere City soils, may stay in suspension for weeks or even months, causing dirty water in our streams and harbours. Not only does this look ugly and cause public complaint, but it smothers plant and animal life, and permanently affects fish feeding and breeding areas – both in streams and in the rich mangrove and shellfish beds of the harbours.

Sediment is the most significant water pollutant in the Auckland region.

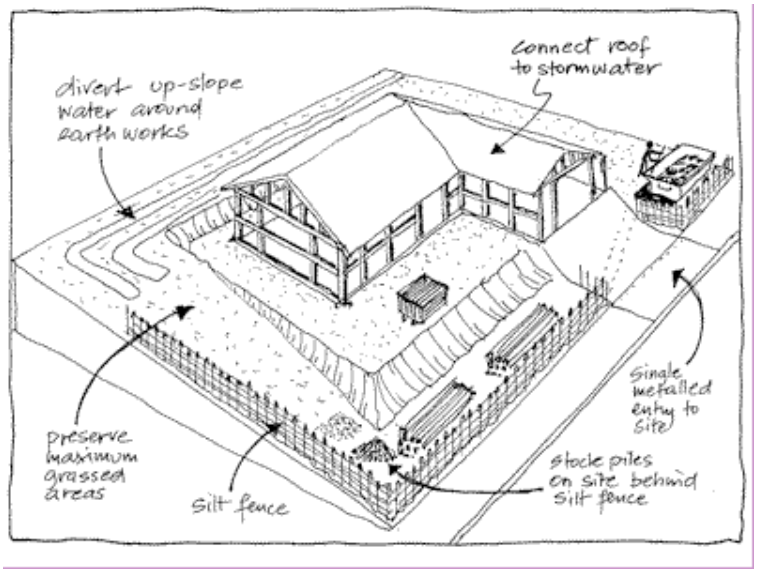
The legal requirement

Waitakere City's District Plan incorporates rules for earthworks. Earthworks means any earthmoving operation that exposes soil to the elements, apart from gardening and horticulture, or work associated with pile foundations for houses, effluent disposal fields for septic tanks, or the maintenance or instalation of underground pipes and cabling.

So long as you carry out the erosion/sediment control measures described in the appendix to the District Plan (and summarised below) you can excavate for the following without a consent:

1. a building platform anywhere in the city
2. up to 50 cubic metres if your site is within the general natural area.

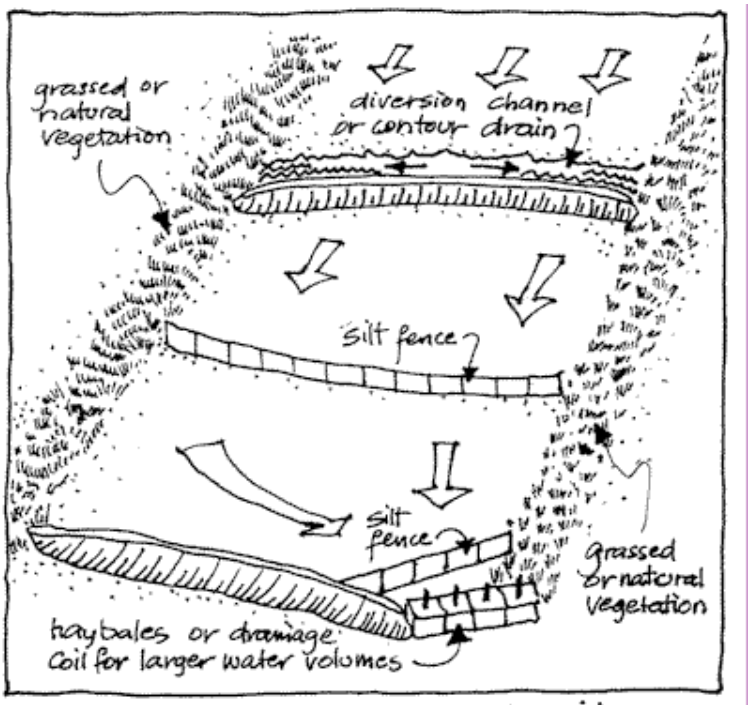
All other earthworks require a resource consent from the Council. For large earthworks you may also need a consent from the Auckland Regional Council (ARC). The ARC has comprehensive guidelines (Technical Publication No.2 – about to be updated to No.90) which are helpful for larger projects. However, regardless of the size of the earthworks, you are required to take the appropriate measures to prevent soil loss and erosion.



