



Small earthworks

Erosion and sediment control for small sites



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Introduction

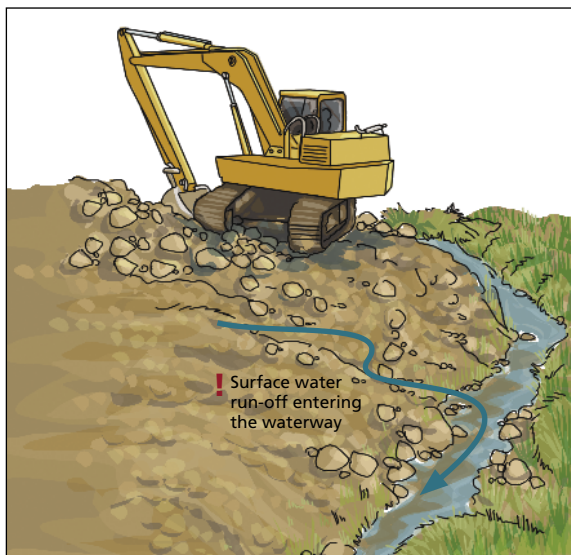
The erosion of topsoil from vegetation clearance and earthwork sites is a problem throughout much of the Wellington region.

The combination of high rainfall, hilly terrain, clayey soil and underlying geology means that if soil is disturbed during site development, it is easily washed away by rainfall. Thousands of tonnes of soil are lost this way in each rain event, and cause a range of problems in our waterways. A typical hilly subdivision site in the Wellington region, once cleared of vegetation could lose up to one thousand tonnes of soil per hectare per year. While individual sites may not export a large quantity of sediment, if there are multiple subdivision sites in a catchment the overall effect on the environment can be significant.

Soil entering a waterway from your site can cause problems for several kilometres downstream, the most obvious being colour change.

However, there are more significant effects that are less obvious. As sediment load in a stream increases, it becomes more difficult for stream life to see and breathe.

Sediment also smothers stream insects, fills the spaces in which fish like to rest and discourages juvenile fish from re-populating affected streams. In extreme cases, it can also affect flow or cause flooding.



Take care with earthworks adjacent to streams.

So if you are developing a site, be aware that draining muddy water into a watercourse or stormwater drain can cause significant pollution, and that it is not permitted to put muddy water into the sewer without prior permission from the local city or district local council.

If you do allow the discharge of muddy water from your subdivision site, you could face regulatory action for any resulting environmental pollution or flooding.

This guideline advises how to minimise erosion and soil loss when completing small scale vegetation clearance, earthworks or construction projects.

It explains how you can reduce the loss of valuable topsoil and improve wet-weather access to your site.

Effective control of erosion and soil loss is based on the following principles:

1. Good forward planning
2. Minimise clean water running onto your site

3. Restrict soil erosion on your site
4. Capture and treat dirty water running-off your site
5. Check to ensure your control measures remain effective.

This guideline describes some of the more common ways in which these principles can be applied.

It also gives you advice about regulatory requirements and where to get further information. If your proposed land clearance or earthworks exceed 3000 square metres, you should refer to Greater Wellington's comprehensive *Erosion and sediment control guidelines*



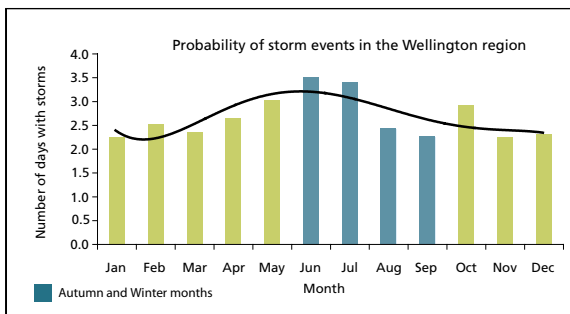
Erosion & sediment control guidelines.

Forward planning

Basic changes at the planning stage can avoid significant impacts later on.

