WALGA

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Erosion and Sediment Control Guidelines for Local Government

Image Source: Bronwyn Scallan, Perth NRM

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Acknowledgement

WALGA acknowledges the continuing connection of Aboriginal people to Country, culture and community. We embrace the vast Aboriginal cultural diversity throughout Western Australia, including Boorloo (Perth) on the land of the Whadjuk Noongar People where WALGA is located, and we acknowledge and pay respect to Elders past and present.

WALGA is committed to supporting the efforts of WA Local Governments to foster respectful partnerships and strengthen relationships with local Aboriginal communities.

WALGA would like to acknowledge the Sediment Task Force for their contribution to the development of this resource.

Contents

Abbreviations

DEP	Derwent Estuary Program
DBCA	Department of Biodiversity, Conservation and Attractions
DWER	Department of Water and Environmental Regulation
EMRC	Eastern Metropolitan Regional Council
ESC	Erosion and Sediment Control
GPT	Gross Pollutant Trap
IECA	International Erosion Control Australia
Perth NRM	Perth Natural Resource Management
STF	Sediment Task Force
TEER	Tamar Estuary and Esk Rivers Program
WALGA	Western Australian Local Government Association
WAPC	Western Australian Planning Commission
WSUD	Water Sensitive Urban Design

1. Erosion and Sediment

Erosion is a process through which soil material is detached and transported from a given location by the processes of wind and water and deposited elsewhere. Whilst erosion is a natural process, anthropogenic activities can accelerate erosion and remove more soil from the land over a shorter period than would naturally occur.

The risk of erosion is directly proportional to the intensity of rainfall, the amount of soil exposed to water, and the slope of the exposed land. This risk increases when vegetation is removed, soil is disturbed, and the natural overland flow of stormwater run-off is altered.

Sediment is solid material that is moved from one location and deposited in another through the process of erosion. When erosion occurs, soil particles suspended in water or air are transported downstream or downwind, eventually settling out as sediment, sometimes far from the source.

Inappropriate land management can generate excess sediment that may contain nutrients, pathogens, or contaminants which are transported across the landscape and deposited within drainage networks, wetlands, waterways and bushland, posing a number of risks to natural and urban environments.

Drivers of Erosion and Sedimentation

Land use changes, vegetation clearing, agriculture, building and construction, mining and other land development activities can be responsible for large-scale erosion and generation of sediment, as they disturb soil, remove vegetation cover and expose soil to rainfall and wind (Queensland Government, 2022).

Vegetation cover protects soil from the impact of rainfall by preventing the dislodgement of soil particles and promoting the infiltration of water into the ground. Plant roots hold soil in place and filter out sediment. When protective vegetation covering a site is removed the bare soil becomes prone to water and wind erosion and the loss of topsoil makes it harder for vegetation to re-establish after works are completed.

In urban catchments, sedimentation is typically the result of soil disturbance associated with building and development works, installation of services and infrastructure, and the disposal of stormwater into receiving environments. Stockpiles of unconsolidated or unprotected builders' sand and topsoil provide another significant source of sediment.

Research has quantified potential sediment supply fluxes associated with greenfield residential construction (Russell, 2021). Water Sensitive SA notes that studies have found that the bulk earthworks phase of development 'generates a large proportion of the sediment run-off as expected, however the model indicates time span of the road and drainage construction while the site is still significantly bare also presents considerable risk" (SA, 2023).

Impacts of Erosion and Sedimentation

Erosion and sedimentation are a major cause of land and watercourse degradation and are also a non-point source of pollution. Sediment generated from land use activities can escape from a site and enter waterways, wetlands, bushland, street gutters, stormwater drainage networks, roadways, and other assets, where it can present various problems that are costly and difficult to remediate. Figure 1 shows an example of building site sediment entering a street drain.

Figure 1: Sediment from a building site entering a drain. Image source: Bronwyn Scallan, Perth NRM

Environmental Impacts

High concentrations of sediment in natural water bodies can lead to:

- increased turbidity—reduces light penetration and affects the growth and diversity of aquatic organisms, particularly those reliant on photosynthesis;
- eutrophication—nutrients, heavy metals, pesticides and other pollutants attached to sediments have the potential to be released into aquatic environments, where they can contribute to decreased blue-green algal blooms and odour problems;
- decreased oxygen availability;
- interference with filter feeding, reproductive cycles, early development of aquatic organisms, and clogging or damage to gills;
- smothering of bottom-dwelling organisms and habitats;
- impacted flows—large sediment accumulations can impede streamflow, cause upstream flooding, or deflect flow into adjacent stream banks or land, causing further erosion and altering flow regimes;
- the creation of breeding grounds for disease vectors such as mosquitoes;

- changes to the abundance and distribution of aquatic plants and animals and disruption of natural food webs;
- increased aquatic weed growth, including within surrounding water bodies.
- the loss of critical habitat such as deep pools; and
- decreased biodiversity around aquatic environments.

(Department of Water and Environmental Regulation, n.d.; McGee, 2013; Queensland Government, 2022; Sediment Task Force, n.d.)

Figure 2 shows builders' sand in a drainage channel leading to the Canning River.

Figure 2: Build-up of imported builders sand in a drainage channel leading to the Canning River. Image source: Bronwyn Scallan, Perth NRM

Urban Impacts

Sediment can create problems in the urban environment, including:

- traffic and pedestrian slip hazards from sediment drifting from sites onto roads and footpaths;
- impeded visibility for motorists and pedestrians (stockpiles blocking line of sight);
- dust nuisance;
- localised flooding and reduced capacity and lifespan of drainage systems caused by sediment flowing into and blocking stormwater drains and basins;
- damage to properties adjacent to or downslope of sites where sediment is generated;
- decreased effectiveness, and increased maintenance requirements, for Water Sensitive Urban Design (WSUD) treatments; and
- amenity impacts, such as untidy streetscapes.

