Pathways to sustainability

Graham Brookman

Property…what is it for?

Water Stats

- Adelaide uses about 300 gigalitres pa
- In a dry year 80% comes from the Murray
- The energy used to lift the water over the hills is equivalent to burning over 60,000 tonnes of brown coal
- Current use of recycled Adelaide sewage water is about 20%


Murray Mouth
dredge
2003....
Water for homes


Water for food production
Image © 2008 DigitalGlobe
35°15'03.04" S 139°26'02.64" E
elev 1 m
Apr 26, 2005

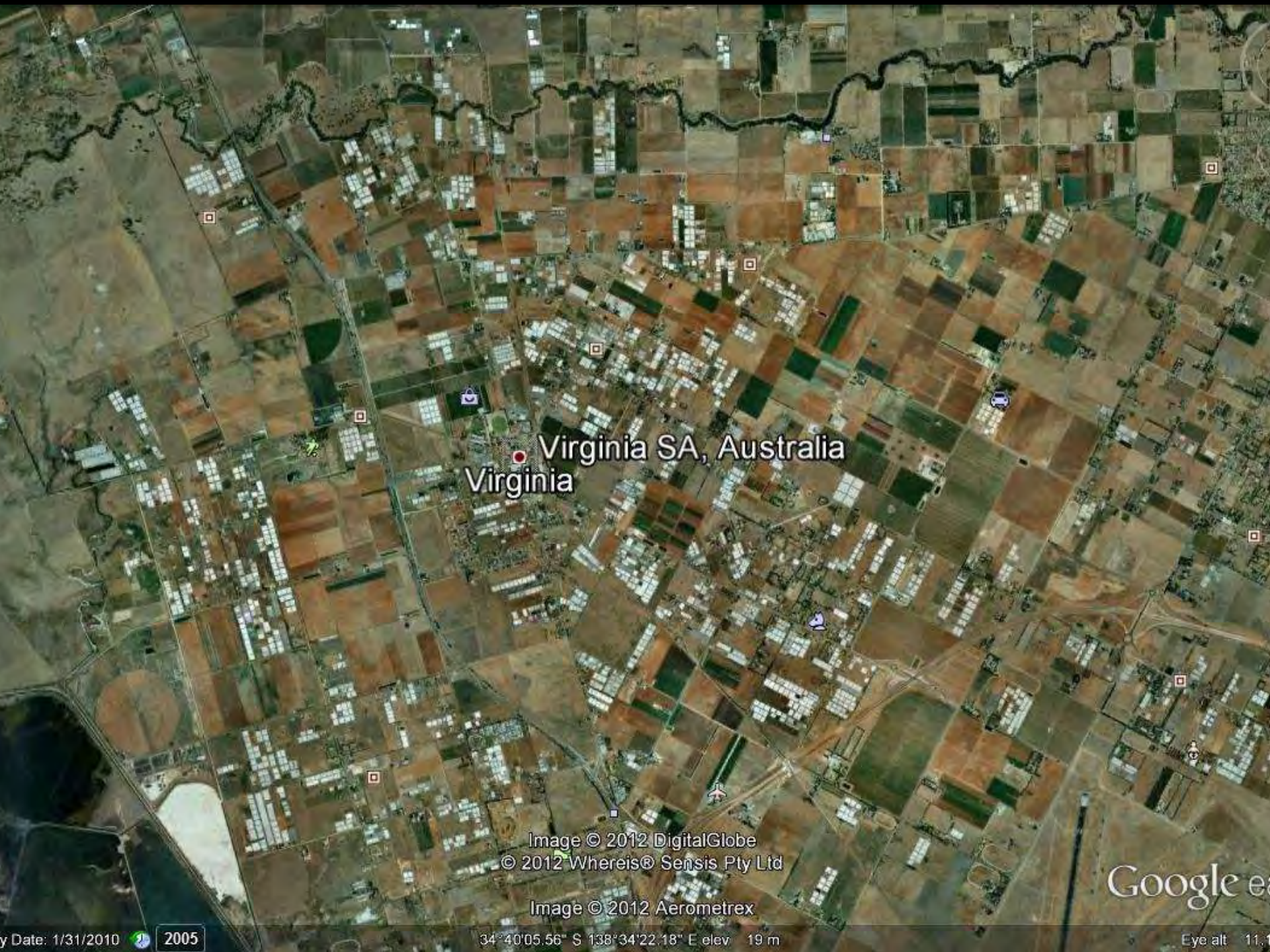
Desalinated water will have an even higher environmental cost

Is water available for relatively intensive urban/peri-urban agriculture?

- Currently well over 60% of Bolivar water is discharged into the sea. The government should be supporting the piping of more recycled water to the NAP (double)
- The increase in the Northern Adelaide Plains population will more than double its stormwater and sewerage flows in the next 18 years
- The sewerage can be exploited for water and nutrients
- Excellent aquifers exist for storage of filtered stormwater

Northern Adelaide Plains

- Currently support SA's highest level of production and density of farmers (>1200 growers & > 3000 employees = 10% of SA's farmers & rural workforce)
- Australia's largest single greenhouse production area, > 900 ha
- Connected to Bolivar sewerage works by a pipeline to facilitate re-use of waste water and nutrients (including over 1500 tonnes of elemental nitrogen and 300 tonnes of phosphorus annually)
- Home to the main facilities for composting Adelaide's urban green and food waste into agricultural inputs
- Strategically located for value-adding and transport


Virginia SA, Australia
Virginia
Image © 2012 DigitalGlobe
© 2012 Whereis® Sensis Pty Ltd
Image © 2012 Aerometrex
Google
y Date: 1/31/2010
2005
34°40'05.56" S 138°34'22.18" E elev 19 m
Eye alt

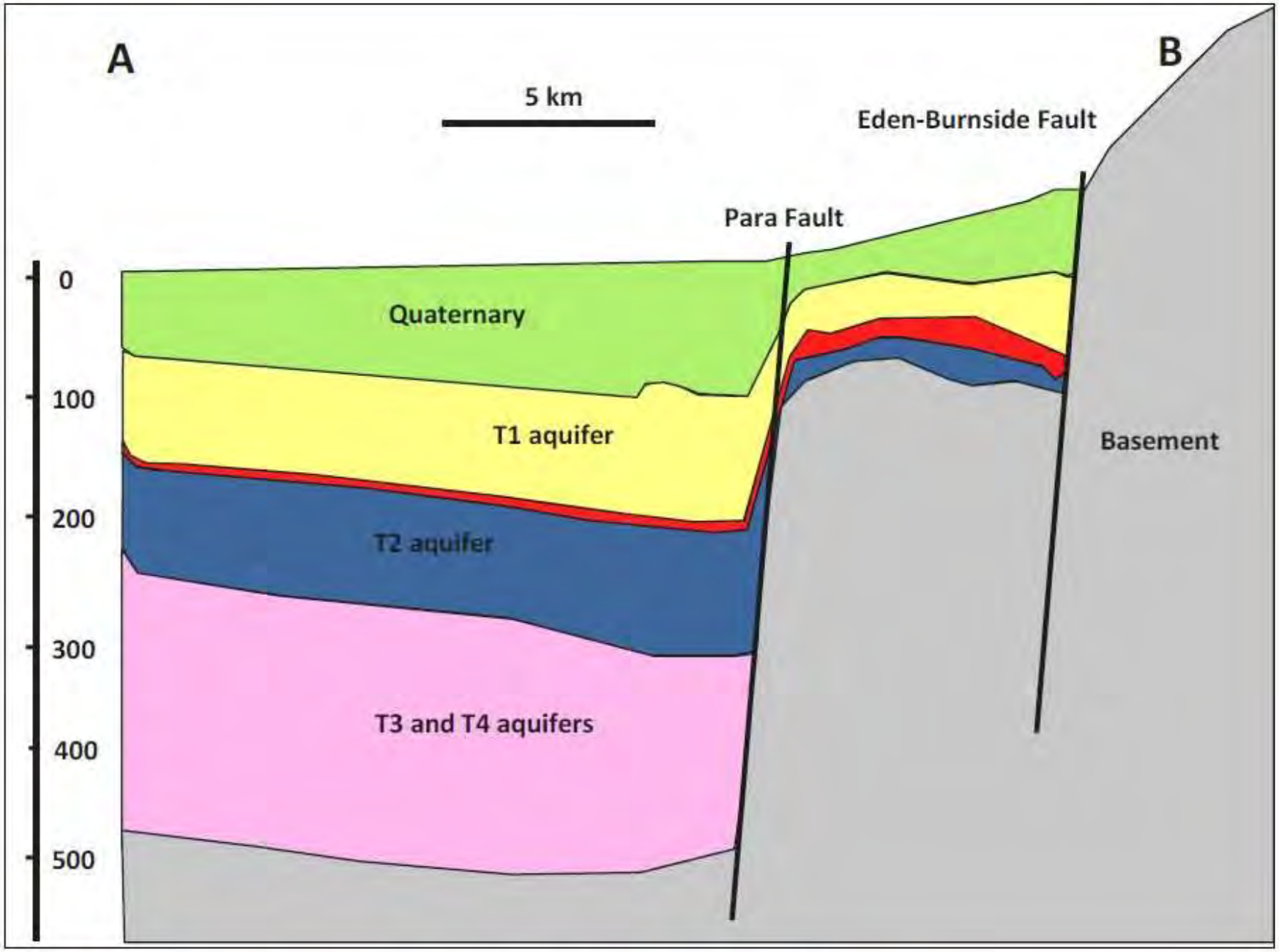
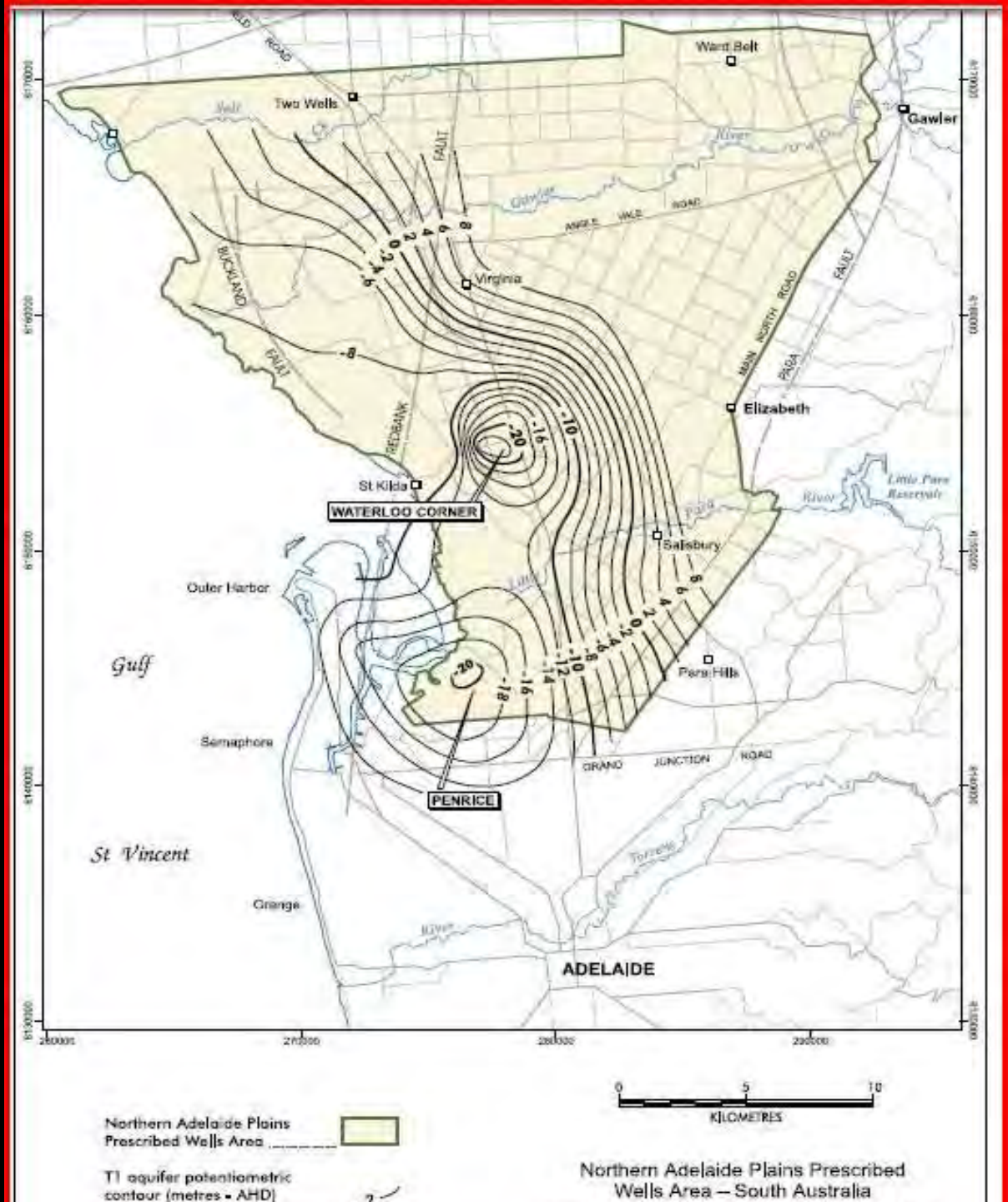


