

D. 7: CONSTRUCTION OF DAMS

7.1 INTRODUCTION

7.1.1 *Application*

This Chapter applies to all land to which this DCP applies, except:

- (a) land reserved as national parks or historic sites or dedicated as nature reserves or declared as wilderness under the *National Parks and Wildlife Act 1974*; or
- (b) land reserved or dedicated within the meaning of the *Crown Lands Act 1989* for the preservation of flora, fauna, geological formations or for other environmental protection purposes; or
- (c) land declared as wilderness under the *Wilderness Act 1987*.

This Chapter applies to the following types of development:

1. the construction of a dam or an extension to an existing dam; and
2. the rehabilitation and or reinstatement of sites where a dam and associated works have been constructed in the past.

This Chapter will apply both to applications solely for the construction of a dam and for applications where the dam is part of the proposed development.

Note: *References to the definitions 'artificial waterbody', 'aquaculture' or any other definition under the Environmental Planning and Assessment Act, 1979, Schedule 3: Designated Development, may require that applications be dealt with as 'designated development'.*

The Chapter does not apply to the cleaning out of dams where the cleaning process does not exceed the original capacity of the dam.

7.1.2 *Purpose*

To provide detailed controls and guidance to land owners and Council, for the construction of dams and the removal or rehabilitation of dam sites.

7.1.3 *Definition*

From the Dictionary of Cessnock Local Environmental Plan (CLEP).

Waterbody (artificial) *means an artificial body of water, including any constructed waterway, canal, inlet, bay, channel, dam, pond, lake or artificial wetland, but does not include a dry detention basin or other stormwater management construction that is only intended to hold water intermittently.*

7.1.4 *Aims and Objectives*

The specific **objectives** of this Chapter are to:

- (a) ensure that any dam proposed is compatible with the existing natural and rural character of the site and the area generally;
- (b) ensure that basic landholder rights, as defined in the *Water Management Act 2000*, are taken into account by the construction and use of the dam;

- (c) ensure that no adverse impact results on local drainage or floodway characteristics in a catchment from dam construction;
- (d) ensure that dam construction is satisfactory to mitigate against potential problems such as dam failure, landslip, soil erodability, sedimentation or siltation of natural watercourses or drainage lines;
- (e) ensure that appropriate environmental measures are applied to dam construction sites in order to conserve the landscape and protect the surrounding environment;
- (f) establish, maintain and promote appropriate site rehabilitation or revegetation techniques for dam construction in order to ensure properties are not sterilised for future land uses and to protect the surrounding environment;
- (g) maintain and enhance the visual and scenic quality of the locality by controlling form, bulk and scale of dams;
- (h) ensure that works do not adversely impact on surrounding properties in terms of drainage, structure, stability, safety and fences;
- (i) ensure that all dams and earthworks are appropriately and safely constructed and maintained;
- (j) protect the health and safety of human life;
- (k) protect water quality within catchment waterways;
- (l) ensure that degradation of the environment does not occur from acid sulphate soils, sodic soil, saline soils or dry land salinity;
- (m) encourage best practice in the management and use of water;
- (n) protect items of Aboriginal significance; and
- (o) ensure that the removal or rehabilitation of dam sites is done in an environmentally sound manner.

7.2 HOW TO USE THIS SECTION

7.2.1 Consent authorities

Council's development approval is required before the construction of most types of dams, noting CLEP, Schedule 2: Exempt Development, for exemptions.

You will need to apply to Council for development consent for a dam where the dam (or an extension to an existing dam) is:

1. one of the types of dams listed below that require a Department of Environment, Climate Change and Water (DECC&W) approval; or
2. to be located on a 1st or 2nd order watercourse (this includes off-stream structures within the catchment of 1st or 2nd order watercourses) over 0.5 megalitres (500m³); or
3. an off-stream structure licenced under the Water Management Act 2000, to hold water extracted from a river or groundwater; or
4. an off-stream structure in the Pokolbin Private Irrigation District; or
5. any structure licensed under the *Protection of the Environment Operations Act, 1997*.

Examples:

1. A roughly circular dam approximately 2 metres deep, 25 metres wide and 30 metres long is just below 1200 litres in size.
2. A square dam approximately 2 metres deep, 25 metres wide and long is 1250 litres in size.

