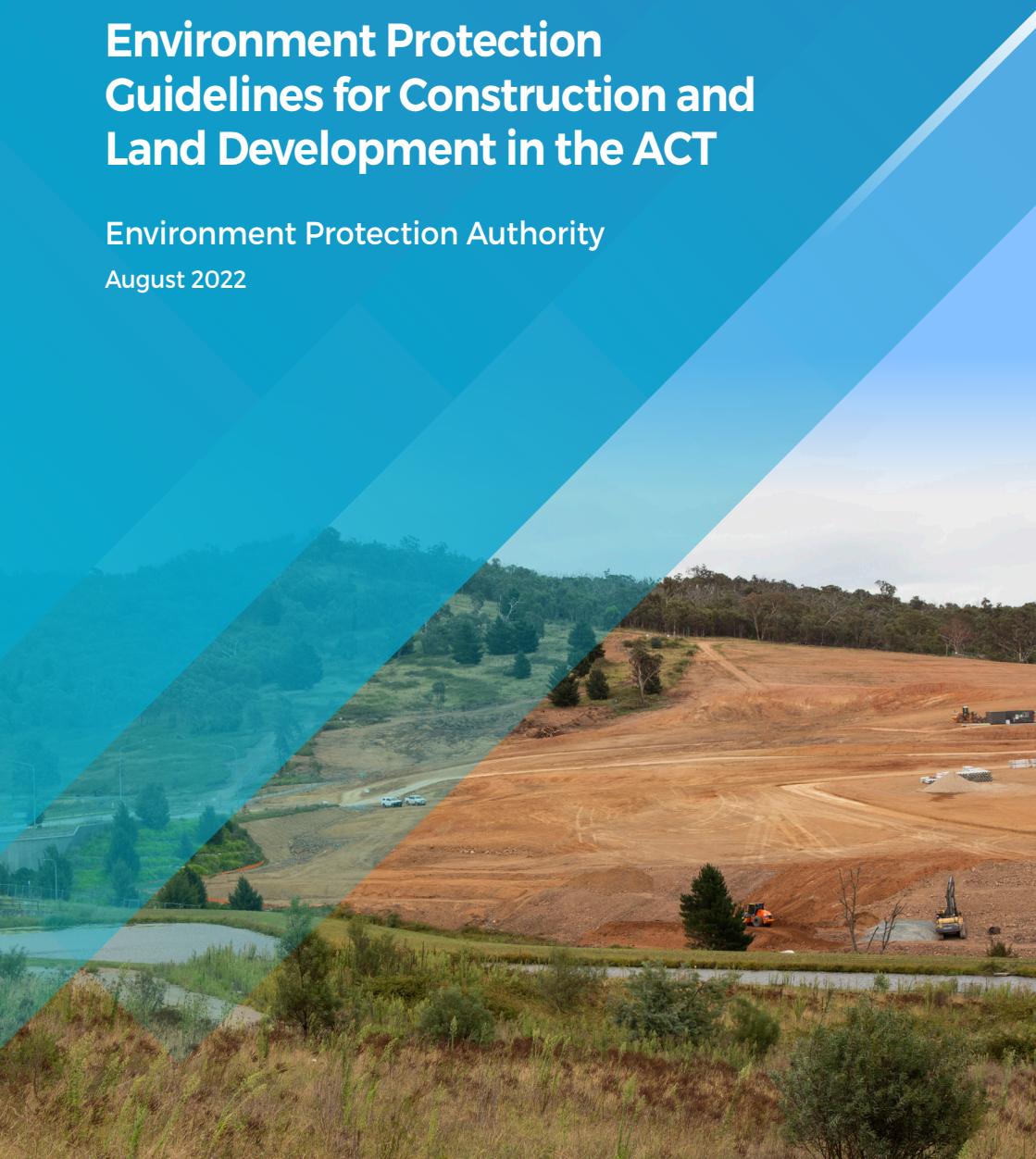
ACT Government

Environment Protection Guidelines for Construction and Land Development in the ACT

Environment Protection Authority

August 2022



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Acknowledgment to Country

We wish to acknowledge the traditional custodians of the land we are meeting on, the Ngunnawal people. We wish to acknowledge and respect their continuing culture and the contribution they make to the life of this city and this region.

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1. Introduction

1.1 Why do we need these guidelines?

The purpose of the guidelines is to provide clear guidance and practical advice to land developers, builders and anyone carrying out or supervising civil construction and building works.

The primary environmental issue addressed in the guidelines is the impacts from erosion and sediment. The guidelines briefly discuss the environmental issues of noise, air emissions, waste management, land contamination, biodiversity and climate change. The guidelines will assist in determining the most appropriate environment protection control measures for commonly experienced situations in the ACT.

Pollution such as sediment can negatively impact our environment by altering the ecosystem of waterways and result in killing fish and other aquatic species, clogging streams, reducing storage volume of reservoirs, damaging infrastructure and increasing filtration costs for municipal water supply.

Sediment can also obstruct roadways, bike paths and footpaths causing fall hazards and blocking drains, resulting in increased maintenance costs and localised flooding. Dust contributes significantly to the total sediment load from disturbed sites (due to wind erosion). Dust can cause hazards by impacting visibility and causing health issues for people with a respiratory condition.

A glossary of terms can be found at Schedule 5.

1.2 What sites do these guidelines apply to

These guidelines apply to all land development and construction sites. This includes infrastructure works. For smaller scale residential developments specific guidance is provided in the Builders Booklet: Preventing Pollution from Residential Building Sites, available at www.accesscanberra.com.au.

1.3 Principles of environment protection

Ensuring environment protection during land development and construction is vital to minimise environmental degradation and to preserve the ACT's important ecosystems and landscapes.

Environment protection is also important as a development without adequate controls increases costs (e.g. through replacing washed away stockpiles and clean-up costs), incurs fines and can lead to loss of business reputation.

Principles of environment protection

- Plan environment protection measures in the design phase.
- Assess risks of erosion and sedimentation.
- Develop a site-specific Erosion and Sediment Control Plan (ESC Plan).
- Use a suitably qualified person to design control measures.
- Implement erosion and sediment controls prior to site works commencing.
- Control the entire site, including risks from outside the site (e.g. overland flow and water entering the site).
- Minimise the area of disturbance by staging works.
- Implement waste and spoil management controls throughout development phases.
- Conserve and reuse material on site.
- Rehabilitate the site or stage of development as works are completed.
- Maintain all controls until the site is fully stabilised.
- Maximise cost effective environmental improvements using a risk-based management approach.

These principles link to the Principles of Water Sensitive Urban Design.

The EPA considers a suitably qualified person to be:

- a Certified Professional Erosion and Sediment Control Practitioner (CPESC) by the International Erosion Control Association IECA Australasia.
- another suitably qualified and experienced professional, having completed specialised training in erosion and sediment control, provided under the auspices of a reputable body such as IECA, Australian Society of Soil Science, or equivalent, or
- able to give evidence of training in erosion and sediment control principles and experience in designing and implementing erosion and sediment control plans and controls on site.

Fully stabilised means 85% of the disturbed site area is stabilised. For further details see Section 5.1 – Site Stabilisation.

Refer Municipal Infrastructure Standard 02 – Earthworks

1.4 Erosion and sediment control

Effective erosion and sediment controls minimise the erosion of land and the loss of soil sediments during land development and construction. Erosion and sediment control is an integral part of achieving Water Sensitive Urban Design outcomes and good air and water quality.

Erosion and sediment control should be implemented when an activity could involve:

- disturbance of earth, placing fill on the soil surface, and changes to the contours of the land or
- change in the rate and volume of stormwater run-off flowing over land, and directly or indirectly entering receiving waters.

Strategies to achieve the objectives of erosion and sediment control:

- Minimise the extent and duration of soil disturbance.
- Control erosion as near to the source as practicable.
- Control sediment as near to the source as practicable.
- Achieve stability of erosion and sediment control (structures) in the design storm event.
- Achieve outcome-based performance levels relating to the control of sediment pollution and turbidity in a specified storm event (e.g. outflows to be less than 50 NTU up to the design storm event), which is the equivalent to 60 mg/L for total suspended solids.
- Plan for wet weather and shut down periods.
- Inspect and maintain control measures.
- Train site personnel.

1.5 Risk Management

There are several risks associated with the implementation and management of erosion and sediment controls (ESC) during land development and construction activities. It is essential for land developers, builders and anyone carrying out or supervising civil construction and building works to understand the risks involved in these activities and manage these risks to minimise potential harm to the environment and to human health. Erosion and sediment control risks normally depend on:

- the nature or type of a development or activity
- the location and site characteristics of a development or activity
- whether it is being carried out in a satisfactory manner
- the sensitivity of the local waterway.

A risk-based framework for ESC can help to identify, prevent/eliminate and mitigate erosion and sedimentation risks associated with projects and developments. In general terms, a risk-based framework aims to:

- identify projects or activities that pose a risk for ESC as early as possible in the project development
- plan, develop, and ensure preliminary designs for erosion and sediment controls and management measures in the concept phase for projects and in alignment to the relevant environmental factors for the site
- identify risks or potential constraints to the implementation of planned ESC measures
- eliminate risks where possible
- develop mitigation measures to manage risks that cannot be eliminated as part of the design
- ensure appropriate expertise is used to assist on high-risk projects
- ensure projects with high risks have enhanced management (including the use of suitably qualified persons during the construction phase).

The level of risk should be determined on a case-by-case basis by considering a combination of different factors and site characteristics, such as:

- extent and duration of disturbance or exposed soil
- environmental sensitivity of the receiving waters
- site characteristics (slope length and steepness, rainfall erosivity and variability and soil chemical and physical characteristics)
- activity characteristics (bare/exposed/disturbed soil, excavation etc.).

Several risk-based frameworks using a variety of risk variables can be considered. Schedule 7 presents some of the key factors that contribute to the susceptibility of soil to erosion and the constraints they impose to ESC. Not all these factors will necessarily be used to assess the risks associated with the implementation and management of ESC risks.

2. Legal requirements

2.1 Legislation and policy

2.1.1 Environment Protection Act 1997 and Environment Protection Regulation 2005

The Environment Protection Act 1997 (EP Act) provides the regulatory framework to protect the environment from pollution and its effects and establishes the Environment Protection Authority (EPA) as the statutory decision maker for environmental regulation and policy.

The Environment Protection Regulation 2005 (the EP Regulation) defines standards and offences under the EP Act to enable compliance and enforcement of the legislation.

Developers and builders have a general environmental duty under section 22 of the EP Act, which requires all people to take practicable and reasonable steps to prevent or minimise any environmental harm or environmental nuisance their actions may cause.

Offences under the Act, the Regulation and other relevant Acts can lead to heavy fines and jail time for individuals and corporations. **Schedule 8** lists several offences related to construction and land development which builders and developers need to be aware of. These offences are also highlighted in relevant sections throughout the document. Please note only the main offences are highlighted in these guidelines and other offences may apply. Builders and developers must be aware of all applicable legislation before commencing work.

Environmental harm means any impact on the environment as a result of human activity that has the effect of degrading the environment (whether temporarily or permanently).

Environmental nuisance means an unreasonable interference with the enjoyment by the public, a section of the public or a person of a place or area, if the interference is caused or likely to be caused by:

a. dust, fumes, light, noise, odour or smoke; or

b. an unhealthy, unsightly or otherwise offensive condition because of pollution.

It is an offence to not advise the EPA when an activity has caused, is causing or is likely to cause environmental harm from pollution.

2.1.2 Environment Protection Policies

Environment Protection Policies (EPPs) help to explain and apply the EP Act and the EP Regulation. EPPs can be found at www.legislation.act.gov.au.

2.1.3 Environmental Protection Agreements

An Environmental Protection Agreement (Agreement) is a formal agreement under the EP Act between the EPA and people undertaking certain activities that pose environmental risks. Agreements allow scope for businesses to manage their environmental performance in partnership with the EPA.

An Agreement is required for land development or construction activities on sites of 0.3 hectare or greater. An Agreement must be obtained prior to works commencing.

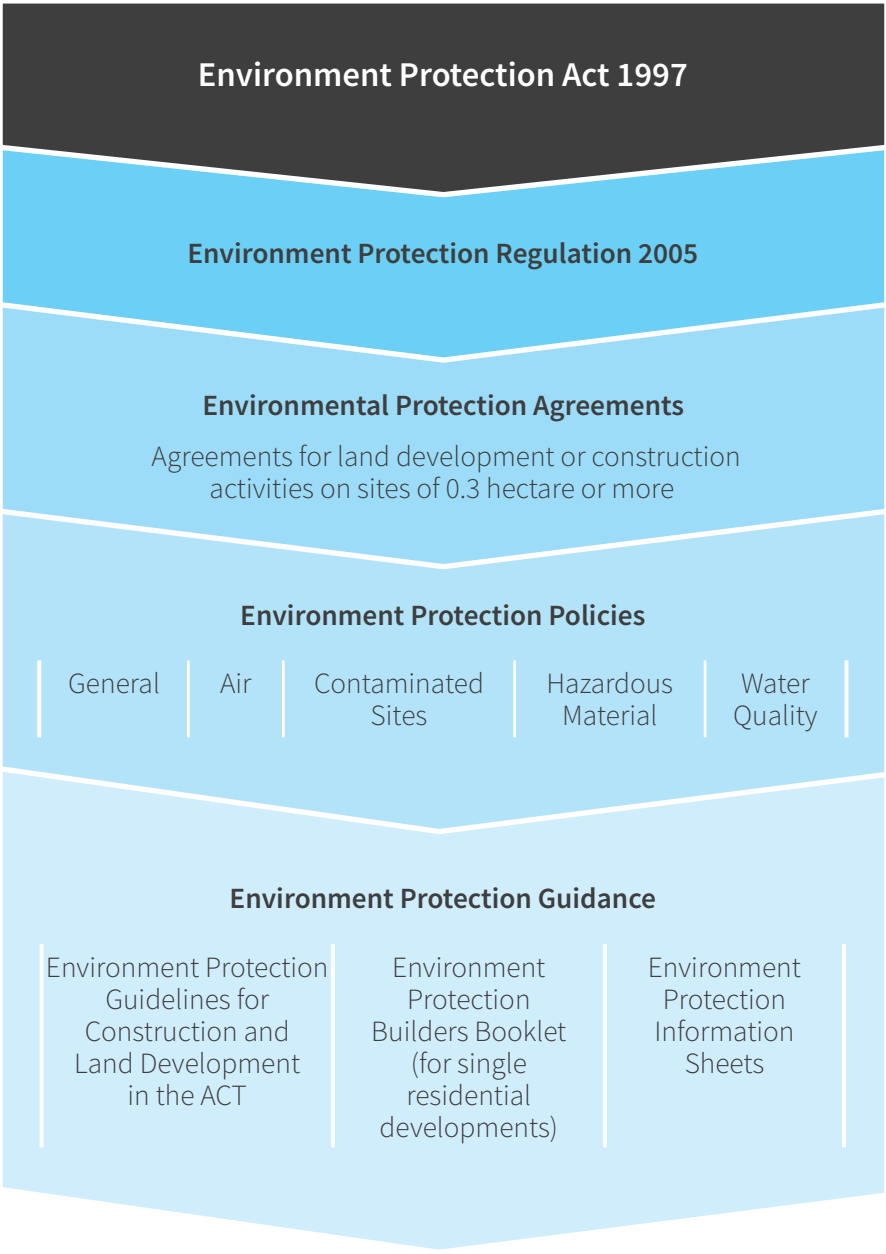
It is an offence under the EP Act to undertake works without an Agreement.

