Assessment of quantity of dam water, livestock demand and loss factors

South East Local Land Services

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STEP 1: Determine Full Capacity of Dam and Current Dam Level

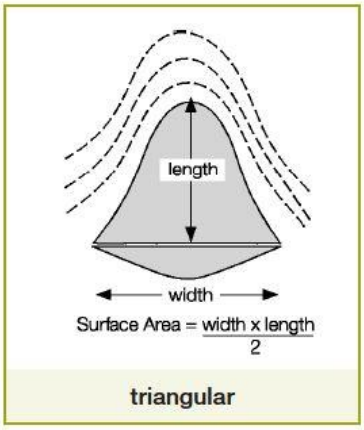
Volume (L) = Surface Area (m^2) x Depth (m) x 0.4 (factor for batter) x 1000 (convert m^3 to L)

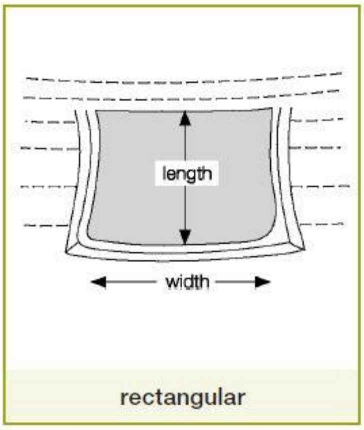
Batter factor of 0.4 refers to 1 m drop in depth for 3 m distance down the dam bank.

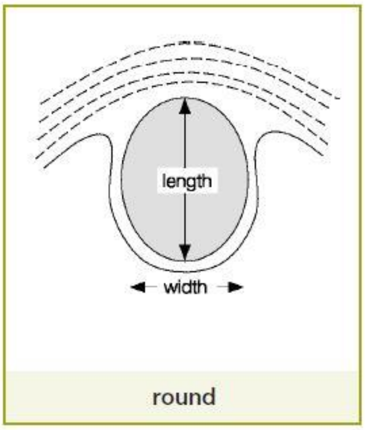
For Shallower dams use: 0.3 batter factor
Very shallow dams use: 0.2/0.1 batter factor

To determine Surface Area (m^2) = Length (m) x Width (m)
Below are some examples of dam shapes and how you would go about determining Length and Width of the dam in order to calculate the surface area at full capacity. You can also use an online mapping tool to determine surface area e.g. https://maps.six.nsw.gov.au

Example of Dam Shapes:







Source: Office of Water Factsheet (2010) Dams in NSW – What size are your existing dams?

Example Calculation:
Assume Dam when full measures 38 m wide and 32 m long, 3 metres deep and has a batter of 3:1 (batter factor is 0.4)

DAM Capacity (L) = Surface Area (m^2) x Depth (m) x 0.4 (factor for batter) x 1000 (convert m^3 to L)

Full Capacity (100%) = Surface area (38m x 32 m) x 3 metres deep x 0.4 x 1000
= 1 459 000 L
= 1.46 ML

Water level 1 metre down = (32 x 26) x 2 metre x 0.4 x 1000
(45 % Capacity) = 665 000L
= 0.66 ML
(Capacity = 0.66 ML/1.46 ML x 100 = 45% of full capacity)

Water level 2 metres down = (26 x 20) x 1 metre x 0.4 x 1000
(14 % Capacity) = 208 000L
= 0.21 ML
(Capacity = 0.21 ML/1.46 ML x 100 = 14% of full capacity)

Smaller size dams of the same depth i.e. 3 m, will result in lower %'s of full capacity as water levels drop to 2 m, 1 m etc. than what is described above.

Knowing the depth of your dam will be important so you will need to seek advice on ways to determine this figure.

Following are further calculations now assuming the dam is less than full. Again to determine the volume of water present it will be critical to measure the surface area of the water present and also again determine depth of dam.

For this example we will assume we have 60% capacity left in dam.
Water present in dam (L) = 0.6 x 1 459 000 L
= 876 000 L
= 0.876 ML (rounded)

Important Note: Only worth doing these calculations on dams that you know still have a larger body of water present. Any dams that are already very low should be disregarded in terms of available water for stock as you move towards summer.

STEP 2: Assess water loss

a) Evaporation Losses – In more recent years total losses can be in the order of 1 m to 1.5 m depth from dams over the late spring to summer period. Evaporation losses have been greater in more recent years where average summer temperatures have been warmer than what has been recorded in the past. Wind will also increase evaporation from the dam. Hence any dams with more protection from vegetation will help to reduce evaporation rates. Note that it is difficult to accurately determine the evaporation amounts however using somewhere between 30 % and 50% evaporation from dams is the ball park over the warmer months.

Example Calculation:
40 % Evaporation assumption (L) = 0.4 x 876 000 L
= 350 000 L (rounded)

Note: Daily evaporation losses in term of L/day can be calculated using the Pan Evaporation in mm/day x storage surface area. It is difficult to calculate this amount into the future. Often best bet is to use a % figure as used above.

b) Fouling – Once dam water reaches a depth in the order of 1 metre or less (will depend on the size of the dam) it is more likely that the water will become unsuitable for stock to drink due to issues such as fouling and bogging particularly with cattle. There is also an increased potential of developing an outbreak of blue-green algae in shallow, stagnant, warm and nutrient rich water.

Example Calculation:

Assumption 14 % of Full Capacity unfit due to Fouling etc. (L)	= 0.14 x 1 459 000 L
	= 204 000 L (rounded)

c) Other Animals – Kangaroos use approximately 0.9 L/day
In this example will assume there is no demand from other animals.

d) Seepage – General benchmark for water budgeting purposes of a good dam is 1 mm per m^2 of surface area/day. A maximum seepage loss figure is around 5 mm per m^2 of surface area/day.
A seepage loss of 1 mm per m^2 of surface area over a 900 m^2 area = 900 L/day Loss. Over 4 months (120 days) this equates to 108 000 L. This figure will be used as a guide to seepage in the calculation in Step 4.

STEP 3: Determine Stock Demand on water for months ahead

Refer to the NSW DPI Primefact 269 6th Edition – Stock taking water supply for Livestock for a guide to quantities of water required by different classes of livestock.

Example Calculations:

Lactating cow including calf requires approx. (warm weather)	= 80 L/day
50 Lactating cows including calves require	= 80 x 50
	= 4000 L/day
Adult dry sheep requires approx. (warm weather)	= 5 L/day
1000 adult dry sheep require	= 5 x 1000
	= 5000 L/day
Weaner Sheep requires approx. (warm weather)	= 3 L/day
100 weaner sheep require	= 3 x 100
	= 300 L/day

STEP 4: DO THE SUMS

STOCK WATER AVAILABLE = Water available – (Evaporation + Fouling + Seepage)

Example Calculations:

Available stock water = 876 000 L – (350 000 (Evap) + 204 000 Fouling + 108 000 (seep))

= 214 000 L

Cattle example: This would supply 50 Lactating cows including calves at 80 L/hd/day for around 53 days. (Calc = 214 000 L/4000 L/day). Alternatively it would supply 25 cows for 107 days.

Sheep example: This would supply 500 Adult dry sheep at 5 L/hd/day + 100 Weaner sheep at 3 L/hd/day for around 76 days.

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