GROUNDWATER in the Western Mount Lofty Ranges

Dragana Zulfic and Steve Barnett
DWLBC

Government of South Australia
Department of Water, Land and Biodiversity Conservation

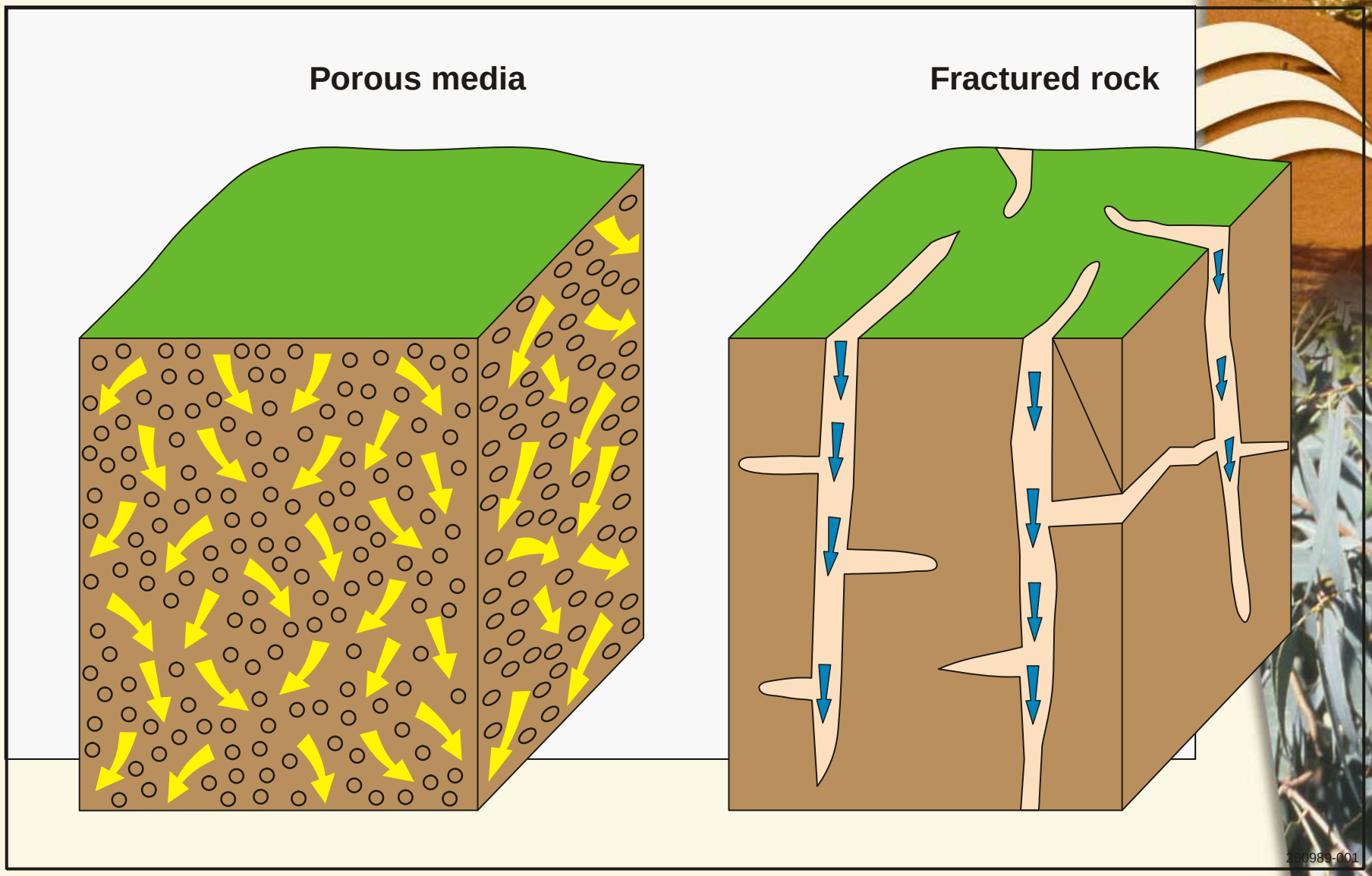
CONTENTS

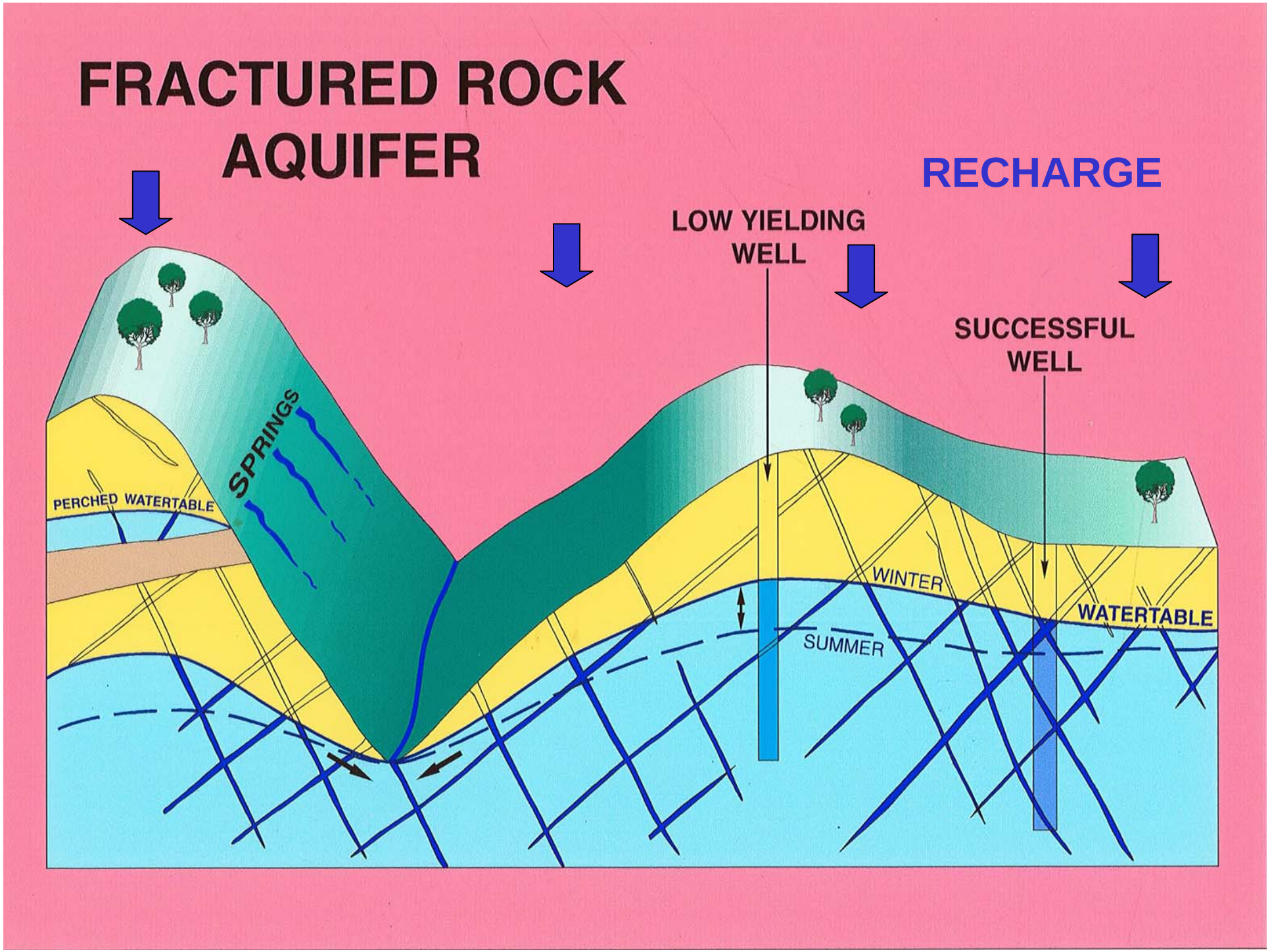
Hydrogeology
Groundwater Investigation
Monitoring
Groundwater Management