Effective sediment control

There are two complementary approaches to preventing silt getting into our streams. One is to use various devices to trap some of the silt before it can leave your site. This is the "ambulance at the bottom of the cliff" approach. Even more important is to prevent water eroding the soil in the first place:

- avoid the need for earthworks by working within the natural contours of the site rather than modifying it. Avoid massive earthworks and expensive retaining walls by stepping the house up the slope. Use pile or pole footings rather than excavations.
- carry out earthworks in the summer if possible – it makes for easier working as well as reducing the erosion risk.
- before you open up the ground, avoid erosion by diverting surface water away with devices described in the next section.
- instal a single stabilised entranceway to your site.
- put silt control measures in place (as described below) before starting the earthworks, and keep them going until the site is permanently protected against erosion.
- open up the ground only when you’re ready to start work.
- expose only as much ground as you need to work on at any one time.
- clean out silt control devices before they are half full of sediment and make sure that the material is deposited in such a way that it cannot run off into any waterways or coastal waters.
- ensure stockpiles of earth are wholly on the construction site and are placed behind a sediment control measure.
- as soon as you get the roof on any building, hook it up to the stormwater system.
- replace topsoil and regrass the exposed ground as soon as possible. In winter you will have to use mulch, in summer irrigation may be necessary.



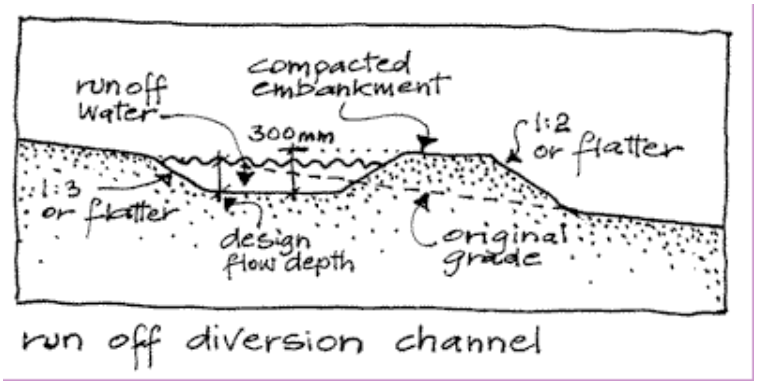
sediment control on small sites

Avoiding erosion

Ideally you minimise the amount of silt by making sure that the only water that runs across exposed ground is what actually falls on it. Divert any other water away from the earthworks onto stable ground (grassed or sealed) by means of runoff diversion channels, contour drains or earth bunds, built before you open up the ground.

Run off diversion channels

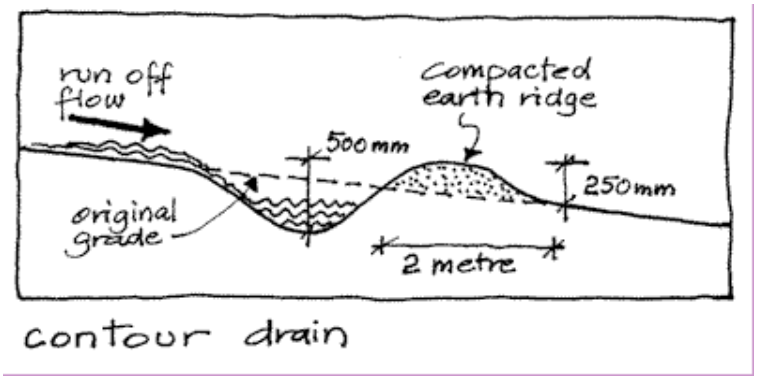
- use channels to protect work areas from run-off higher up.
- guide the water away into vegetation or into sediment control structures.
- make the gradients down the channel gentle (1 in 100) to prevent scouring.
- you may need to stabilise the channel against erosion by regrassing or lining with a geotextile fabric where grades exceed 1 in 100.