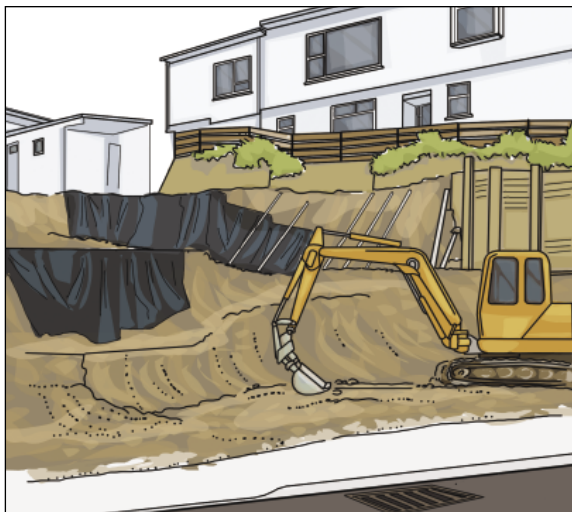
Typical considerations include the following:

- Avoid clearing vegetation during rainy periods (between May and August in the Wellington region). Avoid earthworks during Autumn and Winter where possible.
- Assess rainfall, slope lengths, soil type, vegetation cover and nearby watercourses or stormwater flow paths, to determine the likely effects of proposed earthworks, and how to control them.



Avoid earthworks during Autumn and Winter where possible.

- Check your site for existing streams and overland flow paths, or for water which flows onto your site from neighbouring land. Avoid work in or adjacent to these areas.
- Consider the limitations of your site. If you have very little space available, it will be difficult to install sediment control devices. You will then have to put more emphasis on surface water management, erosion control, street sweeping and the use of sediment control devices in nearby stormwater sumps.



Extra care is needed when space is limited.

- Try to minimise the size of the exposed soil area, and stage your development rather than clearing the entire site.
- You may need to consider temporary stream crossings during site development, if fording the stream will cause muddy conditions.



Temporary culverts can avoid stream damage and improve site access.

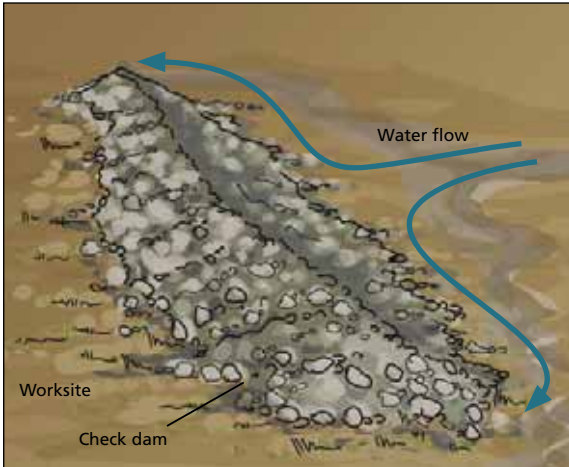
- Plan to stabilise, re-vegetate or seal disturbed soil as soon as possible, and ensure that you have appropriate control measures in place to cope with anticipated run-off while soil is exposed to erosion.
- Keep vehicles off your site where possible, to reduce erosion and the need for access tracks. If you need vehicle access, avoid steep tracks and stream crossings, and take steps to avoid mud being tracked-out onto roads on vehicle tyres.
- Resource consents may be required before starting works for activities such as earthworks, vegetation clearance, stream works (culverts, bridges, diversions, erosion protection etc) and discharging stormwater run-off.
- Check with your local city and district council or Greater Wellington to confirm the resource consents you require.