HYDROGEOLOGY

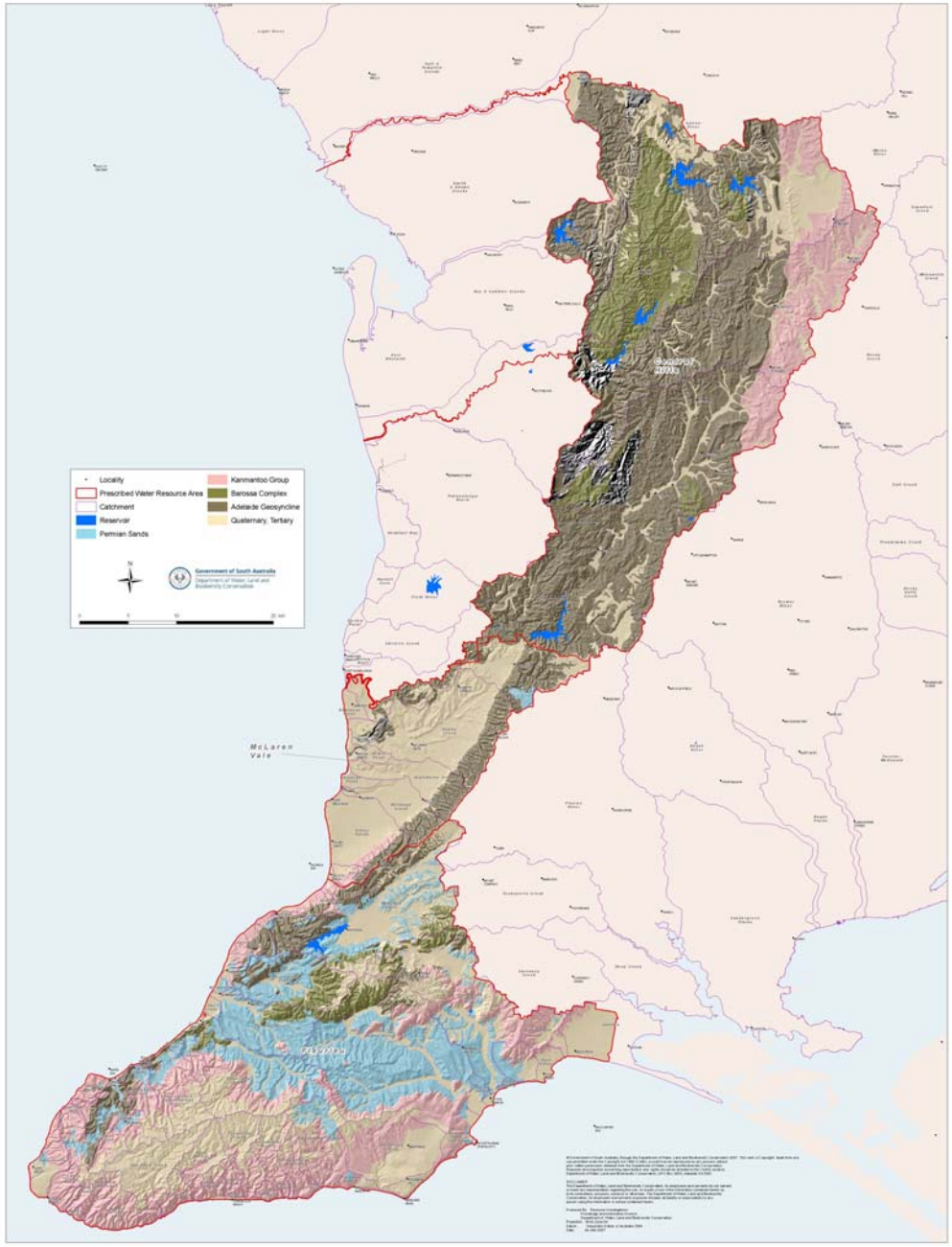
There are two types of aquifers

- Fractured rock aquifers in hills
- Sedimentary aquifers beneath the plains and in the valleys