run off diversion channel

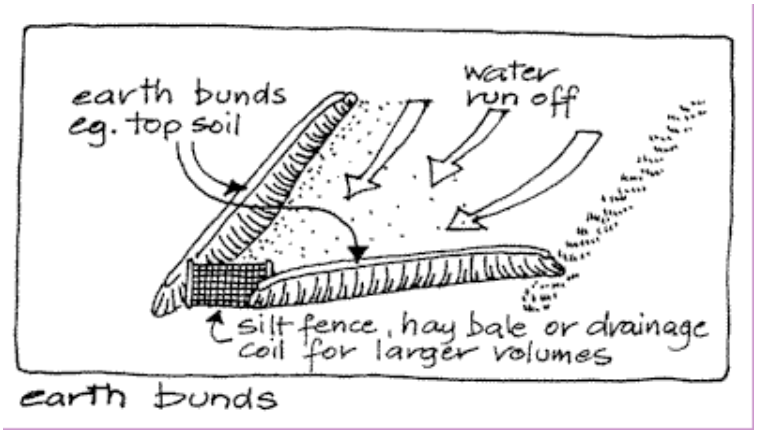
Contour drains

- use contour drains across earthworks to break up the slope.
- use more than one drain on steeply sloping sites.
- for steeper slopes have more drains closer together.
- guide the water away into vegetation or into sediment control structures.



Earth bunds

- build earth bunds across the slope like contour drains to control and detain runoff.
- also use near the edge of the site to prevent sediment from leaving the area.
- you can use topsoil from the earthworks to create a bund.



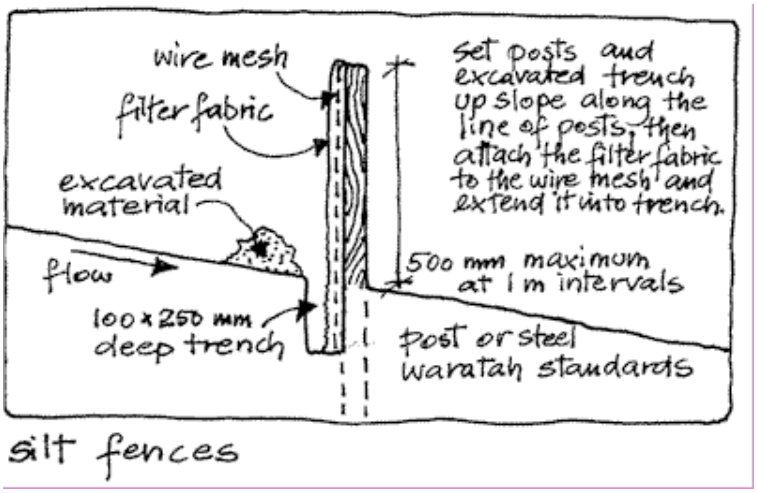
Catching the silt

While the above steps will prevent erosion by keeping excessive water away from your exposed ground, the rain that falls on the actual ground will inevitably erode away some of the soil. You can catch a lot of this soil before it leaves your site and heads for the nearest stream. Devices that will help include silt fences, hay bales, vegetation buffer strips, sediment ponds and earth bunds.