Note: Certain activities may also require an Environmental Authorisation (see Schedule 1 of the EP Act). Examples include extraction of material from a waterway or placement of soil on land.

It is an offence under the EP Act to undertake works without an Environmental Authorisation or to not comply with a condition of an Environmental Authorisation.

For more information, contact the EPA by calling Access Canberra on 13 22 81.

Figure 1: ACT Environment Protection Legislation and Policy



2.1.4 Other relevant legislation

Water Resources Act 2007 (WR Act) and Water Resources Regulation 2007 (WR Regulation), administered by the EPA and the Environment, Planning and Sustainable Development Directorate.

Planning and Development Act 2007 (P&D Act) and Planning and Development Regulation 2008 (P&D Regulation), administered by the Environment, Planning and Sustainable Development Directorate.

Tree Protection Act 2005, administered by the Transport Canberra and City Services Directorate.

Nature Conservation Act 2014, administered by the Environment, Planning and Sustainable Development Directorate.

Heritage Act 2004, administered by the Environment, Planning and Sustainable Development Directorate.

Waste Management and Resource Recovery Act 2016, administered by the Transport Canberra and City Services Directorate.

The Litter Act 2004, administered by the Transport Canberra and City Services Directorate.

2.2 What EPA approvals do you need?

- An Environmental Protection Agreement with the EPA for work on sites greater than 0.3 hectare.
- An EPA approved ESC Plan prior to works commencing on sites greater than 0.3 hectare.
- An Environmental Authorisation for extraction of greater than 100m^3 from a waterway.
- A Waterway Works Licence under the WR Act if undertaking works in a waterway.
- A Water Abstraction Licence under the WR Act if taking water from a catchment or waterway.

For more information, contact the EPA by calling Access Canberra on 13 22 81 or accesscanberra.act.gov.au

Note: For planning and other approval requirements contact Access Canberra on 13 22 81. Legislation and approvals listed are not exhaustive.

Ensure an Erosion and Sediment Control Plan (ESC Plan) is submitted to the planning authority as part of development application for the site.

It is an offence to undertake a development and not comply with a condition of the development approval (such as installing erosion and sediment control measures as per the Erosion and Sediment Control Plan).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3. Best practice overview

3.1 Project planning

> Plan environment protection measures early in the land development and/or construction design process and incorporate the cost into the works program.

> Assess the physical characteristics of the site to determine how it can be developed with the smallest risk of environmental harm.

> Ensure planning considers the whole land development and/or construction period, and plan controls to accommodate all stages.

> Ensure a concept ESC Plan is submitted to the planning authority as part of the development application for all developments.

Note: If a Construction Environment Management Plan (CEMP) is required or submitted as part of a development application, the concept ESC Plan should form part of the CEMP.

> For sites 0.3 hectares or greater ensure an Environment Protection Agreement is in place with the EPA.

> Submit electronic copy of ESC Plan to environment.protection@act.gov.au

> Prior to any works commencing on a site less than 0.3 hectares ensure an ESC Plan has been approved as part of the development or building approval. For smaller scale residential developments specific guidance is provided in the Builders Booklet: Preventing Pollution from Residential Building Sites, available at www.accesscanberra.act.gov.au.

The International Erosion Control Association (IECA) is recognised as an industry leader in erosion and sediment control and, as such, is one of the primary sources of information on current and emerging best practice of ESC. More information can be found at www.austieca.com.au.

An example of a timeline for the environmental management of a project is presented in Table 1.

Table 1: Timeline of a project – Environmental management

Typical period	Phase 1	Phase 2	Phase 3	Phase 4
Project planning (concept ESC Plan) as part of development application				
Agreement with the EPA				
Submit ESC Plan for approval to the EPA				
Install erosion and sediment controls				
Commence development and construction work				
Monitor and maintain erosion and sediment controls				
Stabilisation				
Operational establishment of permanent water quality control assets (if applicable)				
Decommission temporary pollution control assets				
Hand over[1]				
Final stabilisation[1]				

1. Hand over may occur after 'final stabilisation' if site is fully stabilised, however it is common practice for handover to occur prior to final stabilisation, meaning that temporary pollution controls must remain in place and be managed until the site is fully stabilised by the parties responsible for the site(s). If permanent water control assets are in place, the temporary pollution control measures can be decommissioned provided the permanent water quality assets are maintained as pollution control assets until the site is fully stabilised.

3.2 Induction and training

The person responsible for the site should ensure their employees and subcontractors are appropriately inducted/trained to implement and monitor the approved ESC Plan and other pollution control measures.

The training should include:

- overview of the approved ESC Plan and other pollution control measures (e.g. noise, air and waste controls)
- any site-specific constraints (e.g. heritage sites, ecological communities)
- the location and type of erosion and sediment controls
- spill prevention and clean up measures
- maintenance procedures for each of the erosion and sediment controls (and completion of the Daily Environmental Checklist, found at Schedule 2)
- inspection and maintenance record keeping requirements
- their legal responsibilities and duty to protect the environment.

It is an offence under the Environment Protection Regulation 2005 to place soil, sand, building material or waste from development in the stormwater system, a waterway, or where it may enter the stormwater system or a waterway.

IMAGE 1: BUILDING SITE

3.3 Installation of controls

Install erosion and sediment controls prior to commencing any earthworks or construction work.

Protect areas that are to remain undisturbed (e.g., fencing).

Regardless of whether the measures are temporary or permanent, erosion and sediment control measures are the first items constructed prior to work commencing and must be completely functional before land disturbance takes place.

3.4 Inspection and monitoring

The person responsible for the site appoints a staff member to:

- be responsible for inspecting and maintaining the erosion and sediment control measures
- inspect the controls at the end of each day and after any rainfall event
- monitor controls and complete the Daily Environmental Checklist, found at Schedule 2
- maintain and store these records until the conclusion of the project and provide them when requested by EPA officers.

It is highly recommended that an independent suitably qualified person (see section 1.3) is appointed to undertake inspection and monitoring for large scale or environmentally complex construction and land development projects.

3.5 Maintenance

Maintain erosion and sediment control measures until the site is fully stabilised.

Maintain erosion and sediment control measures for each stage of the development until the entire site is fully stabilised.

If erosion and sediment control measures are designed for multiple stages they must be maintained until the whole area they were designed to manage is fully stabilised.

For further details see Section 5.1 – Site Stabilisation.

If controls are damaged or not functional, repair them immediately.

Note: It is good practice to check and maintain sediment and control measures while undertaking daily inspections (refer to Schedule 2 for examples of a daily environmental check list).

3.6 Site handover

The timing of site handover is a key feature in effective erosion and sediment control.

Hand responsibility for erosion and sediment control to the relevant parties when responsibility for a site (or stage of development) is transferred.

Ensure the site is progressively stabilised and all controls are fully functional at time of handover.

Make the new responsible party (whether they are landowners, individual builders or a government agency) fully aware of their obligations to maintain erosion and sediment controls until the site is fully stabilised.

> Where the public land assets are transferred from the land developer to the Territory, the relevant Territory land custodian is responsible for maintaining the controls until the site is fully stabilised.

> For individual building sites within a larger development site, the owner/builder is responsible for erosion and sediment controls until the individual site is fully stabilised.

For further details see Section 5.1 – Site Stabilisation.

Regardless of whether one stage of a development is completed, erosion and sediment control measures are to remain in place until all stages of the development are fully stabilised. If control measures only apply to a specific stage of development or individual site, they can be decommissioned if that stage or individual development is fully stabilised.

Failure to effectively install, inspect and maintain controls (as per approved Erosion and Sediment Control Plan) constitutes an offence under the Environment Protection Regulation 2005. This includes maintaining controls until full stabilisation.

For more information, contact the EPA by calling Access Canberra on 13 22 81.

4. Erosion and Sediment Control Plans (ESC Plans)

4.1 Minimum requirements for Erosion and Sediment Control Plans

Erosion and Sediment Control Plans (ESC Plans) are fundamental to the environment protection process. Not only are ESC Plans a legal requirement, but they allow you to plan controls in advance and factor them into your timeframes and costing.

The ESC Plan details the controls to be used during land development and construction to manage the environmental impacts of activities for a given project.

An ESC Plan must be approved by the EPA for sites 0.3 hectare or greater prior to any work commencing. If there are any changes to an approved ESC Plan, the plan must be resubmitted to the EPA for approval.

It is an offence under the Environment Protection Regulation 2005 to commence any work without installing measures in accordance with an approved ESC Plan.

For more information, contact the EPA by calling Access Canberra on 13 22 81.

ESC Plan checklist:

EROSION AND SEDIMENT CONTROL PLAN	
Contact Details (Name and Mobile Numbers):	
Company undertaking works:	
Builder/Site Manager/Foreman:	
Project Manager:	
Block/Section/District/Street address:	
Plan Requirements	
Concept ESC Plans must be submitted to the planning and land authority as part of development approval application.	✔ Electronic copies of plans must be provided ✔ Should be developed by a suitably qualified person ✔ Should be architecturally drawn ✔ Legend and orientation, including north point ✔ Scope of plans (i.e. demolition, civil works, construction etc.) ✔ Details of staging and timing of works ✔ Total site area (and if staged, area of each stage) ✔ Catchment area (i.e. for sediment basins) ✔ Site boundaries
An ESC Plan must be submitted to the Environment Protection Authority for approval prior to commencing any work.	**Erosion and sediment control measures** ✔ Water flow path/contour lines (0.5 m maximum) ✔ Stabilised access point(s) ✔ Clean water diversions ✔ Sediment basin(s) including calculations for sizing ✔ Sediments fences (and other sediment control measures) ✔ Cut/Wash areas ✔ Stockpile storage areas ✔ Waste enclosure/material storage areas ✔ Location of site shed(s) ✔ Location of staff/contractor parking

EROSION AND SEDIMENT CONTROL PLAN	
Erosion and sediment control measures **Provide details using diagrams and explanatory notes and include on plans as required.**	
Site stabilisation—Stabilised access point	✔ Provide details of entry and exit points. ✔ Detail construction specifications. Refer Section 5.1.1 Detail on plan.
Other site stabilisation	✔ Detail other stabilisation measures. Refer Section 5.1.
Sediment barrier infrastructure	✔ Detail sediment barrier infrastructure such as sediment fences, check dams or stormwater inlet protection. Refer Section 5.5. Detail on plan.
Water conveyance infrastructure	✔ Detail any water conveyance infrastructure such as earth banks, diversions or level spreaders. Refer Section 5.3. Detail on plan.
Spoil management	✔ Detail if it is a balanced site. If not, provide details such as spoil quantity, description, destination and transporter. ✔ If accepting more than 100m^3 an Environmental Authorisation may be required. Refer section 5.2.
Dust suppression	✔ Provide details for dust suppression (including spoil management and covering and securing loads entering and exiting the site). ✔ Seek alternatives to water where possible. Refer Section 5.7.

EROSION AND SEDIMENT CONTROL PLAN	
Water retaining infrastructure	**Refer 5.4**
Sediment basin (blocks greater than 0.3 ha)	✔ Location and size of basin. ✔ Provide details of catchment area (including areas outside site boundary). ✔ Provide information regarding dosing and discharge. ✔ Detail any other water retaining infrastructure.
Other control measures	
Material stockpiles	✔ Detail where material stockpiles will be stored. ✔ Detail how stockpiles will be managed to minimise dust and sediment/material run-off. Nothing to be placed on the nature strip unless prior approval is granted by the relevant agency.
Air quality	✔ No material to be burnt on site.
Waste management	✔ Must have a waste enclosure and no waste is to leave the site. Refer Section 6.2.
Wash down /Brick cutting area	✔ Must have specific cut/wash area. ✔ Detail how this will be managed to ensure no run-off enters the stormwater system or leaves the site.
Contamination	✔ Provide details on any contamination issues. Refer Section 6.5.
Painters	✔ Detail how paint waste will be managed. Refer Section 6.4.
Spills	✔ Ensure you have a contingency plan to manage spills.
Noise	✔ Detail operating hours (must comply with the noise zone standards). Refer Section 6.1.

EROSION AND SEDIMENT CONTROL PLAN	
Maintenance	Provide details of pollution control maintenance schedule including daily/weekly inspection of stabilised access, sediment erosion controls and adjacent roads (refer Schedule 2). Controls must be maintained throughout land development and construction until the site is fully stabilised.
Training	Ensure all employees and contractors are aware of their responsibilities to protect the environment. Refer Section 3.2.
Parking	Provide details and location of employees and contractor parking. Detail on ESC Plan.
Site shed	Specify location of site shed(s). Detail on ESC Plan.

5. Erosion and sediment control measures

This chapter outlines different measures that can be used to prevent erosion and control sediment and highlights common issues and offences that relate to inappropriate installation of measures.

Erosion and sediment control measures are the tools used to prevent erosion on site in the first instance, and to control sediment as a secondary measure. Keeping vegetation (where required) and the soil in place should be the first priority. A list of erosion and sediment control priorities is presented in Table 2.

For details on what is to be included in an Erosion and Sediment Control Plan see Section 4.

Table 2: Erosion and sediment control priorities

Priority 1	Priority 2
Erosion control (keeping the dirt in place) and minimising the impact of construction	**Sediment control** (the second line of defence)
Minimise disturbed areas and protect natural features and soil	Protect storm drain inlets
Phase construction activity	Establish perimeter controls
Control stormwater flowing onto and through the site	Retain sediment on site (e.g. ponds/dams) and control dewatering practices
Stabilise soils promptly	Establish stabilised construction exits
Protect slopes	Inspect and maintain controls

Erosion and sediment control measures include:

- site stabilisation
- spoil management
- water conveyance infrastructure
- water retaining infrastructure
- sediment barrier infrastructure
- dust control measures
- specialised erosion and sediment control.

Common issues include:

- design of controls not appropriate for purpose
- controls not installed early enough
- storm water systems connected too early
- inadequate handover practices
- controls decommissioned too early
- controls not appropriately maintained throughout development.

Design storm event

Unless otherwise specified, develop the controls within this guideline to meet the 2-year average recurrence interval (ARI) design 3 hour storm event, in accordance with the Australian Rainfall and Run-off Guidelines. For sites larger than 1 hectare, develop controls to meet a 5-year ARI.

IMAGE 4: INAPPROPRIATE CONTROL MEASURES

IMAGE 5: POLLUTION ENTERING STORMWATER DRAIN

5.1 Site stabilisation

Exposed soil surfaces in the ACT are at a high risk of erosion due to the soil profiles, climatic and hydrological conditions of the region. Stabilisation is the provision of adequate measures to prevent erosion from occurring, whether by wind or water. Many problems relating to erosion and sediment control relate to inadequate stabilisation practices.

Site stabilisation measures include:

- stabilisation planning
- stabilised access points and grid/vehicle wash bays
- vegetative cover
- other stabilisation measures, such as the use of stabilising polymers, binding agents, straw mulch etc.

Requirements

- All sites are to have a functional stabilised access point.
- Stabilisation measures should be appropriate for the time of year, site conditions, estimated duration of use and potential water quality impacts that stabilisation agents may have on downstream waters or ground water.
- Following earthworks, leave soil surfaces on disturbed slopes in a roughened condition (contoured striations or furrows) and construct a water diversion at the top of the slope. Rough soil surfaces do not erode as easily as smooth soil surfaces.
- All erosion and sediment control measures are to remain in place until the site is fully stabilised.

It is an offence under the EP Act if appropriate stabilisation measures are not in place.

Prior to other erosion and sediment control measures being removed, the entire site or site stages for larger developments must be fully stabilised.