(Department of Water and Environmental Regulation, n.d.; McGee, 2013)

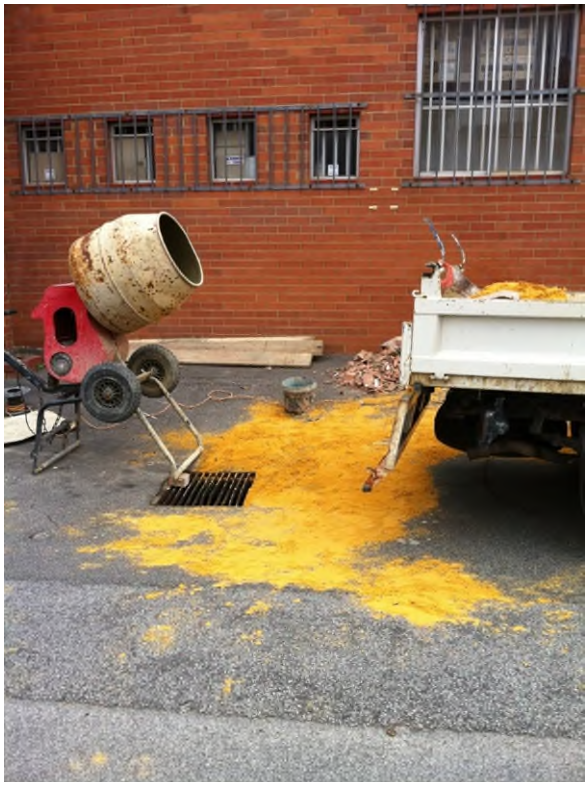

Figure 3: (left) depicts a stockpile of builders' sand deposited partially on a road. Image source: Bronwyn Scallan, Perth NRM
Figure 4: (right) illustrates poor ESC practice onsite, where sediment has been allowed to flow into a drain that is directly connected to a wetland. Image Source: City of Canning

2. Why is Erosion and Sediment an Important Issue for Local Governments?

Local Governments are responsible for managing assets including stormwater drainage networks, roads, footpaths, WSUD infrastructure, wetlands, waterways, and other natural assets. Erosion and sediment pollution can damage these assets.

Local Governments may allocate resources to ESC for several reasons, including to:

- comply with legislative responsibilities;
- protect environmental and community assets;
- maintain streetscapes,
- protect public health and safety; and
- mitigate the economic costs of non-compliance.

Legislative Responsibilities

Local Governments are responsible for enacting local laws, regulations, and policies, and often required to ensure compliance with State laws and regulations. There are several Acts that require Local Governments to ensure their own operational activities are carried out in an environmentally responsible manner, whilst other legislation requires Local Government to ensure that all building and development activity in their jurisdiction is undertaken responsibly.

Relevant legislation includes:

Local Government Act 1995

The *Local Government Act 1995* outlines overarching responsibilities to ensure that Local Governments manage the local environment effectively. Under section 3.25 and schedule 3.1 (6) of the Act, Local Governments have the power to:

Take specified measures for preventing or minimising the movement of sand, silt, clay or rocks on or from the land if, in the opinion of the local government, that movement would be likely to adversely affect other land.

Environmental Protection (Unauthorised Discharges) Regulations 2004

The *Environmental Protection (Unauthorised Discharges) Regulations 2004* list a range of prohibited materials in Schedule 1 that must not be discharged into the environment, including sediment. Under these regulations, it is an offence to unlawfully deposit soil or other contaminants in waters, roadside gutters or stormwater drains.

Authorised officers employed by State and Local Governments have the jurisdiction to issue infringements or enforce legal action against any individual or entity that breaches these regulations. Infringement penalties begin at $250 for the first offence notice, rising to $500 for subsequent infringement notices. If convicted in a court of law, the maximum penalty for an individual is $5,000 and $25,000 for a body corporate.

Planning and Development Act 2005

The *Planning and Development Act 2005* can be utilised by Local Governments to impose conditions of approval on development sites via local laws. Under *Schedule 7 - Matters which may be dealt with by planning scheme*, this allows for the consideration of:

4 - Preservation and conservation

4(2) The conservation of the natural environment of the scheme area including the protection of natural resources, the preservation of trees, vegetation and other flora and fauna, and the maintenance of ecological processes and genetic diversity.

4(3) The conservation of water.

7 – Controls for land management

7 Controls for land or site management for matters to which this Act relates.

Examples of conditions that might be imposed under this Act to mitigate the risk of erosion and sediment pollution include:

- screening the perimeter of a site to assist with dust containment;
- requiring applicants to undertake street sweeping to prevent sediment build-up on roads; and
- installing air monitoring stations that can alert a Local Government of a breach.

Model Subdivision Conditions Schedule December 2022

The Model Subdivision Conditions Schedule is used by the Western Australian Planning Commission (WAPC) to ensure adherence to planning legislation and policies. On advice of the Department of Biodiversity, Conservation and Attractions (DBCA) and where the likelihood of erosion and sedimentation impacts exist without appropriate management adjacent to the Swan and Canning Rivers:

> *A management plan detailing how risk of drainage, erosion and sedimentation or other environmental impacts into nearby water bodies/reserves will be minimised during subdivision is to be:*
>
> > *a) prepared by the landowner/applicant and approved prior to the commencement of subdivisional works; and*
> >
> > *b) implemented during subdivisional works.*

Impact on Environment and Community Assets

Sediment pollution poses a threat to environmental, community and infrastructure assets. It can adversely impact the aesthetic and recreational opportunities provided by natural water bodies; contribute to the development of environmental health issues; impact the essential safety, public amenity and environmental health services provided by stormwater infrastructure and WSUD assets; contribute to an untidy streetscape; and impact upon the liveability and 'sense of place' community members associate with where they live.

Remediation Cost

Sediment pollution has a significant economic cost. Once sediment escapes from a site it can be expensive and impractical to remediate, often requiring costly restoration and maintenance works, the use of large machinery, and the implementation of complex engineering solutions to remove sediment build-up.

Remediation costs for activities during and after land development are often unbudgeted and include:

- street sweeping
- pipe cleaning

- repair and maintenance of drainage and WSUD infrastructure
- remediation of bank erosion
- dredging
- restoration of water quality
- rehabilitation of environmental assets
- revegetation where plants have been damaged or washed away.