Silt fences

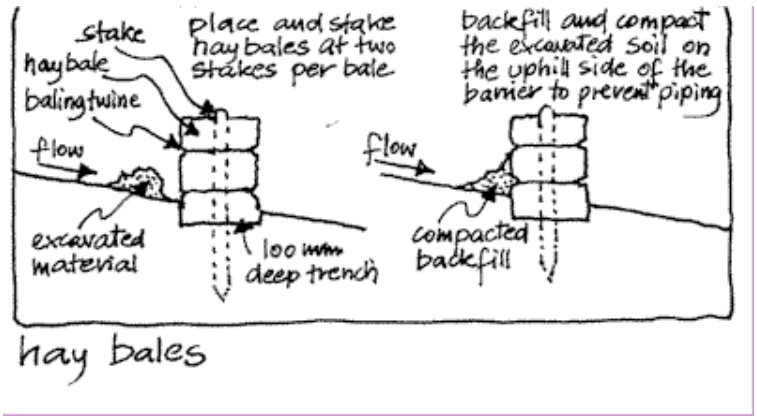
- use silt fences for house sites and other relatively small, disturbed areas.
- for steeper slopes have more silt fences closer together.

- place posts for the fence no more than a metre apart.
- dig a trench on the uphill side and run filter fabric between the posts, burying the base of it in the trench.



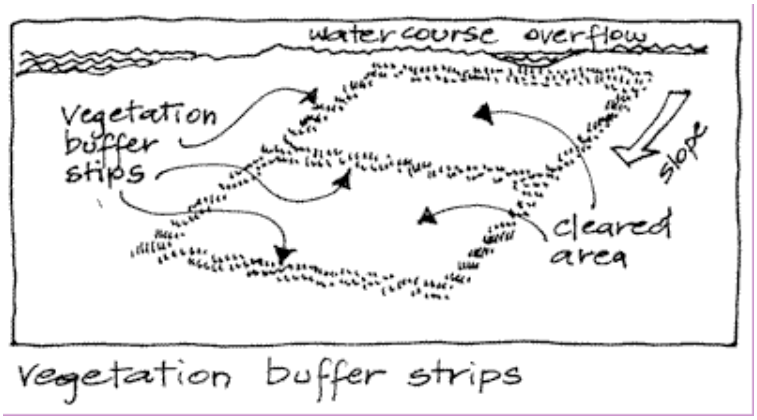
Hay bales

- hay bales are effective for short-term control on small sites.
- dig them into the ground slightly, and lay them down so the twine is running around the sides rather than along the top and bottom.
- anchor them by tying them together and staking.
- you must inspect and maintain them regularly. They will rot and need replacing in 3-4 months.



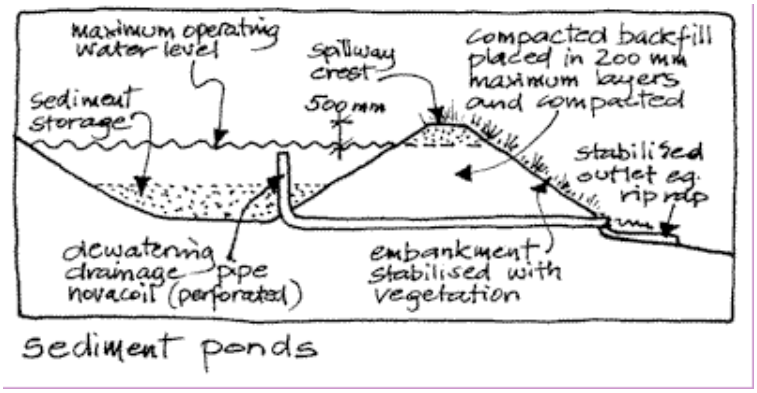
Vegetation buffer strips

- buffer strips can filter sediment from overland flow where the run off rate is low and not concentrated.
- for steeper slopes have more buffer strips closer together.
- alongside a watercourse you should always keep aside a vegetation buffer strip.