It is an offence if the footpath, gutter and road adjacent to the development is not clear of soil, sand, building materials and waste.

→ Definition of full stabilisation:

Full stabilisation means at least 85% of the disturbed ground within the site (or stage of development) is stabilised. Stabilisation means adequate measures have been employed to prevent erosion of soil.

Note: For greenfield development stages this 85% includes both individual allotments and public land. Temporary sediment basins and permanent water quality control features used as pollution controls must be maintained until the site or each stage for which they were designed to manage pollution from is stabilised.

Stabilisation planning

> Assess the physical characteristics of the site to determine how it can be developed with the smallest risk of environmental harm. Minimise land reshaping by using existing topography where possible.

> When undertaking site layout planning, ensure appropriate placement of site compounds and sheds, stabilised access points and material lay down areas, wash areas, cutting areas, stockpile placement and waste enclosure areas.

> Limit the extent of exposed and unprotected areas by preserving existing groundcover where possible.

> Before commencing work, protect all areas to remain undisturbed (e.g fencing or other barrier controls if required)

> Use progressive/staged clearing and construction in preference to mass clearing and construction particularly for greenfield land developments.

ℹ Progressive stabilisation is to be incorporated and specified in the ESC Plan.

5.1.1 Stabilised access points and grid/vehicle wash bays

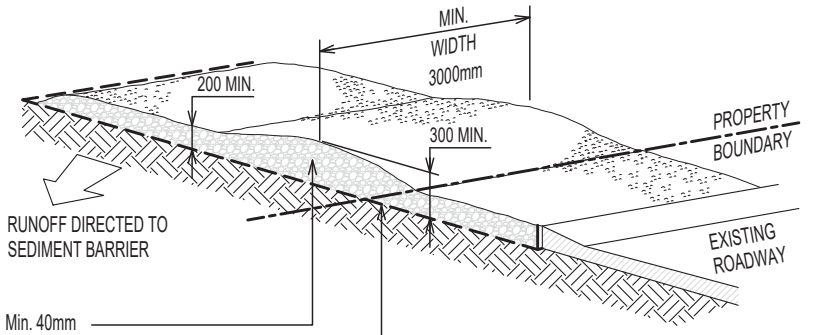
Vehicles tracking dirt and mud from short-term or inappropriate access arrangements are a major problem and can result in sediment entering waterways or causing road and other hazards.

A stabilised access point consists of a stabilised pad of coarse aggregate, rock or recycled concrete (min 40mm in size) underlain with geotextile fabric located at any point where traffic enters or leaves a construction site, including a public road, street, open space or parking area.

Requirements

- Limit to one site entry/exit point where possible.
- Where there is heavy traffic, a grid or vehicle wash bay may be necessary.
- Earthmoving equipment and trafficking by heavy equipment exposes the soil and subjects it to high erosive potential. All access must be controlled on the site and vehicles and plant must keep to well-defined haul roads to minimise ground disturbance and compaction.
- A stabilised access point is temporary and must be decommissioned at the conclusion of construction.

Figure 2: Stabilised access point



Design criteria— stabilised access point

Where possible, choose an access point in an elevated position with little or no water run-off from upslope.

- The appropriate location for construction access may not always be the proposed driveway location.
- Remove top layer of soil at least 3 metres wide from the road to the construction site.
- Use minimum 40mm aggregate or recycled concrete or equivalent to a depth of 200mm with an underlay of heavy-duty geotextile fabric cloth.
- Where the pad slopes toward the road, install a 300mm high bund (hump) across the pad to divert stormwater run-off to a sediment fence for filtering.
- Access arrangements are to have a minimum length of approximately 15 metres or four to five vehicle wheel revolutions over the rock.

IMAGE 6: STABILISED ACCESS POINT

Requirements

> The stabilised access point is to be maintained in a condition that will prevent tracking of sediment onto roads.
> If sediment does track onto the road for any reason, remove it immediately.
> Monitor for compaction from vehicles and add aggregate or equivalent as required.
> Check the stabilised access at the end of each day and before and after a rain event.

It is important to use geotextile fabric underneath the aggregate; otherwise, soil can rise to the surface and it does not serve its purpose.

It is an offence under the EP Act if the surface of each vehicle entrance to, or exit from, the land where the development is being carried out is not stabilised appropriately and/or if the stabilised access point is not adequately maintained throughout the project.

Design criteria—grid/vehicle wash bay

Where there is heavy traffic, a grid or vehicle wash bay may be necessary.

> Design the grid or vehicle wash bay so water leaving the area does not enter the stormwater system.
> Periodically lift and clear out the grid or vehicle wash bay.
> Grids and vehicle wash bays should be preceded and followed by stabilised material to reduce material load entering grid or wash bay and ensure that vehicles do not carry mud/dirt off-site.

Reference: ACT Municipal Infrastructure Standard 06 - Verges.

For more information please see the EPA information sheet: Delivering Supplies to Building Sites.

IMAGE 7: UNSATISFACTORY STABILISATION HAS RESULTED IN SEDIMENT LEAVING THE SITE

It is an offence to allow run-off from washing to enter a waterway.

5.1.2 Vegetative cover

The maintenance and re-establishment of vegetation are the most important factors in minimising erosion during development. Permanent vegetative cover over exposed soil areas will stabilise the soil, slow the movement of stormwater run-off and increase infiltration to help protect nearby wetlands, streams or other environmentally sensitive areas.

Vegetation shields the soil surface from raindrop impact while the root mass holds soil particles in place. Grass buffer strips can be used to filter sediment from surface run-off and to prevent wind dispersion.

Vegetative buffers

The maintenance of vegetation adjacent to water bodies, wetlands and other areas of natural resource value is essential to ensure such areas are not adversely affected by construction or by stormwater run-off once construction is completed.

- During construction, vegetative buffers on their own are not sufficient erosion and sediment control measures.
- It is an offence to allow any substance other than rainwater to enter the stormwater system.

Revegetation

Stabilisation measures (either temporary or permanent) are to be applied within six days of disturbance and/or final earthworks shaping, during November to February inclusive and up to 14 days during the rest of the year.

> For stabilisation beyond six months, a mixture of perennial and annual species is best. The annual species are fast growing and useful temporarily; the perennial species are usually slower to establish and will grow under the annual species and succeed them to provide a permanent surface protection.

> Use species appropriate for the season and climate.

IMAGE 8: GRASS BUFFER

- For additional revegetation guidance refer to the ACT Municipal Infrastructure Standard 08– Stormwater.
- For topsoil handling techniques refer to the NSW Blue Book (Chapters 4–6).
- Plant species: When selecting appropriate plant species it is recommended to refer to the Municipal Infrastructure Standard 25 – Plant Species for urban landscape projects.
- For specifications and standards for vegetative stabilisation of channels and steep slopes refer to the NSW Blue Book (Chapter 7).

Specialised methods of establishing vegetation.

Where sites are unlikely to be successfully vegetated using broad area techniques, adopt specialised methods to establish vegetation. These methods include straw mulching and bitumen spraying, hydromulching, hydroseeding, turfing and the use of other meshes and mattings.

Examples of situations where specialised methods would be applicable are:

- excessively steep slopes
- drainage lines currently operating and requiring immediate cover
- areas where topsoil is absent and cannot be applied
- sowing during unfavourable seasonal conditions.

5.1.3 Other stabilisation measures

Temporary stabilisation measures

- Mulch covers:

  The use of temporary mulch covers such as straw, properly anchored with a binder, is an effective way to protect the soil from erosion until a permanent vegetative cover can be established. Mulch covers can be used during the non-growing season, but are also effective when applied after an exposed soil area has been seeded.

  The mulch helps retain soil moisture and protect the seed before germination.

- Rip rap
- Geotextiles
- Polymers
- Hydra Mulch.

⚠ Do not use temporary measures if the soil is to remain exposed for more than 60 days.

Other non-temporary stabilisation measures

- Gabions
- Concrete or asphalt paving
- Quarry spalls used as ditch lining
- Gravel base (ensure it is clean).

Rip rap and Gabions may not be suitable where dispersive soils are present.

Reference: ACT Municipal Infrastructure Standard 02 – Earthworks.

IMAGE 9: STABILISED SOIL

5.2 Spoil management

Spoil management includes:

- stockpiles
- acceptance and disposal of soil.

5.2.1 Stockpiles

Loss of material through incorrect storage of stockpile and building materials can be a major source of pollution as well as increasing costs for the builder or developer.

IMAGE 10: SEDIMENT FENCE AROUND STOCKPILE

IMAGE 11: STABILISED STOCKPILE

Requirements

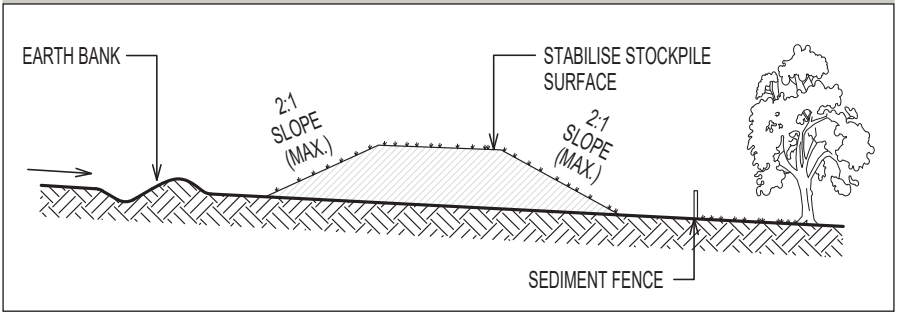
- If stockpiles and batters will remain bare for more than 14 days, they are required to be stabilised (refer Section 5.1). Manage stockpiles to prevent dust emissions.
- Store stockpiles outside hazard areas such as drainage lines. If necessary, install up-slope diversions.
- Place stockpiles near the stabilised access point to reduce damage to the site.
- When ordering materials, give clear instructions about where they should be placed on site.

- Clearly mark the stockpile area.
- Limit the amount of material stockpiled on site if possible.
- Do not place stockpiles on nature strips or verges.

To protect stockpiles and building materials from entering the stormwater system:

- store them behind sediment control barriers
- cover them where necessary
- locate them away from high water flow areas
- keep stockpile height below 2 metres.

Figure 3: Stockpile management



→ Maintenance of stockpiles

Check controls daily and undertake repairs immediately. Put controls back in place if they are moved for any reason.

Back-push banks should be used in preference to catch-drains in areas that have highly erosive or dispersible subsoils.

The **Daily Environmental Checklist** can be found at Schedule 2.

5.2.2 Acceptance and disposal of soil

Acceptance of soil

Before accepting soil on site, follow these steps to reduce the risk of receiving contaminated material:

Requirements

- Ensure all fill used is virgin excavated material (e.g. clay, gravel, sand, soil or rock) that is not mixed with any other waste or from a contaminated site.
- Request the supplier provide formal certification that fill is clean.
- Request the supplier provide information on current and past activities on the site the fill has been sourced from.
- Delivery should be supervised to ensure the appropriate material is received.
- Check for signs of contamination, such as odours (chemical/petrol), staining from chemicals, and rubbish such as bricks, timber, metal, asbestos, etc.
- Maintain all documents and records.

No material is to be placed in a waterway without prior approval from the EPA.

In some cases, an Environmental Authorisation may be required. Acceptance of more than 100 m3 of soil without an Environmental Authorisation may attract penalties of up to $100,000.

For more information, contact the EPA by calling Access Canberra on 13 22 81.

Disposal of spoil

Spoil should only be taken to a location lawfully able to accept it, and in accordance with an Environmental Authorisation, if one is in place.

For information on contamination see: **Contamination Section 6.5**

5.2.3 Reuse of excavated material and other recycled materials

Before accepting excavated materials or any other recycled materials on site, follow these steps to reduce the risk of receiving contaminated material:

Requirements

- Ensure all fill used is appropriate recycled or aggregate material that is not mixed with any other waste or from a contaminated site.
- Request the supplier provide formal certification that recycled material aggregates are clean, including any appropriate record-keeping of the type, amount and source of recycled aggregates.
- Request the supplier provide information on current and past activities on the site the fill has been sourced from.
- Delivery should be supervised to ensure the appropriate material is received.
- Check for signs of contamination, such as odours (chemical/petrol), staining from chemicals, and rubbish such as bricks, timber, metal, asbestos, etc.
- Maintain all documents and records.

5.3 Water conveyance infrastructure

Water conveyance infrastructure is used to convey concentrated flows of water while reducing erosion.

This infrastructure is to be used to convey all concentrated flows during a site's development.

Water conveyance infrastructure includes:

- earth bank (low flow)
- earth bank (high flow)
- diversion of clean surface water
- level spreader.

Diversion of surface water is important because it:

> prevents clean water from getting dirty or turbid by diverting run-off from undisturbed up-slope areas away from disturbed areas
> diverts sediment laden run-off to sediment controls
> reduces the length of a slope into non-erosive segments so soil loss will be reduced.

Water conveyance infrastructure does not provide sufficient water quality treatment of sediment laden flows. Additional downstream treatment from nodal infrastructure will be required. An exception to this is if the water being conveyed is from an undisturbed area.

Requirements

> Plan water conveyance infrastructure taking into consideration the temporary or permanent nature of the infrastructure.
> Design and construct diversion works in a manner that will not erode or cause erosion.
> Design temporary water conveyance infrastructure as per this guideline and decommission and rehabilitate the area at the conclusion of construction, or where infrastructure is no longer required.
> Design permanent infrastructure to Municipal Infrastructure Standard 08- Stormwater, and hand over to the Transport Canberra and City Services Directorate post construction.

5.3.1 Earth bank (low flow)

A low flow earth bank is a berm or ridge of compacted earth located in such a manner as to channel water to a desired location. An earth bank can be constructed with or without an excavated drainage channel.

Where highly erosive of dispersive subsoils are present, consider a back-push bank to form the berm. For further detail and specifications see the NSW Blue Book.

Figure 4: Earth bank (low flow)

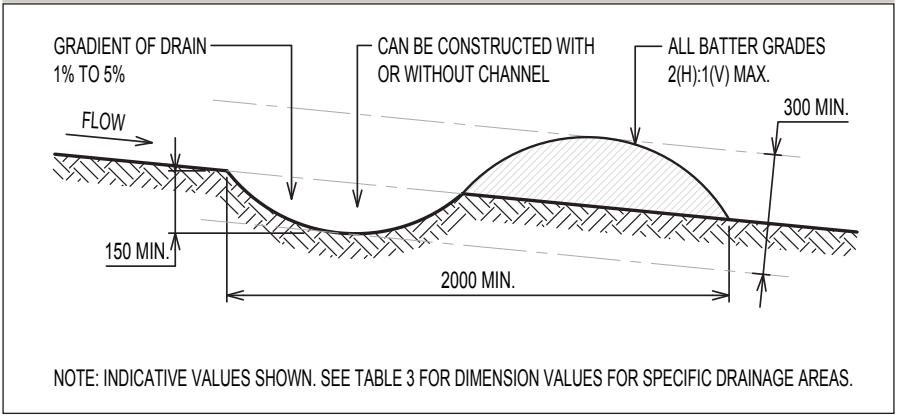


Table 3: Design criteria—Earth bank (low flow)

Drainage Area	< 1 ha	1–2 ha	2–4 ha
Bank height	0.5 m	0.5 m	0.75m
Bank width	1.5 m at bottom	0.6 m at crest	1 m at crest
Side slopes	1:2 or flatter	1:2 or flatter	1:2 or flatter
Width of flow channel	0.6 m	1.0 m	2.0 m
Depth of flow channel	0.3 m	0.3 m	0.3 m

Stabilisation of channel

Stabilise the disturbed area of the bank within seven days of installation according to the below criteria.