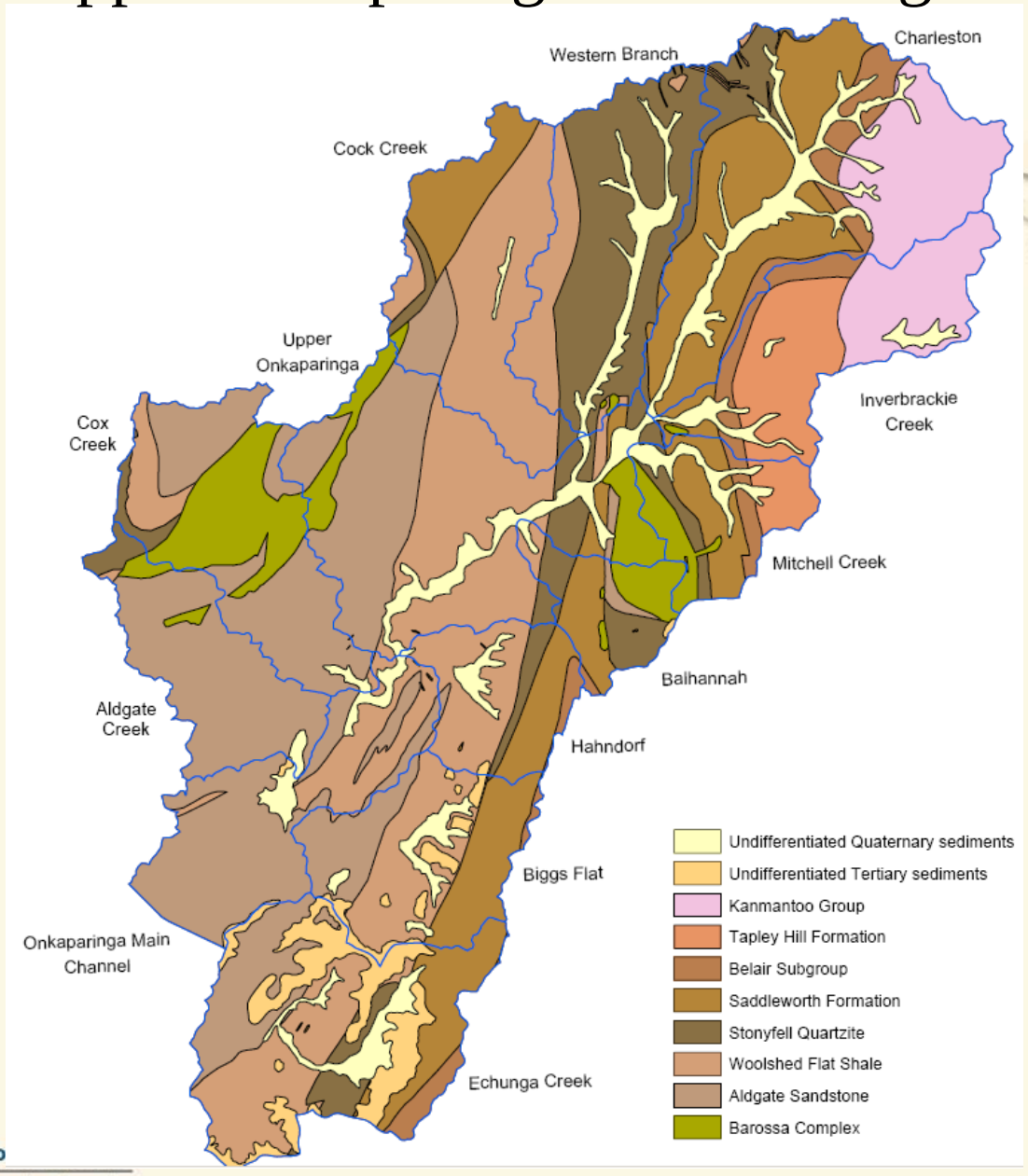

Porous media
Fractured rock
200989-001

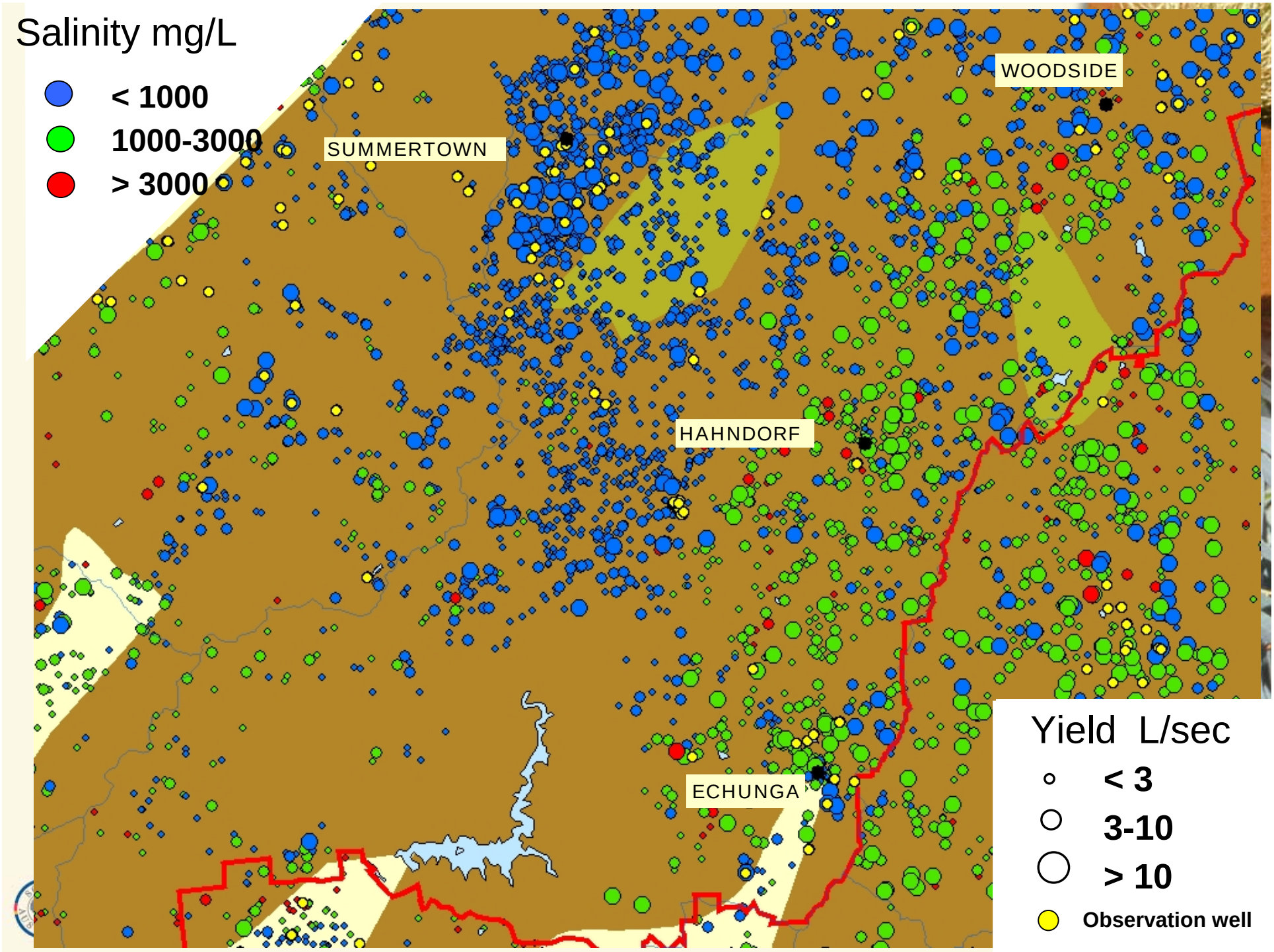

FRACTURED ROCK AQUIFER
RECHARGE
LOW YIELDING WELL
SUCCESSFUL WELL
SPRINGS
PERCHED WATERTABLE
WINTER
SUMMER
WATERTABLE

Geology and Distribution of Aquifer Types within the Western Mount Lofty Ranges



Upper Onkaparinga catchment geology




Salinity mg/L