Site water management

It makes sense to prevent clean water from running onto your site

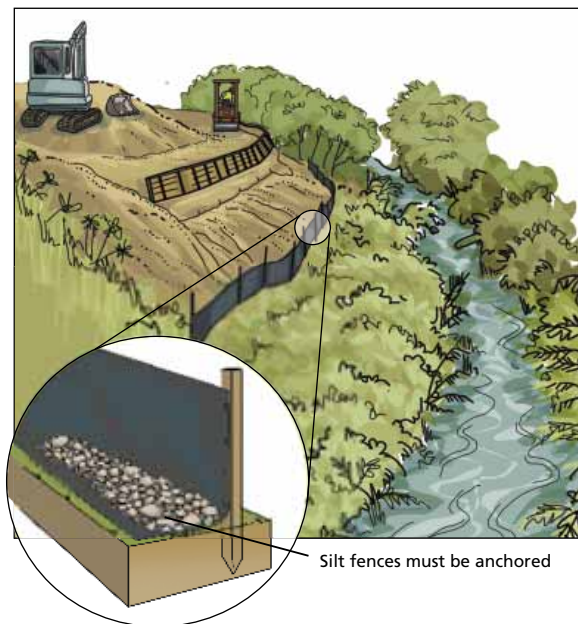
The treatment and disposal of muddy water can cause big problems for earthworks, which can be avoided by the following methods:

- You can control surface water flows using soakaways, perimeter bunds, cut-off drains, swales, pipes or pumps. The aim is to keep clean water away from areas proposed for vegetation clearance, earthworks, stockpiles or tracks. Remember, you cannot divert water onto a neighbouring property without written permission to do so.
- For larger surface water flows such as streams, you may need to divert the flow to keep clean water away from work areas and tracks, or to install a bridge or culvert. Such works are likely to require consents. Take care with any diversion or culvert to prevent erosion of the channel bed, or the channel bank at the discharge point.



Keep clean water away from worksite.

- If your works are close to a stream or river channel, install permanent or temporary barriers to stop soil and muddy water reaching the watercourse. Options include silt fences, composting silt fences and cut-off drains. Note that you may require a consent for such features in or near a channel. Also bear in mind the likely impact of flooding on your worksite.

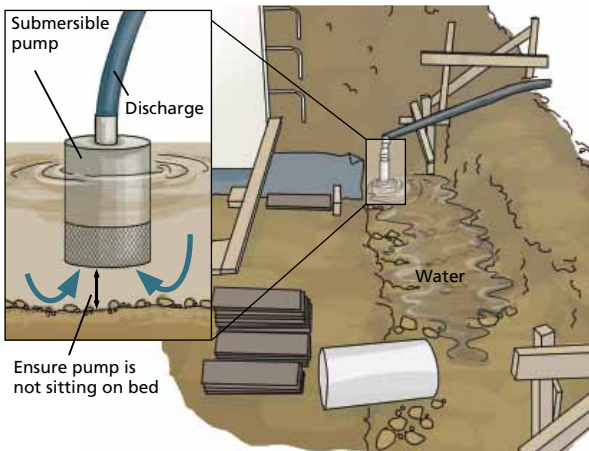


Silt fences must be anchored

Silt fence protecting stream.

- Prevent clean surface water getting into trenches where it will become muddy and create a disposal problem. If you need to dewater trenches, muddy water must not be discharged into stormwater drains or streams without effective pre-treatment.

- When using a pump for trench dewatering, protect the intake and keep it suspended above the base of the excavation to avoid mud being sucked-in. Discharges may go to your sediment pond, a soak away, or (with permission of your local council) into the sewer.
- Restrict the use of hosepipes, as these can also create a dirty water disposal problem for your site. It is often unnecessary to use hoses to sweep-up a dirty yard or clean dirty equipment.



Trench dewatering can remove unwanted muddy water.

Erosion control

Erosion control measures should be installed as soon as possible following vegetation clearance or earthworks, and remain in place until the risk of erosion has passed.

The following summarises common erosion control approaches:

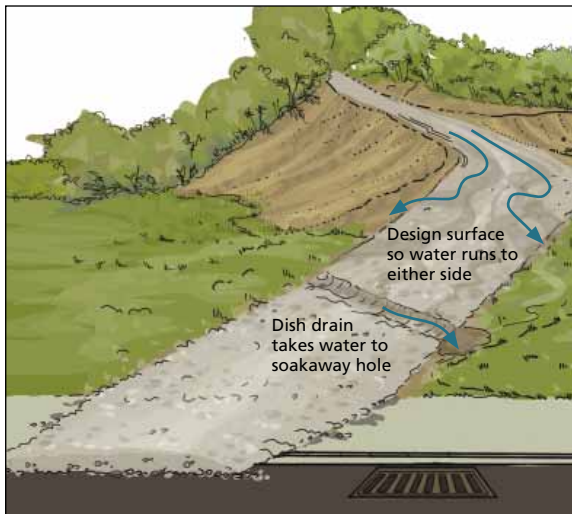
- Consider ways to retain existing vegetation cover and land forms to protect soils, as perimeter vegetation can be used to filter small quantities of muddy water running off your site.
- Replace vegetation cover as soon as possible after earthworks or clearance. A straw or mulch layer 100mm deep can be can provide short-term protection until the new growth is established. Hydroseeding is widely used for re-vegetating slopes, but is not normally as effective if applied during dry periods (typically December to February). Instant turf is an alternative that can be cost-effective for small scale applications.

- When earthmoving, avoid leaving steep, unconsolidated slopes as they erode easily. If there is an excavator on site, use it to compact exposed slope faces. Benching and check dams (made from earth, rock or sand bags) can be used to restrict surface water flow and erosion on cleared slopes.



Excavator tracks can effectively compact slopes.

- Geotextile material or basecourse can also be used to cover and reduce erosion of exposed surfaces, Careful choice of plant species for re-vegetation can allow for quick establishment of cover and could include native plants for long term site enhancement.
- Access roads can provide a flow path for water running-off your site, transporting muddy water to nearby roads and streams. If you have a steep access road, you are likely to need diversion channels, cut-off drains or other ways of keeping water off the track. You can reduce track erosion by laying basecourse or an asphalt surface as soon as possible, and ensuring the road design sheds water, rather than acting as a drain.
- Geotextile lining, check dams and meanders can be used to reduce erosion in overland flow channels, while rock armouring or flumes can be used to prevent erosion at their discharge point.



Track design and materials can prevent runoff.

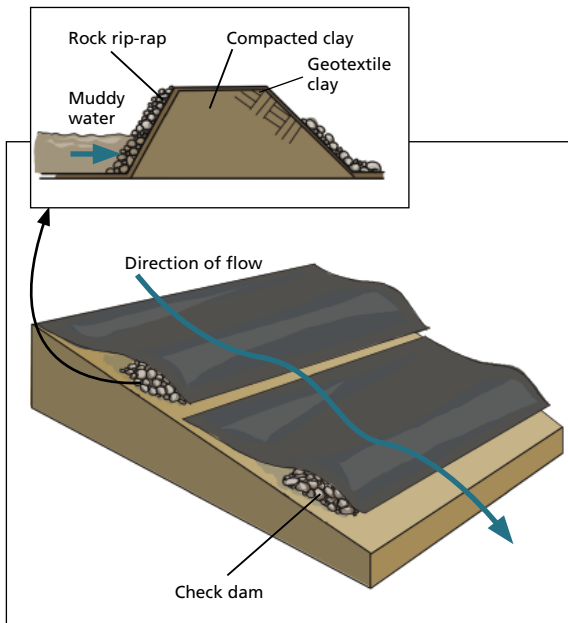
Sediment control

Sediment control measures must be installed before any vegetation clearance or earthworks begin, and remain effective until re-vegetation or re-surfacing removes the risk of soil loss.

If you want to remove muddy water from your site, you will need to treat it before any discharge to a watercourse or the stormwater system.

Common sediment control measures include the following.

- Hay bales, sumps and vegetated buffer strips and basecourse bunds can be effective for minor flows and low sediment loads. They are ineffective once they become choked, and so they need to be monitored and maintained.
- Silt fences or earth bunds can be used to interrupt overland flow down gentle slopes, by reducing its velocity and erosive force. These should be installed along a contour, down-slope of exposed soil areas, with the ends of the fence turned up-slope to prevent water running around them (see Figure on page 12).



A rock check dam will reduce surface water flows.