Table 4: Design criteria—Stabilisation of channel

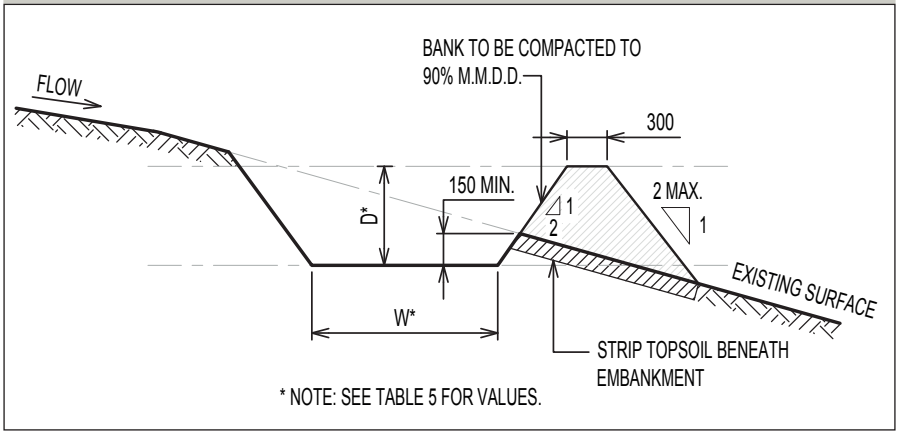
Channel Grade	< 2 ha	2–4 ha
0.5–2.0%	Seed and straw mulch	Seed and straw mulch
2–5.0%	Seed and straw mulch Requires irrigation Seek advice from landscape professional	Seed and cover with jute or similar and spray with bitumen or sod or line with 50 mm aggregate Requires irrigation Seek advice from landscape professional
5.1–8.0%	Seed and cover with jute or similar and spray with Bitumen or sod or line with 50 mm aggregate Requires irrigation Seek advice from landscape professional	Line with 100–200 mm stone or recycled concrete equivalent Requires irrigation Seek advice from landscape professional
8.1–10%	Line with 100–200 mm stone or recycled concrete equivalent	Engineering design

5.3.2 Earth bank (high flow)

High flow earth banks are drainage channels of parabolic or trapezoidal cross-section with a supporting ridge on the lower side that is constructed across the slope.

The purpose is to intercept and convey run-off from the drainage areas of up to 10 ha to stabilised outlets.

Figure 5: Earth bank (high flow)



Design Criteria - Earth bank (high flow)

> Design earth banks in relation to velocity and capacity in accordance with MIS 08 – Stormwater.

> Calculate peak discharge of run-off values when determining capacity requirements by using MIS 08 – Stormwater.

> Stabilise the inverts of the channels in accordance with MIS 08 – Stormwater.

> Discharge from a diversion drain should be via a level spreader or piped diversion.

Channel dimensions in relation to channel slope and catchment area are outlined in Table 5.

> Maximum slope to be set at 2.5 (H):1(V).

> Maximum slope for vegetative batters is 4(H):1(V).

Refer Municipal Infrastructure Standard 08 – Stormwater.

Where highly erosive or dispersive subsoils are present consider a back-push bank to form the berm. For further detail and specifications see the NSW Blue Book

Table 5: Earth bank (high flow) (Trapezoid—for larger catchments)

Channel Slope %	0.5ha		1ha		2ha		5ha	
	(w)	(d)	(w)	(d)	(w)	(d)	(w)	(d)
0.5	1.0	0.15	1.0	0.2	1.0	0.3	1.0	0.4
1.0	1.0	0.1	1.0	0.15	1.0	0.25	1.0	0.35
2.0	1.0	0.1	1.0	0.15	1.0	0.2	1.0	0.3
5.0	1.0	0.1	1.0	0.1	1.5	0.15	3.0	0.2
10.0	1.0	0.1	1.5	0.1	3.0	3.0	5.0	0.1

—Width (w) and depth (d) in metres (m)

5.3.3 Diversion of clean surface water

Downdrain structure (slope protection structure)

A downdrain structure is a pipe or chute structure installed down steep slopes to convey run-off. Maximum drainage area shall be 10 ha without special design and adequate spillway provision (Figure 6).

Due to the risk of these structures from piping, clogging and overtopping, use diversion channels in preference to downdrain structures, while still considering the cost effectiveness of the two options.

Open channels lined with either geofabric and HDPE, a spray on channel liner such as Geospray or a 3D Turf Reinforcement Mat (TRM) should be considered.

Downdrains are a temporary asset and must be decommissioned and removed at the conclusion of construction and the area rehabilitated.

Design criteria

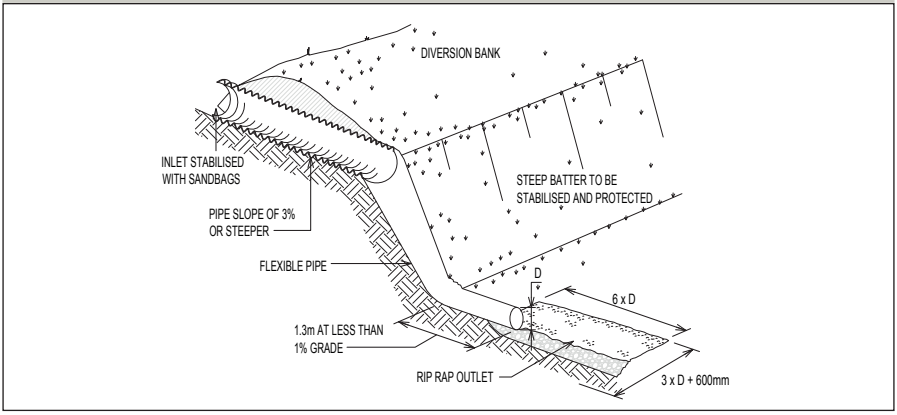
Downdrains consist of:

- pipes of concrete, corrugated steel, cast iron
- flexible conduits of heavy-duty fabric or other material (usually a temporary installation)
- chutes of half round pipes of concrete, corrugated steel (permanently staked), U-sections of concrete nestled together, grouted rock or spraycrete.

The downdrain is to outlet into a sediment trapping device when the drainage area is disturbed.

Install a riprap apron below the pipe outlet where clean water is being discharged into a stabilised area.

Figure 6: Downdrain



Level spreader

The purpose of a level spreader is to convert a concentrated flow of sediment free run-off (e.g. diversion outlets) into sheet flow and to discharge it onto areas stabilised by vegetation without causing erosion.

The level spreader is only to be used:

- when the catchment area is 0.1 ha or less
- where the spreader can be constructed on undisturbed soil
- where the area directly below the level lip is stabilised, preferably by existing vegetation
- where the drainage area above the spreader is stabilised by existing vegetation
- where the water will not be re-concentrated immediately below the point of discharge.

Level spreaders are used to terminate a diversion drain or earth bank or to distribute gully flow where this is undertaken.

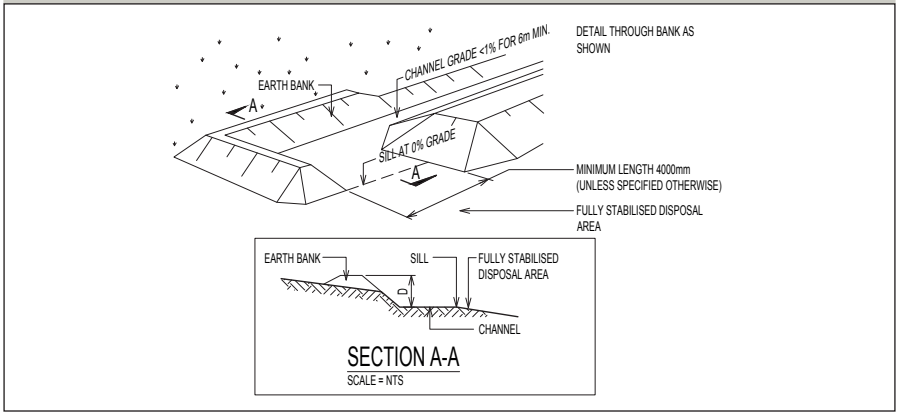
Level spreaders are a temporary asset and must be decommissioned and removed at the conclusion of construction and the area rehabilitated.

CONTROLS

Design criteria

The design criteria for a level spreader shall be a maximum of 0.1 cumecs per metre of length based on the peak rate of flow from a 10-year ARI time of concentration event. Sill length depends on contributing catchment and slope and ground conditions and can be determined from the NSW Blue Book. In any case, the minimum length shall be 4 metres and the maximum length shall be 25 metres.

Figure 7: Level Spreader



5.4 Water retaining infrastructure

This section includes:

- sediment basin
- sediment trench
- sediment pit
- sediment tank
- other water retaining infrastructure
- flocculation and discharge/dewatering.

Water retaining infrastructure is designed to intercept sediment laden run-off and to trap and retain sediment. Before water leaves water retaining infrastructure, it must be treated to ensure it is of an acceptable quality.

For additional background (but not design specification), refer to the NSW Blue Book.

It is an offence to discharge stormwater from retention areas without meeting standards detailed in this guideline.

5.4.1 Sediment basin

A sediment basin is a temporary or permanent stormwater capture device consisting of a barrier or dam or an in-ground basin constructed across the drainage outlet to intercept sediment laden run-off and to trap and retain sediment.

If the sediment basin is temporary, it should be designed to this guideline. If the control is permanent, it should be designed to Municipal Infrastructure Standards 08 (MIS 08 – Stormwater).

The sediment basin should be located to obtain the maximum storage benefit from the terrain and for ease of cleanout of the trapped sediment.

> Monitor and maintain the basin/s on a daily basis throughout construction and do not remove them until the site is fully stabilised.

If the site is larger than 1 hectare, a sediment basin is required.

- You may require a permit from the EPA under Section 44 of the WR Act or an environmental authorisation under Section 42 of the Environment Protection Act to construct a basin.
- The temporary or permanent nature of the basin is to be marked on plans.
- The basin must be located within the subdivision unless otherwise approved by the EPA.

For more information, contact the EPA by calling Access Canberra on 13 22 81.

Design criteria

> Install a water level indicator identifying 'sediment at 10% capacity' and 'water at 20% capacity'. The length to width ratio is a minimum of 3:1.
> Clean out sediment build-up when it is above the 10% water level indicator. Water should be maintained at 20% capacity.
> The total catchment area (including disturbed and undisturbed) should not exceed 40 hectares.

- Construct sediment basins from non-dispersive soils and ameliorate any potentially dispersive soils present in the basin batters.

How to determine volume of sediment basin

OPTION 1:

- Where the site is upstream of a regional water quality pond (i.e. Lake Ginninderra, Lake Burley Griffin or Lake Tuggeranong), the volume of the sediment basin shall be at least 165 m^3/ha of total site catchment area.
- Where the work is in any other area, the volume of the sediment basin shall be at least 190 m^3/ha of total site catchment area.
- if catchment length for the basin is greater than 80 metres or average slope is greater than 7%, then options 2 or 3 below must be used.

OPTION 2:

Calculate the size of the sediment basin by using the following method:
Sites larger than 1 hectare:

- Basin volume (m3) = 110 x total catchment area (ha) + 13 x LS factor x disturbed catchment area (ha).
- Divert any run-off from undisturbed up-slope areas away from disturbed areas. If these diversions are not in place, then the calculation from option 2 is to include the entire site catchment area (ha), not just the disturbed catchment area.

OPTION 3:

Calculate the size of the sediment basin using calculations from the NSW Blue Book.

Inspections and maintenance are essential for controls to be effective and compliant.

Flocculate and de-water basins within five days of a rainfall event in accordance with Section 5.4.6. If this does not occur and another rainfall event occurs, sediment concentrations in outflows will be approximately equivalent to sediment inflows, **which constitutes an offence under the EP Act**.

For more information see Table A1— LS-Factors on construction sites using the Revised Universal Soil Loss Equation (RUSLE) from the NSW Blue Book.

For more details see Appendix J— Volume of Sediment Basins from the NSW Blue Book.

Stabilisation

> Stabilise the embankment and emergency spillway in accordance with the appropriate vegetative standards and specifications immediately following construction (i.e. grassed, jute mesh, mulch and bitumen spray).

> Protect points of entrance of surface run-off into excavated sediment basins to prevent erosion.

> Length to width ratio should be greater than 3:1, where length is the distance between the inlet and outlet. A wedge shape is preferred with the inlet located at the narrow end. However, it is accepted that it will need to be fitted into the available land.

> At 3(H):1(V) rock should be provided at a minimum.

Reference: Section 5.1.2 Vegetative cover.

In no case shall the embankment remain unstabilised for more than seven days after completion.

Safety

> 3(H):1(V) is the maximum slope for the upstream side of the embankment for a temporary sediment basin. At this slope fences are required. Other slopes (e.g. inlet and downstream side of embankment) are required to be flatter.

> Slopes of 8 (H):1(V) are required for internal batters before the need for fences be reviewed.

> External batters with a slope of 3 (H):1(V) are satisfactory for safety and vegetation establishment.

Figure 8: Level Spreader

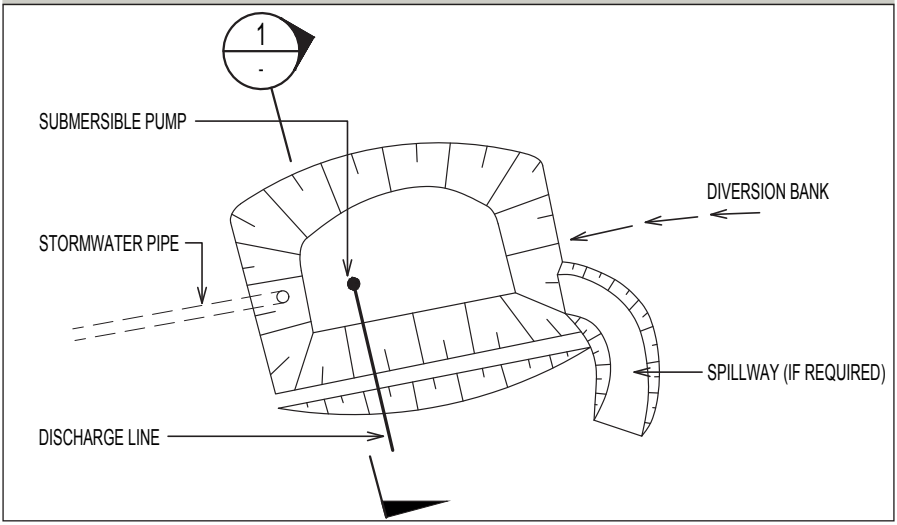
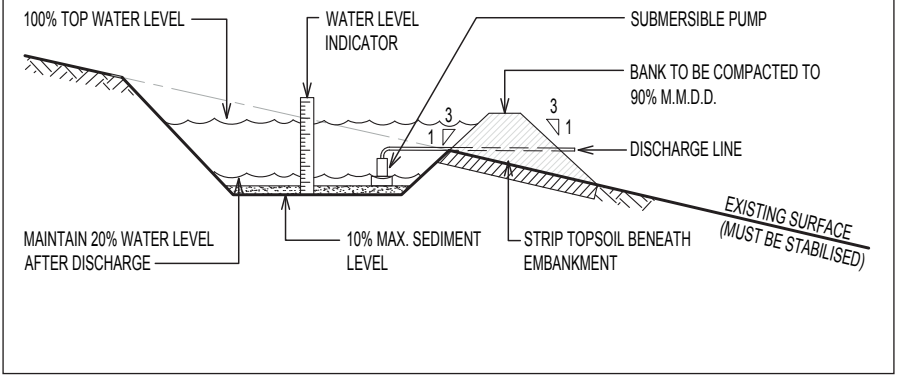


Figure 9: Sediment basin



5.4.2 Sediment trench

A sediment trench is used to contain polluted run-off for treatment prior to discharge and is applicable to smaller sites, particularly where the surface is relatively flat.