< 1000
1000-3000
> 3000
SUMMERTOWN
WOODSIDE
HAHNDORF
ECHUNGA
Yield L/sec
< 3
3-10
> 10
Observation well

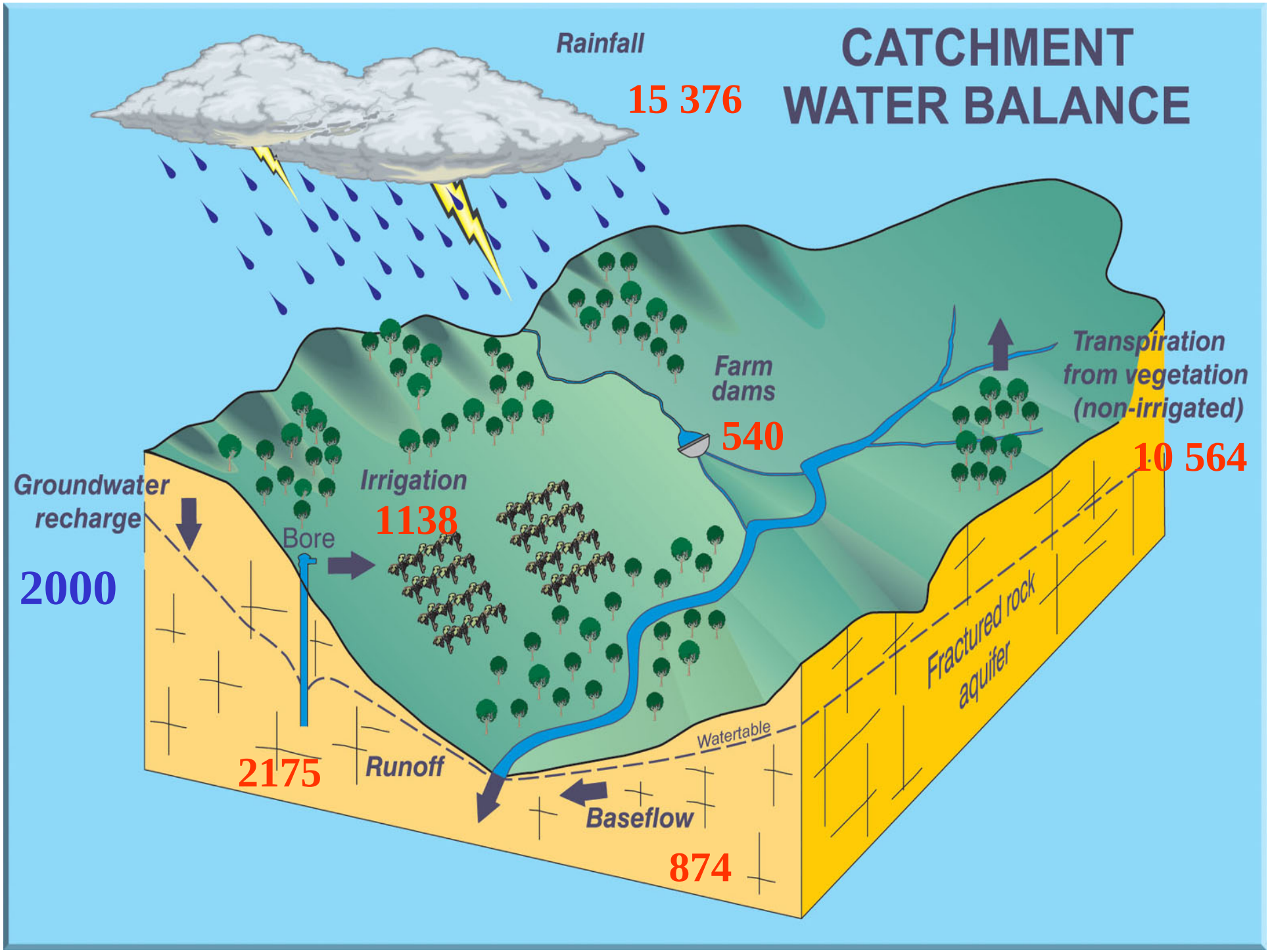
HYDROGEOLOGY

Characteristics of the various aquifers determine the current usage and potential for future development

How do we assess the amount of groundwater that is available to be allocated through the WAP process?