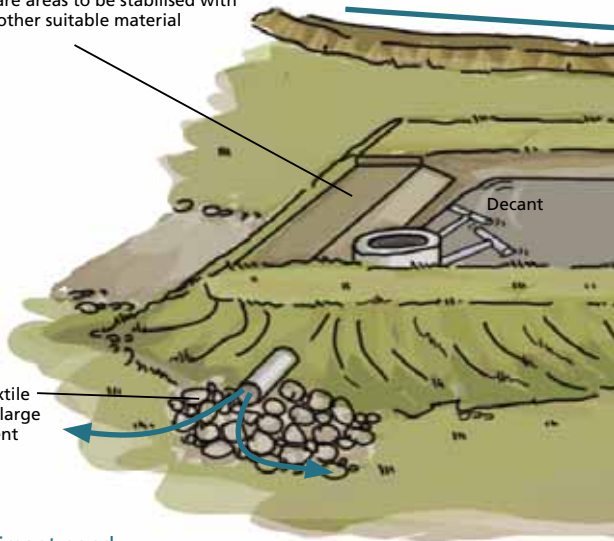
- For silt fences, install posts at 2 metre intervals and firmly anchor filter cloth to the slope by burying it or using large rocks to secure it, plastic or wire mesh or similar can be used to reinforce silt fence cloth. Shade cloth does not make an acceptable silt fences.

- Sediment ponds are recommended for larger sites. These allow sediment to settle out of muddy water before it is discharged. The longer muddy water stays in the pond, the more effective the sediment removal. Pond dimensions are best at a 3 to 1, length to width ratio. It is good practice to have a forebay (a small pond prior to the main one) to collect coarser particulates.

Wide shallow level spillway over existing ground. Where possible retain the existing grass cover. Bare areas to be stabilised with geotextile or other suitable material

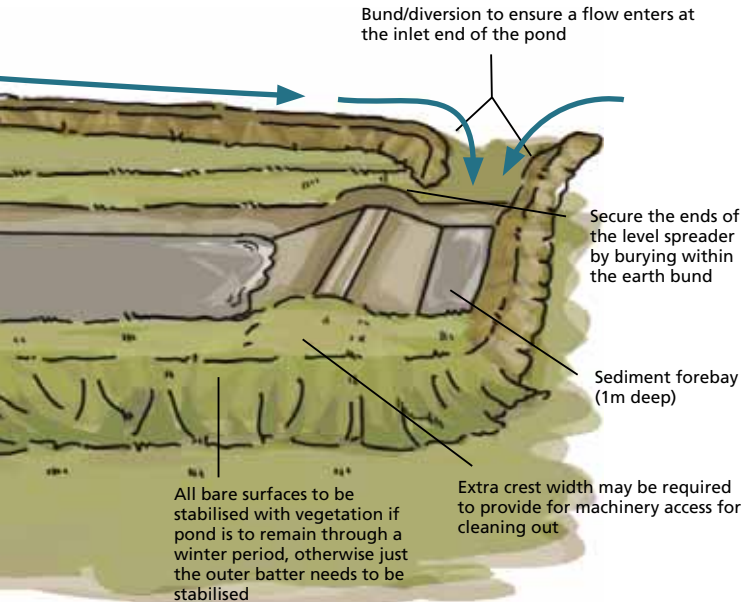
Protected inflow channel

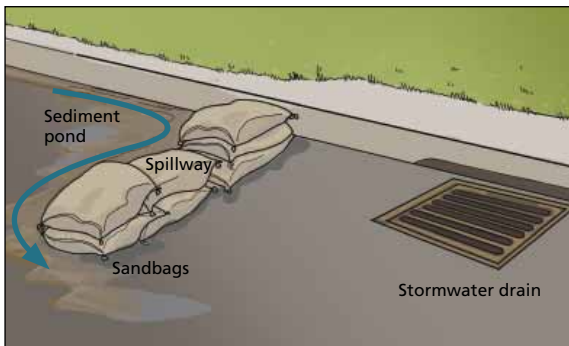
Pinned geotextile overlaid with large rocks to prevent erosion



A typical sediment pond

- Pond efficiency can be improved by adding flocculants such as alum, polyacrylamide or poly aluminium chloride. As ponds can collect large quantities of sediment, they need to be monitored and cleaned out and the sediment disposed of in an appropriate manner.





