The cost of saving farm dam water

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University of Southern Qld (USQ)

Presentation

- Demonstration Ready Reckoner calculator
  - 8 steps
- Resources on dam management
  - National Centre for Engineering in Agriculture (NCEA)
  - National Program Sustainable Irrigation (NPSI)

Economic Ready Reckoner

Web-based tool for farm managers, advisors and consultants to calculate water saved in ML through evaporation / mitigation systems

Estimates the cost of evaporation or seepage mitigation system used to save this water as $/ML/year

ReadyReckoner

Economic Ready Reckoner - Evaporation Mitigation Systems

NCEA

About | Assumptions | Case Studies | *Evaporation Resources webpage*

Demo Case Studies: LockyerValleySouth-EastQLD-Horticulture

Location: Lockyer Valley, South-East Queensland,

Description: Horticulture,

1. Select Storage Type — Rectangular Ring Tank
2. ✓ Enter / Import Monthly Evaporation Data
3. ✓ Enter the Average Amount of Water Stored Per Month (as a % of Total Storage Volume)
4. ✓ Enter the Average Percentage of Years that the Storage Contains Water (per month)
5. ✓ Select your Most Applicable Seepage Option — Impermeable Liner Installed
6. ✓ Initial evaluation for various Evaporation Mitigation System (EMS) — Evaluate

Initial Evaluation Show

7. ✓ Modify selected Evaporation Mitigation System (EMS) — Impermeable Cover
8. ✓ Modify selected Seepage Mitigation System (SMS) — No Seepage Mitigation Required

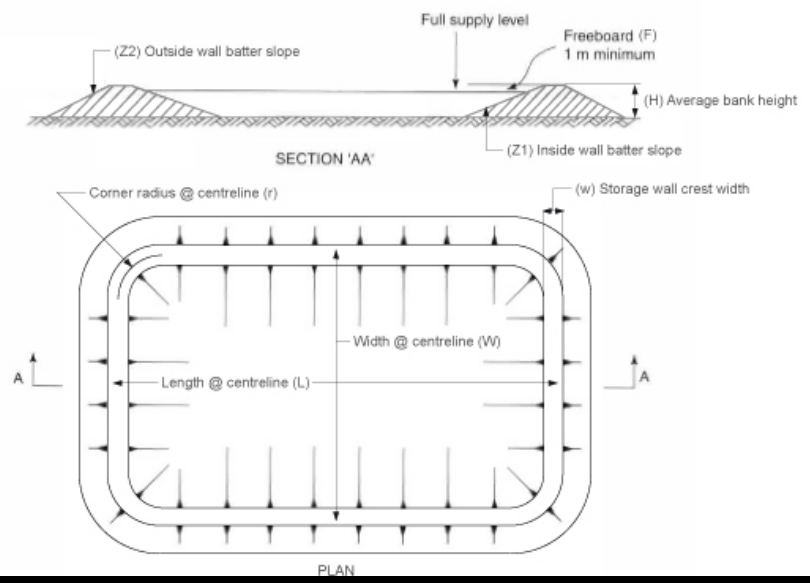
Calculate

User Inputs File (*.csv) Browse... Import

Disclaimer * *This site is best viewed in Internet Explorer*

Length @ Centreline of Crest (L)	50	metres
Width @ Centreline of Crest (W)	50	metres
Corner Radius @ Centreline of Crest (r)	10	metres
Storage Wall Crest Width (w)	2	metres
Average Bank Height (H)	2	metres
Batter Slope of the Storage Inside Wall (Z1)	3	in 1
Batter Slope of the Storage Outside Wall (Z2)	2	in 1
Full Supply Volume	2.4	ML
Freeboard (F)	0.5	metres

Save & Continue



Rectangular Ring Tank

The user is required to enter the following inputs.

Length @ Centreline of Crest (L)
- Length of the longer wall of the ring tank, measured along the centreline of the wall. [metres]

Width @ Centreline of Crest (W)
- Length of the shorter wall of the ring tank, measured along the centreline of the wall. [metres]

Corner Radius @ Centreline of Crest (r)
- Radius of each corner of the ring tank, measured along the centreline of the wall. [metres]

Storage Wall Crest Width (w)
- Width at the top of the storage wall. [metres]

Average Bank Height (H)
- Average height of the storage wall, measured from the original natural ground level to the crest, i.e not from

Batter Slope of the Storage Inside Wall (Z1)
- Inner slope of the storage wall, input as a ratio, i.e. 3 in 1, 4 in 1, etc. [dim.]

Batter Slope of the Storage Outside Wall (Z2)
- Outer slope of the storage wall, input as a ratio, i.e. 3 in 1, 4 in 1, etc. [dim.]

Full Supply Volume
- Maximum storage volume when full, whilst maintaining the freeboard stated. [ML]

Freeboard (F)
- Vertical distance between the water surface level when full and the storage wall crest. [metres]

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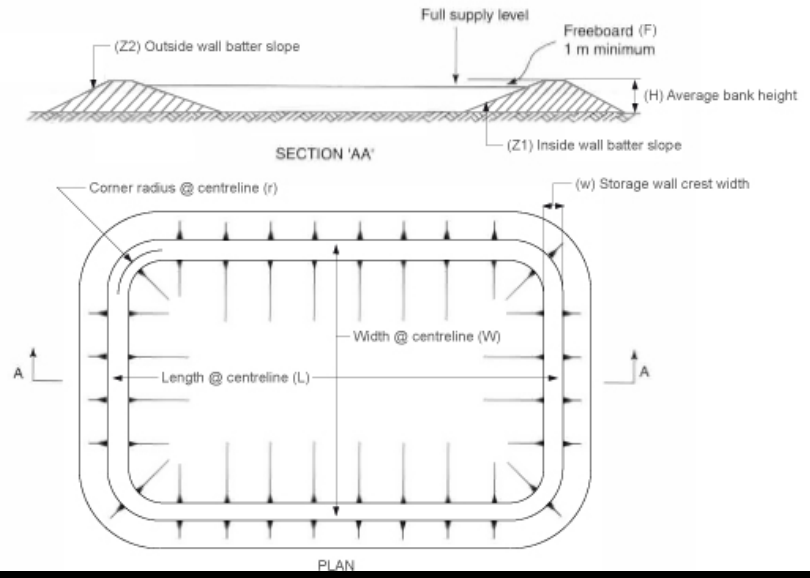