If the dam falls into one of these categories, you shall use this section to prepare your development application to submit to Council. You may also apply to Council for a Construction Certificate for the dam at the same time as making the development application.

Additionally, an approval from DECC&W may be required.

You will need to apply to DECC&W for an approval (under the *Water Management Act 2000*) where the dam (or an extension to an existing dam):

1. exceeds the total Maximum Harvestable Right Dam Capacity (MHRDC) for your property*¹; or
2. is located on 3rd order watercourse, 4th order watercourse or greater order watercourse*²; or
3. is located on 1st or 2nd order watercourse*² that has a permanent flow; or
4. is an off-stream structure that is neither a harvestable rights dam nor a special exempt dam under the DECC&W Farm Dams Policy *³; or
5. intercepts groundwater; or
6. is fed from a spring with a permanent flow.

*1: See 7.3 to calculate your MHRDC.

*2: See 7.2.4 for information on watercourse / stream order definitions or see maps at Council.

*3: See DECC&W Farm Dams Policy for full list of exemptions.

If your dam falls into one of the categories above, you will need to apply for an 'integrated development application', where the application you submit to Council will also be referred to DECC&W for their assessment.

Note: If the dam is within 40 metres of a 3rd order watercourse or greater (even if it is to be constructed on a 1st or 2nd order watercourse) then an approval may also be required under the water Management Act 2000.

Note: Documents from DECC&W will be required to complete your application for this approval. This Chapter does not outline the considerations that DECC&W uses in assessing approval applications.

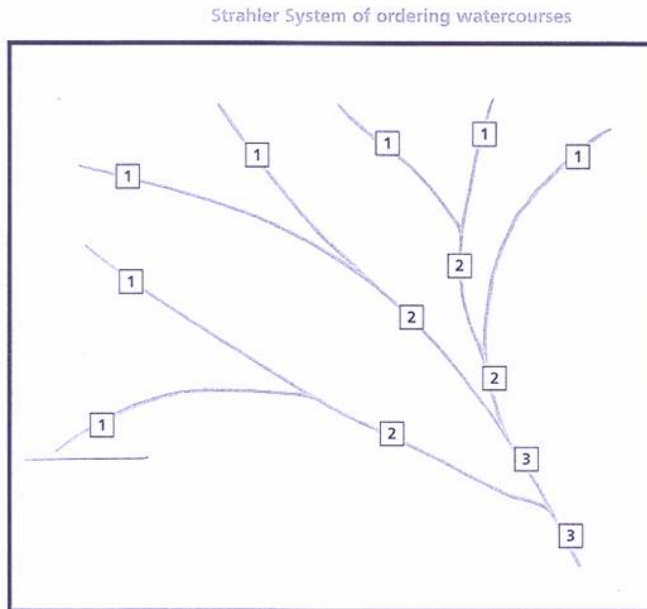
7.2.2 Circumstances where a dam cannot be constructed

A dam shall not be constructed in the following areas:

- a. areas of mass movement, as defined in Cessnock Land Resources Study;
- b. areas of acid sulfate or potential acid sulfate soils;
- c. endangered ecological communities;
- d. areas of high salinity hazard; and / or
- e. immediately below a sewer / septic outlet that cannot be moved or relocated.

7.2.3 Stream Order

The following diagram and text describes the definitions of 'stream orders'. Note that the stream orders in the Cessnock City Council area can be viewed at Council.



The Strahler system explained

- Starting at the top of a catchment, any watercourse which has no other watercourses flowing into it is classed as a 1st order watercourse (1).
- Where two 1st order watercourses join, the watercourse becomes a 2nd order watercourse (2).
- If a 2nd order watercourse is joined by a 1st order watercourse - it remains a 2nd order watercourse.
- When two or more 2nd order watercourses join they form a 3rd order watercourse (3).
- A 3rd order watercourse does not become a 4th order watercourse until it is joined by another 3rd order watercourse.
- and so on.

(Source: Department of Land and Water Conservation 'Farm Dams Assessment Guide')

7.2.5 Other legislation or policy which may apply to your application

The following table outlines other legislation or policy that may affect your application. Matters should be discussed with Council if you consider that any of these may affect your application. Please note that this list was current at the time of writing of this Chapter and that you should check if there are any extra requirements.