Gully sediment barrier.

- If there is a risk that sediment-laden water can enter a stormwater drainage sump, you should consider some way of preventing sediment from entering the stormwater network.
- Common measures include a series of sandbags or hay bale barriers along the kerb and channel, geotextile filter material over or around the drainage sump, or an in-sump filter. It is not normally appropriate to rely on these methods as your main source of sediment control, and they are best used as a back-up method in conjunction with one or more of the measures described above.

Ongoing monitoring

The control features already described can be damaged by flooding, wind, vehicles and even vandals, and so should be checked regularly for signs of damage, fouling or failure, particularly before and after storm events.

- Routinely check your site and nearby streams to ensure that your control measures are effective. You may need to re-work your onsite control methods if you find nearby streams or sumps are discoloured or choked with sediment.
- View your site during rainfall events to check that erosion and sediment control methods are working as intended, and that the quality of water leaving your site is satisfactory.
- Remove accumulated sediment from drains, sumps, channels, silt fences and sediment ponds to ensure they work effectively during rainfall events.

Dispose of this sediment so that it does not run onto paved surfaces or into surface waters. Wet sediments can be stabilised with lime.

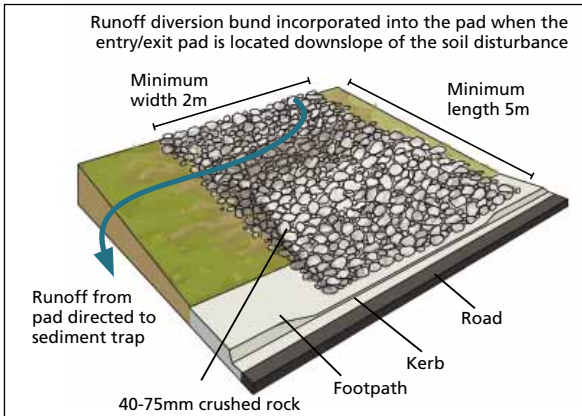
- Check that mud is not being tracked off-site onto the public road beyond your site entrance, and clean road surfaces as necessary.
- Expect compliance inspections from council officers. They will be looking to ensure you have effective erosion and sediment control measures in place, and that they are being maintained.

Other forms of pollution from earthworks sites

Other site activities can also cause pollution and should be avoided

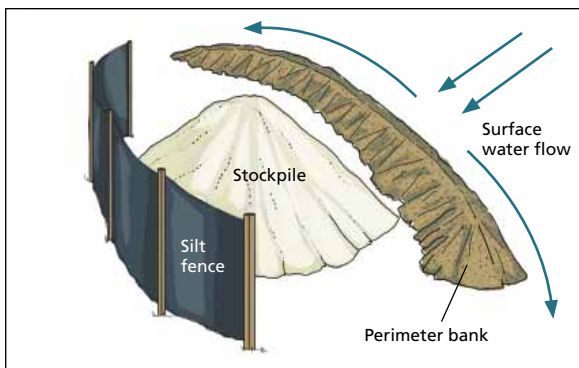
The following summarises the most common types and methods to control them.

- Vehicles can carry mud off site onto nearby roads. Where possible, vehicle access onto your site should be restricted to avoid erosion and sediment loss. For small sites, basecourse can be used to stabilise the vehicle access/exit ways.



Access protection.

- On larger sites, a rumble-strip or wheel wash is usually more appropriate. Whatever your control measures, if mud gets onto the road, it should be removed, taking care not to simply wash the mud into nearby stormwater drains.
- Stockpiles should be located away from surface water flow paths and paved surfaces, as material can be washed into drains and watercourses. Do not stockpile building materials on the footpath or road without prior approval from your local council.



Protect stockpiles.