Recharge estimates from

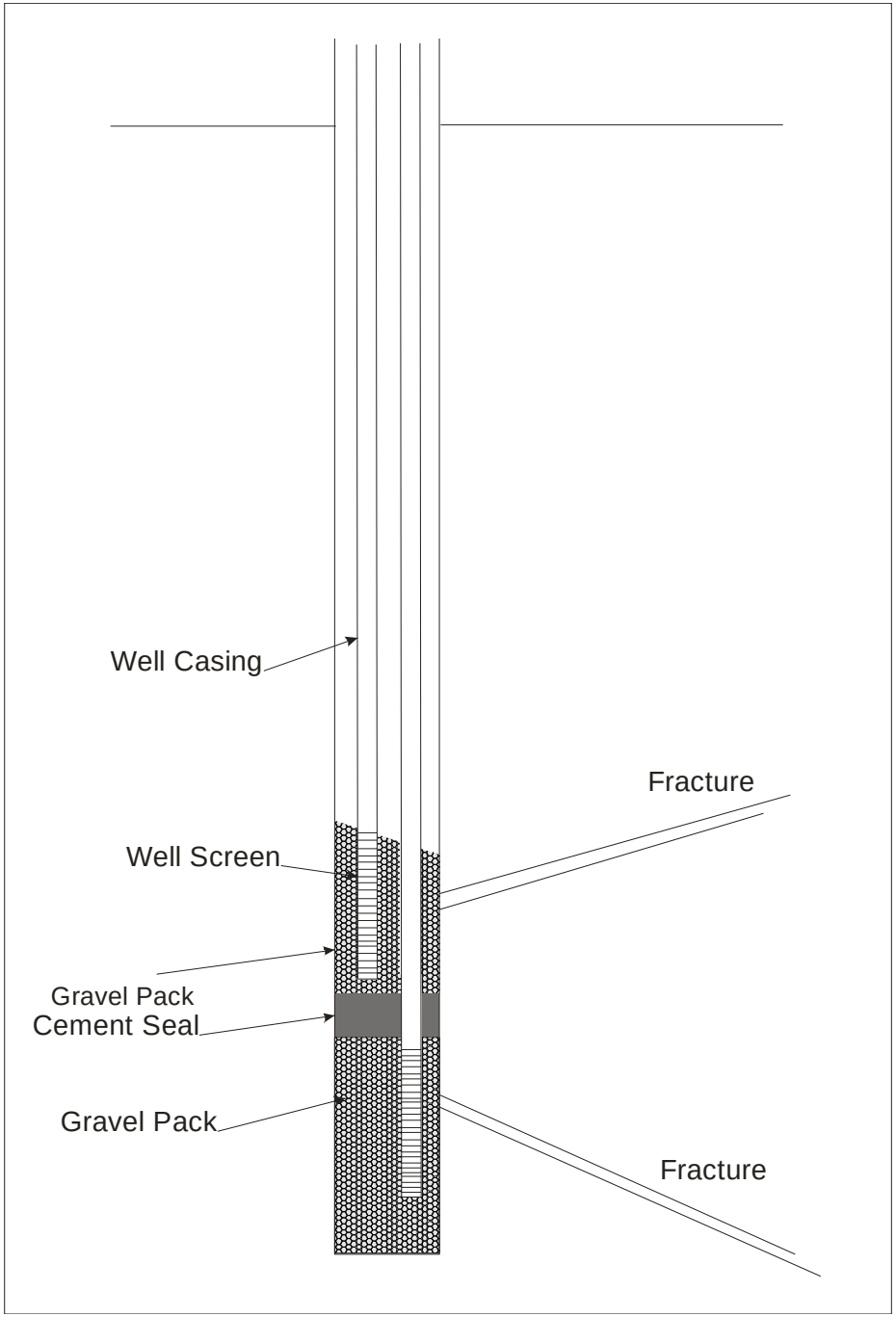
- catchment water balance
- intensive point investigations


CATCHMENT
WATER BALANCE
Rainfall
15 376
Farm
dams
540
Transpiration
from vegetation
(non-irrigated)
10 564
Irrigation
1138
Groundwater
recharge
2000
Bore
Fractured rock
aquifer
Watertable
2175
Runoff
Baseflow
874