Issue	Legislation / policy that may apply	What action do I need to take?
Dam is on Crown Land.	Crown Lands Act 1989	Dept of Water & Energy consent, as owner is required to lodge the development application.
Dam will impact on threatened species, endangered populations or endangered ecological communities.	Threatened Species Conservation Act 1995 and / or Environmental Planning and Assessment Act 1979	See Council regarding Threatened Species requirements / considerations.
Dam will involve clearing of riparian vegetation. Dam will impact on threatened species listed under the Fisheries Management Act.	Fisheries Management Act 1994, Native Vegetation Act 2003, & Environmental Planning and Assessment Act 1979	See Catchment Management Authority (CMA) regarding clearing. See Council regarding Fisheries requirements.
Dam may have significant effect on matters of national environmental significance (eg. listed threatened species, migration species and World Heritage Areas such as Yengo National Park).	Commonwealth Environmental Protection and Biodiversity Conservation Act 1999	Commonwealth legislation – see Council if consultation with Environment Australia is needed. Approval under EPBC Act may be required.
Dam will involve clearing of native vegetation.	Native Vegetation Act 2003	Contact DECC&W and CMA - may need separate consent under Native Vegetation Act.
Dam will involve disturbance to koala habitat.	State Environment Planning Policy 44: Koala Habitat Protection.	Contact Council regarding requirements.

Issue	Legislation / policy that may apply	What action do I need to take?
Dam is for pollution control purposes	Protection of the Environment Operations Act 1997	Contact Council & contact with the Environment Protection Agency may be required.
If dam is an 'artificial waterbody' as defined by Schedule 3 of the Environmental Planning and Assessment Regulation 2000	Environmental Planning and Assessment Act 1979 and Regulation 2000	Development may be 'designated development' – if so, an Environmental Impact Statement shall be prepared. See Council for details.
If dam involves fill being imported into the site and is therefore a 'waste management facility' as defined by Schedule 3 of the Environmental Planning and Assessment Regulation 2000	Environmental Planning and Assessment Act 1979 and Regulation 2000	Development may be 'designated development' – if so, an Environmental Impact Statement shall be prepared. See Council for details.
If dam is an 'extractive industry' as defined as defined by Schedule 3 of the Environmental Planning and Assessment Regulation 2000	Environmental Planning and Assessment Act 1979 and Regulation 2000	Development may be 'designated development' – if so, an Environmental Impact Statement shall be prepared. See Council for details.
If dam has potential to disturb Aboriginal archaeology	National Parks and Wildlife Act 1974	Licence required to disturb relics.
If unauthorised development and works have been undertaken.	Environmental Planning and Assessment Act, 1979	Action may be initiated in situations where individuals or corporations have breached the Act.

7.3 MAXIMUM HARVESTABLE RIGHT DAM CAPACITY (MHRDC)

The 'NSW Farm Dams Policy', prepared by the former NSW Department of Land and Water Conservation (now DECC&W) gives landholders the right to capture and use for any purpose 10% of the average regional yearly rainfall runoff for their property. This is known as the 'Harvestable Right' and for management purposes is implemented as a corresponding total dam capacity for your property.

The policy has applied from 1 January 1999. The 'Harvestable Right' is a basic right tied to the land. It is intended to satisfy essential farm needs such as for stock watering, house and gardens and may be used for any purpose, including irrigation.