Figure 2. Geological cross section across the Central Adelaide PWA

T1 aquifer

- This aquifer is now largely covered by Adelaide's urban development
- It is in good condition and recharge schemes mean that more use can be made of it, sustainably (example Salisbury)
- Intensive food growing within greater Adelaide is the most sustainable way of utilising this resource

T1


Two Wells
Virginia
St Kilda
WATERLOO CORNER
PENRICE
Elizabeth
Salisbury
Para Hills
Outer Harbor
Semaphore
Grange
ADELAIDE
Gulf
St Vincent
Gawler
West Bolt
FAULT
BUCKLAND
REDBANK
MAIN NORTH ROAD
GRAND JUNCTION ROAD
Para
Little Para Reservoir
Torrens
0
5
10
KILOMETRES
Northern Adelaide Plains Prescribed Wells Area
T1 aquifer potentiometric contour (metres - AHD)
Northern Adelaide Plains Prescribed Wells Area – South Australia

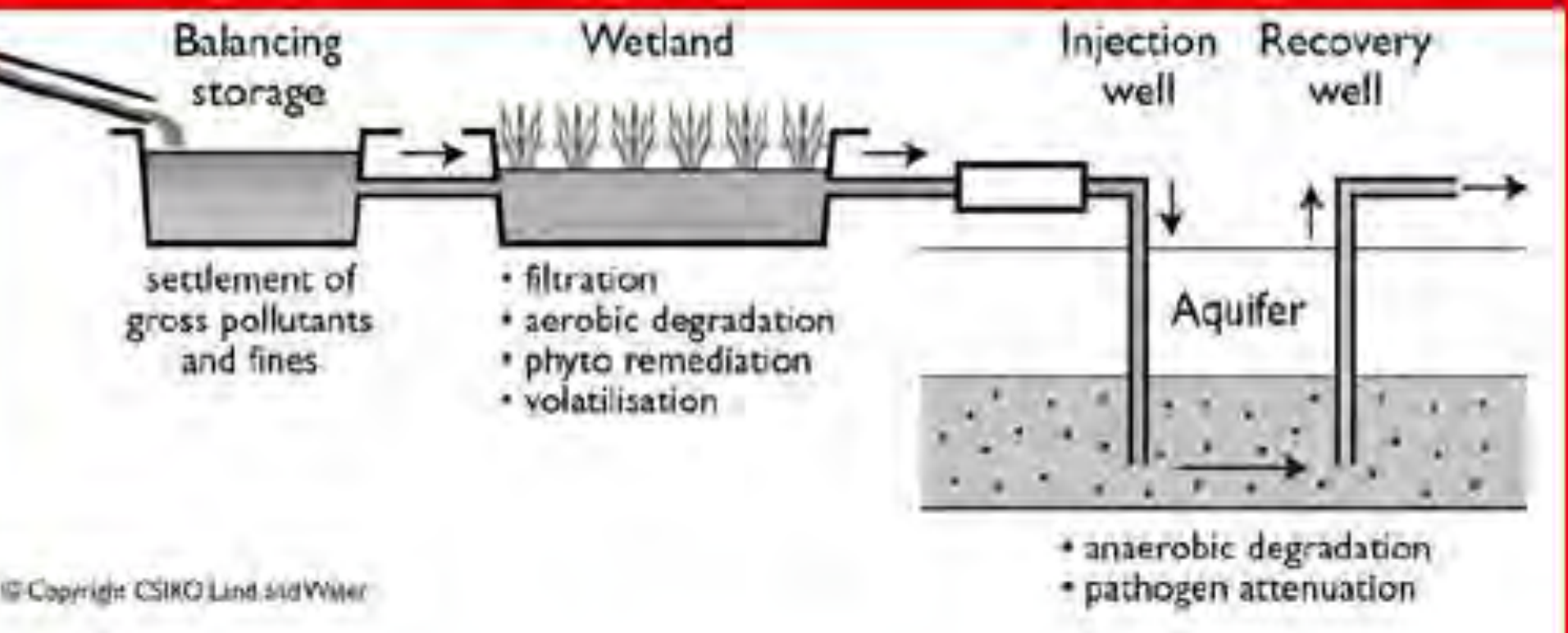


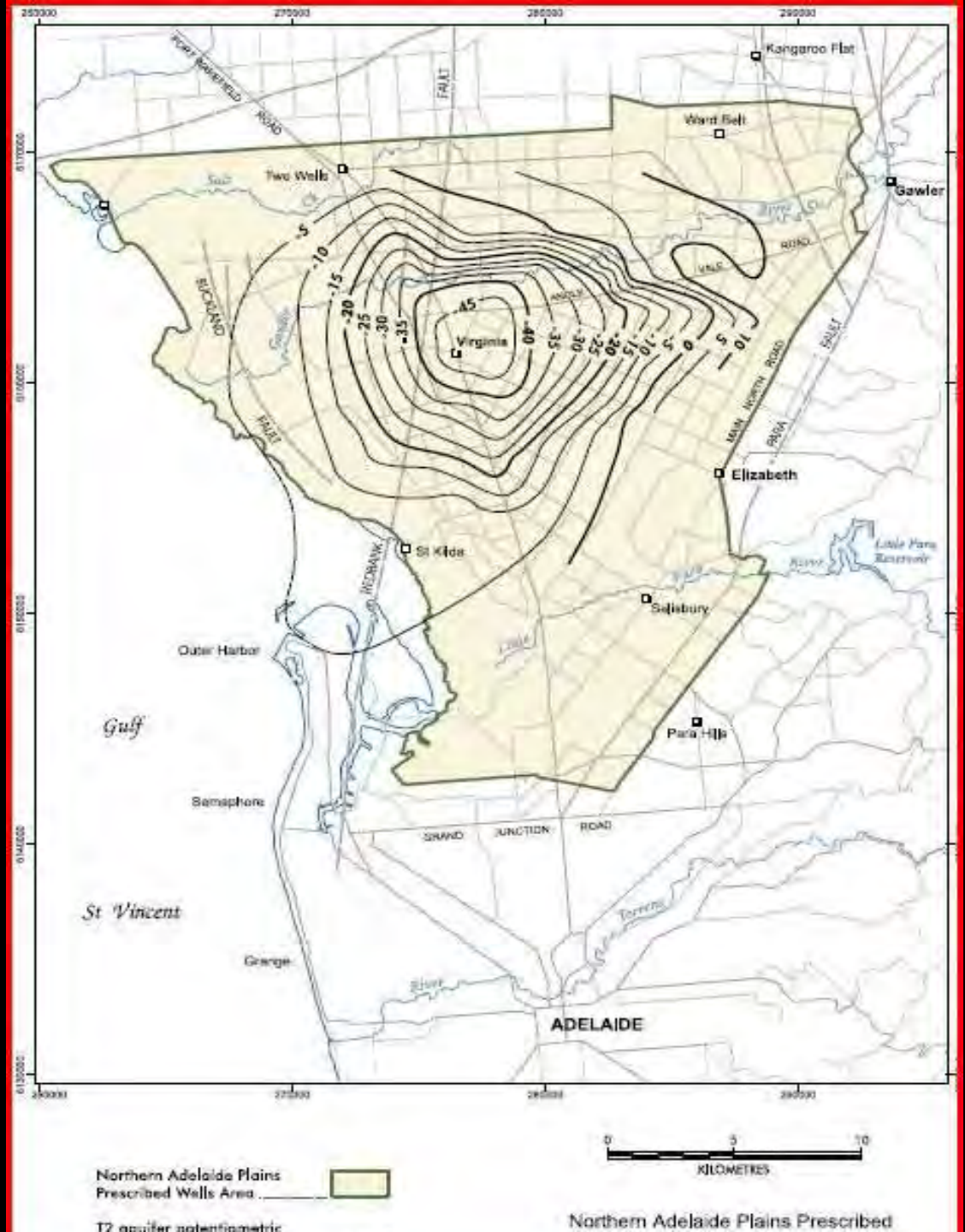
Figure 1: Schematic Representation of the ASTR Process

Aquifer Storage, treatment and Recharge

T2 aquifer area

- Water from this aquifer, supplemented by recycled sewerage water and recycled nutrients can provide SA's most stable and strategic food growing area in future years
- It is vital that this area is protected for sustainable agriculture
- The area is rapidly being covered with broad-acre housing