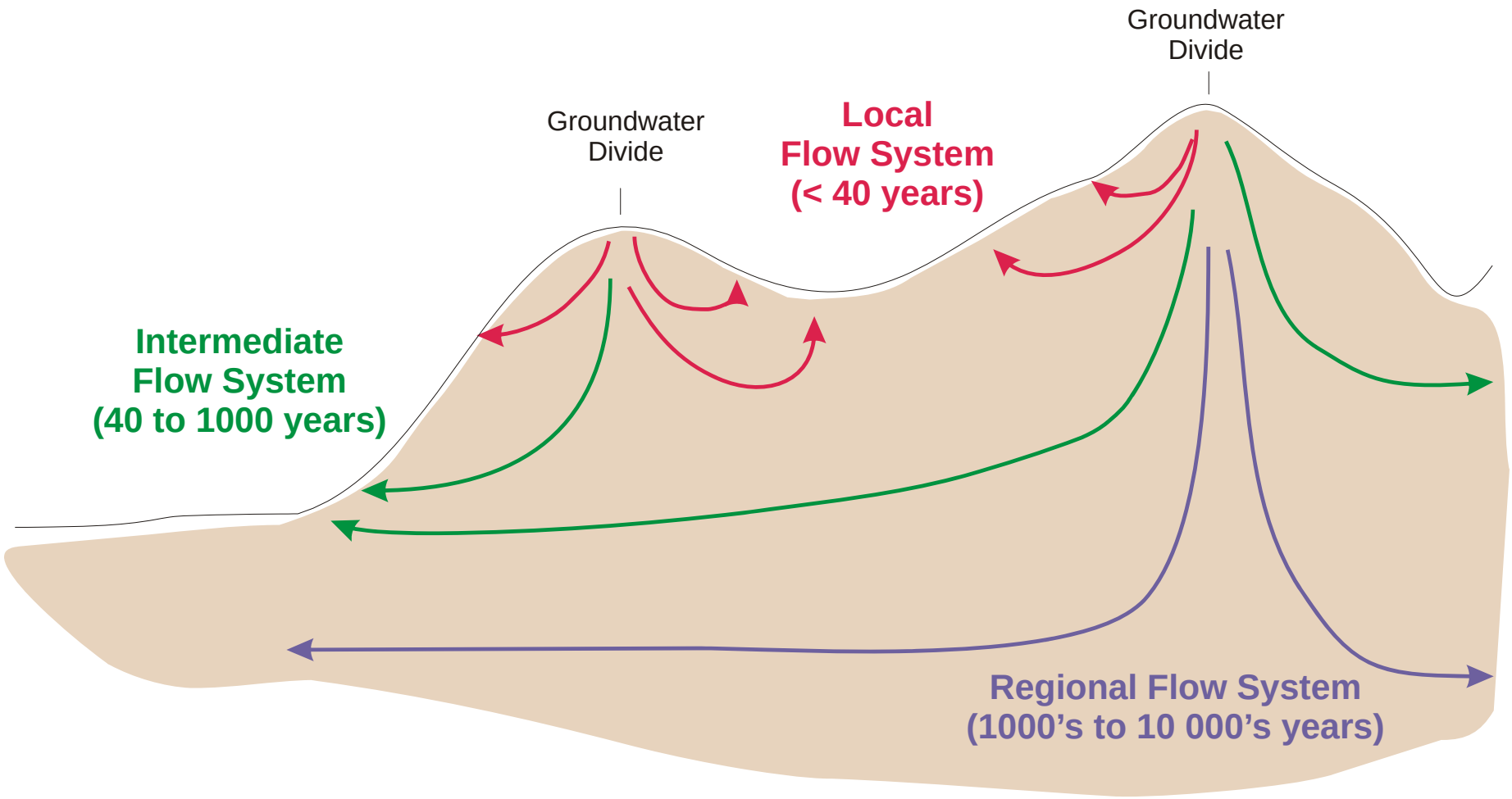
SITE INVESTIGATIONS

- Install specialised wells
- Downhole geophysical logging
- Groundwater chemistry sampling