7.4 CALCULATE THE MAXIMUM HARVESTABLE RIGHT DAM CAPACITY (MHRDC)

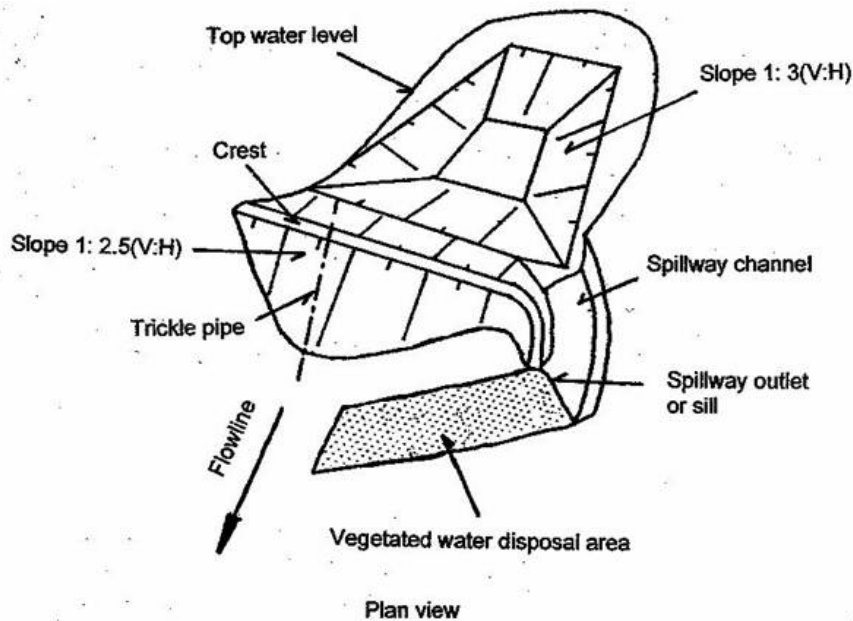
Determining your MHRDC is just a matter of multiplying your property area by the factor shown for the locality of your property on the maps included with the Farm Dams Assessment Guide (the Cessnock area is reproduced at Map 1). The result of this calculation is the MHRDC for your property.

For example, a 200-hectare property at Wollombi will have a MHRDC of 17 megalitres. This is found by referring to the map, reading off (approximating) the multiplier (.085 megalitres per hectare) and multiplying this by the property area (200 ha). The property assessment guide in the 'Farm Dams Assessment Guide' brochure describes this calculation in more detail.

Note: The MHRDC applies to the total number of dams on a property – for example, one dam alone may not exceed the MHRDC, but the total number of dams on a property may together exceed the MHRDC.

Figure 1: Illustrative view of a dam

Note that although this plan is not required with a development application, it illustrates the typical components of a dam.



Source: Department of Land and Water Conservation, 2002

7.5 PERFORMANCE STANDARDS

7.5.1 Location Requirements

The dam shall:

- ideally be built in a depression, as this is generally the most favoured location due to its better storage to excavation ratio; and
- not be constructed on slopes greater than 15% slope, because there is not usually enough suitable soil material to build a satisfactory wall.

(see 7.2.2 for locations where dams shall not be constructed)

7.5.2 Construction Requirements

Dam construction should generally follow the construction principles outlined in the Earthmovers Training Course - Unit 10 Construction of Farm Dams.