Figure 5: Sediment run-off from a development site entering a drain. Image source: Bronwyn Scallan, Perth NRM

Research undertaken by the Sediment Task Force and the University of Western Australia has shown that inadequate sediment management can cost Local Governments upwards of $2,182 per hectare of land developed in dredging costs alone (Scallan B. , 2021). The same research found that in Western Australia:

- In 2019, a large metropolitan Local Government in Perth dedicated 10% of its annual drainage maintenance budget to maintaining drains where builders' sediment had run-off and been captured.
- A large metropolitan Local Government spends up to $1,310,400 per annum on facilitating a sweeping program for internal roads and paths associated with sediment control.
- One Local Government's budget for cleaning drainage pits and lines full of sand within new subdivisions was $375,000 per annum.
- One Local Government's budget for street sweeping of new subdivision stages after residential building was $267,000 per annum.
- Unblocking a singular pipe containing sand and rubble can cost $387 per lineal metre.
- Dredging costs of up to $5000 per tonne of sediment have been reported by some Local Governments.

(Scallan B. , 2021)

3. What Can Local Governments Do?

Local Government can address ESC issues through a range of avenues – including Regulation, increasing industry accountability and encouraging best practice sediment control, building staff capacity and ensuring sufficient resourcing, undertaking community education and behaviour change and putting in place infrastructure solution. The most effective solutions are those that prevent erosion pollution from occurring in the first place.

3.1 Regulation

In Western Australia, sediment management is a requirement of building approvals and is enforceable by authorised officers of both the Department of Water and Environmental Regulation and Local Governments under the *Environmental Protection (Unauthorised Discharges) Regulations 2004*, and through local laws.

Sustained and consistent enforcement builds compliance. The direct operational costs of facilitating an ESC compliance program may be at least partially, if not fully, offset by:

- savings in other Local Government expenditure (e.g. stormwater and WSUD asset maintenance costs, due to lower volumes of sediment entering drainage networks); and
- revenue generated through the issuing of infringement notices to proponents found to be causing or allowing sediment pollution to occur.

Authorised Officers Training

Case Study: Authorised Officers at the City of Bayswater

Authorised Officers in the City of Bayswater offer support and information to builders and developers, educating them on the need and methods for controlling sediment loss from sites. Officers respond to enquiries and speak to industry members onsite to inform them about dust minimisation, erosion mitigation, and sediment control strategies. Only 5% of all development related compliance assessments undertaken by officers relate to sediment loss from building sites, suggesting that the City's efforts in providing education and support are effective in achieving compliance.

To determine compliance, officers conduct site inspections in response to a complaint. A site inspection may also occur if an officer is witness to non-compliance during their movements around the City. If sufficient evidence exists, such as officer observations and photographs demonstrating the origin of the sediment, non-compliance is pursued with the applicant, owner or site supervisor. The City has found that it rarely needs to issue infringements as its compliance approach tends to result in cooperation from the responsible party.

Officers receive ongoing support from the City's senior management team through allocation of resources to monitoring and enforcement activities.

Case study sourced from the Sediment Task Force.

Western Australian Local Government officers can become Authorised Officers under sections 87 and 88 of the *Environmental Protection Act 1986*. This provides Officers with the authority to exercise specified regulatory powers and functions in the administration of environmental legislation relating to unauthorised discharges including monitoring compliance, investigating alleged breaches and undertaking regulatory action.

The Department of Water and Environmental Regulation administers an Authorised Officer Program, which allows Officers to take action to prevent discharges (including sediment) into the environment. Further information about the unauthorised discharges regulations that Authorised Officers are responsible for enforcing can be found here.

Local Laws

Case Study: Stopping sediment spread in the Shire of Augusta Margaret River

Since the gazettal of its *Erosion and Sediment Control Local Law 2019*, the Shire of Augusta Margaret River has required landowners, builders and developers to take reasonable measures to stabilise their land and prevent soil, sediment and pollutants from leaving a site or entering waterways. Since the gazettal, the Shire has issued sediment clean-up notices and $500 infringements for non-compliance.

Some builders and land developers have started to incorporate provisional sums into contracts to allow for proactive ESC measures to be implemented, representing a key shift in industry operations and a significant step towards standardisation of best practice. Officers are reporting a greater understanding and responsiveness from builders when improvement notices are issued.

The Shire is committed to its sediment regulations and the ongoing engagement, education and increased monitoring for compliance to improve management practices, with an emphasis on behavioural change. The aim is to put sediment management at the forefront of everyday activities at building and development sites.

Case study sourced from the Sediment Task Force.

Figure 6: Confluence of tannin-stained Margaret River and sediment-laden Darch Brook prior to the local law being implemented (Image Source: Nature Conservation Margaret River Region)

Local laws can be an effective tool for improving ESC compliance. Local Governments may consider gazetting a specific soil erosion and sediment local law to enhance their capacity to respond to poor practice.

Local laws that are specific to ESC can:

- increase clarity around a Local Government's intent and expectations;
- streamline the enforcement process;
- offer the ability to issue on-the-spot infringements; and
- enable a fairer process for all building contractors when quoting for their work (since all proponents are required to make provisions for ESC measures in project quotes).

Local Government staff must understand the requirements of local laws and their responsibilities and powers under the legislation. This includes officers involved in building and development approvals, and officers responsible for monitoring compliance and inspecting breaches.