Piezometer Installation



Groundwater Flow Systems in the MLR



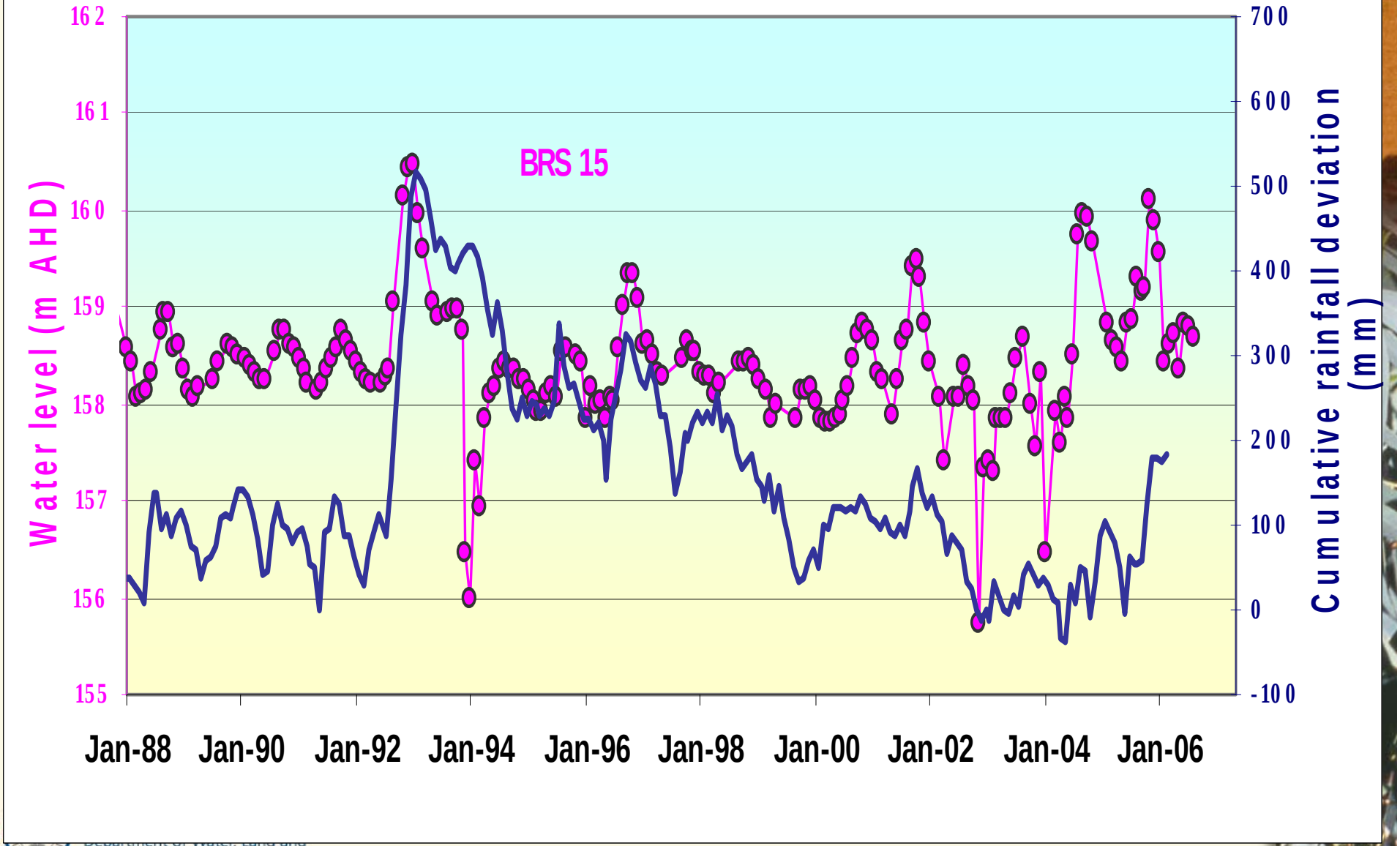
MONITORING

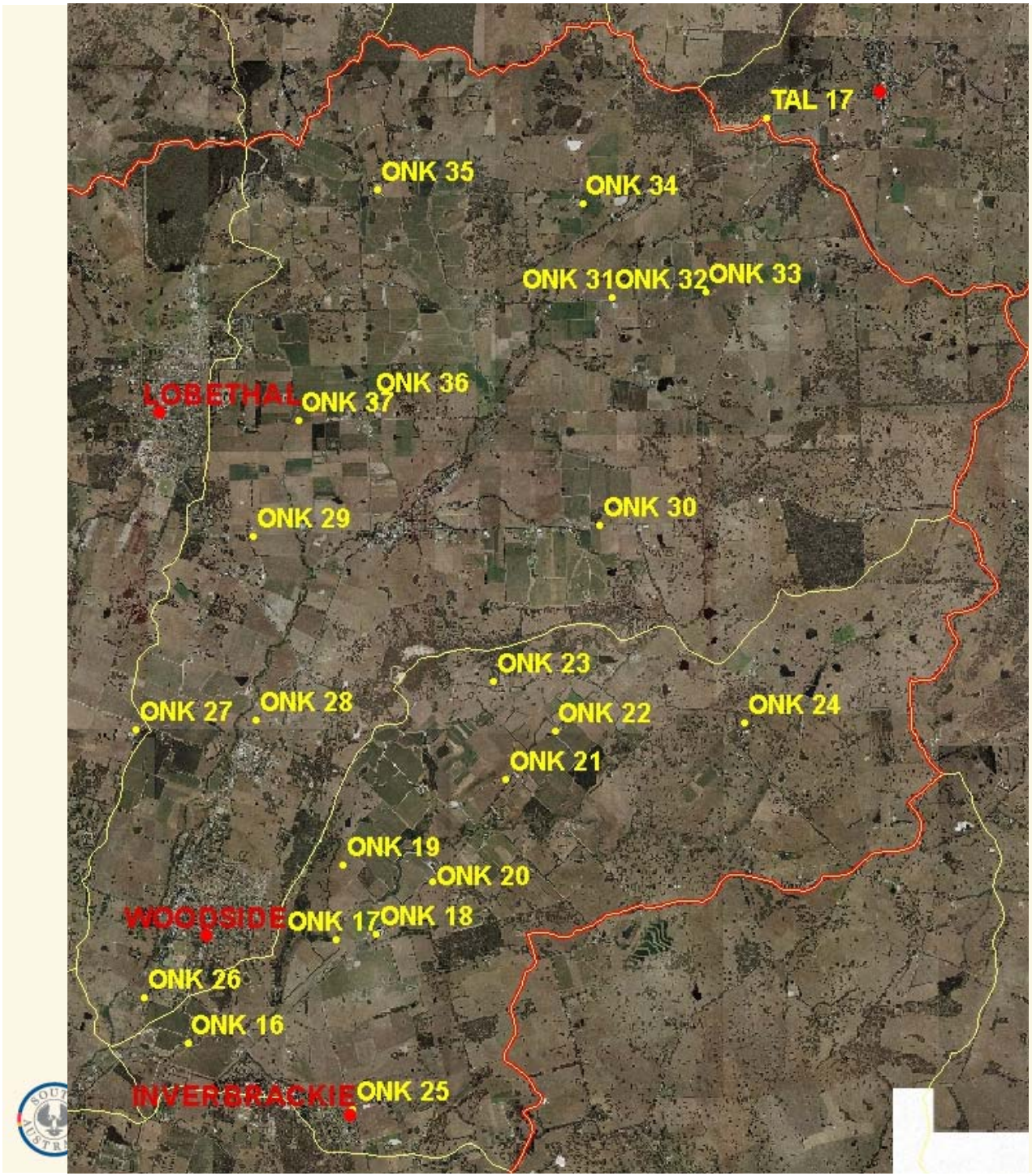
Why monitor ??

- Impacts of irrigation extraction
- Impacts of land use change - clearing and forestry
- Impacts of climate change
- River / groundwater interaction (floods)

Government of South Australia
Department of Water, Land and Biodiversity Conservation

Fractured Rock aquifer hydrograph vs cumulative rainfall deviation




TAL 17
ONK 35
ONK 34
ONK 31
ONK 32
ONK 33
LOBETHAL
ONK 36
ONK 37
ONK 29
ONK 30
ONK 23
ONK 27
ONK 28
ONK 22
ONK 24
ONK 21
ONK 19
ONK 20
WOODSIDE
ONK 17
ONK 18
ONK 26
ONK 16
INVERBRACKIE
ONK 25

Monitoring results can be viewed on the internet using OBSWELL

https://info.pir.sa.gov.au/obswell/new/obsWell/MainMenu/menu

Monitoring networks in the WMLR:

Torrens
One Tree Hill
Piccadilly
Lenswood
Charleston
Inverbrackie

Echunga
Willunga
Myponga
Hindmarsh Tiers
Southern Fleurieu

MINING ACT
Legislative requirements

- 1. <u>Mining Lease</u>
  - Statutory consultation is required
  - Details of mining concept and risks to environment
  - If to be granted, will set conditions to protect environment

- 2. Mining and Rehabilitation Program (MARP)
  - – Details of how environmental risks will be managed
  - – Impacts on groundwater resource and users must be included (DWLBC)
  - – May be reviewed during mine life
  - – A licence and works approval are also required under Environment Protection Act before mining can be undertaken

- 3. <u>"Waivers of exemption"</u>
  - –must be obtained for mining operations near houses (<400m) or on cultivated land
  - –negotiate compensation with affected landowners
  - –If unable to negotiate, may be taken to the Warden's court
  - –Must be obtained before mining operations begin

Early stakeholder consultation

Benefits:

- Applicant stays in control of process/issues
- Less delays to approval process
- Less risk issues may become political
- Tap into local knowledge
- Build good working relationship for operational phase