(a) Crest

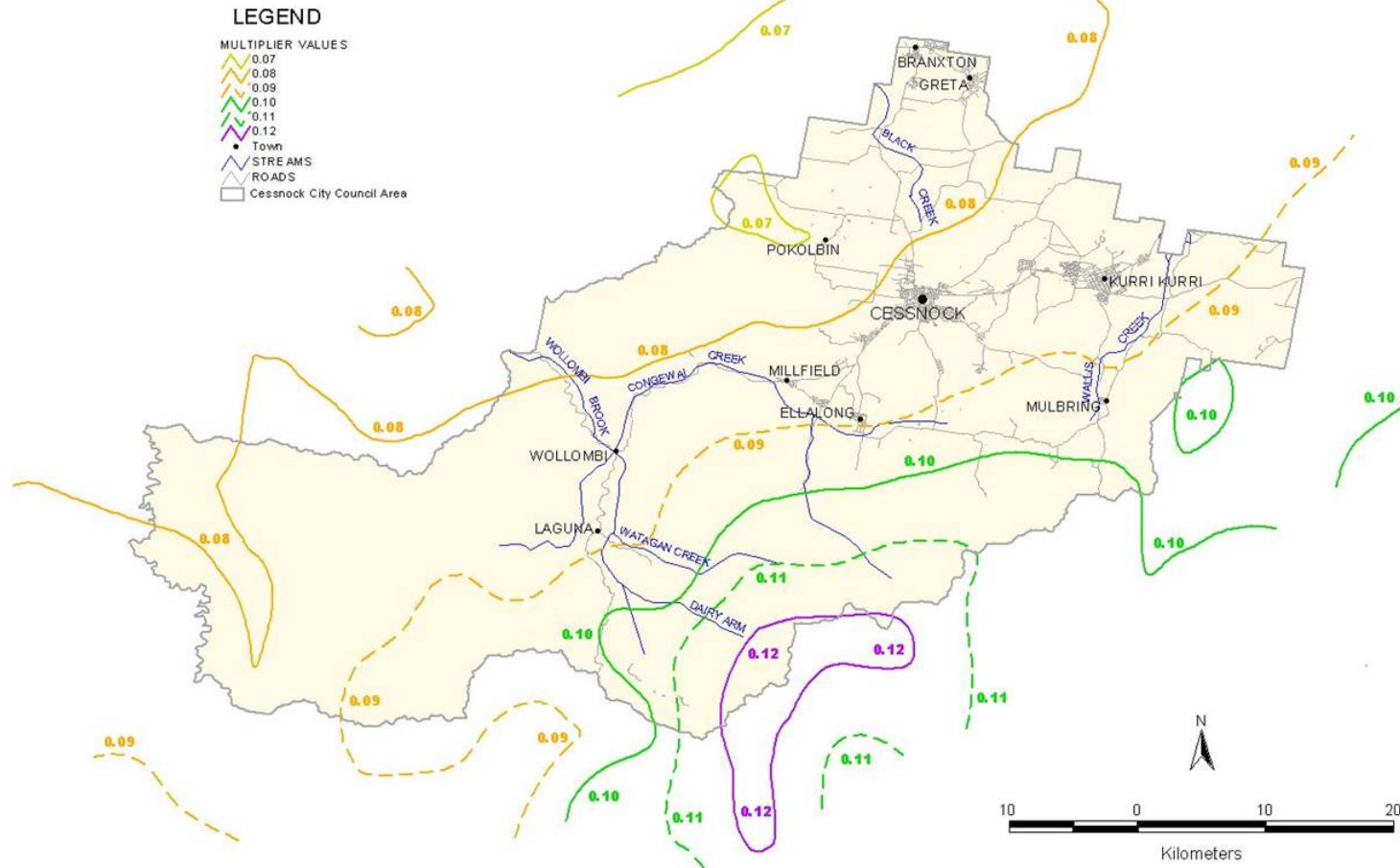
The width of the dam crest is to be a minimum of 3.0 metres for a 3.0 metre high dam wall. The crest should increase in width 0.5m for every metre above a 3.0 metre high dam.

(b) Freeboard

A minimum of 1.0 metre is to be established for freeboard. This should increase by 10% for every metre over a 3.0 metre high wall.

MAP 1

**MAXIMUM HARVESTABLE RIGHT
DAM CAPACITY MULTIPLIER
CESSNOCK LOCAL GOVERNMENT AREA**



MJT - W:\AAAWORKAREAS\CESS_DAMS_DCP

(c) Embankments

The material used to construct an embankment shall be sufficiently impervious to keep seepage low and to be stable. A soil with 25% clay content is in most cases suitable to form an impervious barrier.

- a. The following soil types shall not be used for dam construction: sand; gravels; organic soils; peat; or highly erodible soils.
- b. For dams over 5 megalitres in size, sufficient suitable soil material shall be available for wall construction. Sampling and evaluation of the subsoil at the proposed dam site, or of imported fill material, shall be undertaken to determine the quality and quantity of soil material.
- c. Topsoil shall be stripped and stockpiled from the excavation and wall areas before the dam wall is constructed, with the stockpile located clear of any natural watercourse. All soil excavated above high water mark and the embankment is to be covered with a minimum of 100mm of top soil. During construction, a sediment fence shall be installed immediately below the area of soil disturbance and around stockpile of soil.
- d. If the embankment is to be trafficked, it shall be certified by a geotechnical engineer. The embankment shall have suitable width, guideposts and barriers.
- e. The embankment shall be completed with at least 100mm of topsoil. It shall be planted with a good holding grass such as couch. Trees or shrubs are not to be planted on or within 10 metres of the embankment as roots may provide seepage paths for water.
- f. The slope of the upstream embankment batters shall be no steeper than the ratio of 2.5 horizontal to 1.0 vertical, while the downstream batter shall be no steeper than 3.0 horizontal to 1.0 vertical. However, if the dam is within 100 metres of a dwelling-house and is not fenced, then the upstream batter shall be no steeper than 6.0 horizontal to 1.0 vertical.
- g. The dam wall is to be adequately compacted at optimum soil moisture content by a sheep's foot roller or similar in layers no greater than 150mm.

