Coorong Tatiara

Sustainability, Agriculture & the Environment

Water Harvesting and Lined Catchments

This fact sheet covers the basic considerations & steps involved in constructing a lined catchment. Maintaining a reliable & sustainable farm water supply is a major concern for livestock producers today. Many farmers have invested in lined catchment areas across SA. A lined catchment is a poly lined catchment area that runs into a poly lined dam. A lined catchment will capture water in any rainfall or dew event, where as an earthen dam needs the soil profile to be fully wetted up for water to run off the catchment & into the dam.

The motivation for implementing a lined catchment area varies, but the most common reasons are;

- The cost of mains water.
- Low annual rainfall levels.
- Poor quality groundwater is not an option.
- Sandy soils are too porous to install earthen dams.
- Lined catchments produce high quality water suitable for use by all livestock, intensive agriculture, spraying, and domestic use.

Site selection and preparation

Some points to consider when selecting a site:

- A steep gradient is not required.
- A level area with a slight fall is ideal.
- Siting on elevated area, or the highest point in the landscape can negate water pumping costs.
- If this is not possible the location of storage tanks need to be considered.
- The catchment can be placed on land that is deemed otherwise unproductive.
- Can drains or roads run into the catchment area?

Poly Liners

There are a range of different quality liners including;

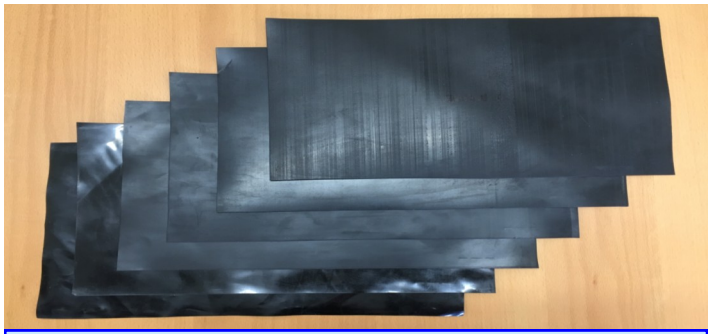
- High Density Polyethylene - HDPE
- Linear Low Density Polyethylene - LLDPE
- Polypropylene -PP and Poly Vinyl Chloride—PVC

High Density Polyethylene (HDPE) geomembrane, is a polyethylene thermoplastic. HDPE provide excellent durability and resistant properties due to its large strength to density ratio. This is the most common liner used in lined catchments.

Linear low-density polyethylene (LLDPE) geomembranes are very flexible, tear resistant and durable. LLDPE has a higher tensile break elongation than HDPE, however HDPE has an excellent ultraviolet (UV) and chemical resistance

What is the difference between HDPE and LLDPE Plastic Sheets?

- Although both materials are polyethylene, they do have different properties.
- LDPE is softer, more flexible and melts at a lower temperature than HDPE.
- HDPE is harder, has a higher chemical resistance and can withstand higher temperatures.



Poly liners come in a range of thicknesses, and qualities

Planning and Regulation

Introduction

Regulatory requirements have been established primarily in response to issues that have arisen over the years that have created either environmental damage, over-use of resources, infrastructure damage or even conflict between land users. Often these issues were not foreseen, and as such the regulatory frameworks have been put in place to prevent or limit any such adverse impacts occurring. In regard to water harvesting the following may need to be considered as part of the overall plan (noting that this is based on livestock water used only).

Dams

Dams that do not meet certain exemption criteria will be required to be assessed as development. Depending upon the location, this might necessitate referral to the Landscapes SA Boards and or the Department for Environment, Water and Natural Resources. Impact on water resources and ecology are important considerations.

Dams are exempt from development approval, except:

- Where a levee or mound with a finished height greater than 3 metres above the natural ground is to be formed; or
- Where a retaining wall which retains a difference in ground levels exceeding 1 metre is to be used or formed; or
- Where the dam is in the Flood Zone or Flood Plain delineated by Council's Development Plan, or in any other zone or area shown as being subject to flooding or inundation in Council's Development Plan; or
- Where the dam is to have a capacity exceeding 5 megalitres.
- A dam is exempt from requiring development approval and it is used to collect or store surface water that it still requires a WAA permit. (Water Affecting Activity) the Department for Environment & Water, Water Licensing Branch.