Assessment process

Mining Lease Application

↓

Statutory public Consultation

↓

PIRSA Assessment and draft Lease conditions

↓

Lease offered and accepted

↓

MARP Assessment and other agency approvals

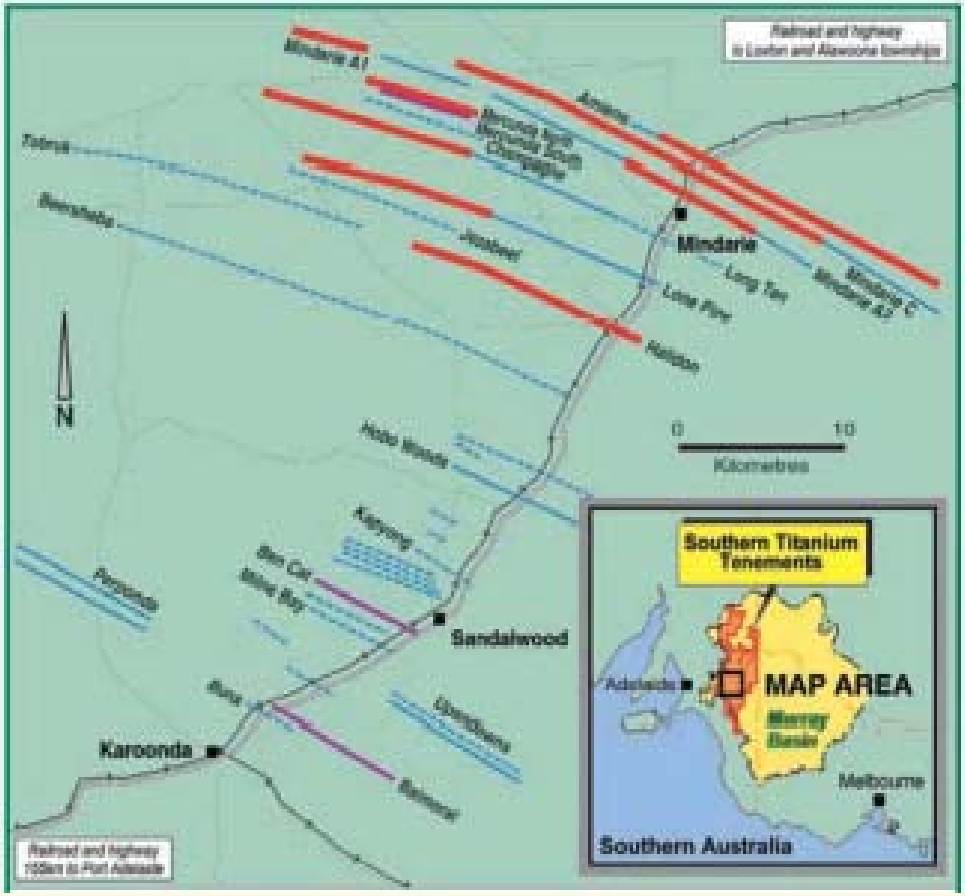
↓

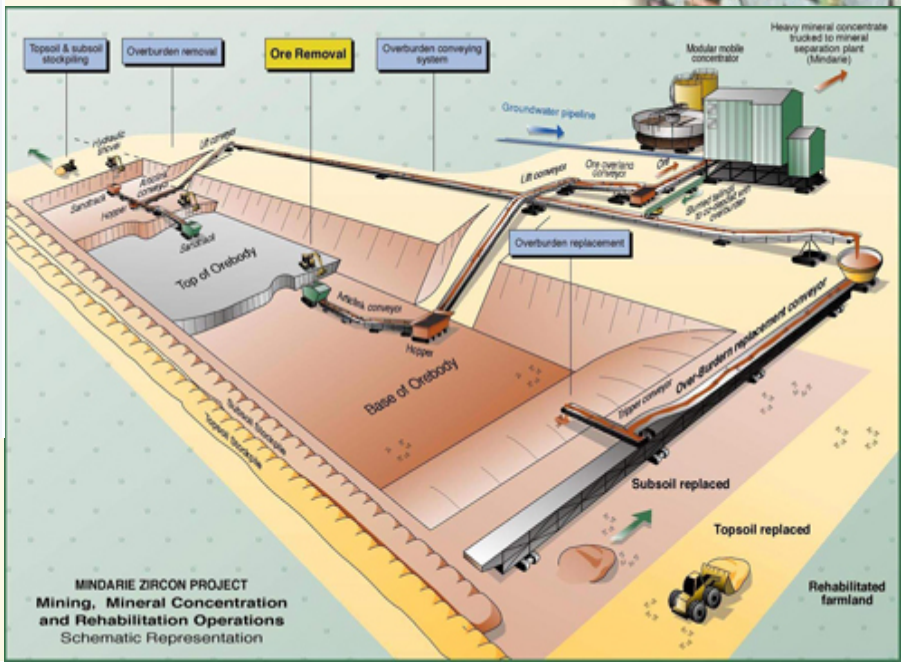
Mining can begin

DWLBC ROLE

- Groundwater management
- Sustainable yield (PAV)
- Protection of GDEs
- Monitoring program
- Liaise with PIRSA on mining issues

Mindarie Heavy Mineral Sands
Australian Zircon





Government of South Australia
Department of Water, Land and Biodiversity Conservation

MARP - What is it?

- **M**ining **A**nd **R**ehabilitation **P**rogram
- An important legal document required by PIRSA, ensuring that mining companies have appropriate rehabilitation, environmental management plans that are **integrated** with the mining plan
- Want to avoid ‘fixing after the event’ – rather, rehabilitation allowed for in all mine planning and management
- The MARP must be approved by PIRSA and the bond in place before mining can commence
- Failure to comply with an approved MARP is considered a breach of the Mining Act and Regulations

Groundwater Monitoring

- Drawdown has been modelled; expecting drawdown of 3 m at 500 m distance, dropping to about 1.5 m at 2 km distance
- Monitoring of water levels and water quality up to 10 km distance by company
- Monitoring continues after mining
- Annual Water Report to PIRSA and DWLBC
- DWLBC intend to make monitoring results available on the web - Obswell

Groundwater Impacts

- Strategies to supplement adversely affected existing users include:
  - Lowering of pump intakes in existing wells if sufficient well depth is available
  - Deepening of existing wells affected by adverse drawdown of the aquifer
  - Provision of supply from the main Australian Zircon wellfield, or other existing wells
- These provisions have been agreed with the landholders as part of the company's access negotiations

Bird in Hand

- Will have to apply for licence like any other landholder (not existing user)
- Engaged local groundwater consultants who are familiar with area and issues (not a multi-national)