T2

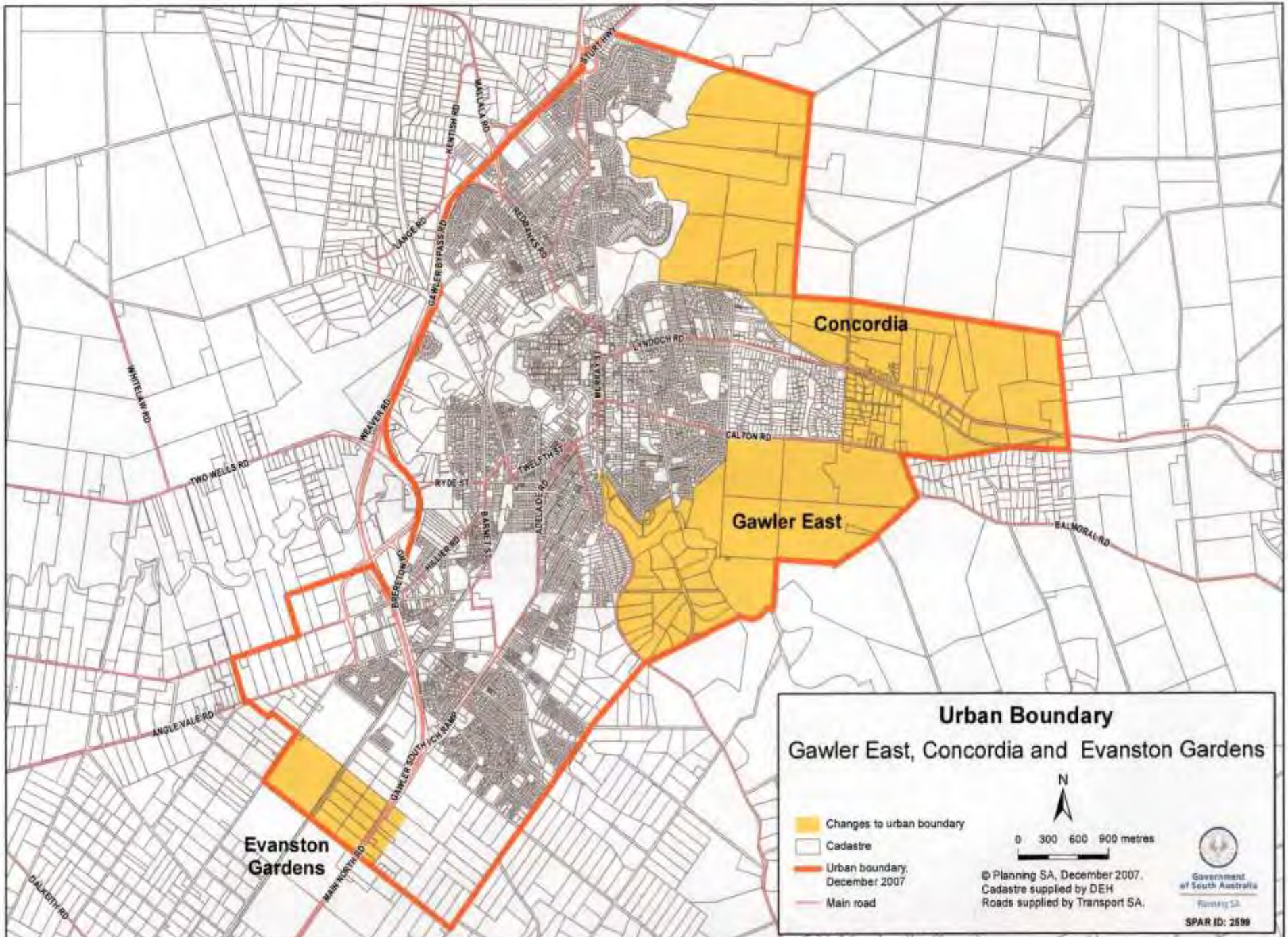

Kangaroo Flat
Ward Belt
Two Wells
Gawler
Virginia
Elizabeth
St Kilda
Salisbury
Outer Harbor
Gulf
Para Hills
Semaphore
St Vincent
Grange
ADELAIDE
-5
-10
-15
-20
-25
-30
-35
-40
-45
0
5
10
KILOMETRES
Northern Adelaide Plains
Prescribed Wells Area
Northern Adelaide Plains Prescribed

Example - Gawler Green Belt

- The southern green belt of Gawler comprises about 800 hectares (2000 acres) of land
- The land is zoned rural with the support of the Gawler community and its Council, and the State Government. It is subject to specific regulation such that it cannot easily be sub-divided.
- The State went to the trouble of requiring assent through the Development Assessment Commission and Gawler Council for any project seeking to sub-divide allotments to less than four hectares.
- Any sub-division process must also include public consultation. HOWEVER the land is not essentially protected from development
- It sits over quaternary and T2 aquifers

Land for food production

Food production?


Concordia
Gawler East
Evanston Gardens
STURT HWY
MAILLA RD
KENTISH RD
LANGE RD
GAWLER BYPASS RD
REDBANKS RD
LYNDOCH RD
WHITELAW RD
WEAVER RD
TWO WELLS RD
RYDE ST
TWELFTH ST
ADELAIDE RD
CALTON RD
BARNETT ST
HILLIER RD
BARRETT RD
BALMORAL RD
ANGLEVALE RD
GAWLER SOUTH FCH RAMP
MAIN NORTH RD
OAKEITH RD
Urban Boundary
Gawler East, Concordia and Evanston Gardens
N
Changes to urban boundary
Cadastre
Urban boundary, December 2007
Main road
0 300 600 900 metres
© Planning SA, December 2007.
Cadastre supplied by DEH
Roads supplied by Transport SA.
Government of South Australia
Planning SA
SPAR ID: 2599


Shelter?
Image © 2008 DigitalGlobe

Infrastructure

Biodiversity


It is countryside but how close is an urban outpost and a hungry developer?
Image © 2008 DigitalGlobe

Land prices and rural reality

- Land prices (‘reliable’ cropping areas) range between $2000 - $20,000 per hectare. Tarlee sale recently $10,000/ha
- Say you borrowed $5000 per hectare at 10% interest…you’d need $500 just for the interest
- Gross margins for wheat growing in SA have averaged under $200/ha for several years

DRYLAND WHEAT (No Till, Short Fallow)

Farm Enterprise Budget Series - North West NSW

Winter 2009

1. GROSS MARGIN BUDGET:

			Previous Crop	WHEAT Budget $/ha	CHICKPEAS Budget $/ha	CANOLA Budget $/ha	Your Budget $/ha
After previous crop:		**INCOME:**					
Wheat	1.70 tonnes/ha@	$271.00 /tonne (PH on farm)		$460.70			
Chickpeas	2.00 tonnes/ha@	$271.00 /tonne (PH on farm)			$542.00		
Canola	2.00 tonnes/ha@	$271.00 /tonne (PH on farm)				$542.00	
		A. TOTAL INCOME $/ha:		**$460.70**	**$542.00**	**$542.00**	

Crop prices were correct at the time of writing (Mar 17 2009), world market volatility makes estimation of future pricing impractical.

VARIABLE COSTS:

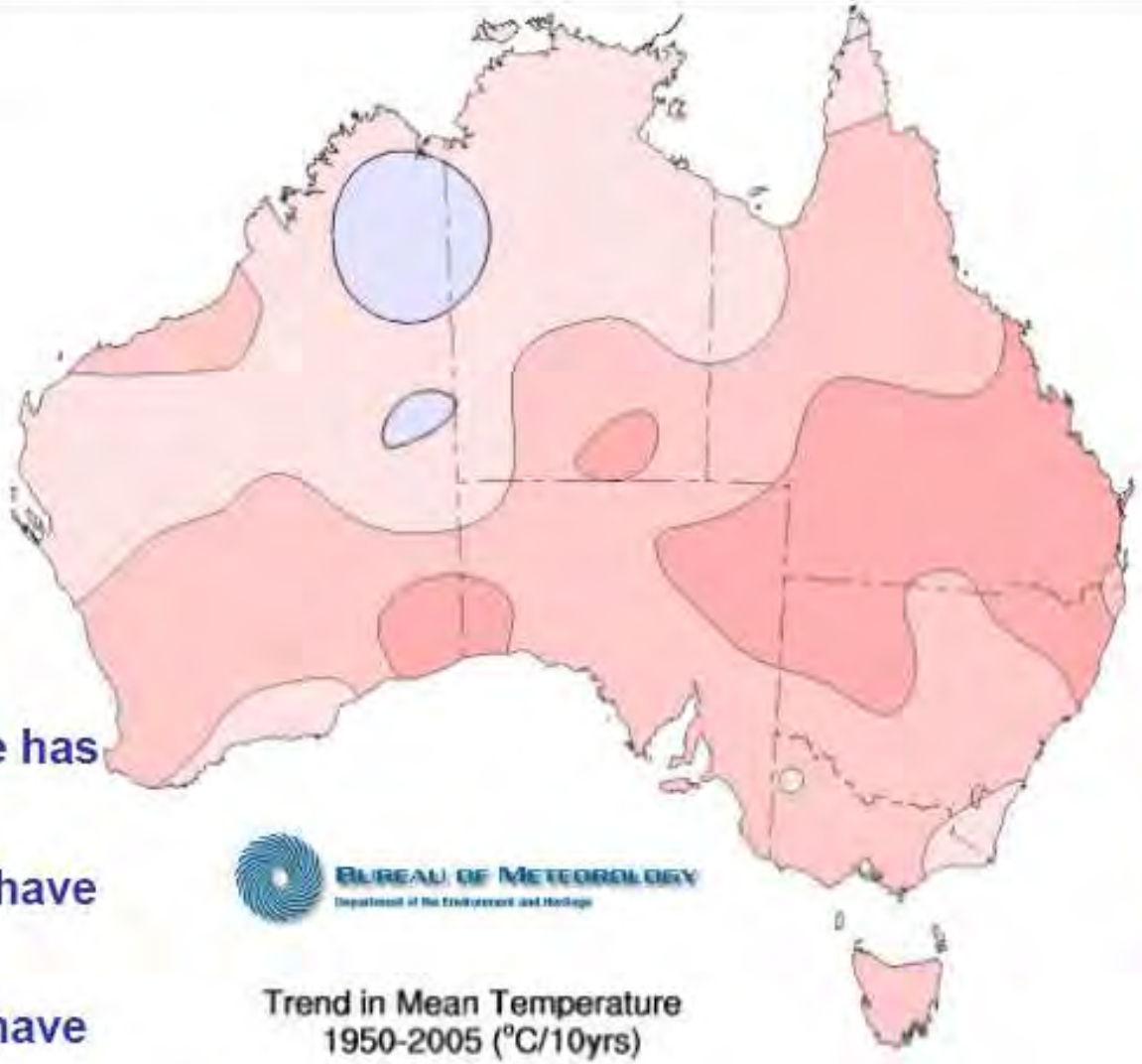
See next page for detail

Sowing	$38.65	$38.65	$38.65	
Fertiliser	$59.75	$46.46	$59.75	
Herbicide	$64.67	$63.23	$64.67	
Contract harvesting	$52.72	$52.72	$52.72	
Levies	$4.70	$5.53	$5.53	
Insurance	$4.75	$5.58	$5.58	
B. TOTAL VARIABLE COSTS $/ha:	**$225.23**	**$212.17**	**$226.90**	
C. GROSS MARGIN (A-B) $/ha:	**$235.47**	**$329.83**	**$315.10**	
Water use efficiency example				
Growing season rainfall (ie in-crop): mm	253	253	253	
Stored fallow moisture: mm (25% of rainfall in fallow period)	60	60	60	
Early crop water use: mm	110	110	110	
Total crop water use mm	203	203	203	
Gross margin per mm	**$1.16**	**$1.63**	**$1.55**	
$ of margin per mm	8.4	0.0	0.0	

Notional value of property


Climate change; coming ready or

Temperature change 1950-2005: most warming in the south and east, least in the northwest



Trend in Mean Temperature
1950-2005 (°C/10yrs)

Average temperature has risen 0.9°C

Max temps have risen 0.6°C

Min temps have risen 1.2°C

Issued: 06/03/2006

Climate change in SA

Conservative figures relating to 2070

Rainfall – In cropping areas likely to reduce by 30% in spring and 20% in winter.