Examples of Western Australian Local Governments that have gazetted a specific local law for soil erosion, sediment run-off, sand drift and dust control include:

- City of Rockingham *Sand Drift Prevention and Abatement Local Law 2000*
- City of Kalamunda *Sand Drift and Litter Control Local Law 2006*
- Shire of Serpentine-Jarrahdale *Dust and Sand Local Law 2008*

- Shire of Jerramungup *Dust and Sand Local Law 2011*
- City of Nedlands Site *Erosion and Sand Drift Local Law 2014*
- Town of Claremont *Site Erosion and Sand Drift Local Law 2016*
- City of Wanneroo *Site Erosion and Sand Drift Local Law 2016*
- Shire of Augusta Margaret River *Erosion and Sediment Control Local Law 2019*

Bonds and Fines

Case Study: City of Kwinana Infrastructure Protection Bonds System

The City of Kwinana has adopted an Infrastructure Protection Bonds System as part of its asset protection goals. Proponents of all construction works valued at over $20,000 are required to pay a bond to the Council as part of their building approval application prior to commencing works. The bond is intended to cover the cost of repairing damages to the public thoroughfare, public space or street trees that may result from private construction works. The bond system intends to improve the management of stockpiles and building materials, and to prevent footpath encroachment, traffic vision issues, verge covering and damage to roads.

Prior to releasing the bond, site inspections are undertaken by Council officers to assess any impacts or damages. A building completion report is compared with the pre-inspection report, and if the site condition is deemed acceptable upon the completion of works the City will refund the bond. If damage is identified the City may retain costs from the bond for repairs.

The City has experienced less damage, and has reported greater compliance from builders and developers.

Local Governments may utilise financial mechanisms, such as bonds and fines, to ensure compliance with best practice ESC amongst builders and developers.

Bonds are an effective strategy for encouraging compliance from the outset of a project. The *Local Government (Uniform Local Provisions) Regulations 1996* enable Local Governments to impose conditions on builders and developers for any works that obstruct or cause damage to a public thoroughfare or place. This includes the condition that an applicant submits a deposit to cover the cost of any damage that may result from construction. This regulation specifically states that:

> *(5) The local government may impose such conditions as it thinks fit on granting permission under this regulation including, but not limited to, any of the following —*
>
> *(a) a condition imposing a charge for any damage to the public thoroughfare or public place resulting from the construction;*
>
> *(b) a condition requiring the applicant to deposit with the local government a sum sufficient in the opinion of the CEO of the local government to cover the cost of repairing damage to the public thoroughfare or public place resulting from the construction, on the basis that the local government may retain*

from that sum the amount required for the cost of repairs by the local government if the damage is not made good by the applicant.

Local Governments can require proponents to pay a bond as part of their permit application, to ensure that adequate site conditions are maintained throughout the duration of a project. If the proponent causes or allows damage to public space to occur as a result of construction activities part or all of the bond may be retained by the Local Government to cover the cost of repair.

Case Study: 'Get the Site Right' Campaign (NSW)

'Get the Site Right' is a coordinated campaign between more than 20 Local Governments, community conservation groups, State Government agencies and the building and construction industry in New South Wales which targets ESC on commercial and residential building sites. The campaign, launched in 2016, aims to educate industry members about the impacts of sediment run-off and to encourage best practice.

Each year, a one-day 'inspection blitz' is held in which Local Governments, the NSW Environment Protection Agency and Department of Planning and Environment inspect development sites of all sizes, and take regulatory action as needed. In 2021, the blitz resulted in 762 sites being inspected, with 67% of those found to be compliant. A total of $383,167 in fines was issued to building sites that didn't meet the standards, with offences ranging from significant sediment tracking off sites, concrete slurry washing into stormwater drains, and building stockpiles being stored on public land.

Local Governments may issue fines for non-compliance if they have relevant local laws. Under the *Environmental Protection (Unauthorised Discharges) Regulations 2004*, if site inspections confirm that a breach has occurred an infringement penalty may be issued at $250 for the first offence notice, rising to $500 for subsequent infringement notices. If convicted in a court of law, the maximum penalty for an individual is $5,000 and $25,000 for a body corporate. Authorised Officers can issue fines for incidents concerning discharges into waterways and wetlands.

There are a variety of orders and notices that Local Governments may choose to issue in enforcing ESC compliance. An enforcement notice is a legal notice that may be issued by a Local Government, requiring the recipient to remedy non-compliant building works or a development offence. The enforcement notice will outline the works to be carried out or actions to be taken to comply with the notice, along with the time frame for compliance.

Stop Work Orders are can be an effective mechanism for addressing poor ESC practice. These orders prevent proponents from undertaking any works on site and enforce extended downtime which can become very costly in a short period of time. The lost productivity associated with Stop Work Orders, combined with clean-up and repair costs and potential legal liability for proponents, means the cost of non-compliance can be considerable.. For example, the Sunshine City Council issued Stockland Aura Subdivisions Development with a Stop Work Order that stated work could not resume until erosion and sediment control compliance efforts were endorsed as sufficient by the Council, at the cost of $3.5 million to the developer, which included 'lost time production'. (Scallan B. , 2021).

Case Study: Compliance Monitoring in the City of Cockburn

Environmental Health Officers (EHOs) at the City of Cockburn are empowered to undertake action on incidences of non-compliance relating to dust through the issuing of infringements for dust nuisance. Non-compliance with the City of Cockburn's local law is identified through periodic monitoring of building sites by officers, responding to complaints, and officer surveillance. Non-compliance with the local law is addressed with verbal direction to the offender to address the non-compliance, a formal written warning, issuing a statutory notice to address the non-compliance, issuing prevention notices, and/or issuing infringement notices.

Infringement notices for offences related to dust nuisance from building sites are in place to act as a deterrent to potential offenders. The City imposes a fine of $500 for non-compliance, however, this is not a common occurrence. Assessing compliance is difficult as the source of a breach can often be hard to determine. City of Cockburn officers are required to witness sand drift when it is occurring to enforce their local law. However, attempts are also made to contact the alleged offending parties when complaints are received but not witnessed.

Case study sourced from the Sediment Task Force.

Industry Accountability

Local Governments can increase industry compliance with ESC measures and foster better practices (see Appendix 1 for examples of better practice). Local Governments can help ensure that all contractors make provisions for ESC when quoting for a project.

The development industry may strive for better practice, however sometimes industry accountability, surveillance, compliance, and enforcement measures are necessary.

By investing in ESC enforcement during land development activities, Local Governments can assist builders and developers to realise the benefits of best practice ESC such as:

- reduced clean-up costs;
- improved site conditions, especially in wet weather;
- reduced wet-weather project delays;
- improved public image and reduced likelihood of public complaints;
- reduced mud and dust problems;
- reduced losses from material stockpiles;
- reduced chance of being fined or prosecuted; and
- improved safety conditions onsite.