(d) Spillway

- a. A spillway is required on all dams in order to pass surplus runoff around the dam which would otherwise pass over the embankment. The spillway shall be a minimum of 3.0 metres in width increasing in size dependent on the size of the dam and catchment. Generally, spillways are to be designed so as not to overflow more than half the depth of the freeboard.
- b. The width of the outlet is not to be less than the inlet width to the dam. The spillway also is not to direct flows onto the downstream toe of the embankment.
- c. The spillway area shall be turfed, stable and able to accept runoff flow. Other treatments may also be acceptable, for example concrete lining. The spillway cut batter should have a maximum steepness of 2.5 horizontal :1.0 vertical.

- d. A small diameter (100mm) pipe is required to be installed through the embankment where spring flows or small flows of long duration occur to ensure that the spillway does not erode. Design details shall be provided if this is the case.
- e. When surplus water flows through the dam spillway, there shall be a suitable place to return it to its normal flow line without causing erosion. If it is near a property boundary, flows shall leave the property in the same place that they did before the dam was built.

(e) Cut-off Trench

All dams are required to have a cut-off trench. The cut-off trench is to be constructed along the entire length of the base of the embankment at a minimum width of 2.0 metres or 1.5 times the height of the dam, whichever is the largest. The trench shall be excavated at least 1.0 metre into impervious soil and backfilled and compacted with impervious material.

(f) Vegetation Filters, Tree Planting and Aquatic Plants

- a. Water running into the dam shall be passed through a fenced and well-grassed filter zone. The vegetation in this area will filter out much of the unwanted material like silt, fertiliser, manure, dead vegetation and litter and rubbish. Farm dams, where cultivating exists, shall include a silt trap.

These simple vegetation filters operate all year round and are especially effective when storm runoff would otherwise carry debris into the dam.

- b. A gate shall be provided in the fence so that the filter area can be renovated by light grazing during rapid growth seasons. Prolonged grazing in dam catchments has potential to cause algal and weed growth in the dam due to the introduction of nutrients from manure.
- c. Where silting of the dam is a problem, vegetation filters of stiff long-stemmed grasses can be used with silt traps to reduce water velocity and cause more silt to be trapped before it enters the dam. A typical silt trap is about one-tenth the size of the dam.
- d. A fence around the dam wall and spillway can improve water quality downstream of the dam.
- e. Trees around the dam can help reduce evaporation and reduce the growth of undesirable water weeds and algae. However, they shall be at least 10 metres from the embankment.
- f. Dams located in flow lines or 1st order watercourses can result in movement of nutrients to downstream waterways. Dams in these locations shall incorporate a constructed wetland to reduce nutrient loads to receiving waterways.

(g) Hydrological Aspects

- a. To minimise the threat of contamination to groundwater, the dam shall be clay lined and dam construction shall be above the watertable.

One of the main hydrological concerns with dam construction is the potential for the excavation to intercept the groundwater causing direct hydraulic interaction with surface waters. Potential concerns include impacts on the groundwater resource through evaporation losses and contamination.

Contaminants can enter the groundwater with little or no attenuation via the dam. As runoff would be directed towards the dam any animal wastes, fertilisers, or other agricultural chemicals could contaminate the groundwater.

- b. All excavations which intercept the groundwater are required to be licensed by DWE under the *Water Management Act, 2000*.

7.5.3 Erosion and Sediment Control

- a. The development's construction shall comply with:
- Council's 'Engineering Requirements for Developments';
 - Conservation and Land Management's 'Urban Erosion and Sediment Control';
 - Landcom's 'Soil and Water Management for Urban Development; and 'Managing Urban Stormwater, Soils and Construction'.
- b. Care shall be exercised during the construction of dams involving excavations and leading to exposed areas which may be sources of sediment and associated nutrient mobilisation by strong winds or heavy rain. These areas need to be stabilised and planted down with a vegetative cover or regularly wetted to prevent erosion. Spillway areas also need to be carefully constructed and vegetated, preferably to spread water spilling from the dam rather than having a focused single point release that any lead to erosion below the spillway.
- c. Erosion and sediment control devices are to be installed prior to construction and maintained to ensure that there is no increase in downstream levels of nutrients, litter, vegetation debris or other water borne pollutants.