For more information please visit :
http://www.coorong.sa.gov.au/waterplanningconsiderations
http://www.coorong.sa.gov.au/waterqualityandlivestockhealth
For a range of information please contact the Murraylands and Riverland Landscape Board or Limestone Coast landscape Board to check to for any 'Water Affecting Activities' regulations.

- Murray Bridge P. 08 8532 9100
- Mount Gambier P. 08 8429 7550

Other Considerations

Shandying Water

Stock do not need mains or rain quality water to thrive so there is the potential to mix water from the lined catchment and bore water.
This can significantly boost the water output from the lined catchment or reduce the area of the catchment or the size of the dam. The water produced just needs to be fit for purpose.

Water Quality

Stock grazing green feed can tolerate higher salt concentrations than the same stock on dry feed. Stock grazing saltbush or salty feeds are less tolerant to saline water than stock grazing other types of pasture. Pregnant, lactating and young stock have a lower salt tolerance than older dry stock.

Algae

Build up of algae in dams can not only block outlets and pipes but also taint the water. Several species of algae are toxic to stock and cause deaths from poisoning. Algae can be controlled with several chemicals, including copper sulphate, calcium hypochlorite and ferric alum.

Estimation of potential water harvested

The figures below can be used as a guide in determining your total stock water requirements.
It should be noted however that the following are <u>average</u> figures and variations will occur depending on weather conditions, the feed available, and the breed of animal.

Area		*Rainfall*		*Volume captured*	Value of same amount of SA Water mains supply *($2.896 kl - Nov 2022)*	Annual no of dry cows watered *(13,500 l/head)*	Annual no of cows & calves watered *20,000 l/head)*	Annual no of dry sheep watered *(2,070 l/head)*	Annual no of lactating ewes watered *(2,880 l/head)*
1 sq m	X	1mm rain	=	1 litre					
0.5ha	X	450mm rain	=	2,250,000 litres (2.25 megs)	$6,516	166	112	1,086	780
1 ha	X	450mm rain	=	4,500,000 litres (4.5 megs)	$13,027	333	225	2,173	1,560
2 ha	X	450mm rain	=	9,000,000 (9 megs)	$26,064	666	450	4,347	3,125
3 ha	X	450mm rain	=	13,500,000 (13.megs)	$39,096	1,000	675	6,520	4,685

CASE STUDY ONE

Owner	*'Orlunda Downs'*	**M & L Scobie**
Property size		**2,690ha**
Location		**Policemans Point**
Rainfall		**500mm**
Enterprises		**1,100 Cattle and 800 Sheep**
Annual water bill pre dam		**$40,000**
Annual water bill post dam		**< $1,000**
Catchment area		**2.3ha**
Catchment liner	Polydam	**1.5mm HDPE**
Dam Capacity		**11 mega litres**
Dam liner	Polydam	**1.5mm HDPE**
Shandying water		**yes**
Year established		**2016**
Cost		**$250,000**

Dam liner cost $40,000 - Catchment liner cost $120,000 (Includes freight and handling)

Benefits

Mark has now switched off his water meter but has left it connected to his farm watering system as "insurance" in case of emergency.

Mark turning off his SA Water meter

Commencing the instillation of the liner and the anchor trenches are clearly visible in the foreground.

Site selection was important and there is plenty of room to extend the catchment at a later date if necessary

Excess rock was used around troughs and on roads The site must be rock free or liner damage may occur

Poly liner initially weighed down with sandbags

The option to shandy bore water to increase the capacity of the lined catchment remains. Water only needs to be fit for purpose and stock don't need pure rainwater to

Project Steps

- Business case.
- Site selection.
- Earthworks carried out to build the dam and shape the catchment area.
- The dam and catchment surface to be lined must be smooth and free of rocks, sharp stones, sticks, roots, sharp objects, or other debris prior to laying liner.
- Ensure the catchment site is level to minimise water pooling and evaporation.
- Placement of liner in dam and on catchment.
- Liner cannot be laid when hot or windy.
- The liner must be laid loosely as it will tighten, and move when the temperature fluctuates.
- Ensure the liner is stable, weighed down, and fully welded to stop poly liner from flapping.
- Welding of liner by contractors (if using purpose made poly liner).
- Fencing the site to prevent wildlife being trapped and damaging the liner.
- Setting up other water infrastructure as required

Project Components

In approximate order of costs

1. Poly Liner	6. Water Pumps *
2. Earthworks	7. Remote Monitoring Telemetry*
3. Catchment Fencing	8. Pump Shed*
4. Tanks *	9. Sand Bags to weigh down liner
5. Power *	10.Tyres to weigh down liner

**May not be required at all sites*

A ladder into the dam is a useful safety feature.