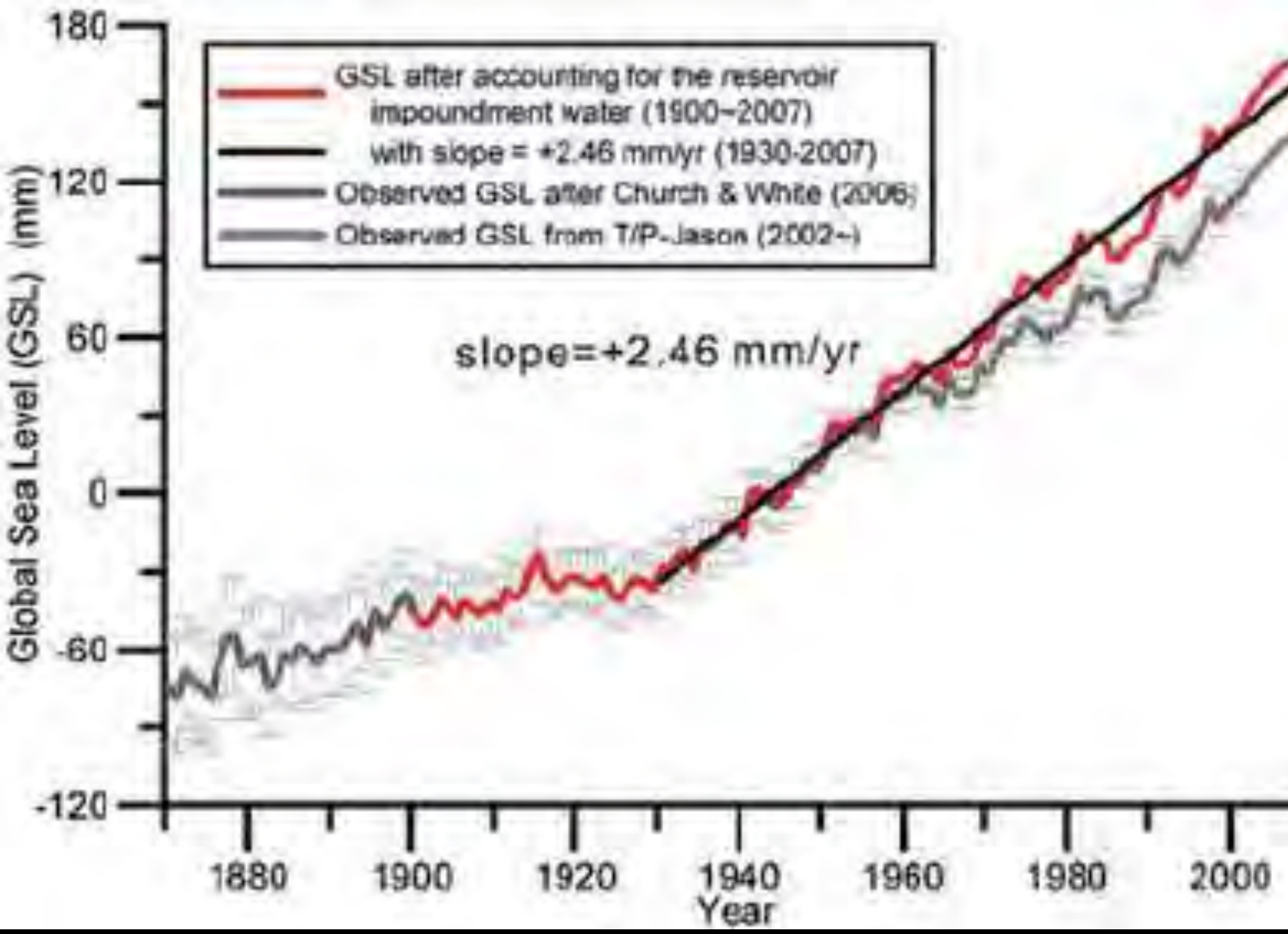
Average temp - up by a 3 – 6 degrees C. Extreme days should reach 50 degrees C regularly. The warmer winter will disrupt the pollination and flowering of many tree crops

CO2 levels - may almost double (currently 395ppm; and rising 2ppm annually. Hansen's tipping point was 350ppm

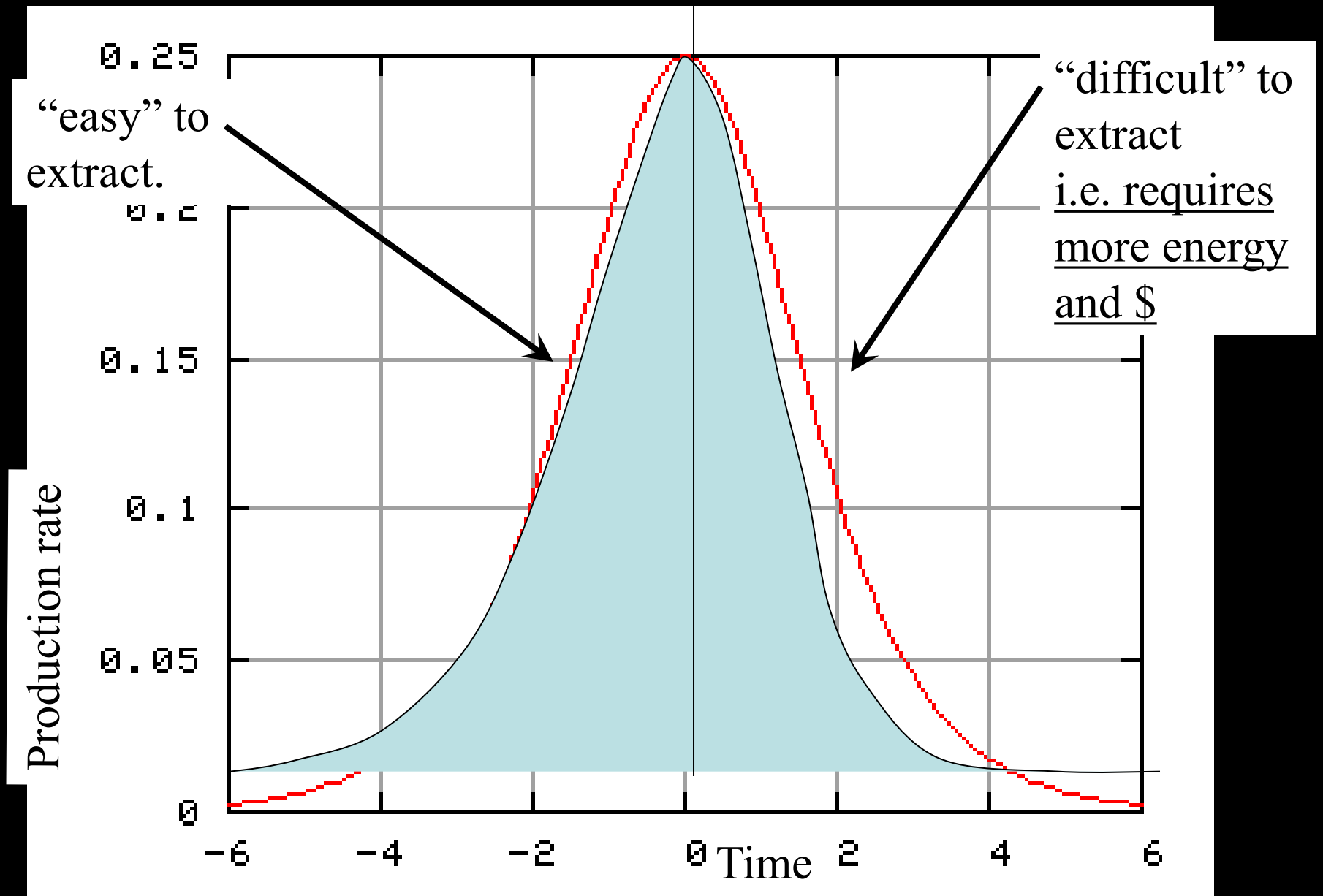
Murray flows – further reduced

Sea level – up by 60cm by the year 2100 (from 1980 level)

Source CSIRO


GSL after accounting for the reservoir impoundment water (1900~2007)
with slope = +2.46 mm/yr (1930-2007)
Observed GSL after Church & White (2006)
Observed GSL from T/P-Jason (2002~)
slope=+2.46 mm/yr
Global Sea Level (GSL) (mm)
180
120
60
0
-60
-120
1880
1900
1920
1940
1960
1980
2000
Year

Peak Oil


0.25
0.15
0.1
0.05
0
Production rate
-6
-4
-2
0
Time
2
4
6
"easy" to extract.
"difficult" to extract
i.e. requires more energy and $

Peak food ?!

The World has failed to produce enough food to satisfy demand for the last 7 years

World food stocks have dropped below 30 days


Deforestation & soil compaction


Salinity


Dust storms


Erosion

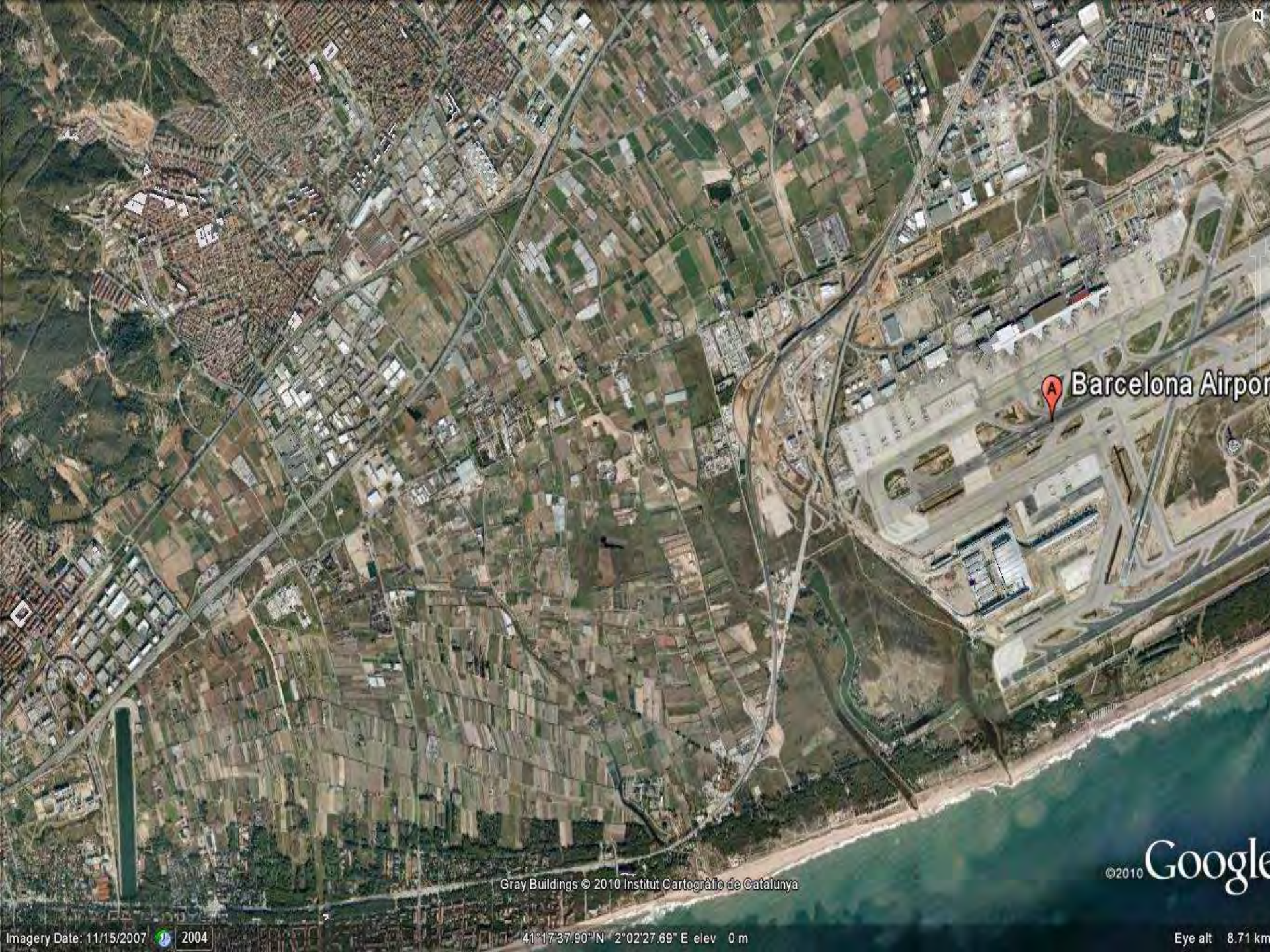
Will growth in population seriously erode our State's capacity to feed itself?