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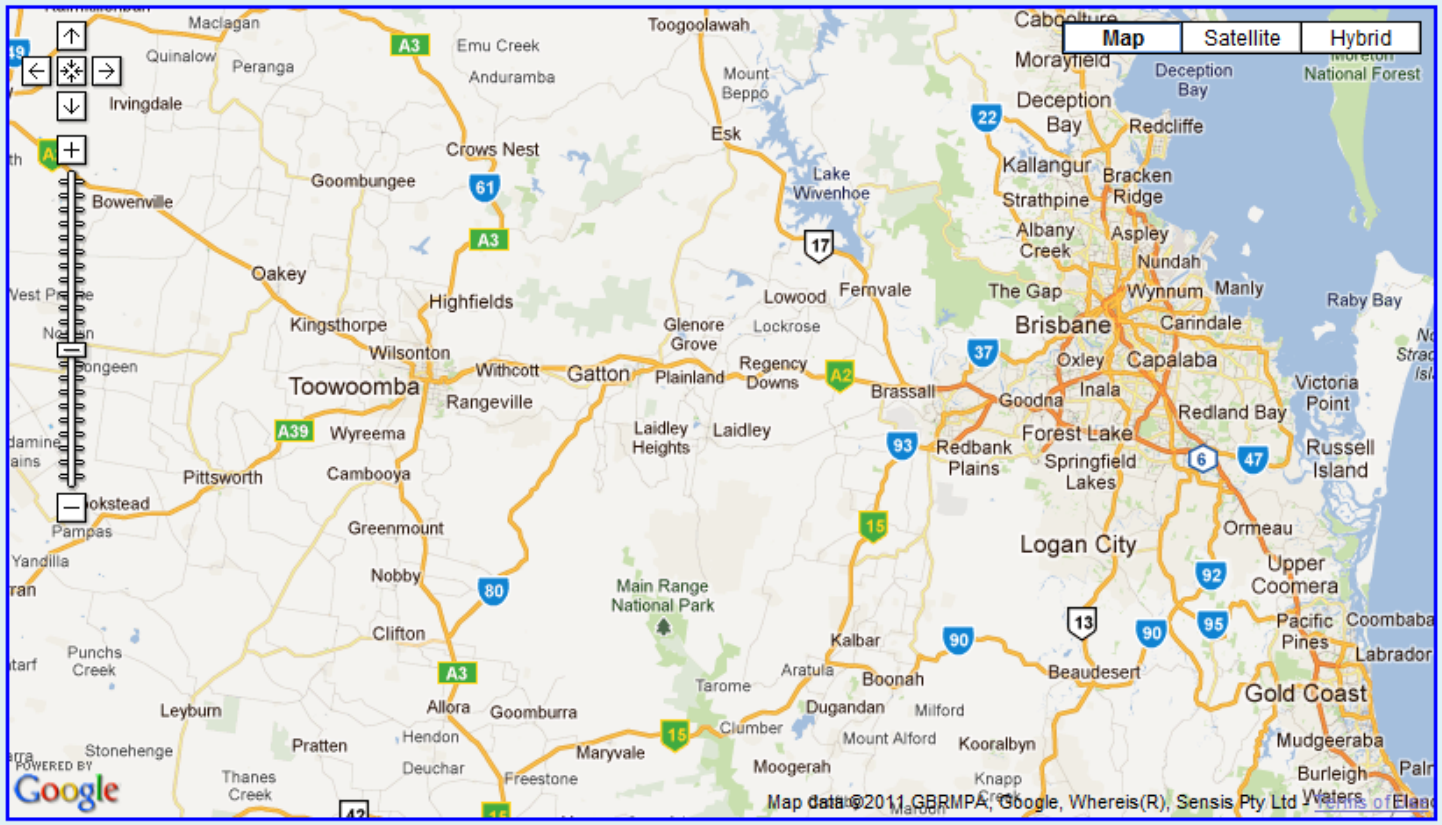
Full Supply Volume
- Maximum storage volume when full, whilst maintaining the freeboard stated. [ML]

Freeboard (F)
- Vertical distance between the water surface level when full and the storage wall crest. [metres]