Sediment ponds

- serious quantities of muddy water need sediment ponds.
- for every 100 square metres of exposed site area you will need 1-2 cubic metres of sediment pond capacity.
- the pond must have a dewatering/drainage facility and an appropriate spillway that won't be eroded in a really big storm.
- regularly clean out the sediment that settles to the bottom. Put it in an area where no runoff will occur.
- never build a sediment pond in a stream.



Pumping water from the site

If you have to remove water from trenches or other areas of the site, you should try to prevent sediment going with it.

- take water from the top rather than the bottom of any trench.
- filter out sediment by an appropriate means (see above).

Once the sediment has settled within the trenches you can discharge the water to a grassed area, or into a tank for removal.

Keeping soil off the roads

Trucks leaving a building site can take a lot of mud on their tyres to drop on the roads. This is a road safety issue as well as a sediment control one. To prevent it from occurring a stabilised entranceway must be built. The simplest method is to establish a single entrance to the site and spread metal aggregate on it. This will stop the entry being churned up and reduce the amount of mud leaving the site on truck tyres. Other methods for larger sites are cattle grids or a wheel wash. The site manager or site owner is responsible for cleaning up any spilt soil or other materials that get onto the road from the site.

Remember also to protect the footpath, berm and kerb from damage by crossing vehicles.

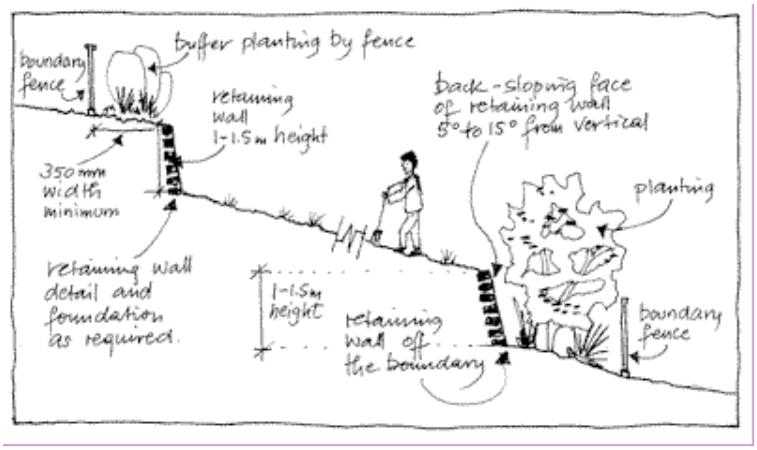
Retaining walls

It is generally better to work with stabilised slopes than to build retaining walls, which interrupt the natural flow of the landscape. Avoid the need for expensive retaining walls by working within the natural contours of the site - stepping the house up the slope, for instance.

Retaining walls on a house site should be in scale with people – up to a metre, certainly no more than 1.5 metres. Two low walls are generally better than a single high one – and almost certainly cheaper.

Retaining walls become part of the earthform, so materials that reflect the earth have the lowest visual impact. The ideal material is local stone, followed by stone from elsewhere, concrete (preferably as a crib wall or split concrete) and timber. Materials should be left unpainted, and the rougher the surface the more easily plants and other life-forms can start to blend the wall in with nature. Remember that quite steep slopes can now be supported using reinforced earth methods.

Retaining walls should be kept away from boundaries if possible. In this way the landscape continues at natural ground level on the boundary, drainage issues can be resolved on-site, fencing is not added to the top of the wall, and there is scope for softening or screening the wall with planting.



Further information

Publications:

Erosion & Sediment Control Guidelines for Earthworks - Technical Publication No.90, Auckland Regional Council

Environmental Impacts of Accelerated Erosion & Sedimentation – Technical Publication No.69, Auckland Regional Council

Advice at Waitakere City Council

Earthworks Field Services Advisor 836 8000, Ext. 8337
for advice on earthworks and sediment control methods, materials, suppliers and costs
Consents generally Customer Services 836 0400