- The loss in production of dryland crops and pastures and the loss of irrigation water due to climate change will reduce SA's potential to export food and fibre and may threaten its food security, even at current population levels.
- Any increase in the size of our cities will mean the withdrawal of reliable farmland for housing.
- The assumption that growth is good or necessary must be questioned

Land-use planning

Key strategies

- Facilitate the growing of food close to population centres such that storm water, sewerage, green waste and food waste can be efficiently returned to the food production cycle on sustainable farms in and around cities and towns.
- Agricultural Park, adjacent to the Barcelona airport in Spain is an example of urban farming
- It required protection of the land from housing development and excessive rates.


Barcelona Airpor
Gray Buildings © 2010 Institut Cartogràfic de Catalunya
©2010 Google
Imagery Date: 11/15/2007
2004
41°17'37.90" N 2°02'27.69" E elev 0 m
Eye alt 8.71 km

Barcelona

- 2000ha of agricultural land adjacent to the airport is protected. There are 600 farms.
- The population of Barcelona pays premium prices for the local produce and supports 30 farmers markets.
- Whilst promoting food value-adding the authority ran skills-upgrade courses for farmers and encouraged the them to become certified organic growers.
- Organic growing provided premium prices & avoided clashes between urbanites and nearby conventional farmers spraying toxic chemicals.

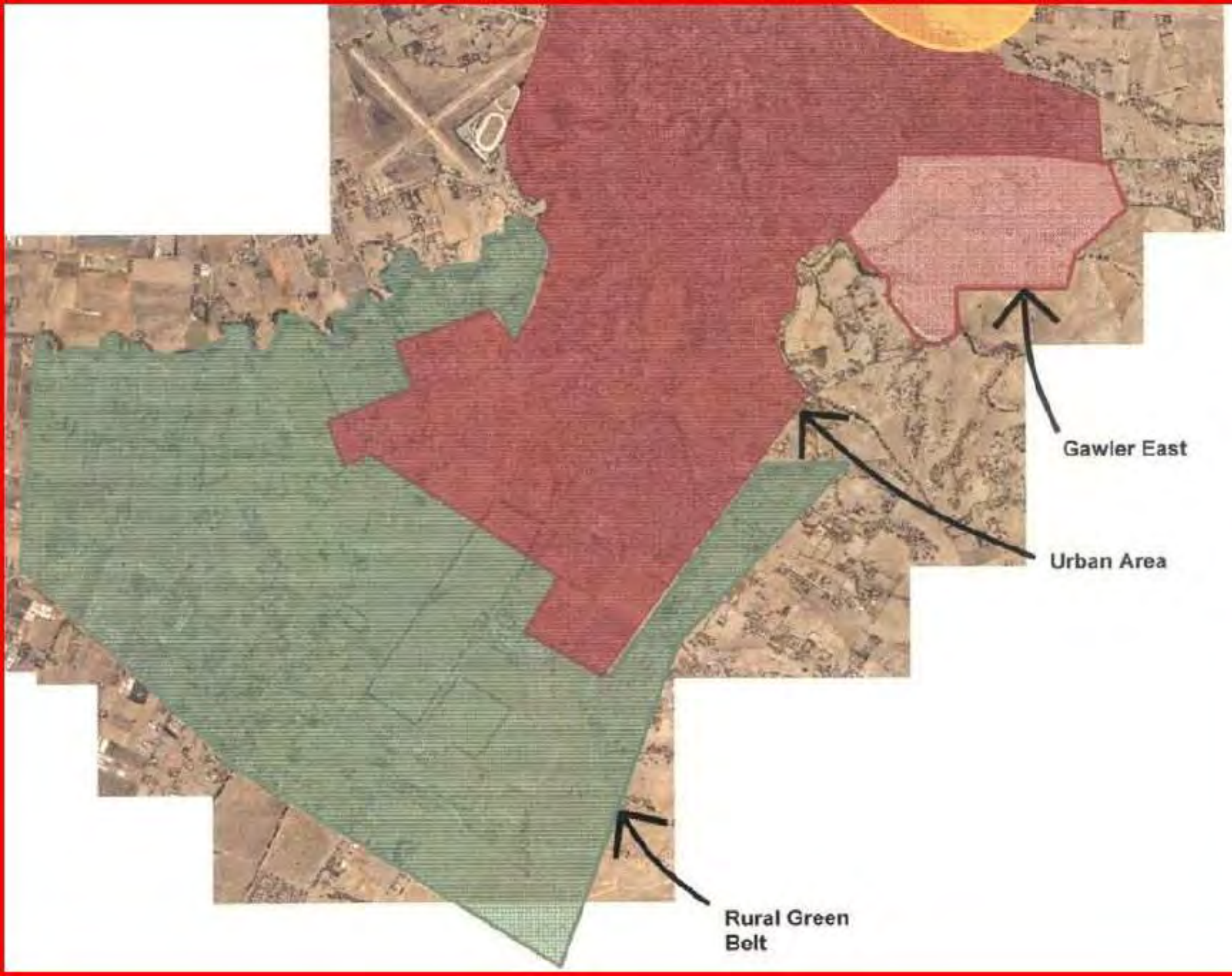
Making urban & peri-urban food production viable

- Permanent protection must be given to prevent speculative land values driving food producers off the land through high rates and taxes
- Organic growing is appropriate in such locations to avoid residential/primary production incompatibility
- Land can be specifically zoned/protected to that end

Protected agricultural areas

- The legislation protecting the Barossa and Southern Hills and Vales is a start but is subject to review in less than 5 years which is an invitation for speculators to sit on land they hope may be freed-up in a review

Protected agricultural areas


Gawler East
Urban Area
Rural Green
Belt

Major aquifer recharge is available from the Gawler River

Activities for the Green belt

- Agricultural, horticultural and viticultural production
- Natural landscapes and natural resource management
- Industries that support agriculture
- Tourism
- Education
- Food and fibre value-adding
- Sewerage processing

Protecting rural land

- Increasing the value of products from the region
- Providing stable employment
- Improvement in quality of life through environmental enhancement and fresh food production
- Increasing biodiversity
- Reducing carbon emissions as a result of lowering food miles, regional food value-adding and less commuting miles
- Providing balance and resilience in the economy

The Right to Farm Act (British Columbia)

- Clarifies the relationship between rural and urban communities
- Sets boundaries between land eligible for urban development and ‘non-urbanisable’ land
- **Right to Farm Act - RSBC 1996, Chapter 131**

What's next ?

- Boundary of the protected area confirmed by State and Local Government
- Notional land values and rate protection established
- Water access arranged
- Business advice given and brand developed
- Farmers markets started
- On-farm biodiversity and river corridor improved
- Tourism facilities developed

Food security

- It is not for SA to feed the rest of the world
- With naturally poor, salty, soils and low rainfall (which is likely to get worse), it is not realistic to regard the State as a significant food producer in the face of an emerging world population of 9 billion
- Developing expertise in recycling nutrients and water, and the use of affordable modified growing environments through research, education and innovation is an important response
- Empowering urban communities to grow and provide food for themselves is also central to food security. Backyard growing, food swaps, community orchards and gardens, farmers markets etc all have a role

Natural Resources Management & farmer sustainability

- Farmers can be compensated for environmental services, as is done in Europe…eg
- Free extension services, especially those aimed at whole farm planning which integrates biodiversity management or organic growing
- Payments for land and water resources managed specifically for environmental purposes
- Rebates for revegetation and similar costs

Mining conflicts

- There is something seriously wrong when a farmer's land under a State Heritage Agreement can simply be appropriated for mining, under current legislation, and taken away in trucks, completely changing the landform, soil profile, hydrological characteristics and ecology
- Fracking for coal seam gas

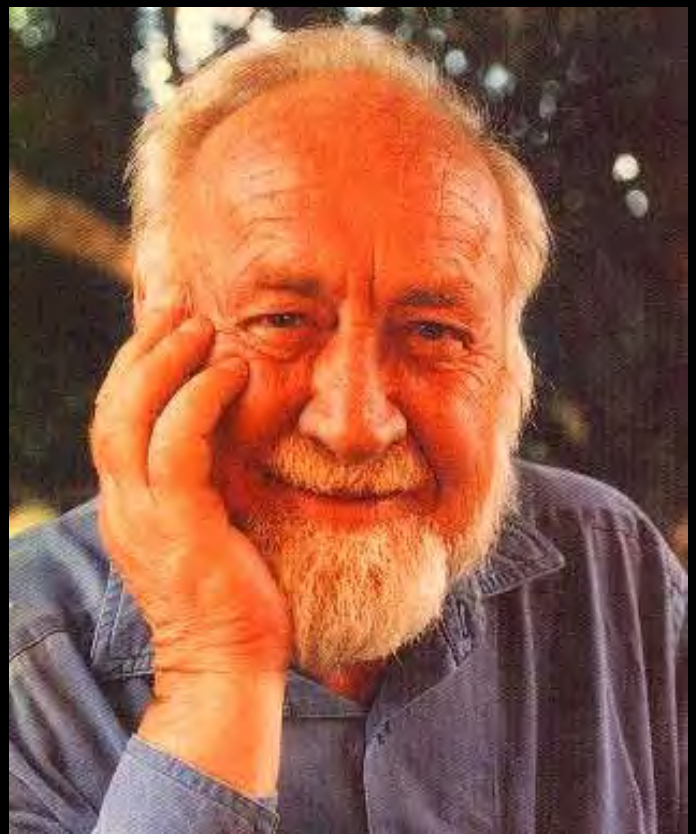
Permaculture

A system of applied design for sustainable human settlement using a synthesis of traditional knowledge and modern science, applicable in both urban and rural urban and rural areas