Other types of dams

- Circular ring tank
- Gully dam

Step 2 – Evaporation data



Click on the map to obtain Latitude & Longitude

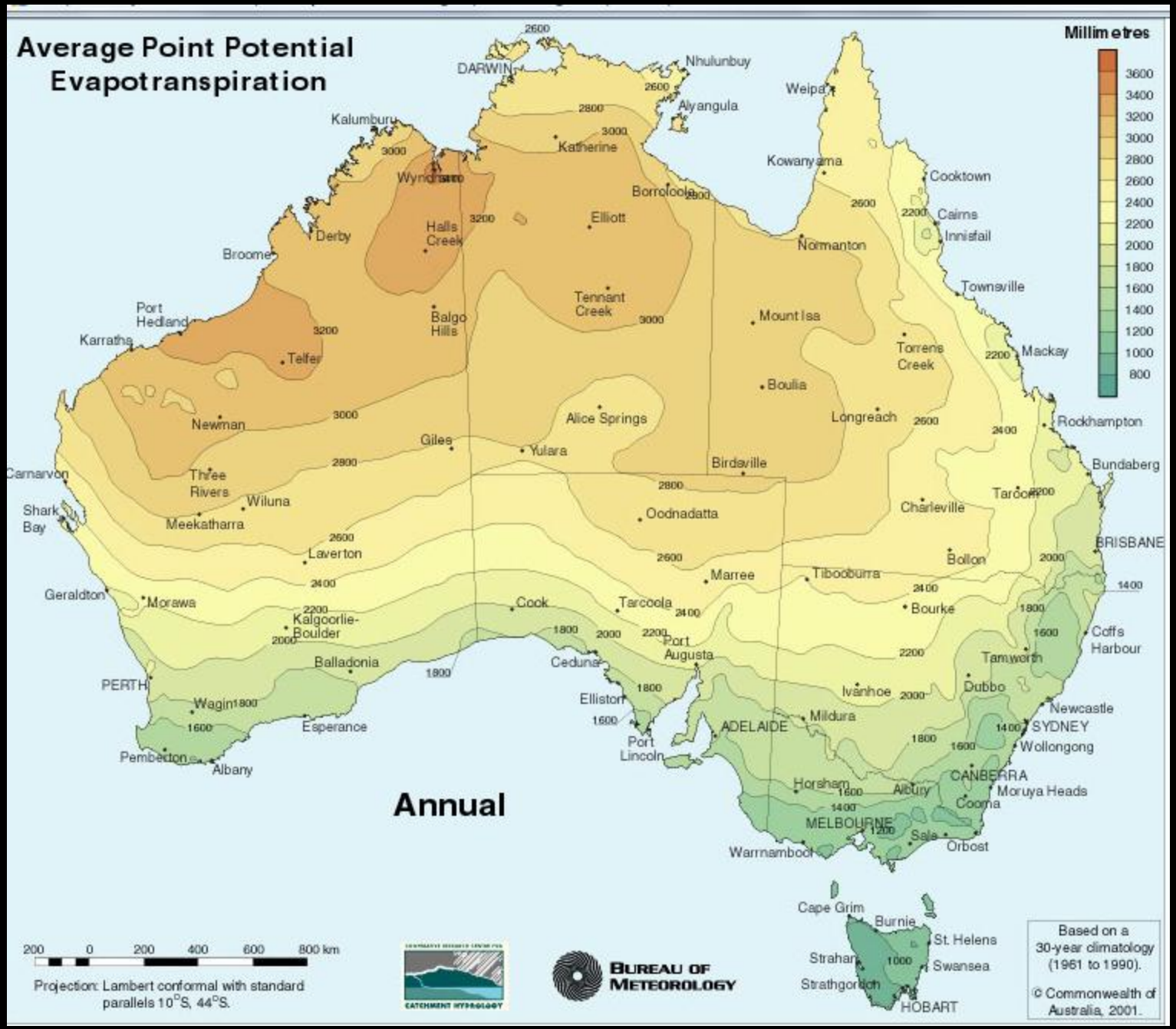
degrees SOUTH	27	+	0.58 deg (35 min)	Latitude
degrees EAST	152	+	0.38 deg (23 min)	Longitude