Requirements

> Trenches are generally situated at the lowest end of the site so they can receive all polluted run-off.
> Trenches are to be less than 1 metre deep and constructed along the contour to maximise capacity. For difficult sites more than one trench may be required.
> A sediment trench is a temporary structure and must be decommissioned and removed at the conclusion of construction and the area rehabilitated.

⚠ Submersible pumps are not to be used to dewater sediment trenches.

ℹ For more information on Dewatering see section 5.4.6.

5.4.3 Sediment pit

Sediment pits are applicable to small sites (<0.5 hectare) with limited open space. Sediment pits are constructed to contain polluted run-off for treatment prior to discharge.

Sediment pits are either temporary or permanent water retaining assets which form part of a future sub-soil or stormwater drainage system.

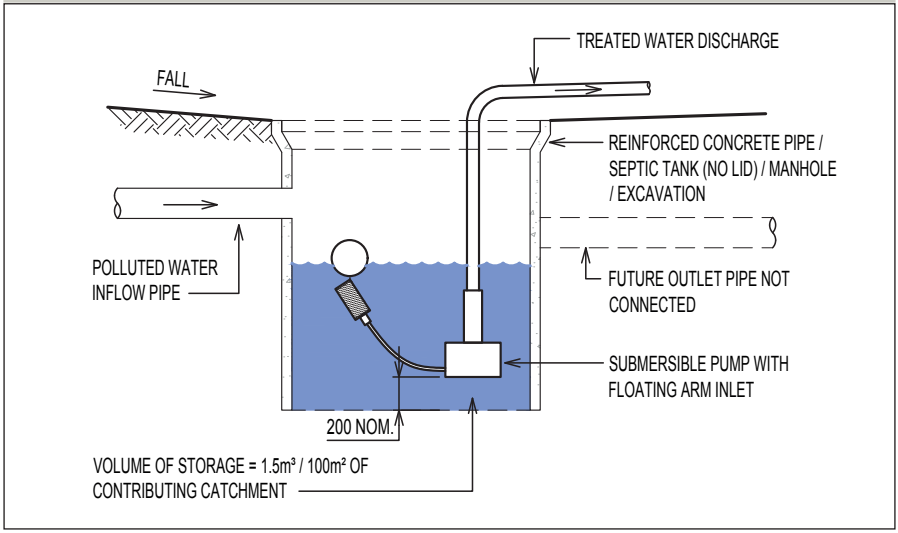
Requirements

> Temporary structures must be decommissioned and removed at the conclusion of construction.
> Sediment pits are located at the lowest end of a piped system and the lowest point within the site.
> Where contained within a stormwater system, the inlet pipe should be substantially higher than the base of the sediment pit.

⚠ The future outlet is not to be connected until upstream areas are fully stabilised (see section 5.1).

ℹ Refer to Dewatering Section 5.4.6.

Figure 10: Sediment pit

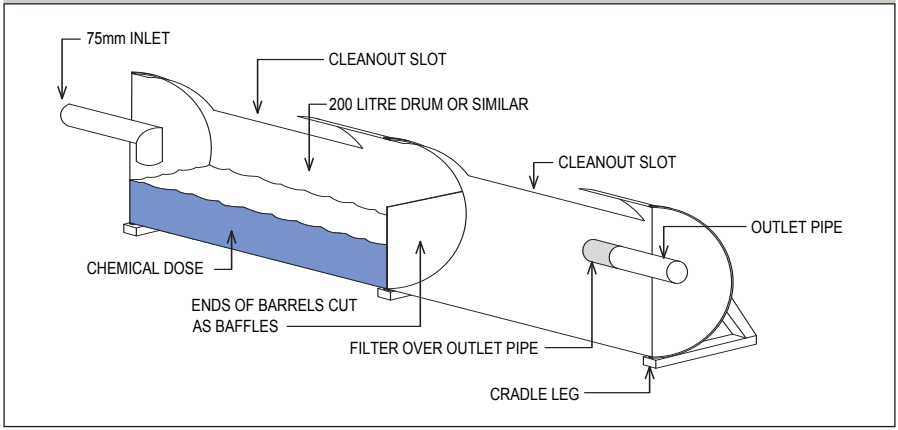


5.4.4 Portable sediment tank

A portable sediment tank traps and retains sediment and treats turbid water prior to pumping the water to the stormwater system.

A sediment tank can be used on sites where excavations are deep and space is limited, such as urban building sites.

Figure 11: Portable sediment tank



5.4.5 Permanent water retaining infrastructure

Permanent water retaining infrastructure, whether constructed for sediment or nutrient removal, should be designed to the MIS 08 – Stormwater.

Requirements

If an asset is to become permanent following use for erosion and sediment control during construction, the following minimum requirements apply:

- Remediate assets at the completion of the development so their levels and functions are as they were designed. This will usually require excavation or dredging at a minimum.
- Vegetate assets to the point where plants are well established and coverage is acceptable for handover (refer to Section 5.1.2 Vegetative Cover for more information).
- Where possible, protect plants that serve an ongoing water quality purpose from sediment loads during construction.
- Protect surface and subsurface materials that are designed to provide a water quality benefit (e.g. filters and growing media) from sediment loads during construction.

Stormwater assets are to be offline and not connected until the site is fully stabilised (see section 5.1).

5.4.6 Flocculation and discharge/dewatering

Flocculation

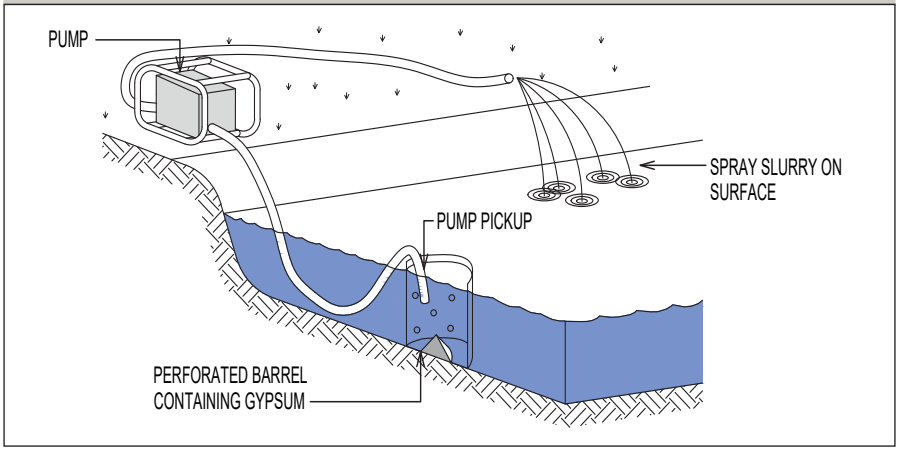
Flocculation is where a chemical agent is used to reduce the turbidity of water by binding suspended particles to form larger particles that then settle to the bottom of the water retaining infrastructure.

- Chemically dose the water with gypsum to accelerate settlement of suspended solids.
- Mix the gypsum in either a tank or tanker or into slurry in a concrete mixer and distribute it to several points in the basin by a spray or spreading technique. Spraying over the surface is preferred and in-dam mixing may be required.
- Gypsum dosing should be applied at about 30 kg/100 m3 of stored water. In some instances higher rates may apply, typically less than 50 mg/L.

> Dosing can take from several hours to overnight, depending on the water quality and the amount of water to be dosed.

If dosing with alum or other chemicals, apply in accordance with IECA 2018 Appendix B or the NSW Blue Book.

Figure 12: Chemical dosing



Discharge/dewatering of water retaining infrastructure

Discharging or dewatering is the removal of water from any water retaining infrastructure.

Turbidity is measured in Nephelometric Turbidity Units (NTU). Clean water is where pH is 6.5–8.5 and is clarified to at or below 50 NTU.

> Discharge is only permitted for clean water.

> Ensure safe and effective access for vehicles conducting dewatering or sediment removal.

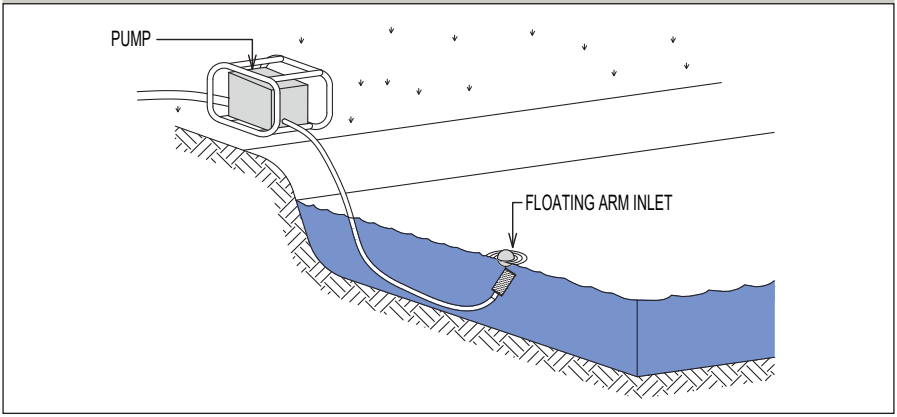
Suspend the submersible pump from the base of the pit to ensure sediment/sludge is not collected during discharge.

Keep records of all measurements prior to, during and after discharge. See Schedule 3.

Requirements

> Flocculation and discharge/dewatering is to occur within five days of a rain event or when water level is above 20% of the basin's full capacity (indicated by the 20% water level indicator which was installed when the basin was constructed).
> Manage water so dosing and discharge can be achieved in a timely manner before the next rain event.
> Conduct dewatering so it removes the relatively clean water without removing any of the sediment that has settled out and without removing any appreciable quantities of floating debris.

Figure 13: Dewatering



Outlet

An outlet is to be designed, constructed and maintained in such a manner that under operating conditions sediment does not leave the trap/basin and erosion does not occur.

> Set the outlet at the top level of the sediment storage zone.
> Use a gravity outlet pipe with a floating arm to select top water and avoid picking up sediment. Pumping out of a sediment basin may be acceptable if a gravity solution is not practicable.

- Monitor the pump at all times during pumping to ensure sediment is not being disturbed, creating turbid water. If water exceeds 50 NTU during dewatering, cease pumping immediately and carry out further treatment before recommencing pumping.
- Design outlets to be stable in the peak flow from at least the 10-year average recurrence interval (ARI) time of concentration event.

Spillway

Design outlets to be stable in the peak flow from at least the 10-year ARI time of concentration event. However, where individual circumstances dictate, adopting higher design standards for basin outlets may be necessary.

Refer the basins to the technical regulator for the Dams Register if the wall is more than 5 metres high or has a storage capacity of more than 250 ML and/or failure could adversely affect the community's interest of the environment downstream. Contact Access Canberra on 13 22 81.

Discharge/dewatering of footings, trenches and excavations

Dewatering activities should be undertaken to ensure the water quality, if discharged from the site to the stormwater system, meets 50 NTU. It is an offence to discharge water from the site that does not meet this standard.

The water is often highly sediment laden and care needs to be taken to ensure sediments are settled out before pumping. It is important when pumping to ensure the pump inlet is elevated to prevent disturbing sediments at the bottom the footing, trench or excavation. In some cases, it is preferable to pump the sediment laden water to a depression on site to allow sediments to settle before pumping off site. This can also allow water to evaporate, reducing the necessity to pump water off-site.

Suspend the submersible pump from the base of the footing, trench or excavation to ensure sediment/sludge is not collected during discharge.

Keep records of all measurements prior to, during and after discharge. See Schedule 3.

5.5 Sediment barrier infrastructure

Sediment barrier infrastructure includes:

- check dams for channelled run-off
- sediment fence
- stormwater inlet protection.

Sediment barriers are relatively effective at retaining suspended soils coarser than 0.02 mm, however finer particles and soluble materials pass through them.

Given the fine particle nature of ACT soils, it is recommended that, where possible, nodal treatment of sediment laden stormwater should occur downstream from sediment barrier infrastructure.

Do not use sediment barriers as a substitute for other erosion and sediment control measures.

These guidelines indicate most commonly used methods, but alternative mechanisms can be used as long as they meet the design criteria.

5.5.1 Check dams for channeled run-off

A check dam is a sediment control device to intercept and retain sediment from channelled sediment laden run-off. It is designed to be placed along the channel containing concentrated flow in order to reduce velocity, however does not address sediment in water.

Requirements

- A check dam is required where channel grades are between 2% and 10%.
- A guide to check dam spacing is that the top of the upstream check dam is equivalent to the elevation of the crest of the downstream check dam.
- Check dams are a temporary control that must be decommissioned and removed at the conclusion of construction.
- Spacing of check dams along the centreline and scour protection below each check dam is to be specified on the Erosion and Sediment Control Plan.

Gabions should never be used as check dams as they will be flanked in dispersive/non-cohesive soil and fail.

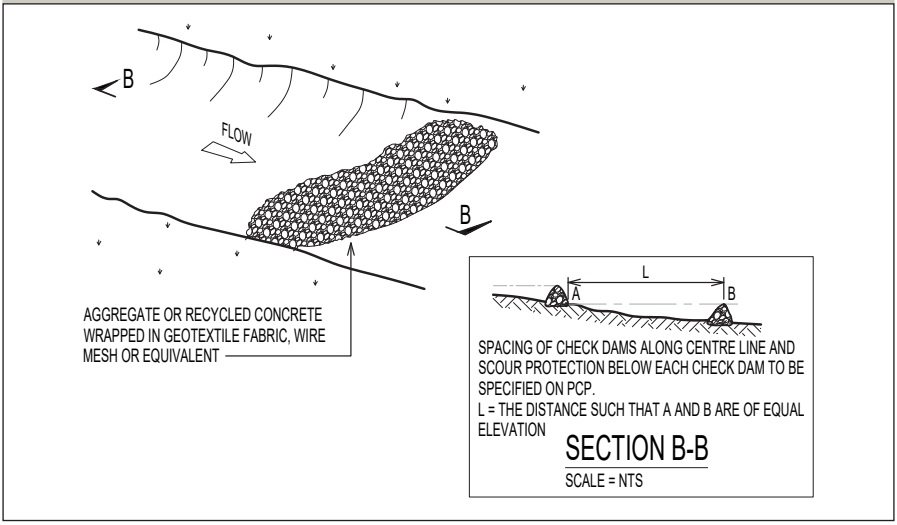
Straw bales should never be used as check dams in concentrated flows.

Check dams reduce the erosive capacity of flow and can be constructed from semipervious or impervious materials, typically rock or sandbags filled with a variety of porous materials. Check dams should not be constructed from straw bales or gabions. Rock check dams may be recessed into a channel bed to allow the use of larger sized rock, and/or to limit the crest height of the dams (IECA Australasia, 2012).

Rock bund/Gabion check dams

Rock bund/Gabion check dams consists of a trap formed by rock, 50 mm aggregate or equivalent, wrapped in geotextile fabric, wire mesh or equivalent.

Figure 14: Rock Bund/Gabion check dam



Rip-rap outlet check dams

Rip-rap outlet check dams consist of a trap formed by the placement of rock. Rip-rap outlet check dams may be used for catchment areas of up to a maximum of 5 hectares.