- Fresh concrete is highly alkaline and can have a devastating effect on stream life. Cement wastes or washwater must not be allowed to enter stormwater drains or surface water.
- Significant pollution commonly occurs due to inappropriate waste disposal from water-blasting (to expose concrete aggregate), cleaning of cement mixers and pumping equipment, water sprays for curing fresh concrete, and the washing of shovels and floats etc.
- Concrete cutting creates a fine dust, and if water is used to cool the blade or clean surfaces it creates a silty wastewater that can enter stormwater drains and pollute watercourses. Where possible, cooling water should be disposed of into the cut, or allowed to soak into the ground. If it enters a stormwater drain, the outlet should be temporarily blocked, and sediment or wastewater removed for disposal elsewhere.

- Excess paint should be allowed to go dry in the container; it can then be disposed of it as a solid waste. For larger quantities (over one litre), you may be able to give your leftovers to a paint recycler (contact your city or district council for details).
- Paint brush washwater must not be put into stormwater drains. It is best to dispose of it into the sewer, or for small quantities, let it soak into the soil.
- Plaster wastewater does not have the high alkalinity of cement wastewater, but can discolour watercourses, and so must not be allowed to enter storm water drains or watercourses. Dispose of this wastewater into the sewer, or allow it to soak into the ground.
- Hazardous substances (including petrol, diesel, lubricants, solvents, corrosives, additives and some cleaning materials) should be used and stored in such a way that they do not contaminate water or soil.

They should be held in appropriate containers, and any spills, leaks or overflows cleaned-up promptly. It is recommended that an appropriate spill kit be held on site where hazardous substances in excess of 50 litres are present.

- Solid waste such as packaging, off-cuts, reinforcing and litter must be removed from site. It is not appropriate to burn or bury such waste on site.

So what's important?

Sand and soil stockpiles

Stockpiles should be placed wholly on the construction site and behind a sediment barrier.

Entry/exit point (rumble pad)

Restrict vehicle access to one entry/exit point where possible. Stabilising the access with rock will allow all weather access and will reduce the amount of soil carried off the site by vehicles.

Services trench

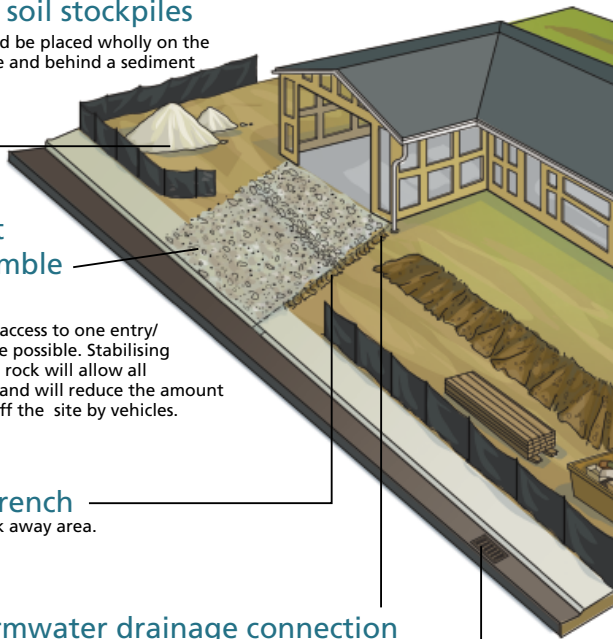
Dewater to soak away area.