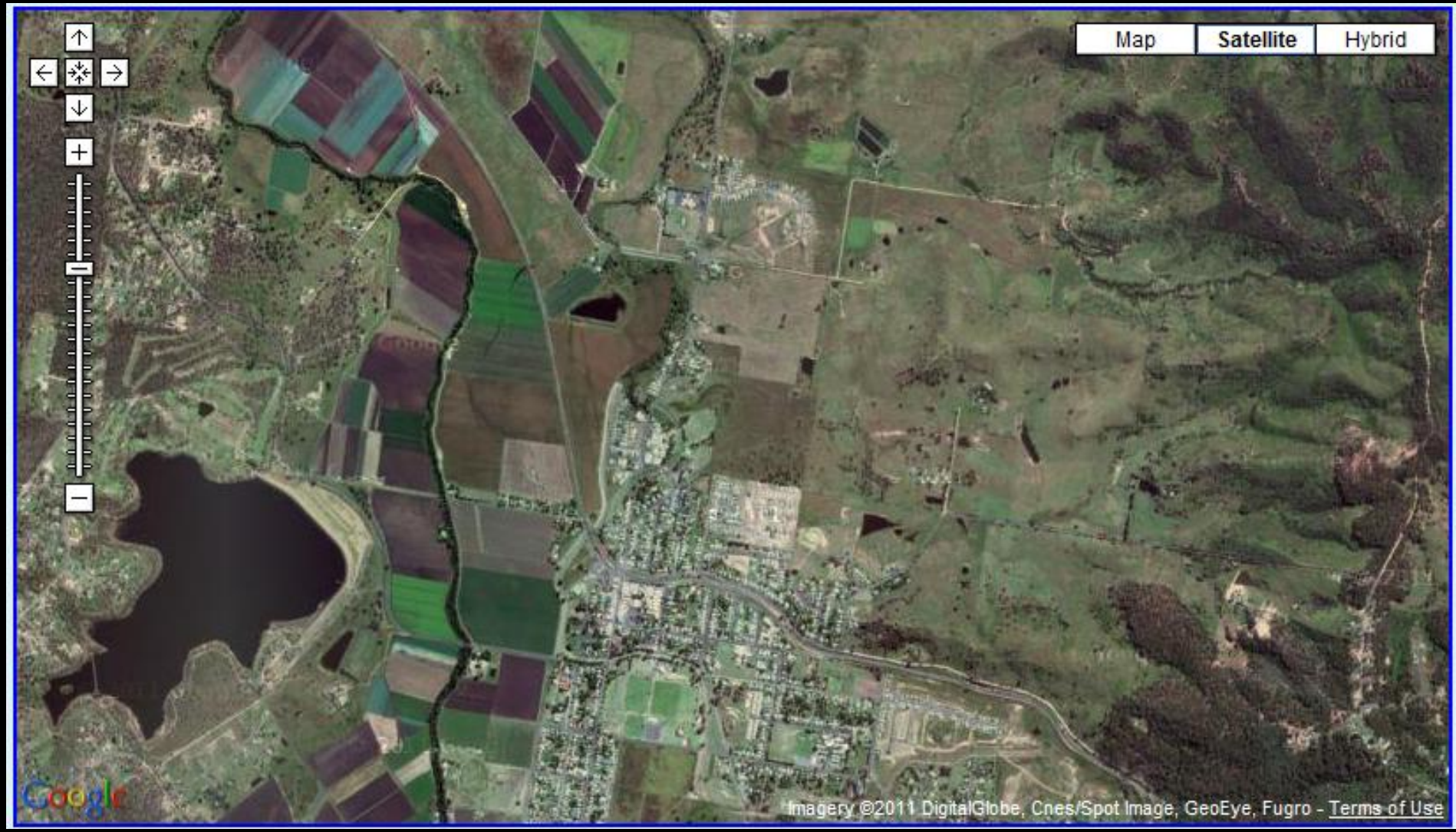
Import dam evaporation data

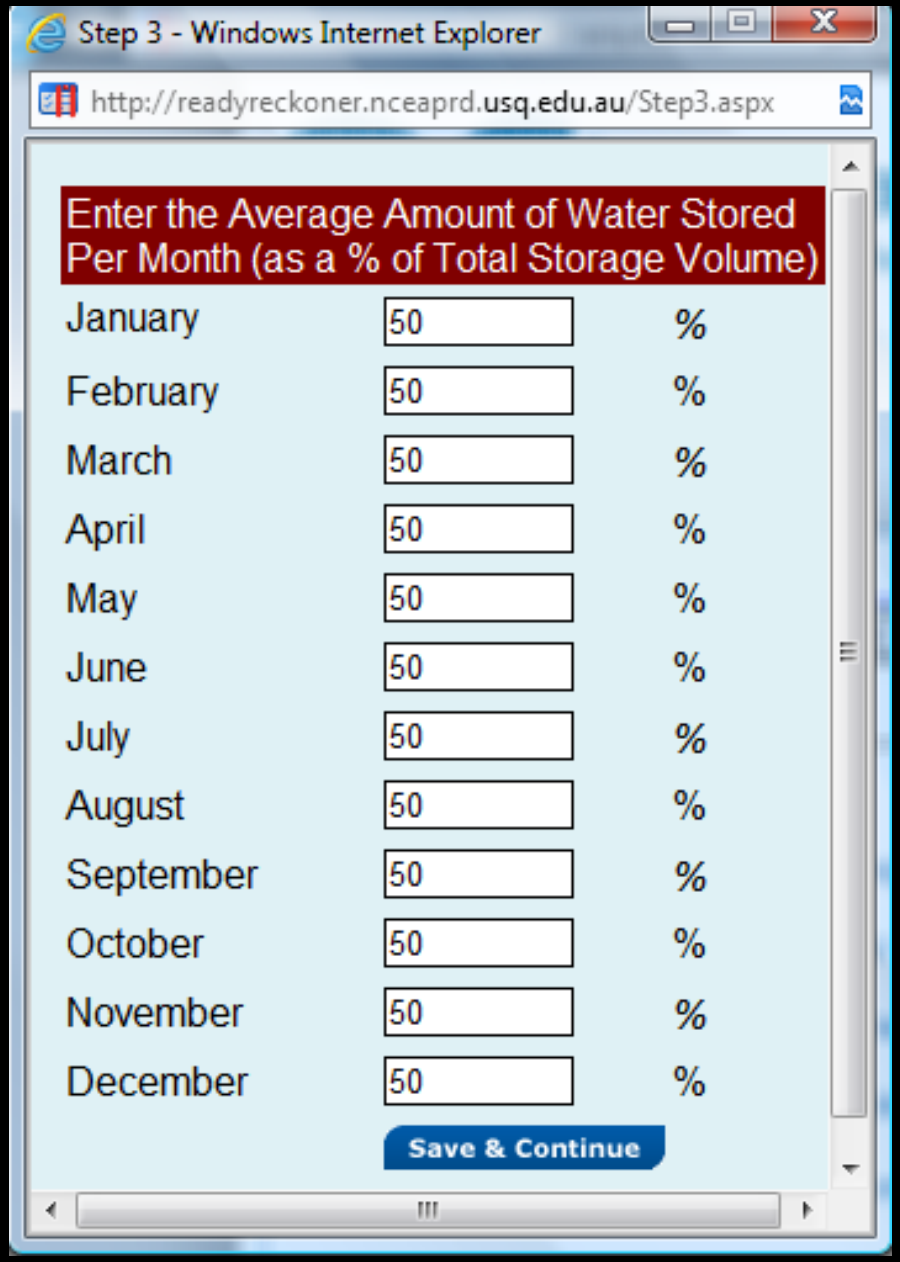
Click here to view 'Annual Evaporation' map

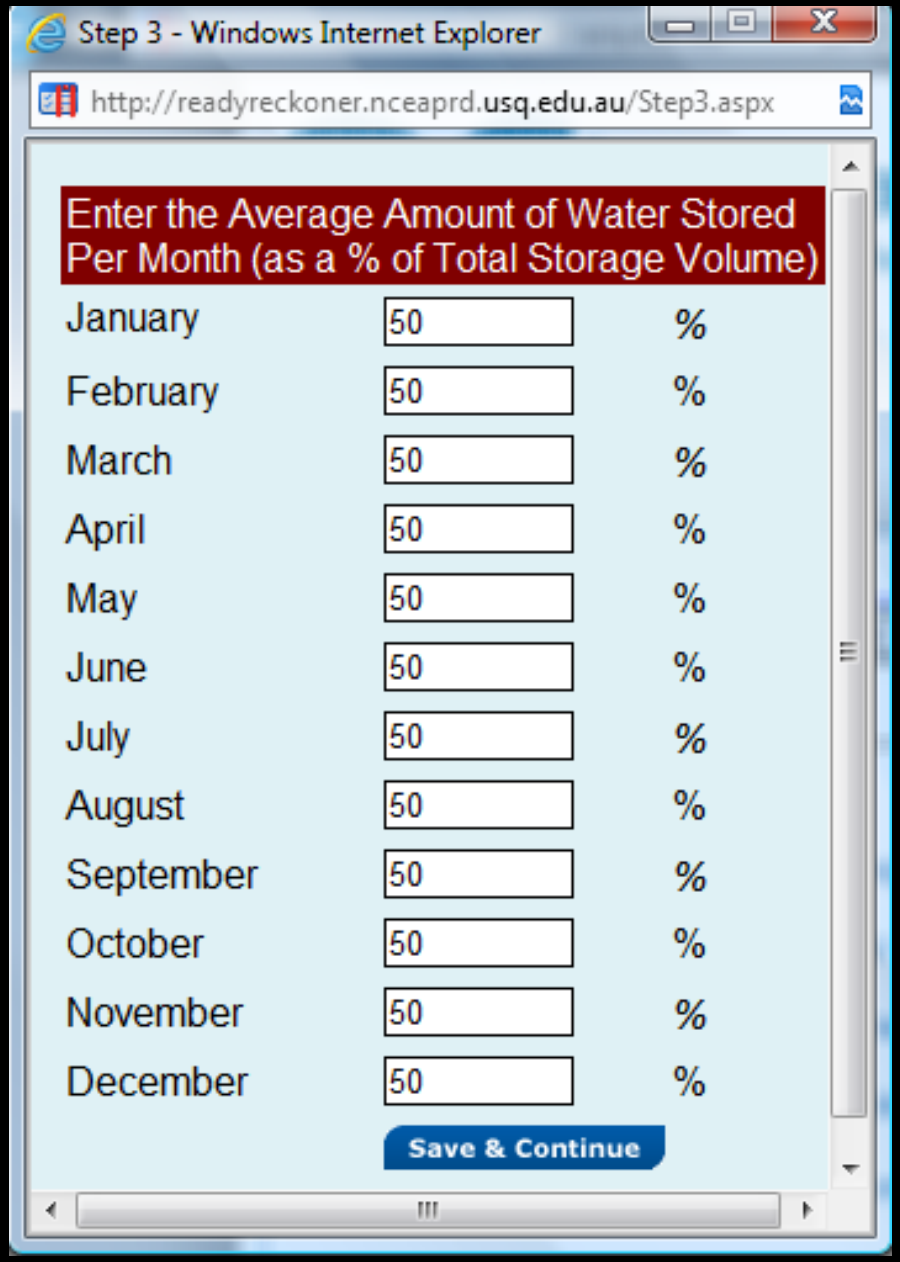
January	236	mm
February	191	mm
March	191	mm
April	146	mm
May	111	mm
June	93	mm
July	105	mm
August	132	mm
September	169	mm
October	205	mm
November	220	mm
December	241	mm
Annual Total	2040	mm