When to use

A check dam is usually installed in either a floodway, at a storm drain inlet or other points of discharge from a disturbed area.

Cleanout

Remove sediment and restore the dam to the original dimensions when the sediment has accumulated to half of the design depth of the dam.

Outlet

Design, construct and maintain the outlet in such a manner that under operating conditions sediment does not leave the dam and that erosion does not occur.

> Check dams may outlet onto stabilised (preferably undisturbed) ground.

> If there is no area available, it is permissible to discharge to the stormwater system when the water pH is 6.5–8.5 and is clarified to at or below 50 NTU for urban areas and for other areas on the advice of the EPA.

> Gypsum dosing rate should be applied at about 30 kg/100 m3 of stored water. In some instances higher rates may apply, typically less than 50 mg/litre.

If dosing with alum, apply in accordance with the NSW Blue Book.

Drainage area for various types of check dams

The drainage area for check dams shall be in accordance with the specific type of check dam used, as per the following criteria.

Table 6: Check dam drainage areas

Type	Max Catchment (ha)
Rip-rap outlet check dams	5.0
Grass outlet check dams	2.0
Rock bund/gabion	1.0
Geotextile check dams	0.5
Straw bale check dams	0.5

Rip-rap outlet check dam dimensions are provided in Table 7.

Table 7: Rip-rap drainage areas

Drainage Area (ha)	Depth of Channel (m)	Length of Weir (m)
0.5	0.5	1.5
1.0	0.5	1.5
1.5	0.5	3.0
2.0	0.5	3.5
2.5	0.6	3.5
3.0	0.6	3.75
3.5	0.6	4.0
4.0	0.6	4.0
4.5	0.6	4.0
5.0	0.6	5.0

5.5.2 Sediment fence

Sediment fences are designed to run along a contour and are not recommended to capture any concentrated flows.

Note: A sediment fence is a temporary asset and must be decommissioned and removed at the conclusion of construction.

IMAGE 12: SEDIMENT FENCE

Geotextile sediment fence

A temporary barrier of geotextile fabric can be used to intercept sediment laden run-off from small drainage areas of disturbed soil.

Design criteria

- Identify low point of site.
- Construct a sediment fence parallel to the site contours or as close as possible.
- Put 1.5 m star pickets no more than 2.5–3 m apart and 600 mm deep.
- Put a star picket 1.5 m upslope of the others every 20 m (if the fence is longer than 20 m). This spreads the volume of water that flows through each section of fence.
- Dig a trench and bury the base of the sediment control fabric. The trench should be 150 mm deep. Alternatively, use backfill or aggregate to make sure the fabric is tight on the ground.
- Use wire ties to attach the fabric to the upslope side of the fence posts.

If you need to join two pieces of fabric, overlap the fabric at least 150 mm and support with a star picket.

⚠ The geotextile sediment fence is:

- to be in place prior to commencement of construction works
- retained until revegetation is fully established after construction has been completed
- to be checked daily (refer to daily environmental checklist at Schedule 2 for recording).

⚠ Geotextile sediment fences are not appropriate for use across drainage lines.

Figure 15: Geotextile fence

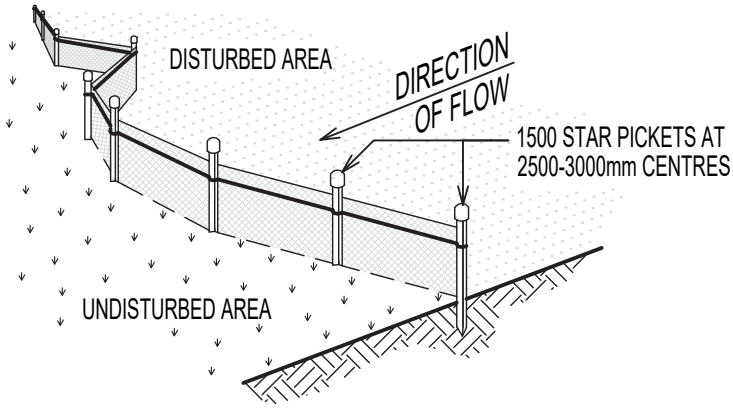
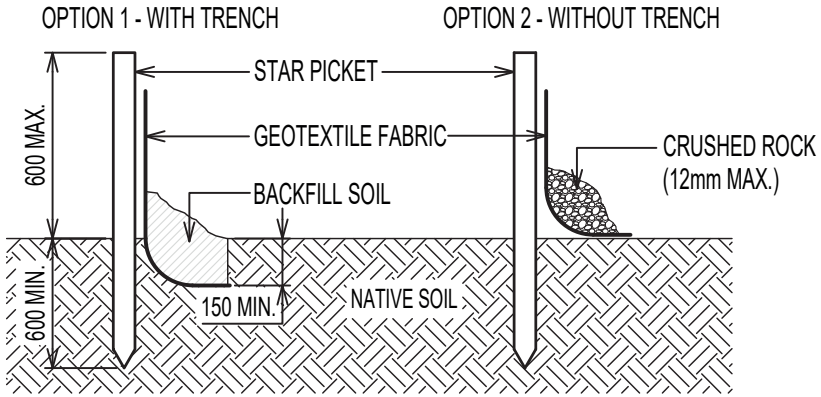


Figure 16: Geotextile fence detail



Straw bales

Straw bale sediment controls (Image 11 and figures 17 and 18) may be used upstream of other controls as a complementary measure or on minor drainage lines of less than 0.5 hectare and located at specified intervals to minimise erosion. It is essential these controls are effectively maintained.

Design criteria for straw bale installation:

- Dig a trench 100 mm deep to stop water running under the straw bale. The trench should be as wide as the straw bale and as long as needed along the contour lines of the block.
- Put the bales lengthways along the trench. Use straw to fill any gaps between bales. Bind bales along the side rather than top and bottom as they will hold together better when wet.
- Fix the bales in place using two 1.2 m star pickets at each end of each bale. Angle one stake towards the previously laid bale before driving it 600 mm into the ground. Put the other stake in vertically.
- Backfill and compact the trench to ground level on the downslope side of the straw bales. On the upslope side, build up the soil to 100 mm. This will slow the speed of the water flows and trap coarse sediments.
- Maintain and replace straw bales regularly.

IMAGE 13: STRAW BALE SEDIMENT CONTROLS

Figure 17: Straw bale sediment controls

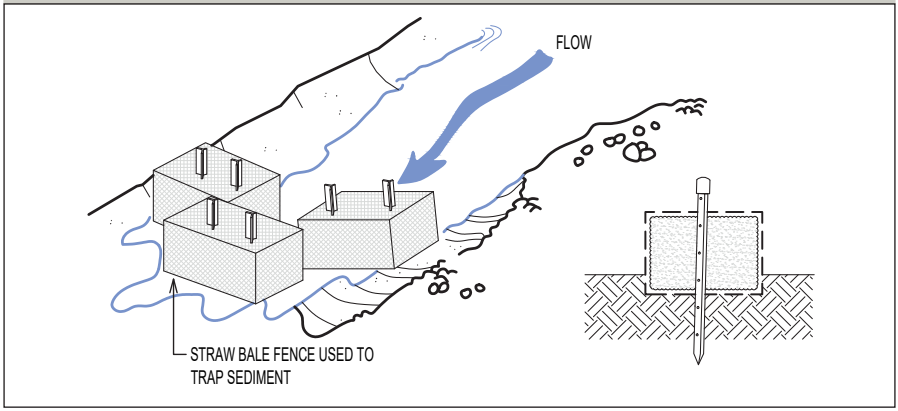
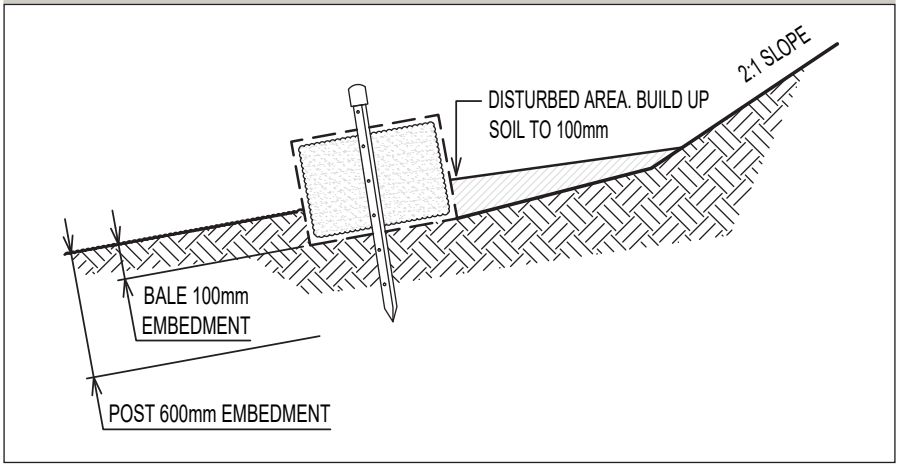


Figure 18: Straw bale sediment fence detail



Vegetated filter strip

A vegetated filter strip may be used alongside sediment fences to help filter stormwater run-off.

Do not use native vegetation as a filter strip.

Refer to Section 5.1.2 on vegetation for more information.

5.6 Stormwater inlet protection

An inlet protection device prevents sediment-laden water from entering a stormwater drainage system.

Requirements

Use stormwater inlet protection where the drainage area to an inlet is disturbed and it is not possible to temporarily divert the stormwater drain outfall into water retaining infrastructure and watertight blocking of inlets is not advisable.

- A stormwater inlet protection device is a temporary asset and must be decommissioned and removed at the conclusion of construction.
- Do not use this control without other upstream measures in place. It is to be used as a backup if the upstream measures fail (to decrease risk of committing an offence).
- Do not use this in place of other erosion and sediment control measures.
- Maintain and check stormwater inlets regularly and clean the road at the end of every day and, particularly, before and after rain events.
- It is an offence to allow any substance other than rainwater to enter the stormwater system.

IMAGE 2: KERB INLET CONTROL WITH GRAVEL WRAPPED IN NETTING AND GEOTEXTILE FABRIC

Figure 19: Kerb inlet control

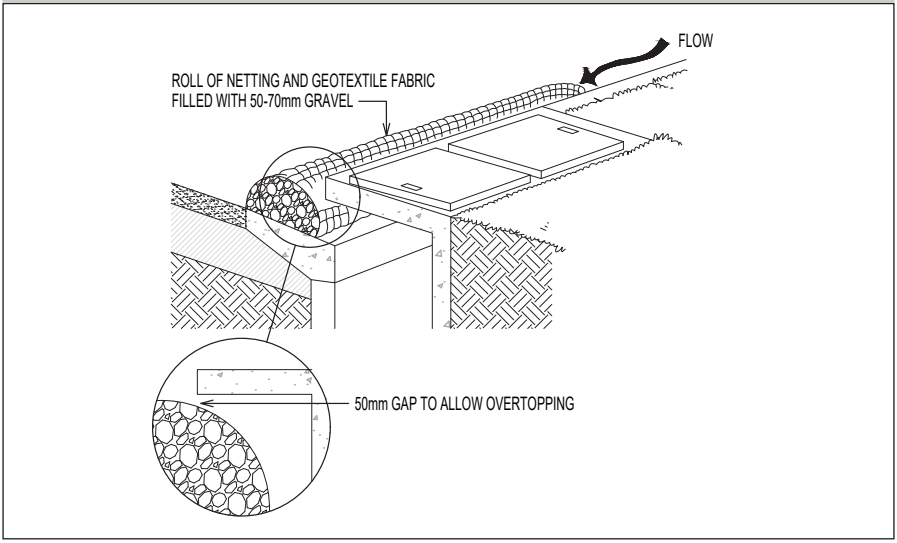
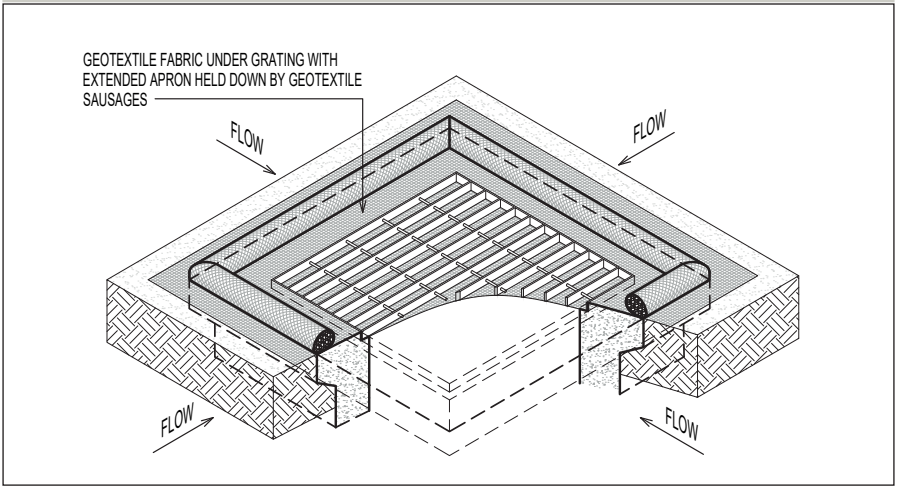


Figure 20: Stormwater inlet sediment control



5.7 Dust control measures

Where construction work generates dust, all reasonable and practicable measures should be taken to minimise that dust.

Requirements

- Retaining existing vegetation where possible.
- Stripping areas progressively and only where it is necessary for works to occur.
- Employing stabilisation methods such as matting, grassing or mulch.
- Dampening the ground with a light water spray (contact the EPA for requirements during extreme drought conditions). If additives in the water are used to increase its dust suppression properties, the chemical should have no adverse impact on adjacent water bodies.
- Roughening the surface of exposed soil.
- Covering stockpiles and locating them where they are protected from the wind.
- Restricting vehicle movements.
- Covering the load when transporting material.
- Constructing wind breaks such as wind fences in accordance with the NSW Blue Book.
- Immediately revegetating the area when an area of works is completed to inhibit the generation of dust.

Trafficable and non-trafficable areas should be considered when determining appropriate dust control measures.

IMAGE 3: DUST CONTROL MEASURES

5.8 Specialised erosion and sediment control

Specialised erosion and sediment controls include:

- works within a waterway
- temporary waterway crossing.

5.8.1 Works within a waterway

Methods for crossing or working in a waterway are numerous and complex. They include site specific factors including groundwater level, flow rates, geology and the sensitivity of the surrounding environment (see WR Act).

It is recommended that due to the elevated risk and cost of works associated with works within a waterway that specialist site specific advice is sought.

You may require a permit from the EPA under Section 44 of the WR Act or an Environmental Authorisation under Section 42 of the EP Act to construct a basin.

It is an offence to undertake waterway work without a licence.

For more information refer to IECA 2008, Book 3 Appendix I.

For more information, contact the EPA by calling Access Canberra on 13 22 81.

5.8.2 Temporary waterway crossing

A temporary waterway crossing is a temporary structure placed across a waterway to provide access for construction purposes. Temporary waterway crossings are usually formed using culverts or pipes to carry flow under a raised gravel carriageway that allows vehicles to cross the stabilised waterway safely without causing damage and erosion.

Pipe jacking is the preferred method for temporary waterway crossing.

It is recommended that engineering advice be sought in the design of a temporary or permanent waterway crossing, particularly if the waterway has a continuous surface water or groundwater flow.

Do not use temporary access crossings to maintain traffic for the public.