(McGee, 2013)

Local Governments should ensure that their own civil works projects meet legislative requirements and fulfill their organisation's own local laws, policies and guidelines relating to ESC. By implementing better practice measures, Local Governments can lead

by example and establish a high expectation for other works being undertaken in their jurisdictions.

3.2 Strengthening Planning and Building Application Requirements

Case Study: ESC Plans at Sunshine Coast Council (QLD)

Sunshine Coast Council in Queensland facilitates a progressive and innovative ESC program, designed to assist industry in achieving best practice. The Council requires land developers to develop and submit an ESC plan before any site works may commence, which must be certified by a qualified professional and address all stages of planned works. The *Sunshine Coast Planning Scheme 2014 – Planning Scheme Policy for Development Works* outlines the specific requirements for ESC plans, and requires proponents to:

- Provide a concept ESC plan with the development application, which must include details of control measures, drawings of drainage and sediment basins, and calculations of catchment basin sizes.
- Provide a design certificate signed by a suitably qualified ESC practitioner (e.g. RPEQ-registered engineer with training in ESC, or other certified ESC practitioner), which certifies that the proposed ESC plan will achieve the State Planning Policy 2017 stormwater outcomes and is in accordance with an accepted ESC guideline, such as International Erosion Control Association's best practice guidelines for Erosion and Sediment Control
- Make provisions for ESC measures within development costs.
- Conduct regular inspections of ESC measures implemented on site.

Click here to view examples of the ESC documentation required by Sunshine Coast Council.

Many Local Governments across Australia require an ESC plan to be submitted by all project proponents with their planning and building applications, before approval is granted. An ESC plan demonstrates how the proponent will minimise the occurrence of erosion and sediment loss caused by land disturbance activities. Requiring an ESC plan can be an effective way to ensure that projects comply with local laws and State Government legislation.

The need for an ESC plan is determined by the Local Government, and may be dependent on the catchment area, size of the area being disturbed, duration of exposure, soil type, proximity to a water body, environmental sensitivity, and depth of excavation. Requirements for ESC measures need to be assessed on a site-by-site basis and may be dependent on different land use activities (TEER & DEP, 2023).

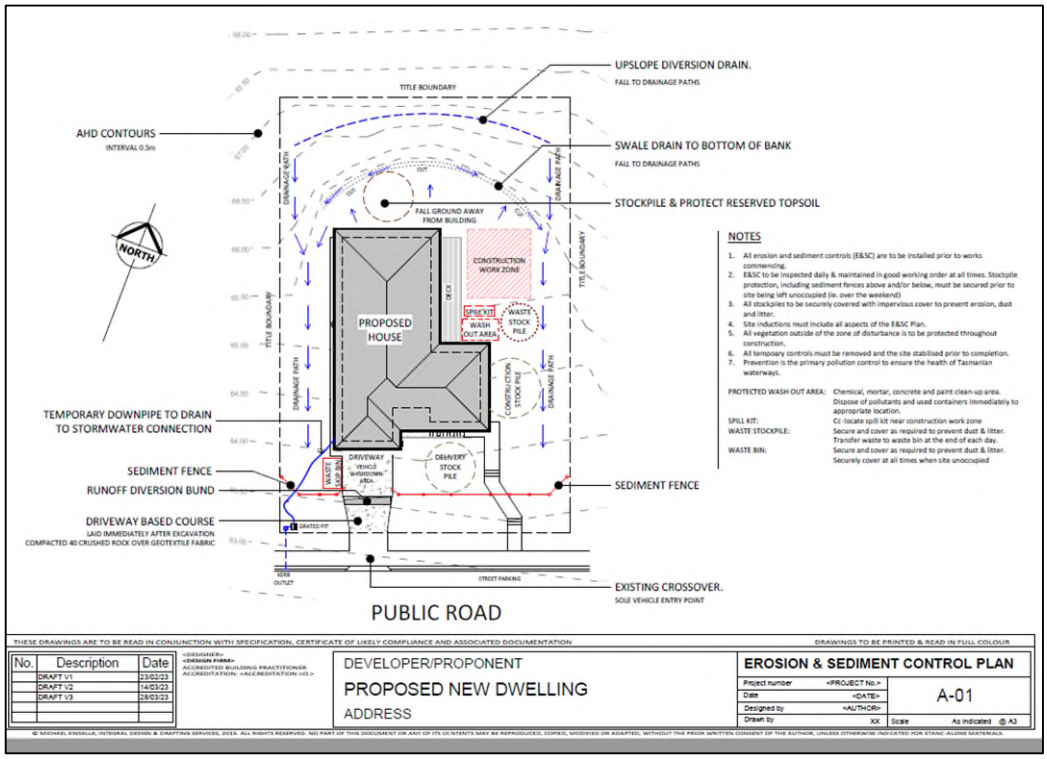

Figure 7: Example of a site drawing detailing the slope of the ground, site drainage patterns, and the location and type of ESC measures to be installed. Image source: TEER & DEP, 2023

Lake Macquarie City Council's (QLD) ESC Guideline is a useful example that illustrates some possible requirements of an ESC plan. The City requires ESC plans to support a development application in accordance with its Development Control Plan.

3.3 Build Staff Capacity and ensure sufficient resourcing

Case Study: Great Lakes Council (NSW)

Great Lakes Council is a former Local Government Area in New South Wales, which experienced adverse impacts of erosion and sedimentation on the quality and ecology of its waterways. The Council developed the 'Great Lakes Improvement Program' to build staff capacity in ESC enforcement and overall best practice compliance.

The Program involved the following seven-step process aimed at facilitating cultural change within the organisation and improving staff performance in ESC enforcement.