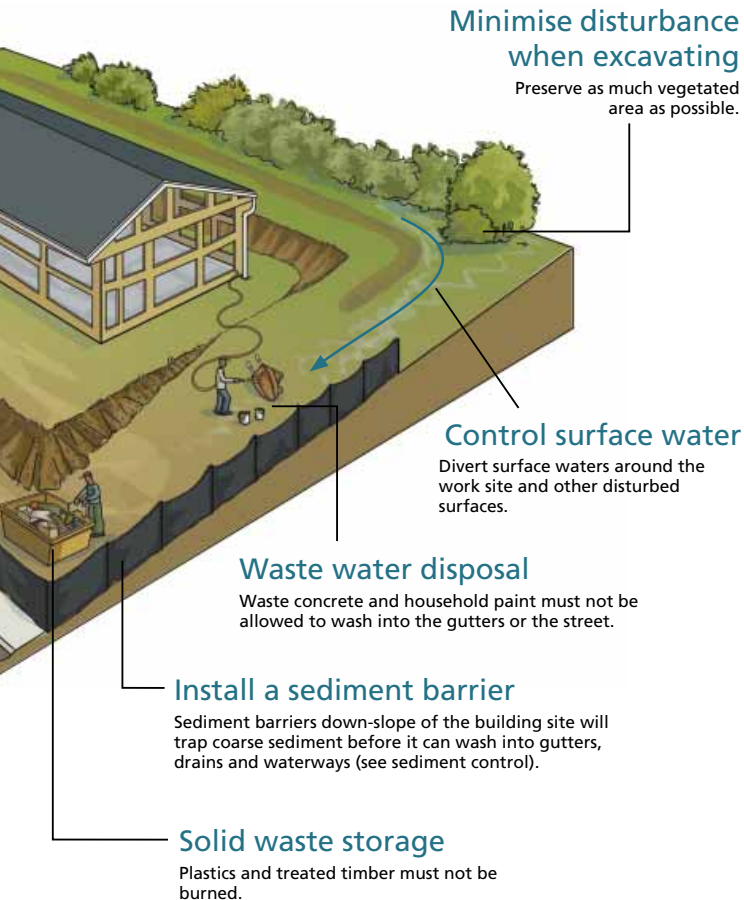
Early stormwater drainage connection

Connect temporary or permanent downpipe/s to the underground stormwater system immediately after the roof is laid.

Road sweeping

Road sweeping and stormwater sump clearing may be required after rain events.





Minimise disturbance when excavating

Preserve as much vegetated area as possible.

Control surface water

Divert surface waters around the work site and other disturbed surfaces.

Waste water disposal

Waste concrete and household paint must not be allowed to wash into the gutters or the street.

Install a sediment barrier

Sediment barriers down-slope of the building site will trap coarse sediment before it can wash into gutters, drains and waterways (see sediment control).

Solid waste storage

Plastics and treated timber must not be burned.

Regulatory requirements

The Resource Management Act 1991 restricts the discharge of contaminants into the environment (*section 15*), and requires every person to avoid, remedy or mitigate the adverse effects of their activities (*section 17*).

Greater Wellington and your city and district councils (see p36) require you to get the necessary consents before you start your works.

Council compliance officers may visit your site to make sure your works comply with these and other requirements of their regional and district plans. They will check that you have the necessary controls in place (as outlined in this guideline) and whether your development is adversely affecting nearby drains or watercourses.

For significant breaches of the Resource Management Act 1991, you could be issued with an infringement notice (fine up to \$1,000), abatement notice or enforcement order (requiring that you do specified works), or be prosecuted.

Alternatively, councils may recover their costs for responding to confirmed non-compliance, or cleaning blocked street sumps and muddy road surfaces etc.

The contractor, land owner and project manager can all be liable for a breach of the Act, or regional and district plans (*section 340*).

Further information

If you are unsure about what is needed for erosion and sediment control at your site, call your local council to clarify rules and consent requirements. The following are contact details for councils in the region:

Greater Wellington Regional Council	Wellington 04 384 5708	www.gw.govt.nz
	Wairarapa 06 378 2484	
Wellington City Council	04 499 4444	www.wcc.govt.nz
The Hutt City Council	04 570 6666	www.huttcity.govt.nz
Upper Hutt City Council	04 527 2169	www.upperhuttcity.govt.nz
Porirua City Council	04 237 5089	www.pcc.govt.nz
Kapiti Coast District Council	04 904 5700	www.kapiticoast.govt.nz
Masterton District Council	06 378 9666	www.mstn.govt.nz
South Wairarapa District Council	06 306 9611	www.swdc.govt.nz
Carterton District Council	06 379 6626	www.cartertondc.co.nz

Further technical guidance

we recommend the following documents:

Erosion and Sediment Control Guidelines - (see Greater Wellington web site for details)

On Site Stormwater Management Guideline
- New Zealand Water & Environment Research Foundation - (see web site at <http://www.nzwerf.org.nz/publications.html>)

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