Save & Continue


Average Point Potential Evapotranspiration
Millimetres
3600
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
DARWIN
Nhulunbuy
Alyangula
Weipa
Kalumburu
Katherine
Kowanyama
Cooktown
Wyndham
Borroloola
Cairns
Innisfail
Elliott
Halls Creek
Derby
Broome
Normanton
Townsville
Tennant Creek
Mount Isa
Port Hedland
Balgo Hills
Karratha
Telfer
Torrens Creek
Mackay
Boulia
Newman
Alice Springs
Longreach
Rockhampton
Giles
Yulara
Birdsville
Bundaberg
Carnarvon
Three Rivers
Wiluna
Charleville
Tarcoola
Shark Bay
Meekatharra
Oodnadatta
BRISBANE
Laverton
Bollon
Marree
Tibooburra
Geraldton
Morawa
Cook
Tarcoola
Bourke
Coffs Harbour
Kalgoorlie-Boulder
Port Augusta
Tamworth
Balladonia
Ceduna
PERTH
Dubbo
Ivanhoe
Wagin
Elliston
Newcastle
Mildura
Esperance
ADELAIDE
SYDNEY
Port Lincoln
Wollongong
Pemberton
Albany
CANBERRA
Horsham
Albury
Moruya Heads
Cooma
MELBOURNE
Sale
Orbost
Warrnambool
Annual
Cape Grim
Burnie
St. Helens
Strahan
Swansea
Strathgordon
HOBART
200 0 200 400 600 800 km
Projection: Lambert conformal with standard parallels 10°S, 44°S.
CATCHMENT HYDROLOGY
BUREAU OF METEOROLOGY
Based on a 30-year climatology (1961 to 1990).
© Commonwealth of Australia, 2001.


Map
Satellite
Hybrid
Google
Imagery ©2011 DigitalGlobe, Cnes/Spot Image, GeoEye, Fugro - Terms of Use