Ethics -care of the earth

-care for others

-take personal responsibility for population and consumption



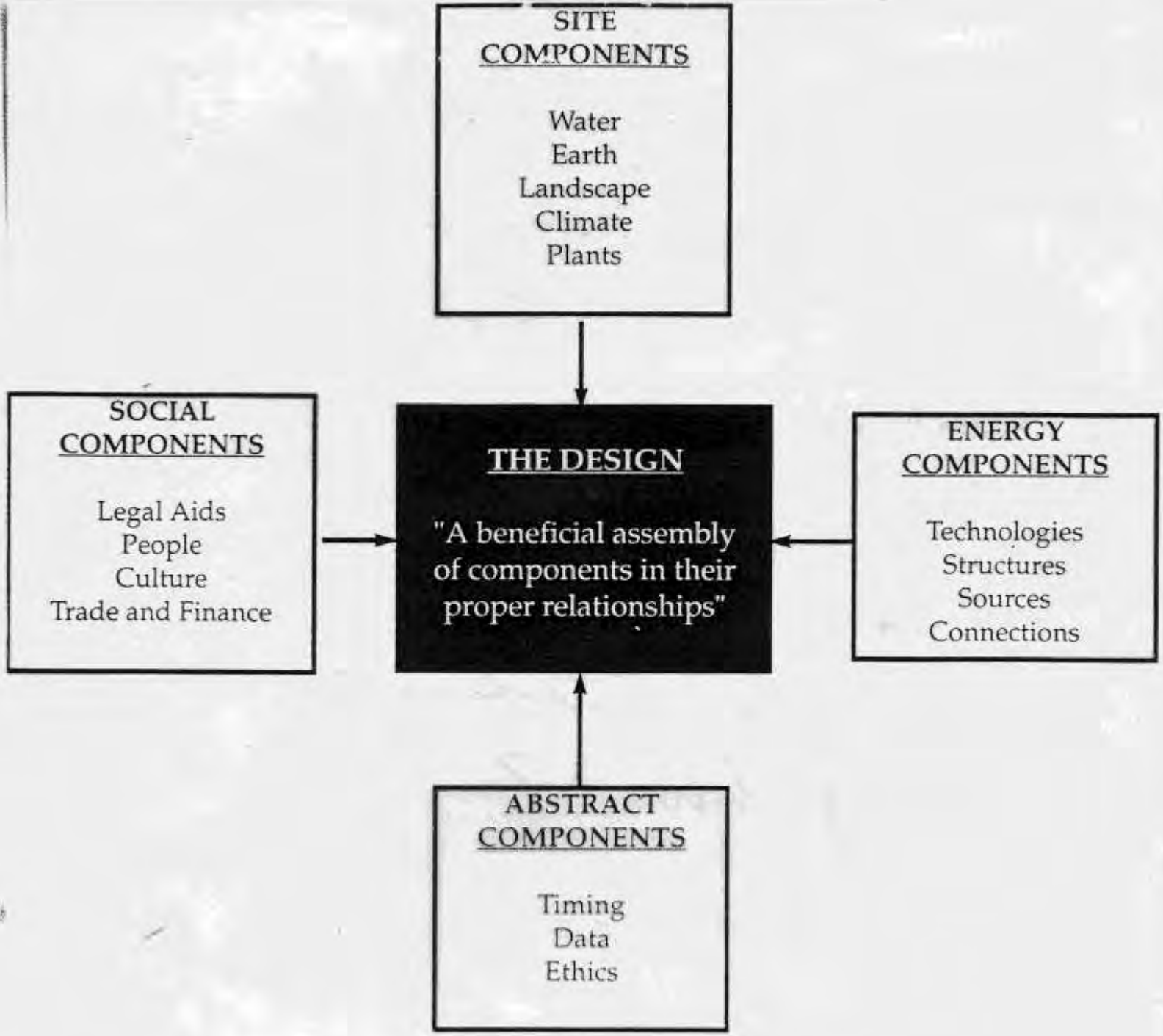

SITE COMPONENTS
Water
Earth
Landscape
Climate
Plants
SOCIAL COMPONENTS
Legal Aids
People
Culture
Trade and Finance
THE DESIGN
"A beneficial assembly of components in their proper relationships"
ENERGY COMPONENTS
Technologies
Structures
Sources
Connections
ABSTRACT COMPONENTS
Timing
Data
Ethics


Image © 2008 DigitalGlobe
97 m
Google
34°36'48.91" S 138°43'17.36" E
May 27, 2006
Eye alt 325 m


pecan nuts
homestead
pome fruit
veg.
scrub block
learning centre
agroforestry
bush tucker
carob block
cereals
experimental
pistachio nuts
Gawler River
forest
yabby ponds
walnuts

The organic market niche

- Permaculture and Certified Organic growing
- Premia for organic fruit and veg are usually 30-100%
- With a little value-adding our premium for organic pistachios is well above 200%
- Organic growing is compatible with urban dev

Permaculture is a design system

PRINCIPLES

•Each important function is supported by several elements. Each element performs more than one function

• Use biological and renewable resources - is there a way of getting a job done by organisms going about their normal life?

The function - fresh eggs for brekky

Provides eggs to the house

Receives scraps from the house

Destroys weed seeds

Receives supplementary grain

Eats windfall fruit

Fertilzes the soil with manure

The element – the chook

Eats pests

Prepares seed bed

Entertains and provides companionship

PRINCIPLE

- Allow no waste - Reduce, reuse and if all else fails, recycle

FARM DERIVED INPUTS

Ash

Compost

CERTIFIED OFF- FARM INPUTS

Compost

Carbon dioxide

Mulch

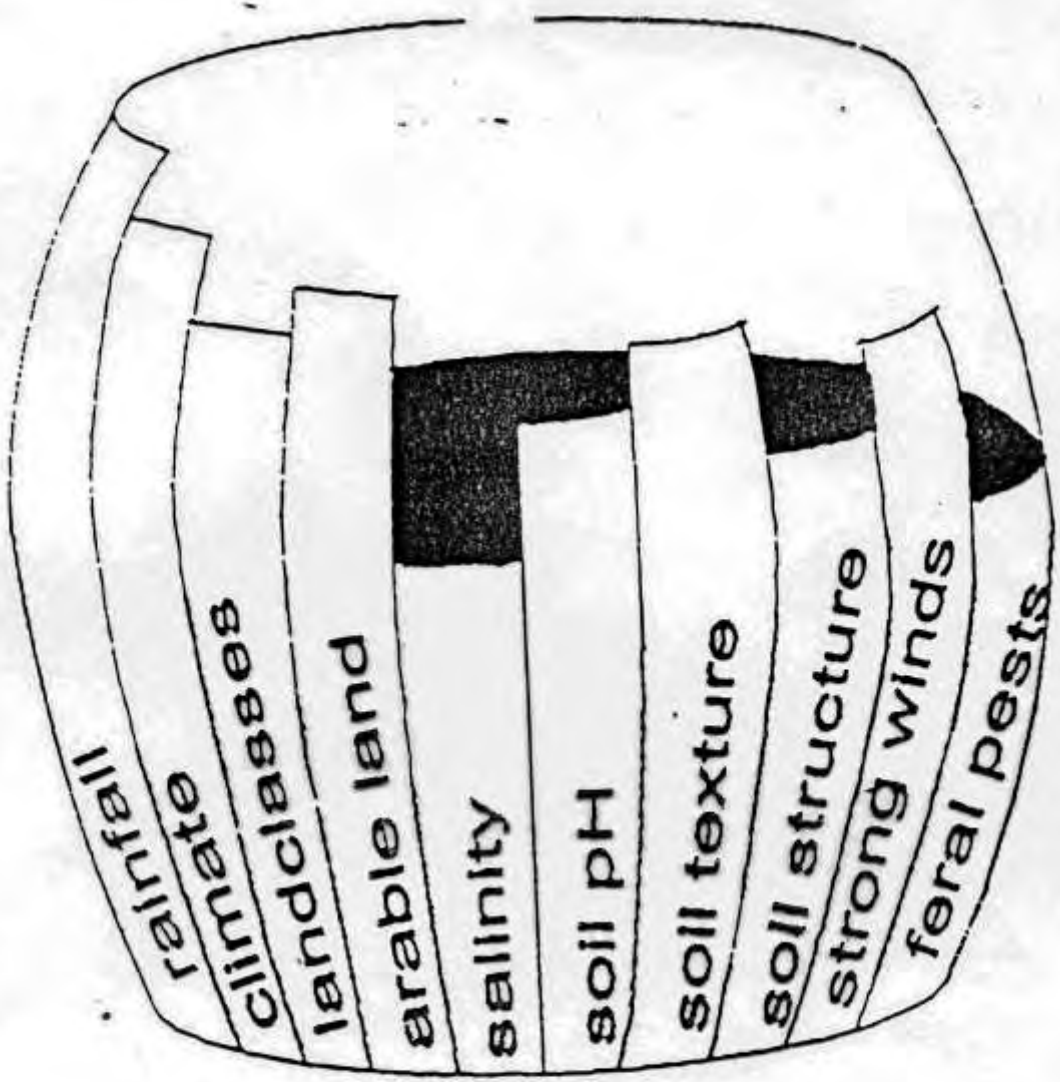
PRINCIPLE

- Catch and store energy - eg wind, sunlight, water; a system not catching energy is dying

Farm use:

Solar panels for hot water in on-farm processing.

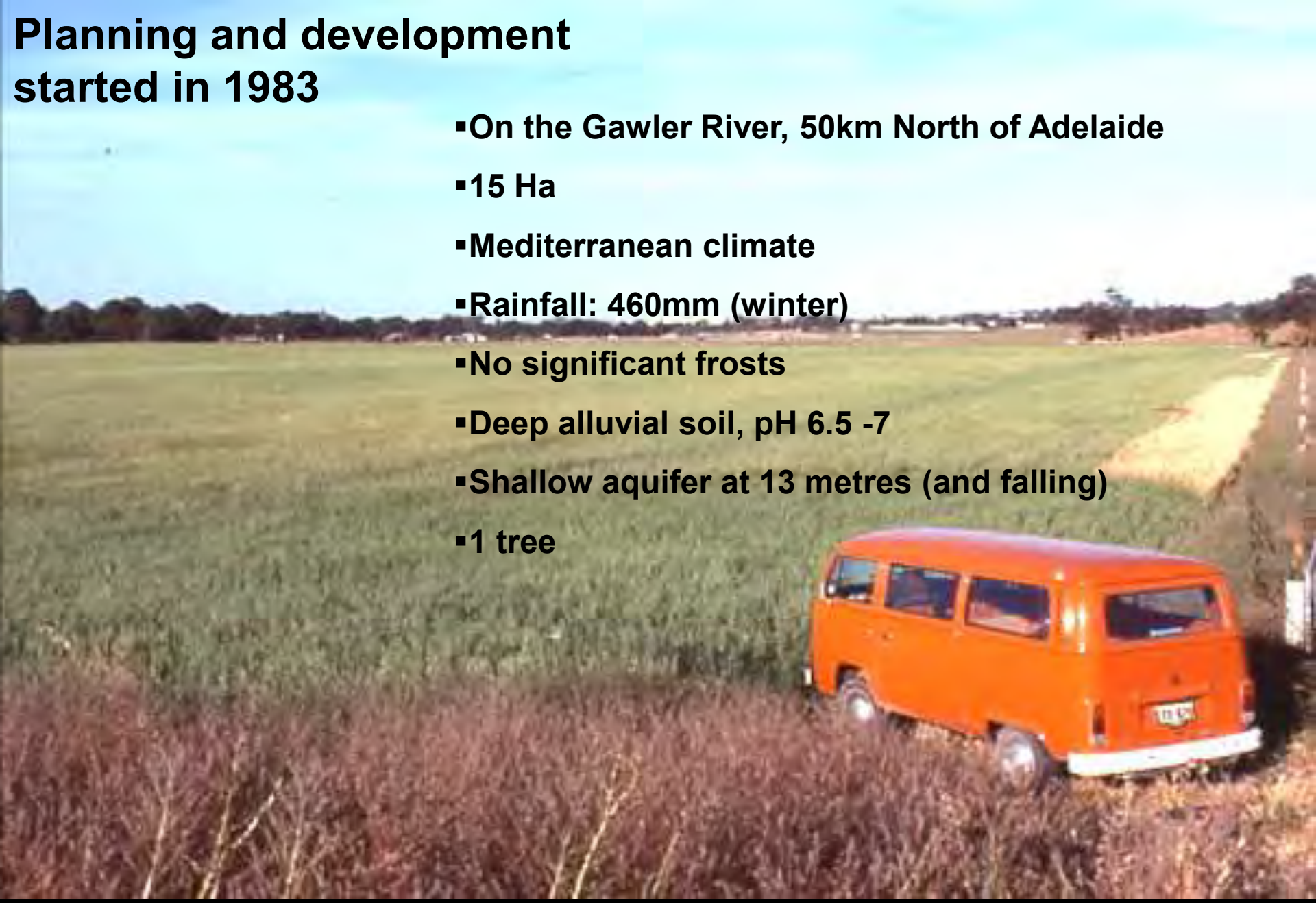
So far no electricity has been used to provide hot water.