1. Select the right team: A range of roles should be engaged, including on-ground staff, management and executives.
2. Assess internal ESC practices: Review current processes for enforcing ESC compliance, including a review of policy, legislation, roles, responsibilities and expectations.
3. Analyse current performance: Conduct surveys of staff involved in ESC regarding current performance, practices, knowledge, barriers and ideas for improvement. Field assessments could be conducted to gain a better understanding of current performance.
4. Identify improvement opportunities: Use information collected in the survey, along with discussions and field assessments, to identify areas for improvement, such as work procedures and the assignment of responsibilities.
5. Develop solutions: Solutions should be enabling systems to support behavioural change in ESC.
6. Implement process improvements: This could include the establishment of standard drawings and compliance checklists for staff to use when conducting site inspections; tracking improvements in compliance; developing work procedures; and ensuring adequate resources are available for training and knowledge building.
7. Standardise the process: Establish a high profile of best practice ESC within the organisation by providing adequate resources. Staff should be assisted with understanding and implementing new policies and procedures through the facilitation of regular field-based training (e.g. demonstration sites with best and poor practice ESC examples).

   The training proved to be a highly effective tool for improving overall ESC compliance. Read more about the Great Lakes Council's staff capacity building program here.

(Sediment Task Force, n.d.; Tucker, 2011)

To ensure that ESC compliance efforts are effective, officers responsible for undertaking compliance activities should possess adequate knowledge of ESC issues, control measures, and their powers under legislative requirements and local laws. Reporting and responding to non-compliance with soil erosion and sediment control legislative requirements, policies or guidelines is the responsibility of a Compliance Officer or Environmental Health Officer, or less frequently a building inspector. Appropriate training and resources should be made available to officers to build the capacity and authority needed to report and respond to incidences of non-compliance.

Regular field-based training is essential to building and maintaining this capacity and might include participating in site audits or tailor-made demonstration scenarios. Tailor-made demonstration sites are an effective tool for encouraging critical analysis of ESC measures; these should feature both best practice and poorly implemented controls and give Officers the chance to practice undertaking a full site inspection using appropriate documentation and resources.

Given the wide-ranging impacts of ESC issues it is important to establish collaboration and cross-departmental awareness. A holistic compliance program that engages all

relevant teams can help to achieve more effective monitoring and enforcement outcomes, by elevating the profile of ESC issues. This should include staff who are responsible for:

- planning and building approvals;
- town planning and urban design;
- compliance;
- drainage infrastructure maintenance and design;
- environmental health; and/or
- environment.

The Sediment Task Force has developed a short guide to building staff capacity in achieving ESC compliance.

Resourcing

It is also important to ensure there is sufficient staffing capacity to undertake the required monitoring, investigation and follow up.

> **Case Study: ESC Resource Allocation in South East Queensland**
>
> Local Governments in South East Queensland with dedicated ESC Compliance Officers who regularly inspect sites have experienced significantly higher levels of compliance (85% site compliance rate) than reactive Local Governments (i.e. those who act following public complaints). Brisbane City Council has seven dedicated ESC Compliance Officers whose roles are funded using revenue from the City's ESC compliance programs.

Sufficient personnel and financial resources should be allocated across the organisation to develop and maintain an effective ESC compliance program. To build the justification for sufficient resource allocation, ESC should be made a priority environmental health issue and liveability concern among executive staff and Councillors. This might be achieved through analysing expenditure on sediment-related clean-up activities such as street sweeping, dredging of sediment from waterways, restoring or replacing damaged drainage infrastructure, and costs of rehabilitating degraded environmental assets such as wetlands.

Compliance Monitoring

Proactive monitoring for erosion and sediment loss from building and development sites is essential to improving compliance rates. Responsibility for monitoring compliance with legislative requirements, local laws, policies and guidelines should be assigned to specific roles within a Local Government (most likely Compliance Officers or Environment Officers), who will make pre-arranged and/or unannounced site inspections.

An ESC inspection checklist should be made available to officers responsible for monitoring compliance which can be utilised when inspecting a site to determine if the implemented controls are satisfactory. The Sediment Task Force has developed an 'On-Site Checklist for Inspecting Soil Erosion and Sediment Loss from Building, Subdivision and Construction Sites', which can be used by Local Government Officers to:

- Identify and inspect incidences of erosion, sediment run-off and sand drift.

- Record and follow up on actions to resolve a breach.
- Provide best practice recommendations to builders and developers.

Officers should be provided with other resources to assist in making site inspections, such as:

- Standard drawings for what is considered 'satisfactory ESC'.
- Photographs of satisfactory and unsatisfactory practice.
- A report template that can be used to identify areas for improvement onsite and list specific actions required by proponents.

Local Governments should commit to making regular site inspections during all phases of development to monitor compliance. Drainage infrastructure and the quality of water near sites should be monitored regularly, to ensure that any undetected sediment loss is not causing damage to these assets.

Other Local Government staff who are regularly on-ground within their jurisdiction should be encouraged to keep alert for incidences of non-compliance. This is where it becomes important to maintain a high profile of ESC within the organisation, to ensure that all staff are aware of the process for reporting and responding to breaches.

3.4 Community Education and Behaviour Change

Case Study: Shire of Augusta Margaret River Sediment Management Workshops

The Shire of Augusta Margaret River has experienced ongoing sediment and erosion issues at local construction sites. Following the gazettal of their *Erosion and Sediment Control Local Law 2019*, the Shire has made a commitment to ongoing engagement, education and increased monitoring for compliance with its sediment regulations to improve management practices, with an emphasis on behavioural change.

The Shire engaged a consultant to deliver two workshops on sediment management, one for Shire staff and one for builders and developers. The first workshop sought to introduce a proposed sediment toolbox to relevant staff, to ensure they were aware of the project and their roles in implementing it. The second workshop aimed to introduce the project and intent of the local law to the construction industry. The workshops were an effective tool for facilitating the exchange of information and feedback and were well received.