Step 3 - Windows Internet Explorer
http://readyreckoner.nceaprd.usq.edu.au/Step3.aspx
Enter the Average Amount of Water Stored Per Month (as a % of Total Storage Volume)
January 50 %
February 50 %
March 50 %
April 50 %
May 50 %
June 50 %
July 50 %
August 50 %
September 50 %
October 50 %
November 50 %
December 50 %
Save & Continue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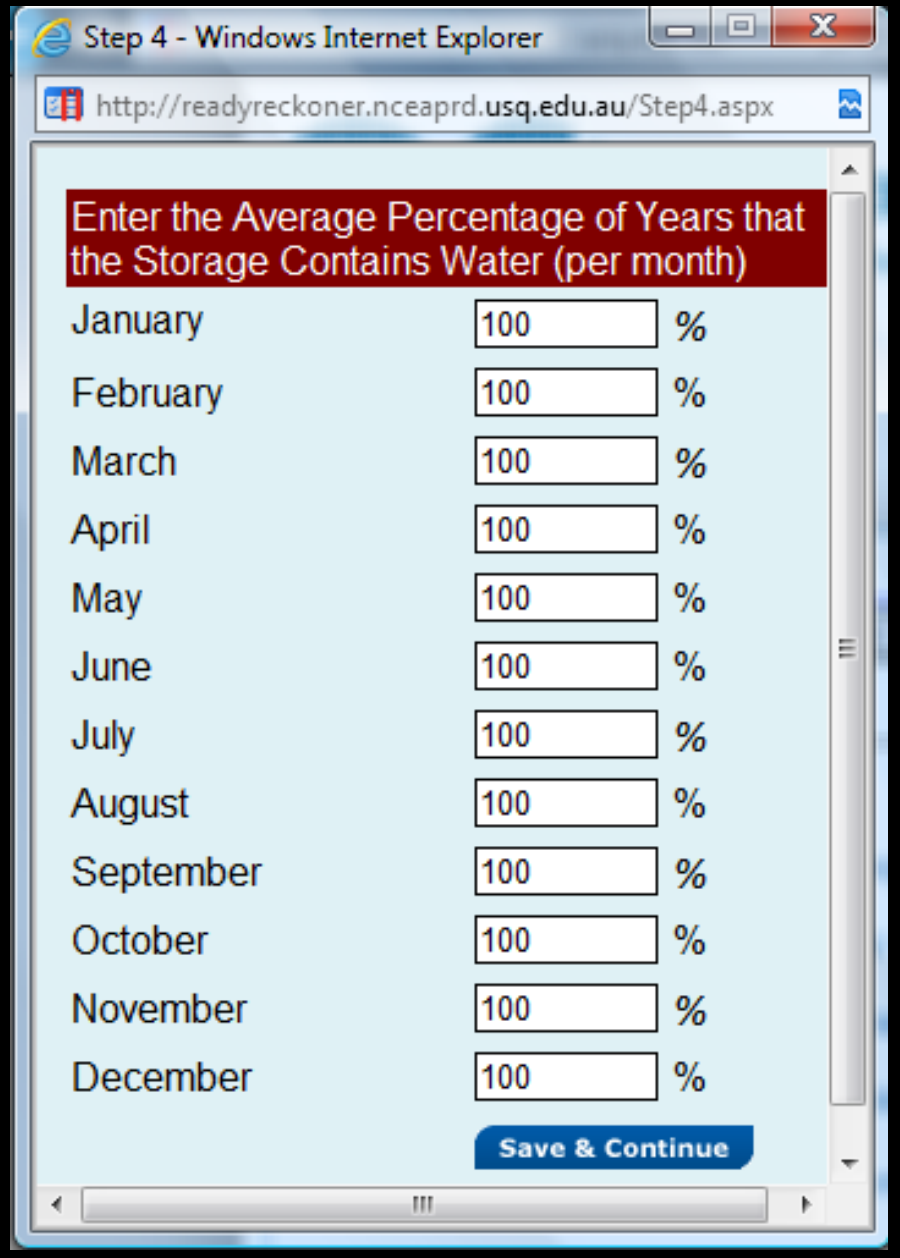
Step 4 - Windows Internet Explorer
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Enter the Average Percentage of Years that the Storage Contains Water (per month)
January 100 %
February 100 %
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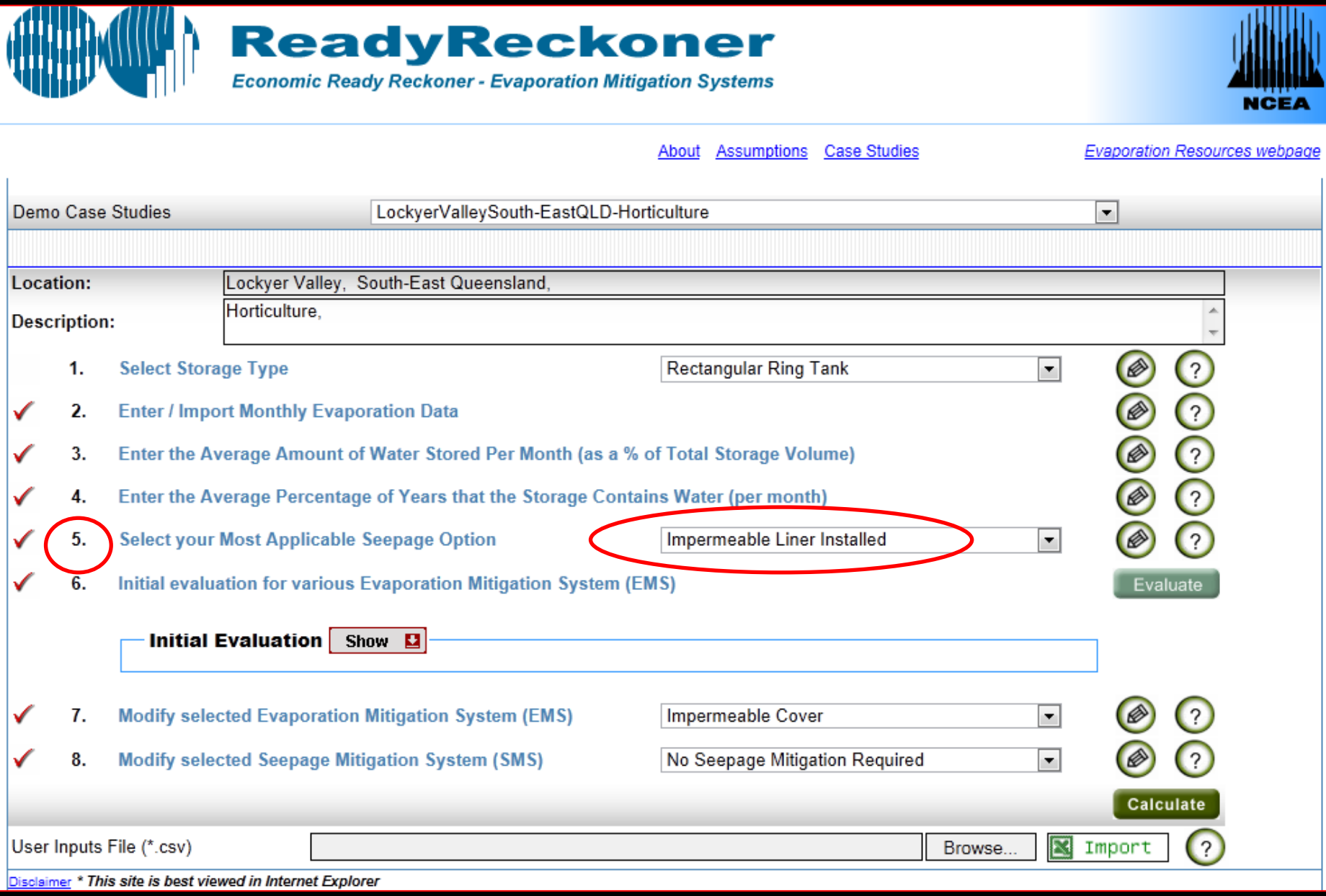
April 100 %
May 100 %
June 100 %
July 100 %
August 100 %
September 100 %
October 100 %
November 100 %
December 100 %
Save & Continue



* I have measured seepage loss * I don't know the seepage loss

Step 6 - Initial Evaluation

Evaporation Mitigation System	Performance	Cost	Cost to Save Water ($/ML)
Impermeable Cover	Good	Low	225.6
	Poor	High	2,667.4
Shade Cloth	Good	Low	371.5
	Poor	High	2,167.6
Chemical Monolayer	Good	Low	27.8
	Poor	High	672.7
Modular Cover	Good	Low	148.5
	Poor	High	2,096.3
Increase Wall Height	Good	Low	133.3
	Poor	High	1,351.6