Land Capability

Planning and development started in 1983

- On the Gawler River, 50km North of Adelaide
- 15 Ha
- Mediterranean climate
- Rainfall: 460mm (winter)
- No significant frosts
- Deep alluvial soil, pH 6.5 -7
- Shallow aquifer at 13 metres (and falling)
- 1 tree



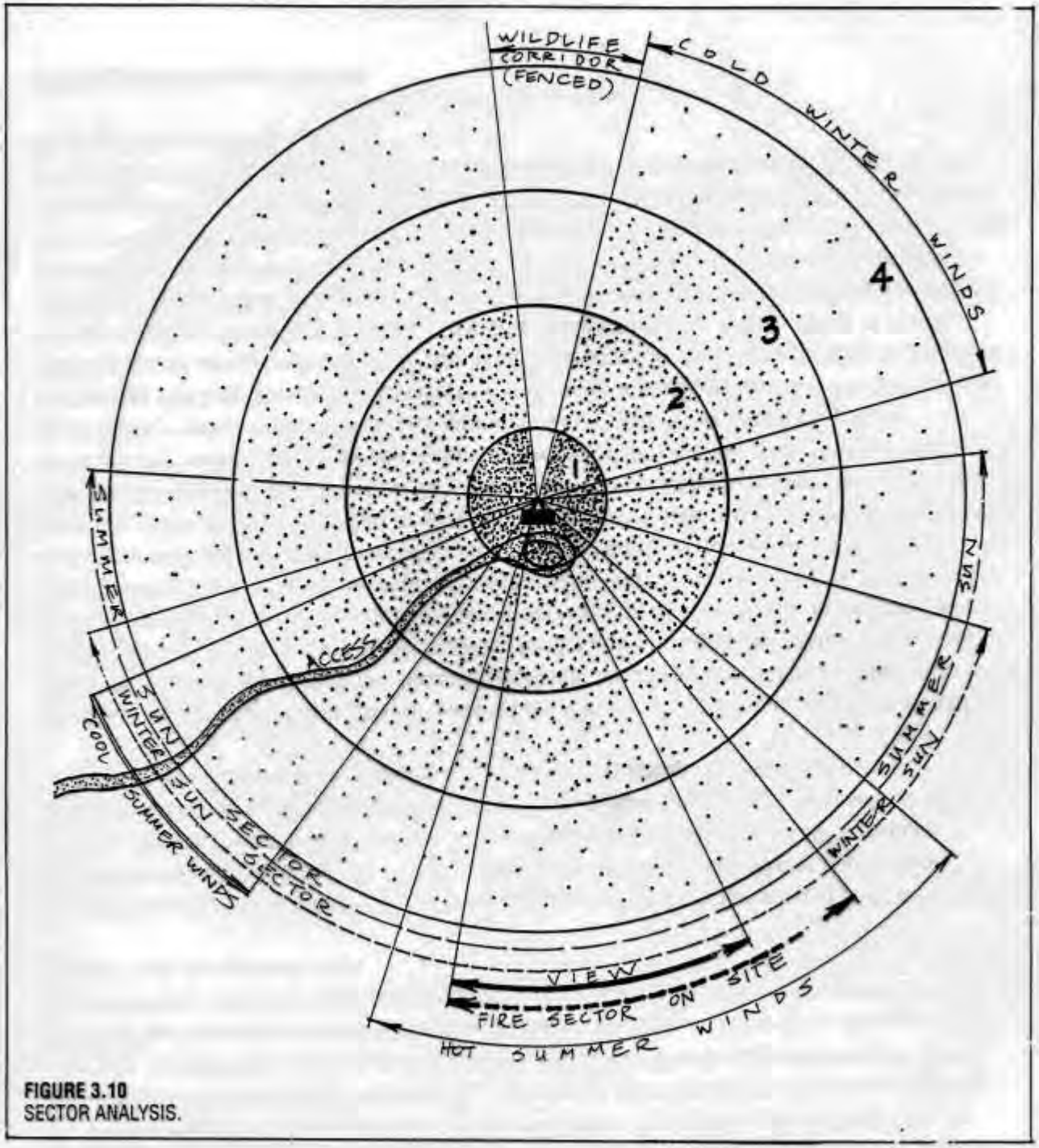
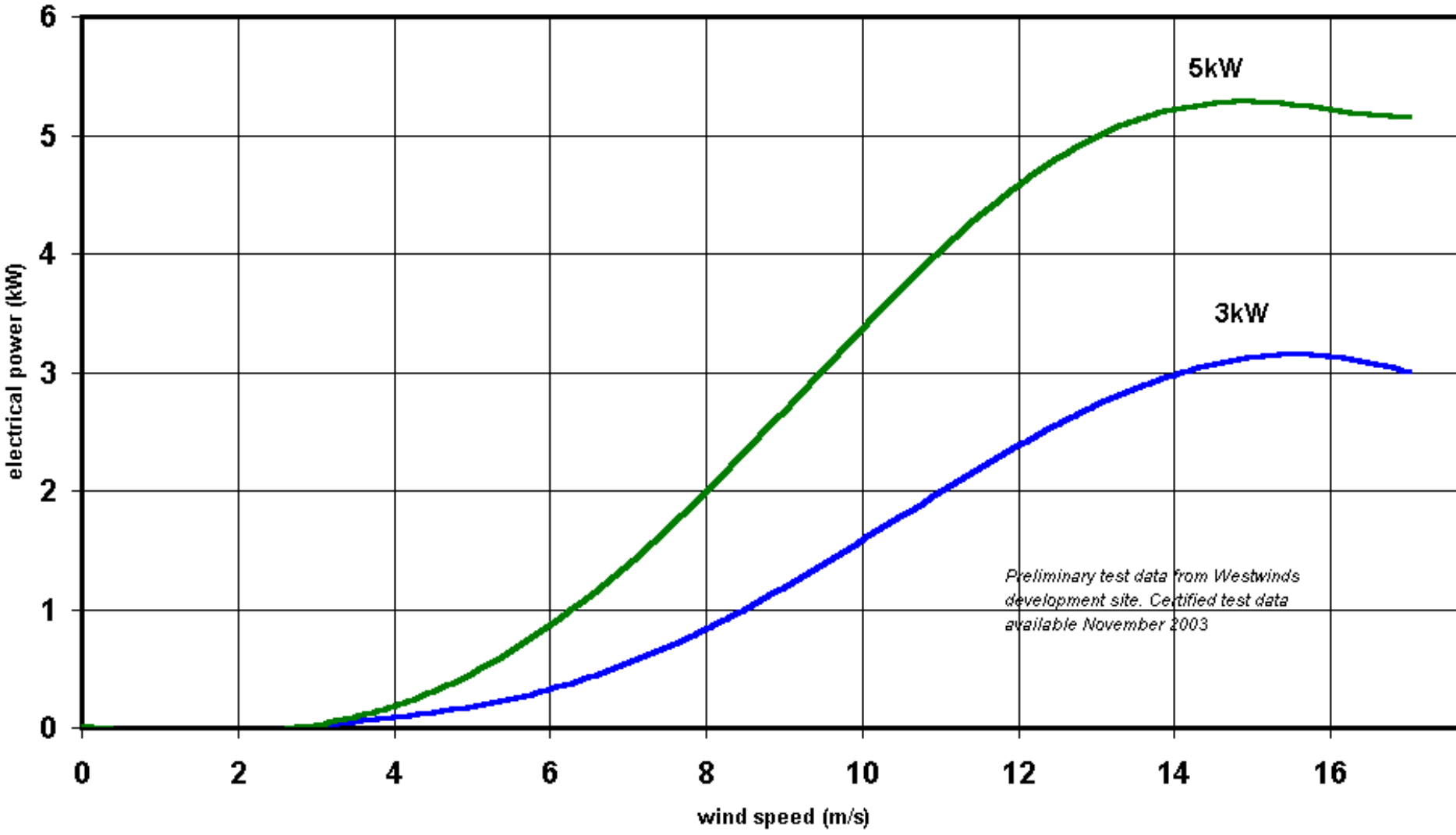


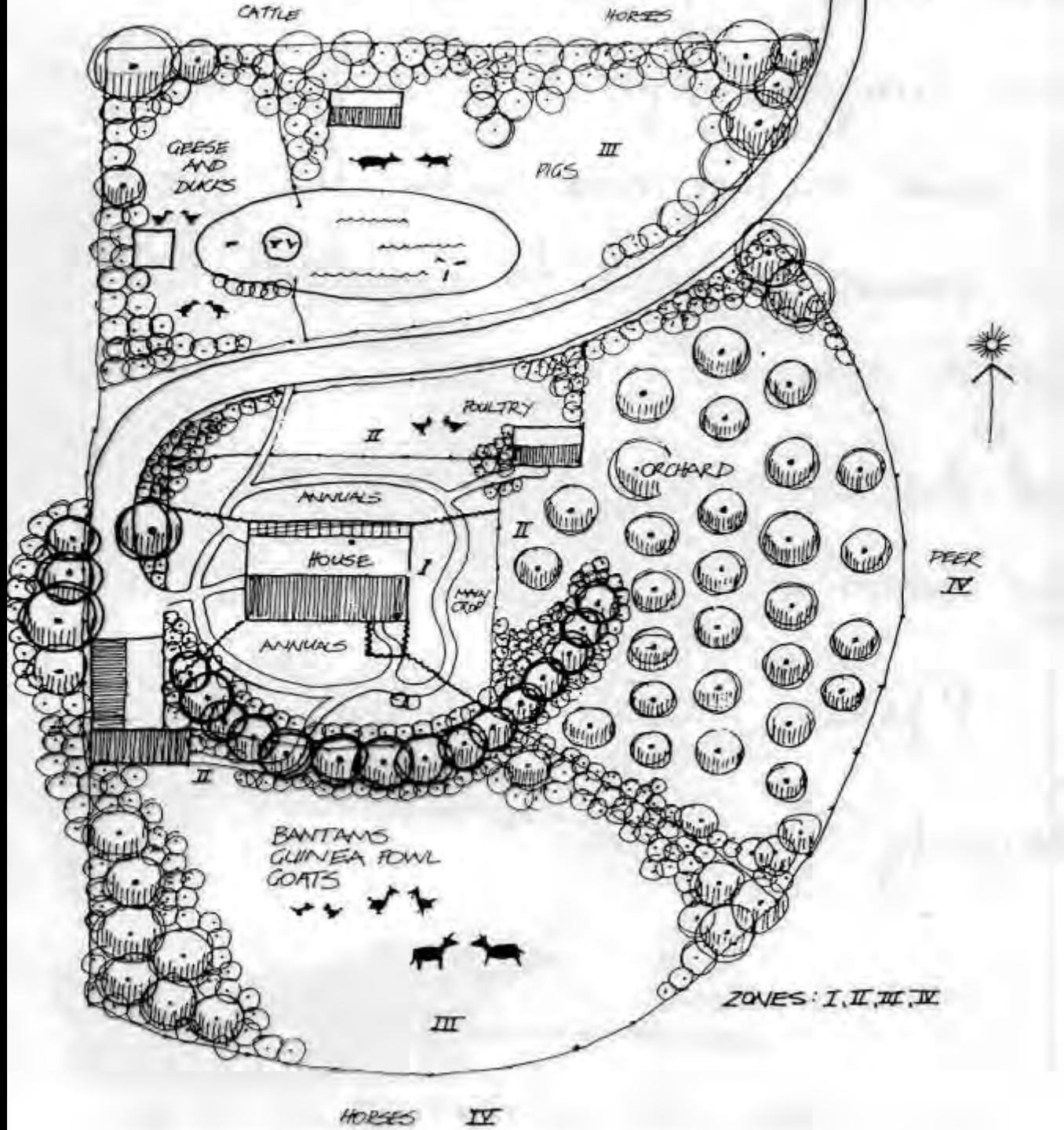
FIGURE 3.10
SECTOR ANALYSIS.