7.5.4 Vegetation Impacts

See *Part C: General Guidelines, Chapter 2: Flora and Fauna Survey Guidelines*.

7.5.5 Salinity Impacts

- a. Identified discharge sites are not to be cleared of existing remnant vegetation.
- b. Unsealed dams shall not be constructed in designated recharge areas. Information about sealing of dams shall be obtained from DECC&W.
- c. In areas showing signs of saline water logging and / or areas with shallow saline groundwater (depth to groundwater less than 2.0 metres), salt tolerance limits shall be investigated in relation to the proposed use before the dam is constructed.

7.5.6 Dam safety

Proximity to dwelling houses

Where dams are to be within 100 metres of a dwelling-house, the dam shall have a maximum upstream batter slope of 6.0 horizontal to 1.0 vertical.

Dam Safety Committee

The requirements of the NSW Dams Safety Committee shall be met.

The Committee's main objective is 'to ensure that all prescribed dams in NSW are in such a condition as to not pose an unacceptable danger to downstream residents and property, nor to adversely affect the public welfare and environment.' The Committee advises that "... *the ultimate responsibility for the safety of a dam lies with the dam owner*".

Source: Dams Safety Committee Information Sheet No.5 'Advice on Legal Matters for Dam Owners'

Further information on the NSW Dams Safety Committee can be found at www.damsafety.nsw.gov.au.

7.5.7 Visual Impacts

A consideration of the visual impacts of the dam shall be made. The visual impacts on and from the following shall be considered:

- neighbouring and adjoining properties;
- items of the environmental heritage and other buildings or places with heritage significance; and
- visual impact from roads and other public spaces.

7.5.8 Pokolbin (Hunter Wine Country) Private Irrigation District

Dams within the Pokolbin (Hunter Wine Country) Private Irrigation District (PID) shall comply with the Property Management Plan prepared as part of the District's Strategic Irrigation Management Plan.

7.5.9 Compliance with other legislation and policies

The application shall comply with all requirements of other relevant legislation and policies. A list of other legislation and policies that may affect your dam construction (see 7.2.4).

7.5.10 Impacts on neighbouring properties

The potential impacts of the dam on neighbouring properties during construction and post construction shall be considered. These impacts are:

1. *Visual impacts* (see section 7.5.7 above);
2. *Runoff* – the potential for runoff from the spillway onto neighbouring properties shall be satisfactorily addressed. Release of polluted waters (eg. salt, sediment or pollutants) shall be avoided;
3. *Stability* – the impacts on neighbouring properties and nearby buildings if the dam should fail shall be considered;
4. *Fences* – the construction and siting of the dam shall not interfere with the siting of boundary fences and their reasonable access for maintenance.
5. *Flows* - shall leave the property in the same place that they did before the dam was built. Also, flow shall not be concentrated onto adjoining properties unless it occurred prior to the construction of the dam. Dams shall not be located so that any impounded water backs up across property boundaries.

7.5.11 Areas affected by underground mine workings

Applications for dams proposed to be constructed in areas affected by underground mine workings will be referred to the Mine Subsidence Board for their comment.

7.5.12 Reinstatement / rehabilitation of dams and dam sites

Any threat proposed by the previous dam shall be removed. Details of the decommissioning of the dam and the rehabilitation of the site shall be submitted to Council.

7.5.13 Cumulative Impacts

The cumulative impacts of dam construction on catchments shall be considered. These include:

- the cumulative impact of a decreasing flow to the Hunter River and other sub-catchments to maintain a suitable environmental flow;
- cumulative visual impacts; and
- the cumulative impact of loss of riparian vegetation.

7.5.14 Additional information regarding dam maintenance

While these are not performance standards that will be assessed by Council, the following information will assist in managing your dam:

1. maintain grass on all areas of the dam, especially the inlet and outlet;
2. check trickle pipe for blockages;
3. avoid driving through or damaging spillway;
4. spillways shall be kept well-grassed and free from debris. A build-up of debris in the spillway could reduce its capacity and cause the dam to be overtopped;
5. do not allow trees or shrubs to grow on or near the wall. When trees growing on the wall die, the decomposing roots can form tunnels which lead to seepage and leaks and possibly to a piping failure of the structure. Shrubs also provide cover for rabbits which can damage the wall by burrowing.