Step 7 Detail for impermeable cover

Efficiency of EMS (Range - 85-100% (90-95% recommended))		90	%
Capital (Upfront) Cost (Range - $3.50-$30.00/m2)	$	7	per m2
Lifespan (~ 10-15 years recommended)		15	years
Annual Operating and Maintenance Cost (~ $0.01 - $0.03/m2 recommended)	$	0.2	per m2
Discount Rate (%)		5	%

Save & Continue

Step 7 Detail for impermeable cover

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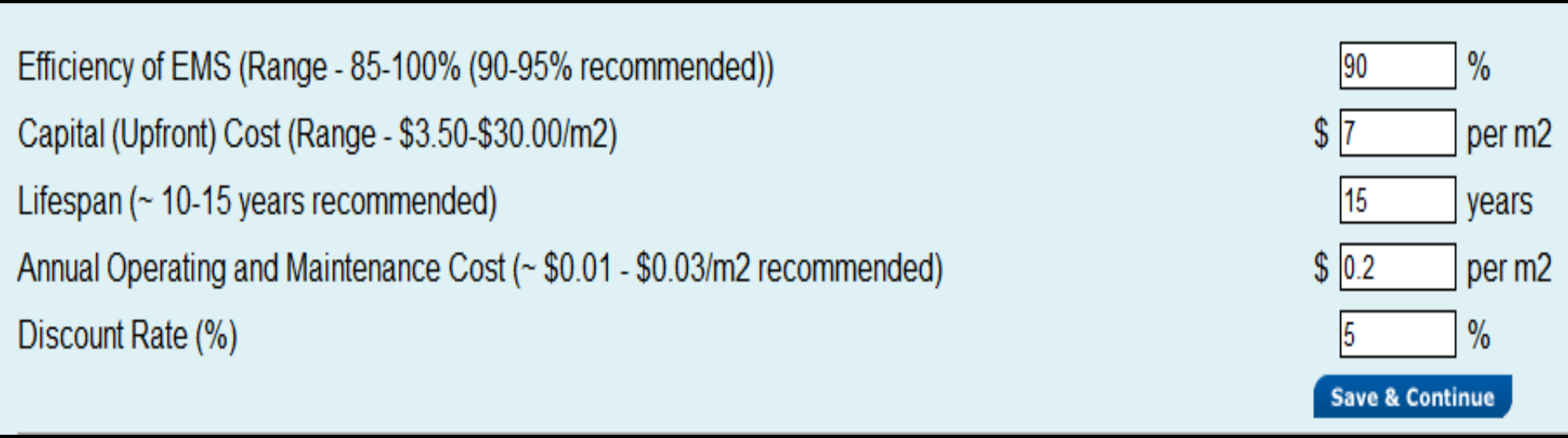
Save & Continue

Step 7 Detail for impermeable cover



Step 8 Detail for seepage mitigation

No system needed, impermeable liner already installed

Final calculation

ReadyReckoner

Economic Ready Reckoner - Evaporation Mitigation Systems

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Save Session As CSV Save Page As PDF

