



# WaterSmart Dams

Enhanced catchments

## Introduction

As part of the WaterSmart Dams project, five demonstration sites across south-west WA trialled different catchment surface treatments from roaded earthworks to repurposed PVC and HDPE tarpaulins. These enhancements targeted a persistent challenge in Australian agriculture: capturing runoff from small, often-overlooked rainfall events. The trials aimed to explore how surface modification technologies can help farmers improve water resilience in a drying climate.

## Overview & Objective

This trial evaluated the performance of enhanced catchments in increasing water runoff into farm dams. Across five sites spanning the Wheatbelt and South Coast, researchers monitored rainfall and runoff data to compare surface types. The objective was to:

- Quantify total water harvested
- Identify rainfall (Rf) thresholds for runoff
- Compare cost-effectiveness across catchment types

The study provided clear evidence that surface treatment when matched to site and budget can dramatically improve on-farm water harvesting, even during minor rainfall events.

## Key Players

This project was conducted with the following partners:

- Leigh Giles – Landholder (Hines Hill)
- Goss Family – Landholders (Darkan)
- Mark Lester – Landholder (Jacup)
- Scott Wandel – Landholder (Grass Patch)
- University of Western Australia (UWA) – Technical support
- South East Premium Wheat Growers Association (SEPWA) – Grower group support (Wandel site)
- Department of Primary Industries and Regional Development (DPIRD) – Technical support
- Department of Water and Environmental Regulation (DWER) - Community Water Supplies Program
- Grower Group Alliance (GGA) – Project management
- MadFig, Compass Ag, FBG – Grower group partners and support

## Challenges

For most dams, the reason they are unreliable is an undersized or underperforming catchment. Roaded and high-performance catchments that generate dam inflows are critical for secure water resources.

Key issues for roaded catchments include site selection to avoid highly erodible soils, with regular catchment maintenance being critical. Plastic-lined systems provide greater runoff efficiency, but require higher upfront investment. These systems need to be securely anchored to prevent wind uplift.

# Solution & Approach

Across all five sites, enhanced catchments significantly improved water capture by effectively harvesting small rainfall events, demonstrating that surface treatments such as roaded and tarpaulin linings can greatly increase runoff efficiency and improve overall dam reliability.

## Roaded Catchments

### Hines Hill (Leigh Giles)

Rf threshold:	~8mm, 44% runoff coefficient
Runoff:	0.54 ML from monitored bay (scaled to ~2.59 ML from full catchment) from 374mm of rainfall
Cost:	\$1.71/m <sup>2</sup> (\$26,738 for 1.56 Ha catchment)
Insight:	Captured about half (52%) of rain that were events below the 8mm threshold



### Darkan (Goss Brothers)

Two bays:	C1 untreated RC (100,495m <sup>2</sup> ), C2 well-maintained RC (11,375m <sup>2</sup> )
Rf threshold:	6.5mm (C1), 5.5mm (C2)
Discharge:	107kL (C1), 58kL (C2) from 374mm total rainfall
Insight:	Well-maintained RC bay had a lower threshold and more rainfall events captured, but smaller catchment size limited total runoff volume.

## Plastic Catchments

### Jacup (Mark Lester – 2nd-hand PVC tarpaulin)

Rf threshold:	0.8mm, 75% runoff coefficient
Runoff:	1.90 ML from 413mm of rainfall, 88% of total rainfall fallen at site was captured
Cost:	~\$3/m <sup>2</sup> of tarp (excl. ground prep & fencing). Estimated 3-7 year lifespan for 2nd hand PVC tarp
Insight:	If instead this catchment was a well-maintained roaded catchment with 8mm threshold more than half, 56%, of rainfall would have been lost

### Grass Patch (Scott Wandel – 2nd-hand PVC grain tarpaulin)

Rf threshold:	1mm, 75% runoff coefficient
Runoff:	1.19ML runoff from 217mm rain fallen at site, 84% of total rainfall fallen at site was captured
Insight:	If this site had remained a paddock (~25mm threshold), no events over the entire monitoring period where enough to produce runoff

### Borden (HDPE Tarpaulin)

Rf threshold:	1mm, 78% runoff coefficient
Runoff:	1.37 ML from 293mm rainfall, 92% of total rain fallen at site was captured
Cost:	~\$10/m <sup>2</sup> of tarp (excl. ground prep & fencing)
Insight:	If instead well maintained RC, only 52% of total rainfall captured

\*\*Rf = Rainfall/

## Rationale

Each site trialled a unique surface modification, selected based on landholder needs, landscape characteristics, and cost considerations. Roaded catchments involved earthworks and grading, while PVC and HDPE surfaces used second-hand or purpose-laid tarps to reduce infiltration losses and capture more runoff from low rainfall events.

## Results & Insight

- Conventional pasture or crop paddocks are unreliable as dam catchments in the current climate and under no-till farming systems. During the project and across all sites, between 0-20% of the total rainfall was events >25mm in a day (threshold for a conventional catchment to run water).
- A well-maintained roaded catchment (8mm runoff threshold) captured between 27-74% of the rainfall events during the study, with a ~45-50% runoff coefficient.
- The high-performing catchments had similar performance, capturing all rainfall events >~1mm in a day and with a ~75% runoff coefficient. The only variation for PVC and HDPE was the up-front costs of materials and the corresponding lifespan of the high-performing catchment. For our study sites, they captured between 84% and 96% of rainfall during the study period.
- Costs of water from the roaded catchments was around \$1-3/kl, and \$2-11/kl (average ~\$4-6/kl) for PVC or HDPE high-performance catchments
- Carting water (\$17-28/kl) is the most expensive water supply option

## Take-home message

A dam is only as good as the catchment supplying the water inflows. Investing in surface treatment increases reliability, especially as rainfall becomes less frequent but more intense. Matching surface type to landscape and budget is key to maximising on-farm water security.