Site selection is very important and it is advisable to do a test dig with a backhoe so there are no nasty surprises during construction

The whole site must be free of rocks and other debris otherwise liner damage may occur

Concrete sump and outlet

The liner needs to be weighed down to prevent lifting in the wind

The site needs 1.8m high secure fencing

CASE STUDY TWO

'Gundooee'		**Nick Daniel**
Location		**Field**
Property size		**1,230 ha**
Rainfall		**450mm**
Enterprises		**Cattle**
Annual water bill		**$28,000**
Catchment area		**12,200sq m**
Dam area		**3,200 sq m**
Total area		**1.54ha**
Catchment liner	Fabtech	**1mm HDPE**
Dam Capacity		**5 mega litres**
Dam liner	Fabtech	**1.5mm HDPE**
Year established		**2015**

Challenges

Have had issues with algae, but it was easily treated with copper sulphate.

Benefits

SA Water meter now switched off.
It remains connected and could be switched on in case of emergency.
The only SA Water charge is the annual connection fee.

Cost

Poly Liner 12,200 sqm + dam 3,200 sqm	$76,300
Earthworks	$28,200
2 pumps & telemetry (SMS)	$15,400
Tank and extra poly	$15,400
Pump shed	$250

Payback Period

Will capture 15,400 litres per millimetre rain, the lined catchment is working well
450mm rain will produce 6,930kl or 6.93 megs
This would equate to $23,000 for an equivalent amount of mains water at the current price (March 2020)

All joints double seem welded. The gap between the welds is pressure tested for any leaks

Completed dam with floating pump

Pump shed and storage tank

Dam evaporation losses

Evaporation losses from the dam will be between 1.5m and 2.0m and need to be factored into calculating catchment area.

Covers are expensive, and are in the range of $5 to $8 per sq m. The cheapest option to address losses may be to dig the dam deeper to compensate for the evaporation loss.

Floating Dam Covers - Benefits:

- Evaporation control
- Blocks sunlight preventing algae
- Protects water from bird droppings, pollens, air born and animal borne particulates
- Can acts as a catchment area, water is diverted to a drainage system and stored in the dam.

Catchment liners can save evaporation losses but are very expensive. It may be more cost effectives to dig the dam deeper or make the catchment larger to offset evaporation losses.

Factors to consider with dam covers:

- How stable will the cover/barrier be in high winds?
- How long will it last?
- Will it be stable when the dam is dry?
- Are there special requirements – at least one product requires 30cm or more of water in the dam at all times?
- Will it leach toxic substances into the water?
- How will it stand up to what is a corrosive environment – continual contact with water and air and some level of salinity; exposure to ultra-violet light that can degrade some plastics?
- Some products are easily and cheaply installed by the land owner, others require expensive installation by specialists.
- What warranty is there & is the company likely to be around in five years if you need to call on the warranty?
- Does the product need to cover only the water, or does it need to be large enough to allow for anchoring beyond the lip of your dam – making a big impact on the final price?
- Many of the products on the market are flammable.

Fencing the lined catchment is essential to prevent trapped wildlife and livestock damaging the liner or drowning.

Additional Resources

Water Harvesting and Lined Catchments
Coorong Tatiara Local Action Plan :
Planning information
https://www.coorong.sa.gov.au/council-services/coorong-tatiara-local-action-plan/water-security

Water affecting activities regulations
Murraylands and Riverland Landscape Board or Limestone Coast landscape Board
- Murray Bridge P. 08 8532 9100
- Mount Gambier P. 08 8429 7550

Catchment and Dam Liners:
Fabtech: https://www.fabtech.com.au/
Tel: 1300 664 776 / 08 8347 3111

Poly Dam: https://polydam.com.au/
Mobile 0411 101 468

Other Fact Sheets in this series

https://www.coorong.sa.gov.au/council-services/coorong-tatiara-local-action-plan/water-security/water-security-technology-project

Coorong Tatiara Local Action Plan
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https://www.coorong.sa.gov.au/council-services/coorong-tatiara-local-action-plan

'National Landcare Program: Smart Farms Program, an Australian Government initiative'.

Australian Government | National Landcare Program