Location : Lockyer Valley, South-East Queensland,
Description : Horticulture,

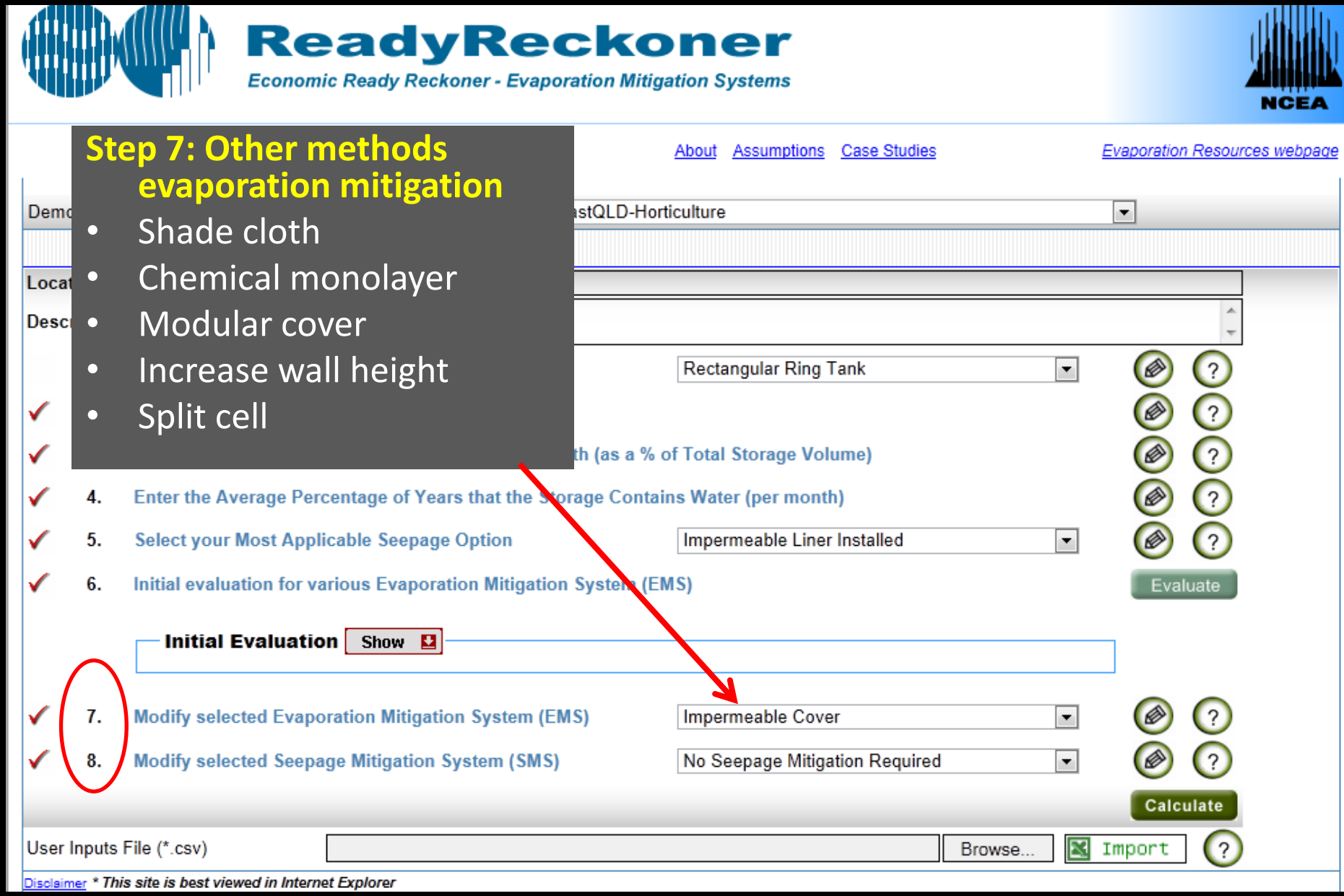
Result

Result - Rectangular Ring Tank			
Calculated Storage Volume at Full Supply Level		2.4	ML
Surface Area at Full Supply Level		.2	ha
Annual Seepage Loss		0	ML
Annual Evaporation Loss		3.3	ML
Evaporation Mitigation System: Impermeable Cover			
Total Water Saved From Evaporation		3	ML each year
Cost to Save this Water	$	596.3	per ML per year
Total Cost of Evaporation Mitigation System at Installation	$	13,837	
Annual Operating and Maintenance Cost	$	395.3	

See case study in paper

Sensitivity Analysis - Cost to save water ($/ML)

Re-do Steps 7 & 8 with other mitigation methods



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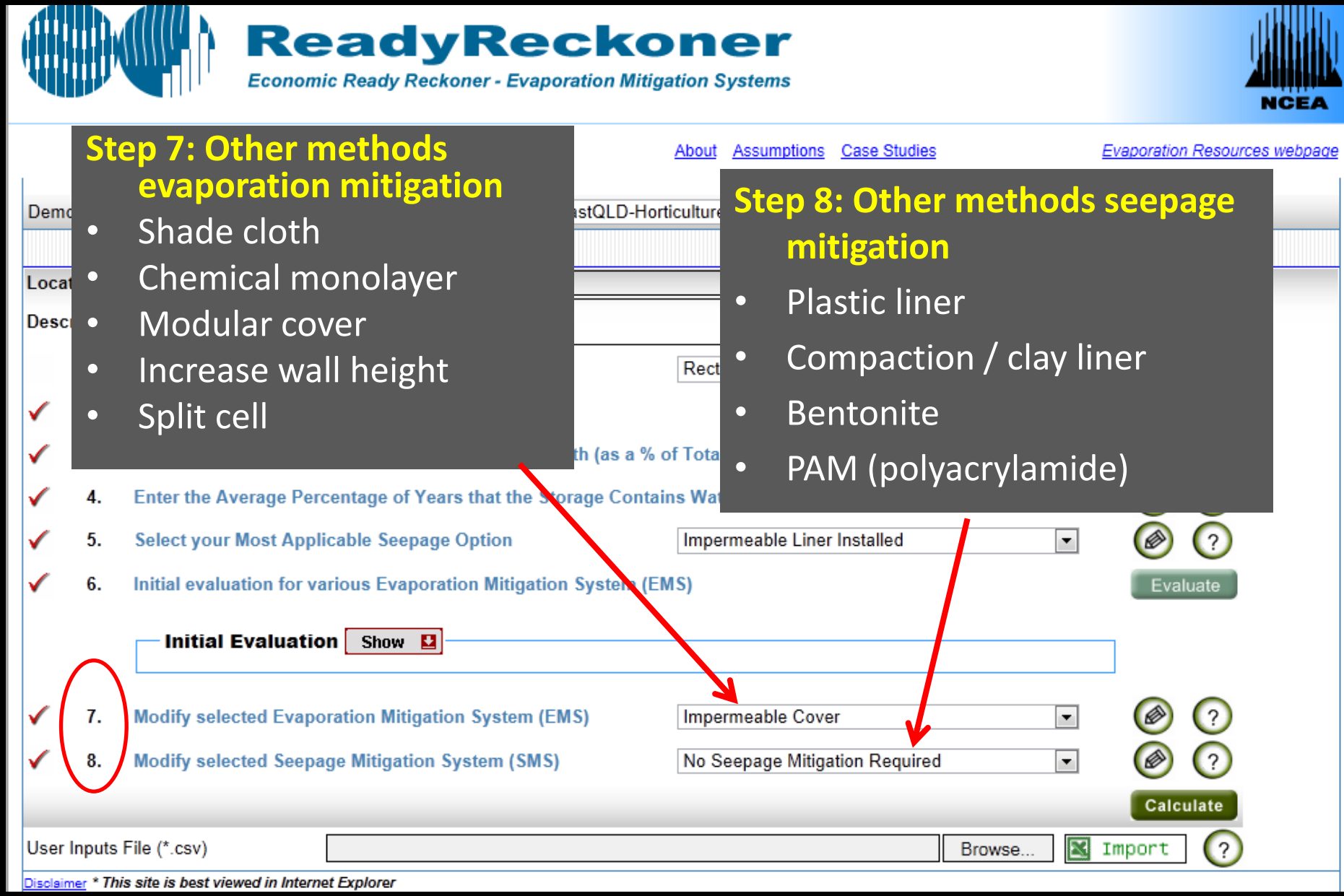

Summary

Ready Reckoner valuable tool to help with decision making by estimating

- ❑ **Potential water loss**
- ❑ **Possible water savings**
- ❑ **Cost of mitigation methods**

Cost of doing nothing

Cost of doing something

Resources on dam management

http://readyreckoner.nceaprd.usq.edu.au

http://farmdammanagement.ncea.biz

www.ncea.org.au

www.npsi.gov.au

http://farmdammanagement.ncea.biz

MAIN MENU

- Home
- Evaporation And Seepage
- Economics
- Biodiversity
- Aquaculture
- Water Quality
- Weed and algae management
- Integrated water management

HOME

Welcome to the Farm Dam Management Resource Kit

This new resource is designed to provide clear information to:

- Measure and manage seepage and evaporation
- Calculate costs in managing water losses
- Improve biodiversity
- Assess options for aquaculture
- Manage water quality, weed and algae