Requirements

- Types of standard temporary waterway crossings are bridges, culverts, and fords. A culvert is normally preferred over a ford type of crossing since disturbance to the waterway is only during construction and removal of the culvert.
- Temporary fords may be used where the stream banks are less than 2 metres above the invert of the stream, and the streambed is armoured with naturally occurring bedrock, or can be protected with an aggregate layer in conformance with this specification.
- Stream diversion may be in the stream bed, via a piped culvert or via an excavated channel which is stabilised with lining orsimilar.
- If in-stream activities require construction of a stream crossing, it is to be installed during low-water flows with downstream weirs in place to trap any released sediment.

Stream crossing design documentation requirements:

- Crossing method
- Ephemeral nature
- Frequent design storm event flow depths
- Infrequent design storm event flow depth
- Diversion method (if required)
- Sediment capture method (if required)
- Safeguard from leaks

Design criteria

- Limit in-stream excavation to the minimal necessary level to allow installation of the standard methods for temporary waterway crossing as presented in the NSW Blue Book.
- Limit all fill materials associated with the roadway approach to a maximum height of 600 mm above the existing floodplain elevation.
- Construct a water diverting structure, such as a swale, across the roadway on both roadway approaches to 15 m (maximum) on either side of the waterway crossing.
- Ensure all crossings have one traffic lane. The minimum width shall be 4 metres with a maximum width of 6 metres.
- Design and check all crossings so they do not to cause upstream flooding of any

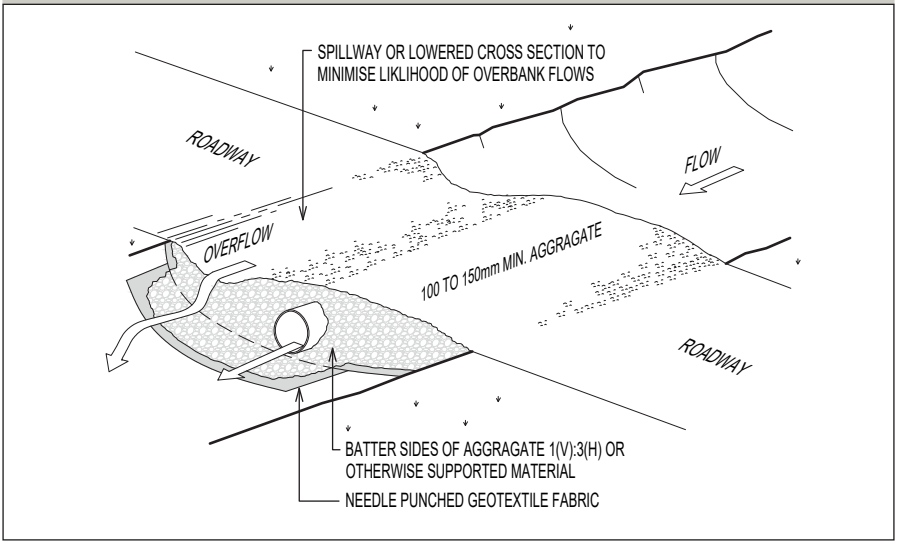
works or facilities.

- Do not use earth or soil for construction within the waterway channel. Coarse aggregate (of 100–150 mm size) is the minimum acceptable aggregate size for temporary crossings. Larger aggregates will be allowed.
- Remove all temporary crossings within a month after the structure is no longer needed.
- Clean up without construction equipment working in the stream channel.
- Stabilise all areas within 21 calendar days of the disturbance.

Monitoring

Measure turbidity continuously immediately downstream from the areas in which work is occurring and modify work practices where monitoring shows degraded water quality (> 50 NTU).

Figure 21: Temporary waterway crossing



6. Other environmental issues

6.1 Noise

Construction and land development activities can generate levels of noise ranging from being a nuisance to actually damaging people's health.

Requirements

Ensure all construction work that generates noise in excess of the noise zone standards and associated activities, especially those that may cause vibration, are conducted within the time periods detailed in Schedule 2 of the Environment Protection Regulation 2005 (Table 8).

In addition:

- schedule noisy activities for the least sensitive times of the day, such as mid-morning and mid-afternoon
- select machinery that produces less noise
- ensure machinery is well maintained.

For additional information please see Guidelines for the Preparation of Noise Management Plans for Development Applications available at Access Canberra website.

Table 8: Noise guidelines

Building Work Details	Monday to Saturday	Sunday and public holidays
Industrial, city and town centre areas	6am to 8pm	6am to 8pm
Any other area when work is completed within two weeks	7am to 8pm	8am to 8pm
Any other area when work is not completed within two weeks	7am to 6pm	Construction work must not exceed Noise Standard

Noise during these periods is exempt from the noise zone standards, as detailed in the Regulations, provided the equipment is operated and maintained in accordance with manufactures specifications

Works can occur outside these times provided they comply with the noise zone standards as detailed in the Regulations for the land use.

6.2 Air quality

Mismanagement of air quality on site has the potential to result in detrimental effects on the health and amenity of neighbours and employees, reduced visibility on site, increased wear on machinery and equipment and complaints from neighbours.

Incorporate measures to limit the effect on air quality by minimising dust from construction activities and smoke from fires.

6.2.1 Dust

Refer to Section 5.7. Dust for more information.

Refer to Information Sheet: Dust suppression during construction.

6.2.2 Fire

It is an offence under the Environment Protection Regulation 2005 to burn waste materials such as plastics, chemicals or wood that is painted, chemically treated or contaminated with chemicals.

A fire may be permitted for heating purposes provided it is in a brazier or constructed fireplace. Only seasoned, untreated timber can be burnt for heating purposes.

6.2.3 Vehicle and equipment exhaust

Ensure all vehicles and machinery are fitted with appropriate emission control equipment, are maintained frequently and are serviced to the manufacturers' specifications.

Smoke from internal combustion engines should not be visible for more than ten seconds.

In relation to air pollution, it is an offence for a person to cause an environmental nuisance.

6.3 Waste management

Principles of waste management:

- Operate a material collection and disposal system.
- Follow the waste minimisation hierarchy of reduce, reuse, recycle and dispose appropriately.

Refer to Section 5.2.2 for disposal and acceptance of soil.

ACT Waste Management Strategy:

- Reduce—use reusable or recycled products where practicable.
- Reuse—reuse construction, demolition or green waste materials on site where practicable.
- Recycle—where disposal of materials is required, provide waste to construction material recovery facilities where possible.
- Dispose appropriately—materials that cannot be recycled should be disposed to a licensed facility.

Illegal dumping of material can result in a fine or prosecution.

It is an offence under the Environment Protection Regulation 2005 if the footpath, gutter, and road adjacent to the development is not clear of soil, sand, building materials and waste.

6.4 Hazardous substances

- Store all possible pollutant materials (e.g. chemicals and fuel) well clear of any poorly drained areas, flood prone areas, streambanks, channels and stormwater drainage areas.
- Store pollutant materials in a designated area, under cover where possible.
- Construct containment bunds with provision for collection and storage of any spilt material.
- Implement a contingency plan to handle spills so environmental harm is avoided.
- Dispose of any liquid waste (fuel, wet paint, solvents etc.) through a hazardous waste contractor.

> Paints:

  - Wash water-based paints in small amounts of water over newspaper to collect residue. Place paper in a solid waste bin.
  - Wash oil-based paints in a series of solvent baths. Solvent can be reused several times and must be stored in labelled, sealed containers. You must dispose of waste solvent through a hazardous waste contractor. Do not place in a normal bin or on the ground.

> Do not burn waste materials on the site, such as plastics, chemicals or wood that is painted, chemically treated or contaminated with chemicals; it is illegal.

It is an offence to allow any substance other than rainwater to enter the stormwater system.

It is an offence to allow run-off from the washing of equipment or vehicles to enter a waterway.

Refer to Preventing Pollution from Concreting Operations Information Sheet and to the Hazardous Materials Environment Protection Policy.

6.5 Contamination

Placing contaminated material on land can harm the environment by polluting waterways, destroying vegetation and contaminating land, and may leave you with an expensive clean-up bill.

An unexpected finds protocol should be incorporated into contract documentation to detail what actions will be undertaken if any contamination is uncovered while undertaking earthworks.

Do not remove material from a potentially contaminated site for re-use or disposal without EPA approval.

Do not accept material from a known or potentially contaminated site without EPA approval.

Notify the EPA before disposing spoil off site or accepting soil on site. In some cases, an Environmental Authorisation may be required. See Section 4.2 for more information.

For more information regarding contamination refer to the EPA Contaminated Sites EPP or contact the EPA by calling Access Canberra on 13 22 81.

6.6 Biodiversity

An initial assessment of the site is to be conducted to identify sensitive environmental areas or uses that require protection.

These may include:

> sensitive or threatened flora and fauna
> aquatic plants and animals if a natural waterway is affected.

Ensure you maintain the original soil profile of the site.

Refer to the ACT Nature Conservation Strategy.

6.7 Climate change

When planning your development, consider the impacts on greenhouse gas emission from construction, including vehicles, waste and material selection. The ACT is a global leader on climate change action and the ACT Climate Change Strategy outlines the steps the community, business and Government will take to meet the Territory's ambitious emissions reduction targets. The Strategy is complemented by Canberra's Living Infrastructure Plan: Cooling the City, which sets the direction for maintaining and enhancing trees, soils and waterways to keep our city cool, healthy and liveable in a changing climate.


SOLD

7. Schedules

> Schedule 1—Checklists for the management of particular activities
> Schedule 2—Daily environmental checklist
> Schedule 3—Water discharge table
> Schedule 4—Index of figures and tables
> Schedule 5—Glossary of terms
> Schedule 6—Key reference documents
> Schedule 7— Factors affecting susceptibility of soil to erosion
> Schedule 8 — Offences

Schedule 1 — Checklists

Medium-density housing projects/commercial buildings

These are more limited development projects than subdivisions and are more akin to large construction sites. Environment protection measures to ensure that no sediment leaves the site or pollutes the stormwater system should be determined at the design stage.

The following controls apply:

- The area of disturbance is limited and temporary or permanent stabilisation undertaken immediately upon completion of the works.
- Stabilised access point is established.
- Vehicle entry is restricted to a stabilised access point.
- A designated parking area is assigned.
- Clean water is diverted away from disturbed area to a stabilised area on site.
- A sediment control barrier is installed around the lower end of the site.
- The stormwater system is protected with sediment control measures.
- Sediment basins are required for blocks >1 hectare.
- The use of a sediment basin, sediment tank or sump pit is considered for turbidity control.
- Topsoil is stockpiled at the start of project (not higher than 2 metres) and re-spread over disturbed areas when works are complete.
- Environment protection measures are maintained during construction and until full stabilisation.
- Roads adjacent to the work area are cleared of sediment regularly. Do not wash into the stormwater system.
- An area for the washout of concrete trucks is designed and no substance allowed to enter a stormwater system or waterway.

Land development—subdivisions

The following controls or specific principles apply:

- Works are staged to minimise disturbed areas.
- Stabilised access point is established.
- Designated parking area is assigned.
- Undisturbed areas are fenced off.
- Vegetative cover is maintained as much as practical, particularly beside main drainage lines.
- Permanent drainage facilities are installed at an early stage.
- Water conveyance infrastructure is installed, diversion structures used to convey upstream run-off to a stable disposal area and diversion works stabilised.
- Off-stream sediment basins are installed.
- Sediment basins are discharged only at water pH of 6.5–8.5 and is clarified to below 60 mg/litre suspended solids (turbidity < 50 NTU).
- Water level in a sediment basin is maintained at 20% capacity.
- Sediment basins are maintained until the site is fully stabilised.
- Topsoil is stockpiled separately (not greater than 2 metres high) from general excavated material and stabilised.
- Roads adjacent to the work area are cleared of sediment regularly. Do not wash into the stormwater system.
- Sediment fences are constructed at drainage inlets and other points of discharge from areas of disturbance.
- Temporary or permanent vegetative stabilisation measures are undertaken immediately after completion of final land forming.
- Alternative stable drainage systems are installed through the site while permanent facilities are being installed.
- Cut and fill batters are protected from run-off.
- Contour ploughing and/or surface roughening is used on finished landform over all disturbed blocks as an aid to stabilisation and to slow water flow during rain events.
- Controls are checked daily and Daily Environmental Checklist completed (Schedule 2).
- Controls are maintained during construction and until full stabilisation.
- Handover is managed to ensure controls are maintained and all new parties are aware of their responsibility to maintain controls until full stabilisation.

Road projects

Road projects are linear developments that could cross drains and water courses. Therefore, appropriate measures to this characteristic need to be adopted. Suitable control measures should be determined at the design stage.

The following controls or specific principles apply:

- Water conveyance infrastructure is installed.
- Clean water is diverted from disturbed area to a stabilised area.
- Permanent drainage facilities are installed at an early stage.
- Culverts are installed prior to constructing embankments.
- Existing groundcover is preserved where possible.
- Work is progressively constructed and stabilised to minimise area of exposure.
- Critical areas are fenced off.
- Diversion drains and earth banks are used to carry run-off away from disturbed areas.
- Topsoil is stockpiled separately (not greater than 2 metre high) from general excavated material and stabilised.
- Downstream sediment barrier infrastructure is installed.
- Upstream check dams are installed.
- Controlled run-off conveyance is installed.
- Stormwater inlet protection measures are installed.
- Permanent drainage structures and road table drains with sediment barrier infrastructure are installed at the completion of initial earthworks.
- Cut and fill batters ar e protected from run-off and stabilised immediately following construction.
- All disturbed areas are stabilised following construction.
- Environment protection measures are maintained during construction and until full stabilisation.

Underground utilities

Underground utilities are also a linear development that may cross drains and watercourses, so appropriate environment protection measures need to be implemented.

The following controls or specific principles apply:

- Excessive trench widths or depths are avoided.
- Construction equipment activity is limited to disturbed areas.
- Where possible, spoil is placed on the far side and uphill of the trench away from the stormwater system.
- Topsoil is stockpiled separately (not greater than 2 metres high) from general excavated material and stabilised.
- Excess or unsuitable spoil is removed from the site and the disposal location is detailed on the ESC Plan.
- Excavations are left open for the minimum practical time and not opened for a greater length than pipes can be laid.
- Work is progressively constructed and stabilised.
- If the trench needs to be pumped dry, water is discharged only at a pH of 6.5–8.5 and clarified to below 60 mg/litre suspended solids (turbidity < 50 NTU).
- Run-off from works passes through sediment controls.
- Where on site controls are not practical, the stormwater system, water channels or bodies of water are protected from sediment laden run-off.
- Stream diversions are installed where pipes are to be laid across a stream bed.
- Temporary waterway crossing is used for vehicle access across a watercourse or works crossing a watercourse.
- Roads adjacent to the work area are cleared of sediment regularly. Do not wash into the stormwater system.
- Environment protection measures are maintained during construction and until full stabilisation.
- Supervisory staff ensure employees or contractors understand and follow the above requirements.

Channels and floodways

Channels and floodways can be the most difficult works to control and stabilise. Suitable control measures should be determined at the design stage.

The following general controls and principles apply:

> Environment protection measures are maintained during construction and until full stabilisation.
> Environment protection works are undertaken as a first priority in order to stabilise against and ahead of upper catchment development.
> Diversion structures are used to convey upstream run-off away from the site to a stable disposal area. Diversion works are stabilised.
> Topsoil is stockpiled separately (not greater than 2 metres high) from general excavated material and stabilised (section 5.2)
> Construction equipment activity is limited and limited access provided.
> Works are progressively constructed and stabilised after construction.
> Sediment barrier infrastructure and diversions to limit erosion potential are used.
> Control measures are maintained during construction.