Case study sourced from the Sediment Task Force

The Sediment Task Force has developed resources that Local Governments can provide to builders, developers and the community to educate on best practice. This includes a series of information sheets, along with an onsite builders' checklist for preventing sediment loss. Also available is free sediment pollution public awareness and reporting signage for Local Governments to trial. The signage seeks to raise public awareness of sediment pollution and acts as a reminder to builders and contractors that penalties apply for breaching legislative requirements related to sediment discharge from construction sites. The signs will direct members of the public on how they can report instances of non-compliance and sediment pollution entering a gutter, stormwater system or water body (Scallan, 2023). Local Governments can contact the Sediment Task

Force to request free copies of this signage, to which they can add their own logo and messaging.

In Tasmania, the Derwent Estuary Program and the Tamar Estuary and Esk Rivers Program have developed a guideline 'Erosion and Sediment Control: The Fundamentals for Development in Tasmania', along with a series of best practice fact sheets, available on the Derwent Estuary Program website. These are useful tools for improving the technical knowledge of Local Government Officers and industry members alike.

Workshops can be an effective way of engaging with Local Government staff, the community, and industry members about ESC issues.

3.5 Infrastructure Solutions

Case Study: City of Bayswater Eric Singleton Bird Sanctuary Wetland Rehabilitation Project

Eric Singleton Bird Sanctuary is a man-made wetland located in the City of Bayswater. Following decades of development within the City, the environmental quality of the wetland declined into a severely degraded, contaminated, water-consuming site with limited environmental and social value. Sediment from building and development sites, surface run-off and sand drift were significant contributors to this problem, causing high nutrient levels in the wetland. Consequently, the wetland was contributing to poor health outcomes for the receiving Swan River.

To restore the wetland's environmental and social value and to protect the wetland for future generations the City of Bayswater sought to transform the site. The City aimed to create a productive, nutrient-stripping wetland through improved water quality, reduced pollutants, and the elimination of unsustainable groundwater extraction into the wetland. In partnership with the Department of Biodiversity, Conservation and Attractions (DBCA), the City undertook construction works over 2014 and 2015.

The final design includes:

- The diversion of water from the Bayswater Brook into the wetland through a Gross Pollutant Trap to remove any pollutants, including sand.
- The direction of water through a sedimentation pond designed to capture further suspended solids.
- A wetland treatment train with over 170,000 plants and alternating deep and shallow vegetation marshes to aid nutrient removal.
- An adjustable outlet with a one-way flap that prevents treated water from the brook from flowing back into the wetland.

The project succeeded in restoring the ecological value of the wetland, delivering cleaner water to the Swan River, improving public amenity, and providing ongoing benefits to the local economy. The City estimates that the project prevents around 40 tonnes of sediment, 1.35 tonnes of nitrogen, 200kg of phosphorous and other

pollutants from entering the Swan River annually. Read more about the project here.

Whilst preventing erosion and sediment from leaving a site should be a priority, Local Governments may choose to supplement this by investing in infrastructure that prevents sediment and associated nutrients from impacting on water quality, drainage infrastructure and the environment. A range of innovative infrastructure exists to capture sediment after it has left a site. Depending on the scale of developments and their proximity to sensitive environments, Local Governments may require proponents to incorporate certain infrastructure assets into their project plans (such as man-made wetlands or bioswales).

Examples of sediment-screening infrastructure include:

- Gross Pollutant Traps (GPTs) – Structures that trap solid waste, including coarse sediment and litter, and remove it from the water system.
- Swales – Linear, depressed channels that collect and transfer stormwater. Typically, swales are lined with vegetation, and screen coarse sediment and other pollutants from stormwater.
- Sediment basins – Ponds that capture coarse sediment and pollutants by intercepting stormwater before it reaches a waterway and slowing it down to allow sediment to fall to the bottom. Sediment basins are often used in catchments with high sediment loads, such as construction sites, and are also suitable to use upstream of wetlands and at drainage outlets of industrial areas.
- Infiltration trench – An excavation filled with porous material that collects stormwater run-off, and infiltrates this into the surrounding soil. Coarse sediment and other particulates are retained.
- Constructed wetlands – A series of shallow, densely planted man-made ponds that help to filter water through various physical and biological processes. One segment of the wetland works as a sediment basin to remove coarse sediment, by slowing and filtering water and allowing sediment to settle to the bottom. Plants are utilised within the system to remove pollutants that might be attached to sediment.

(Melbourne Water, 2017).

4. Conclusion

Soil erosion and sedimentation generated by development has the potential to cause significant damage to urban and natural environments. Local Governments can address this by fostering adoption of best practice ESC measures amongst industry, educating Local Government Officers and industry members, and monitoring for non-compliance with legislative requirements. Your Local Government may choose to adopt the actions provided in this guide to improve environmental, public health, asset protection and liveability outcomes.

5. Further Resources

Environmental Protection (Unauthorised Discharges) Regulations 2004 factsheet – Department of Water and Environmental Regulation document

Derwent Estuary Program – fact sheets and best practice ESC guidelines

Water by Design – fact sheets, checklists and other ESC resources for use by Local Governments

International Erosion Control Australia (IECA) – best practice ESC guidelines, resources and training opportunities

IECA Online Education Hub – webinar recordings on best practice ESC

Sediment Task Force, Perth NRM – resources, fact sheets and checklists for use by Local Governments

Lake Macquarie Erosion and Sediment Control Factsheets

Catchments & Creeks – provides technical information on waterways, stormwater management, and ESC practices

Erosion and Sediment Control Manual for the Darling Range (Upper Canning/Southern Wungong Catchment Team, 2001)

Managing Urban Stormwater: Soils and Construction (NSW Department of Housing, 1998) - Appendix A and B provide an explanation of ESC plan components and a sample ESC plan

Southern River Sediment and Erosion Project Report (Essential Environmental Services, 2010)

Annual Nutrient Survey for Local Government Authorities (South East Regional Centre for Urban Landcare, 2022)

Sediment Control Tools & Resources – Master Builders Western Australia resources list for sediment control and WSUD

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Appendix 1

Better Practice Erosion and Sediment Control

Better practice ESC measures can minimise erosion and prevent sediment from leaving sites.

ESC measures should:

- be applied whenever soil is disturbed for on-ground works, including the clearing of vegetation, housing developments, driveway construction, road projects, installation of underground services, excavations, and dam and landfill construction;
- include a combination of controls should be implemented to capture different sized sediment particles and budgeted for during project planning (TEER & DEP, 2023);
- be maintained in good working order throughout the development period and remain in place until all disturbed areas have been stabilised, restored, or sealed. Controls must be regularly monitored for maintenance, and be inspected before, during and after rainfall events (TEER & DEP, 2023); and
- require that during development work, all soil material arising from clearing, levelling, filling, excavation, and site disturbance, along with any building material stockpiles, be wholly contained onsite and prevented from entering adjacent lands or waters.

Figure 8: Sediment fencing installed on a development site, designed to capture sediment and prevent it from leaving site. Image source: Bronwyn Scallan, Perth NRM

A range of best practice ESC measures exist, including:

- **Creation and implementation of an ESC plan:** An ESC plan is typically provided with a project proposal to the Local Government, and provides details of the site assessment, site maps, construction details, and planned ESC measures.

- **Integration of best practice site management principles into a project:** Preventing erosion, retaining topsoil, catching and preventing run-off, and preventing entry to external drainage systems.
- **Physical ESC measures:** Diversion drains, drop structures, vegetative stabilisation, stockpile protection, site access stabilisation, sediment traps, sediment fences, stormwater inlet filters, vegetated buffers.
- **Regular inspection and maintenance:** Monitoring of site conditions and ESC measures by the site supervisor, especially after wet weather events.

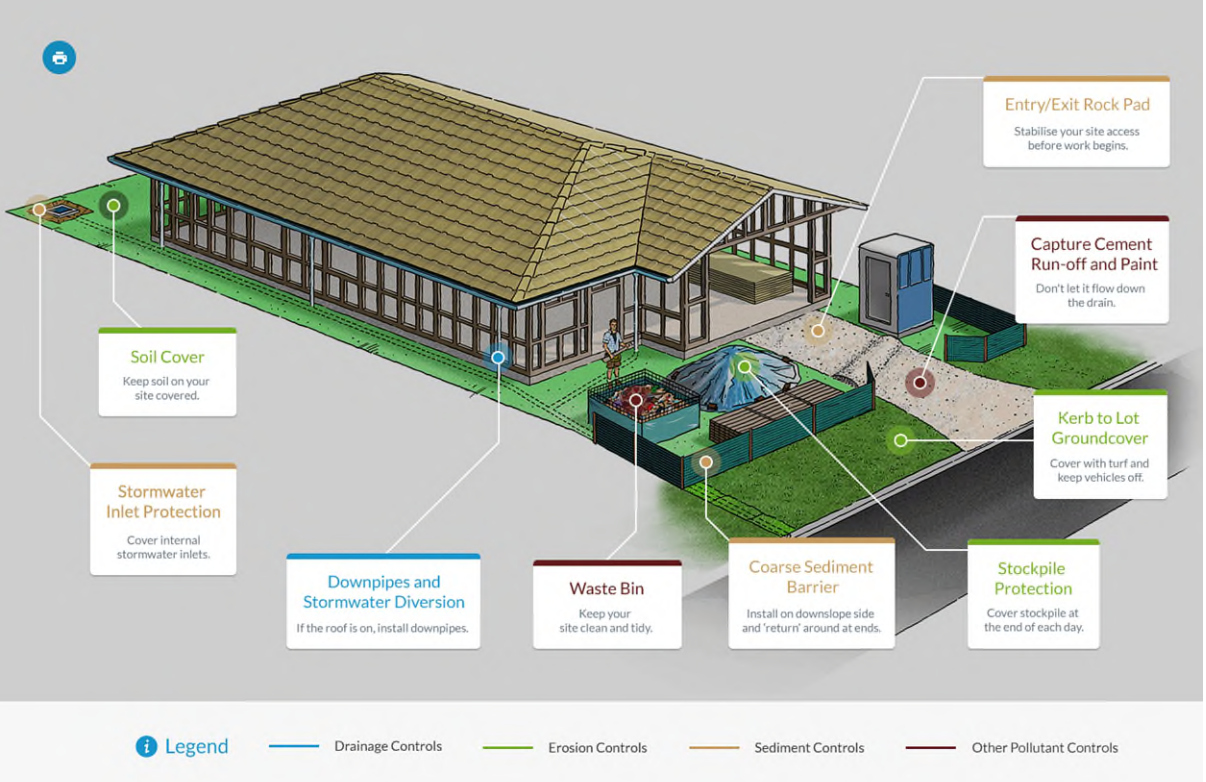

Figure 9: Examples of best practice ESC measures for lot-scale building and construction sites. Image source: Water by Design – an initiative of Healthy Land & Water

Local Governments should undertake sufficient action to ensure that all land development activities:

- preserve existing vegetation where possible;
- control surface water quantity and flow paths;
- minimise the amount of sediment and polluted material leaving the site;
- install and maintain ESC measures onsite;
- minimise site disturbance during land development activities; and
- undertake prompt and sufficient rehabilitation of the site once works are completed.

(Eastern Metropolitan Regional Council, 2008)

Local Governments should review their internal ESC compliance procedures to determine the effectiveness of current approaches, and to identify where resources should be directed for improved compliance outcomes.

For success, four key elements are needed to achieve best practice Erosion and Sediment Control:

1. Good ESC Plan
2. Competent contractor
3. Adequate budget and program
4. Regulator that will enforce compliance.

(Rowlands, 2023)

Healthy Land and Water have developed a tool which Local Governments can use to conduct an ESC internal management systems review. The *Soil Erosion & Sediment Control Internal Management Systems Review Report Template & Action Plan* prompts Local Governments to collect and input data that reflects local issues. Once completed, a summary of the current processes will be provided, along with a plan for action. Results generated in this report should ideally be retained to be used as a baseline for comparison with any future investigations, to demonstrate progress and the success of implemented changes.

Examples of actions that Local Governments can take within their own organisations to enhance their capacity to respond to ESC issues include:

- Strengthening planning and building application requirements
- Empowering staff
- Monitoring for compliance
- Centralised public reporting system
- Allocating sufficient resources
- Local government projects.