Ponds and Dams

Ponds and dams are generally constructed as initial infrastructure works, are generally located downstream of major urban development, and are designed to protect downstream water quality.

A pond or dam may require a permit under Section 44 of the Water Resources Act 2007 to construct if:

- 2 megalitres or larger
- will be located on a waterway or
- any structure may affect flow in a waterway

Contact Access Canberra on 13 22 81 for more information.

Suitable control measures should be determined at the design stage. The following general controls apply:

- Clean water is diverted away from disturbed area to a stabilised area.
- Discharge from basin excavation works is discharged into a pond such as a cofferdam and at water pH of 6.5–8.5 and is clarified to below 60 mg/litre suspended solids (turbidity < 50 NTU). See Section 4.5.6.
- Discharge flow is dispersed and slowed by using level spreaders and/or other erosion and sediment controls.
- Run-off is diverted from embankment and spillway areas into a sediment basin. Sediment basins are discharged only at water pH of 6.5–8.5 and is clarified to below 60 mg/litre suspended solids (turbidity < 50 NTU).
- Topsoil is stockpiled at the start of project (not higher than 2 metres) and re-spread over disturbed areas when works are complete.
- Downstream batter of embankment and spillway area stabilised immediately on completion.
- Environment protection measures are maintained during construction and until full stabilisation.

Schedule 2 — Daily environmental check list

Site Address: Company Name: Suburb:

Environmental control		Condition			Action taken		Date	Time	Checked by	Signature
		Good	Fair	Poor	Repair	Replace				
1	Stabilised access point									
2	Clean road									
3	Sediment barrier									
4	Waste area									
5	Grass buffer									
6	Material storage									
7	Sediment basin									
8	Stockpile area									
9	Working hours									
10	Wash area									
11	Brick cutting area									
12	Dust suppression									
13	Undisturbed areas									
14	Noise plan									
15	Spoil disposal (off site)									
16	Acceptance of soil (on site)									
17	Stormwater sump protection/ filter socks/sandbags									
18	Other									

Schedule 3 — Water discharge table

Sediment Basin name: Location:

Date	Time	Name of person checking pond	NTU	pH	EPA officer contacted	EPA response	Pond level	Pump out start time	Time NTU checked	Pump out stop time

These records are to be maintained and stored until the conclusion of the project and provided at the request of EPA officers.

Schedule 4 — Index of figures, tables, and images

Figures

Tables

Images

Schedule 5 — Glossary of terms

Acceptable standard for discharge

Discharge is allowed when the water is clarified to below 60 mg/L (suspended solids). Based on most soil types in the ACT, a measurement of 50 NTU is comparable to 60 mg/L.

Back-push banks

Back-push banks is an embankment formed by pushing in-situ soils up a slope to form an earth embankment, used as an alternative to catch-drains in areas with highly erosive or dispersive subsoils.

Batter

The sideslope of an embankment or cutting.

Chemically dosed water

Water which has been treated with gypsum or alum or similar to reduce turbidity.

Clean water

Water which runs across land which is undisturbed by building/construction works.

Cofferdam

A temporary enclosure formed to exclude water from an area in which construction is to take place. Cofferdams can take a variety of forms and are constructed from materials such as driven sheet piling, rock, earth or concrete.

Cumec

A measurement of flow rate. One cumec is one cubic metre per second (m^3/s).

Design storm event

The design storm event is a theoretical storm event with typical characteristics for storms in a given region. Unless otherwise specified, controls within this guideline are to be developed to meet the 2-year average recurrence interval (ARI) design storm event. For sites larger than 1 hectare, controls are to be developed to meet the 5-year ARI design storm event.

Diversion drain

An earth bank constructed across a slope for intercepting and diverting water. Typically constructed at the upper edges of cut slopes to collect water from nearby properties and divert it around the cut.

Dispersive soil

Dispersion means the separation of soil into single particles and is governed by soil texture. Dispersive or dispersible soils are structurally unstable in water and readily split into their constituent particles resulting in turbid water that never seems to clear. The particles can stay in suspension for very long periods, mainly because of negative electrical charges on the surfaces of particles finer than 0.005 mm diameter that cause them to repel each other (Refer to the NSW Blue Book – Chapter 3 for more information)

Downdrain structure

A pipe or chute structure installed down steep slopes for the conveyance of run-off.

Earth bank

A berm or ridge of compacted earth located in such a manner as to channel water to a desired location.

Environment Protection Authority (EPA)

The statutory decision maker for environmental regulation and policy in the ACT. The EPA administers legislation covering air and water quality, waste, contaminated land, noise control, pesticides and hazardous chemicals.

Environmental authorisation

A licence to conduct an activity which has a significant potential to cause environmental harm. An authorisation sets out the conditions under which the activity may be conducted.

Environmental Protection Agreement

A formal, non-contractual agreement between the EPA and a business. Agreements are intended to allow businesses to manage their environmental performance in partnership with the EPA.

Erosion and sediment control measures

Includes the protection of soil from dislocation by water, wind or other agents. Also includes all measures used to slow down loss of sediment from construction activities.

Erosion and Sediment Control Plan (ESC Plan)

A plan which addresses the management of environmental impacts of activities in a given project during construction and land development.

Full stabilisation

Full stabilisation means that at least 85% of the disturbed ground within the site is stabilised.

Geotextile fabric

A synthetic fabric, woven or non-woven, used for various purposes including:

> embankment reinforcing and stabilisation (including channels)
> seepage control
> pollution containment
> providing a filter layer between dissimilar materials
> as a strain alleviating membrane.

Grid

A device placed on the stabilised access used to open the tread on tyres and vibrate mud and dirt off the vehicle.

Level spreader

A device to convert channel or pipe flow to sheet flow to prevent concentrated, erosive flows from occurring and to enhance filtration.

Nephelometric Turbidity Units (NTU)

A measurement of water turbidity.

Portable sediment tank

A portable tank used to trap and retain sediment and treat turbid water prior to pumping the water to the stormwater system.

Rip-rap apron

Rip-rap aprons are flat beds of crushed rock over geotextile fabric installed at storm drain outlets. Rip-rap aprons are energy dissipation measures that decrease flow velocity to a non-erosive level prior to entering an earthen channel.

Road table drain

The side drain of a road next to the shoulder, having its invert lower than the subgrade level and being part of the formation.

Rock bund/Gabion

A rectangular wire mesh or geotextile fabric cage filled with rock, recycled concrete, aggregate or similar hard material.

Sediment control barrier

A barrier typically consisting of permeable material stretched between and attached to supporting posts and entrenched in the earth.

Sediment basin

A temporary or permanent storm capture device consisting of a barrier or dam or an in-ground basin constructed across the drainage outlet to intercept sediment-laden run-off and to trap and retain sediment.

Sediment pit

A pit that contains polluted run-off for treatment prior to discharge which is applicable to small sites (<0.5 hectare) with limited open space.

Sediment trap

A temporary sediment control device to intercept and retain sediment from channelled sediment laden run-off. Can be constructed with geotextile fabric, straw bales, rock, etc.

Sediment trench

A temporary structure to contain polluted run-off for treatment prior to discharge. Applicable to smaller sites particularly where the surface is relatively flat.

Sedimentation tank

A tank which traps and retains turbid water for treatment prior to discharge.

Sill

The lower horizontal face of an opening as in a level spreader.

Soil

Virgin excavated natural material (e.g. clay, gravel, sand, dirt and rock) that is not mixed with any other waste and that:

> has been excavated from areas that are not contaminated as a result of industrial, commercial, mining or agricultural activities, with manufactured chemicals and that does not contain sulphidic ores or soils, or

> consists of excavated materials that may be approved by the EPA.

Spoil

Excess material which can include soil and other waste.

Stabilised access point

A stabilised pad of aggregate underlain with geotextile fabric located at any point where traffic enters/leaves a construction site.

Stockpile

Soil, waste and building materials stored on a construction site.

Stormwater

Water run-off from an urban area that is normally collected by the stormwater system.

Stormwater inlet protection

A barrier used to block pollution from entering the stormwater system inlet.

Stormwater system

A system of pipes, gutters, drains, floodways and channels that comprise public works constructed to collect or transport stormwater in or through an urban area.

Stabilisation

Stabilisation means that adequate measures have been employed to prevent erosion of soil.

Temporary waterway crossing

A temporary structure placed across a waterway to provide access for construction purposes.

Turbidity tube

Transparent tube used to measure turbidity of a water sample.

Water level indicator

A marker that is installed in a sediment basin or similar in the initial stages of construction. It is used to identify the amount of sediment and water contained in the pond.

Water Sensitive Urban Design

Water sensitive urban design (WSUD) is an approach to urban planning and design that aims to integrate the management of the urban water cycle into the urban development process, providing benefits to both the community and the environment.

Schedule 6 — Key reference documents

Additional information on issues addressed in these guidelines can be found in the following key documents that are referenced throughout this guide:*

> ACT Municipal Infrastructure Design Standard (MIS)
  - MIS 02 – Earthworks and site grading
  - MIS 04 – Subsurface drainage
  - MIS 06 – Verges
  - MIS 08 – Stormwater
  - MIS 25 – Plant species for urban landscape projects

> ACT Nature Conservation Strategy

> ACT Waste Management Strategy

> Best Practice Erosion & Sediment Control – International Erosion Control Association (IECA)

> Environmental guidelines for preparation of an Environment Management Plan, ACT Environment Protection Authority

> EPA Environment Protection Policies
  - General Environment Protection Policy
  - Water Quality Environment Protection Policy
  - Air Environment Protection Policy
  - Contaminated Sites Environment Protection Policy
  - Hazardous Materials Environment Protection Policy
  - Noise Environment Protection Policy

> Legislation:
  - Environment Protection Act 1997
  - Environment Protection Regulation 2005
  - Water Resources Act 2007
  - Magistrates Court (Environment Protection Infringement Notices) Regulation 2005

> Standards Specification for Urban Infrastructure Works
  - MITS 02 – Earthworks
  - MITS 09 – Landscape

> The NSW Guide – Managing urban stormwater: soils and construction Volume 1: The Blue Book

> Water Sensitive Urban Design General Code

* From time to time these documents are updated. The most recent versions should be used.

Schedule 7 — Factors affecting susceptibility of soil to erosion

Erosion Susceptibility Factor	Constraint
Area of disturbance	The extent of the disturbance (or soil exposure) will influence the risk and consequences of erosion/sediment at a site.
Duration of works	Soil loss from a site is related to the time that the soils are exposed (i.e. bare earth), before rehabilitation/stabilisation. The time from commencement of construction to rehabilitation should always be minimised.
Rainfall erosivity factor (R)	The rainfall erosivity factor, R, is a measure of the ability of rainfall to cause erosion. It is the product of two components: total energy(E) and maximum 30-minute intensity for each storm (I30). So, the total of EI for a year is equal to the R-factor (Landcom, 2004).
Rainfall intensity	High rainfall intensities increase erosion hazard.
Run-off coefficients	The run-off coefficient (C) relates the amount of run-off to the amount of precipitation received. The lower the coefficient, the more permeable and well-vegetated areas (e.g. forest, flat land). The higher the run-off coefficient, the lower the infiltration, higher run-off and erosion risk (e.g. compacted surface, steep gradient).
Seasonality	Soil loss usually is more significant during the wetter months however intense rainfall events during drier months can cause significant soil loss. Providing erosion control measures for developments where construction occurs through the drier months of the year is equally important as those planned for development during wetter months.

Erosion Susceptibility Factor	Constraint
Slope gradient	Steeper slopes increase erosion hazard due to flow velocity.
Slope length	The greater the distance or length of slope, the greater the erosion hazard.
Slope Length (SL) factor	A factor that considers both the slope gradient and its length.
Soil dispersibility	The more dispersible the soil the less stable and greater the erosion hazard. Dispersion (the separation of soil into single particles) is governed by soil texture, clay type, soil organic matter, soil salinity and exchangeable cations (DPI, undated).
Soil erodibility factor (K)	The soil erodibility factor, K, is a measure of the susceptibility of soil particles to detachment and transport by rainfall and run-off. Soil texture is the principle component affecting K, but soil structure, organic matter and profile permeability also contribute (Landcom, 2004).
Soil organic matter	Organic matter content in soils increases soil stability.
Soil permeability	Reduced permeability increases erosion.
Soil salinity	Restricts plant growth and increases erosion hazard.
Soil sodicity (subsoil)	Excess subsoil sodicity gives rise to soil dispersibility, low permeability and gully/ tunnel erosion hazard.

Erosion Susceptibility Factor	Constraint
Soil sodicity (surface)	Sodic surface soils rely on surface cover to maintain and develop soil structure. Significant areas of sodic surface soils occur on alluvial plains of the Riverina. Excess subsoil sodicity gives rise to soil dispersibility, low permeability and gully/ tunnel erosion hazard.
Soil texture	The greater the silt and fine sand proportion of soils, the greater the potential for erosion.
Surface soil erodibility	High silt content, poor aggregation, low organic matter give rise to increased erosion hazard.
Vegetation cover	Vegetated ground cover filters sediment and reduces erosion potential.

Schedule 8 — Offences

The following offences under the Environment Protection Act 1997 (the Act) and the Environment Protection Regulation 2005 (the Regulation) can lead to fines of up to $1,600 for an individual and $8,100 for a corporation, and court-imposed penalties of up to $81,000 and six-month imprisonment for more serious offences.

It is an offence under the Environment Protection Act 1997 if you:

- do not advise the EPA when an activity has caused, is causing or is likely to cause environmental harm from pollution (**section 23**).
- undertake works without an Environmental Protection Agreement (**section 42**).
- undertake works without an Environmental Authorisation or to not comply with a condition of an Environmental Authorisation (**sections 42 and 45**).
- pollute the environment causing environmental harm or likely environmental harm (**section 139**).
- pollute the environment causing an environmental nuisance (**section 141**).
- allow a pollutant or the source of a pollutant to be placed in a position where it could reasonably be expected to cause environmental harm (**section 142**).

It is an offence under the Environment Protection Regulation 2005 if you:

- burn waste materials such as plastics, chemicals or wood that is painted, chemically treated or contaminated with chemicals (**section 10**).
- place soil, sand, building material or waste from development in the stormwater system, a waterway, or where it may enter the stormwater system or a waterway (**section 45**).
- allow any substance other than rainwater to enter the stormwater system (**section 44**).
- do not keep the footpath, gutter, and road adjacent to the development clear of soil, sand, building materials and waste (**section 46**).
- do not ensure the surface of each vehicle entrance to, or exit from, the land where the development is being carried out is appropriately stabilised and/or the stabilised access point is adequately maintained throughout the project (**section 47**).
- allow run-off from the washing of equipment or vehicles to enter a waterway (**section 48**).
- discharge stormwater from retention areas without meeting standards detailed in this guideline (**section 50**).

- to commence works on a site greater than 0.3 hectares without installing sediment and erosion controls measures in accordance with an EPA approved Erosion and Sediment Control (ESC) Plan (**section 66B**).
- to commence works on a site less than 0.3 hectares without installing sediment and erosion controls measures in accordance with a building certifier or planning authority approved Erosion and Sediment Control (ESC) Plan (**section 66C**).

The following offences under the Water Resources Act 2007 can lead to penalties of up to $81,000 and 1-year imprisonment.

- undertake waterway work without a licence.
- take water without a licence.
- do bore work without a licence.
- not comply with a condition of a licence

Note: Penalties are based on a penalty unit value prescribed by the Legislation Act 2001. The penalty value is indexed for inflation and therefore subject to change.