Wind Power Potential



Pistachios, well adapted to our climate


A STRAW STORY


CATTLE
HORSES
GEESE AND DUCKS
III
PIGS
POULTRY
II
ORCHARD
ANNUALS
II
HOUSE
I
ANNUALS
II
BANTAMS
GUINEA FOWL
GOATS
III
ZONES: I, II, III, IV
PEER IV
HORSES IV

Zone planning

Placing elements according to how much we use them, how often we need to maintain or harvest them and how much energy and water they use.


zone 5
revegetation/forestry
vegetables
zone 1
house
zone 2
home orchard
drying green
zone 3
recycling
olive grove
food processing
tank
studio
learning centre
Gawler River
zone 5
windbreak
walnuts
zone 3
pistachios
Gawler Bypass
yabbie ponds
cropping
zone 3
pomes
canary island pines
experimental
zone4
agroforestry demo
biodiversity block
zone 5
carobs
pecan nuts
pistachios
jojoba
Jack Cooper Drive

Hills Agroforest

Species and features for an Adelaide Hills Permaculture

Agroforest

Honey Locust, Algerian Oak, Tagasaste, Holm Oak, Cork Oak, Casuarina spp, Pinus sp Wallaby, Goose, Alpaca

Orchard

Apple, Pear, Nashi, Plum, Quince, Mandarin Chook, Goose, Wallaby, Alpaca, Potoroo

Woodlot

Euc grandis, maculata, globulus, nitans
Ac melanoxylon, intertexa (interplanted)

Biodiversity Block (includes Bush Tucker spp)

Native Apricot, Melaleuca spp, Kangaroo grass, Native Cherry, Ac retinodes, Euc obliqua, Native Currant etc etc

Organic Garden

Summer Lettuce, Asian Leaf Crops, various Herbs, Veg and Edible Flowers


Geese:
Webbed feet
Grassy weed grazers – esp
Couch & Kikuyu
Gourmet food


Fox and rabbit proof fence built in 1993

Australian Natives

Value adding

Bio regional ID

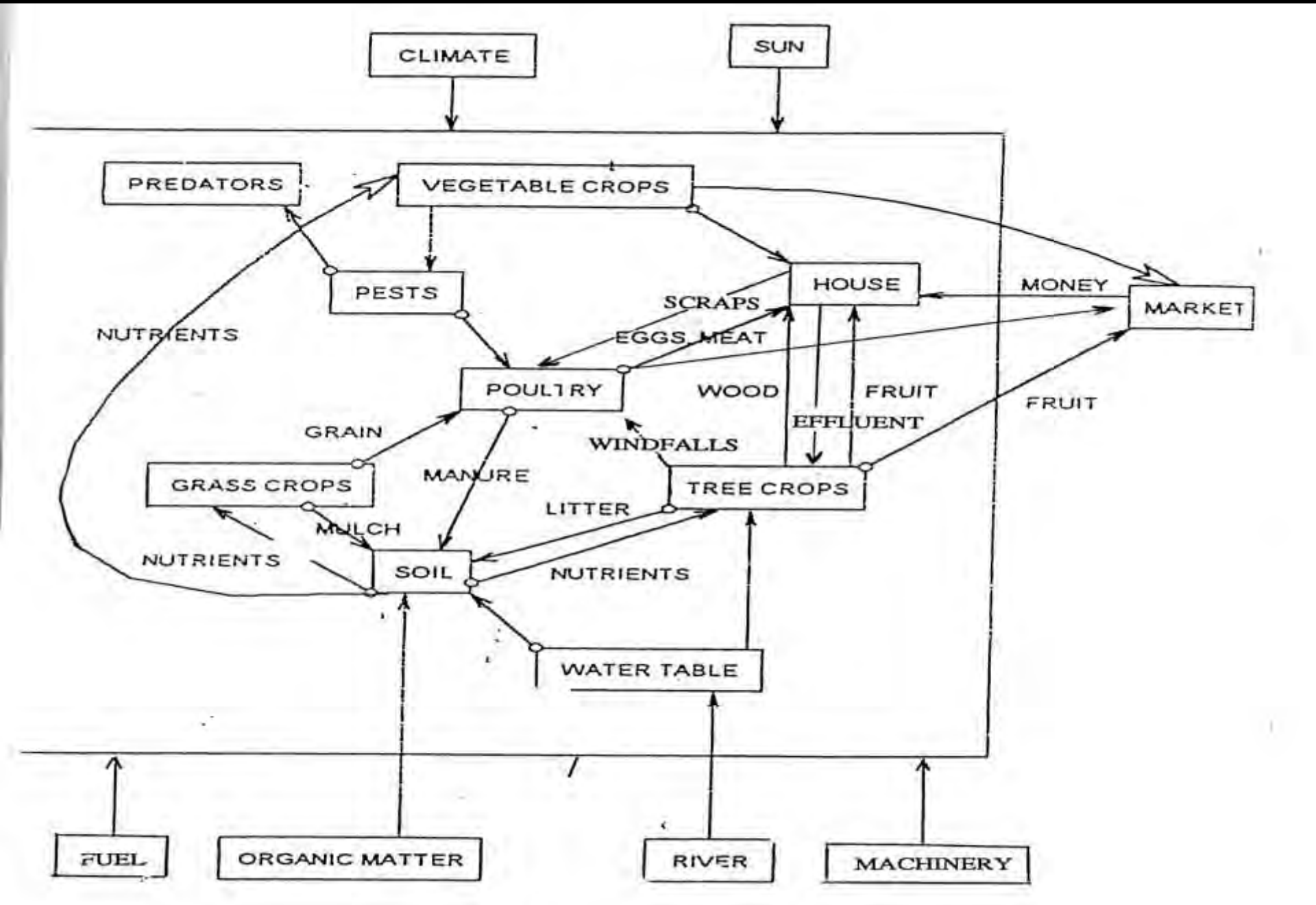
Landcapability

Diverse systems

Acacia victoriae

Quandongs

Systems Diagram showing energy flow



PROCESSING ON SITE

Dehydrator

Locally designed & made

Efficient

Clean heat

Value-add on site

Farmers Markets

Direct from grower to consumer


Aldinga SA, Australia
Image © 2008 DigitalGlobe
Image NASA
146 m
Google


Image © 2008 City of Davis
49 m
Goog

Ho Chi Minh transport bike

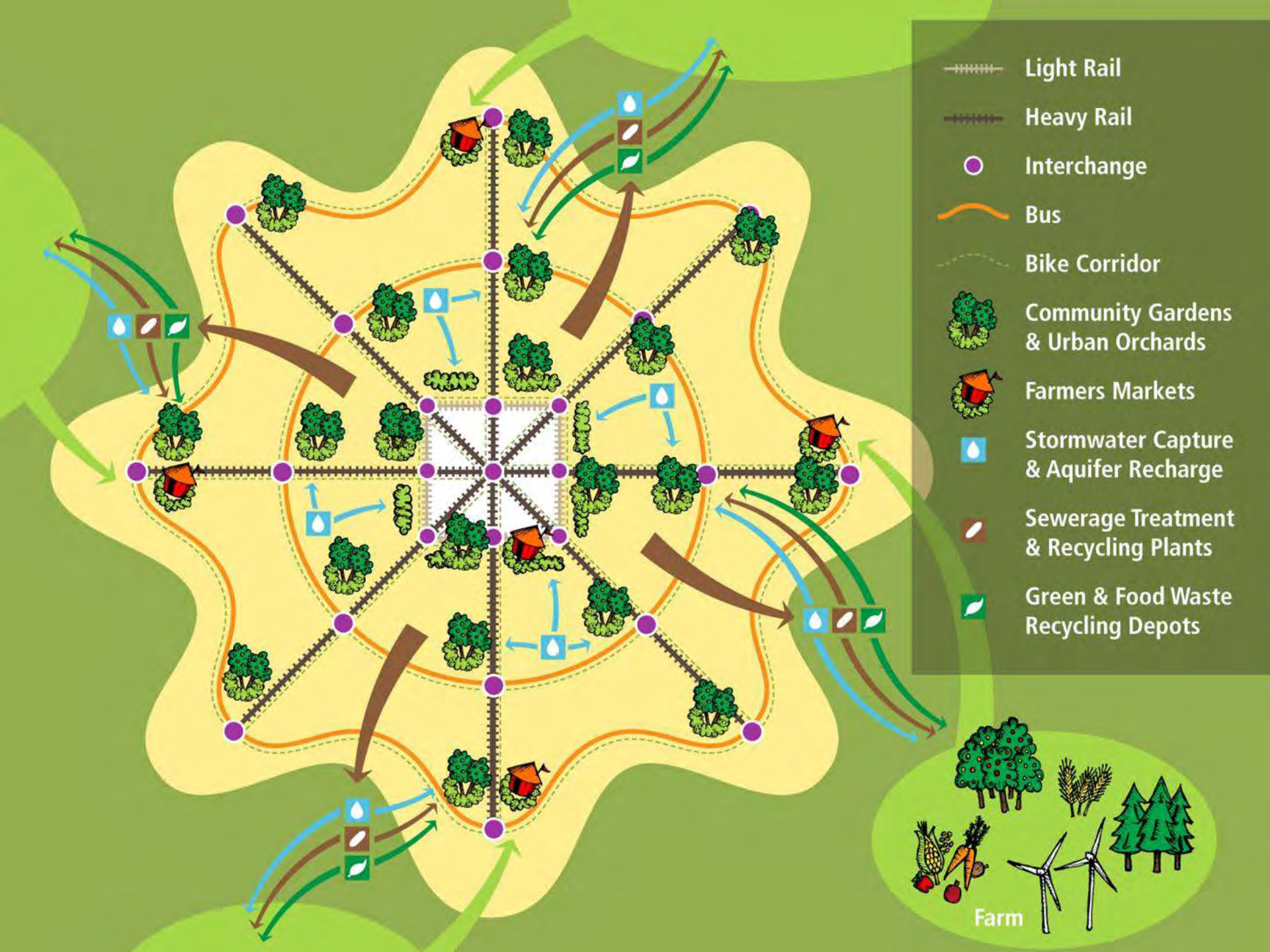
Wellard

COCKBURN CENRAL
AERIAL VIEW

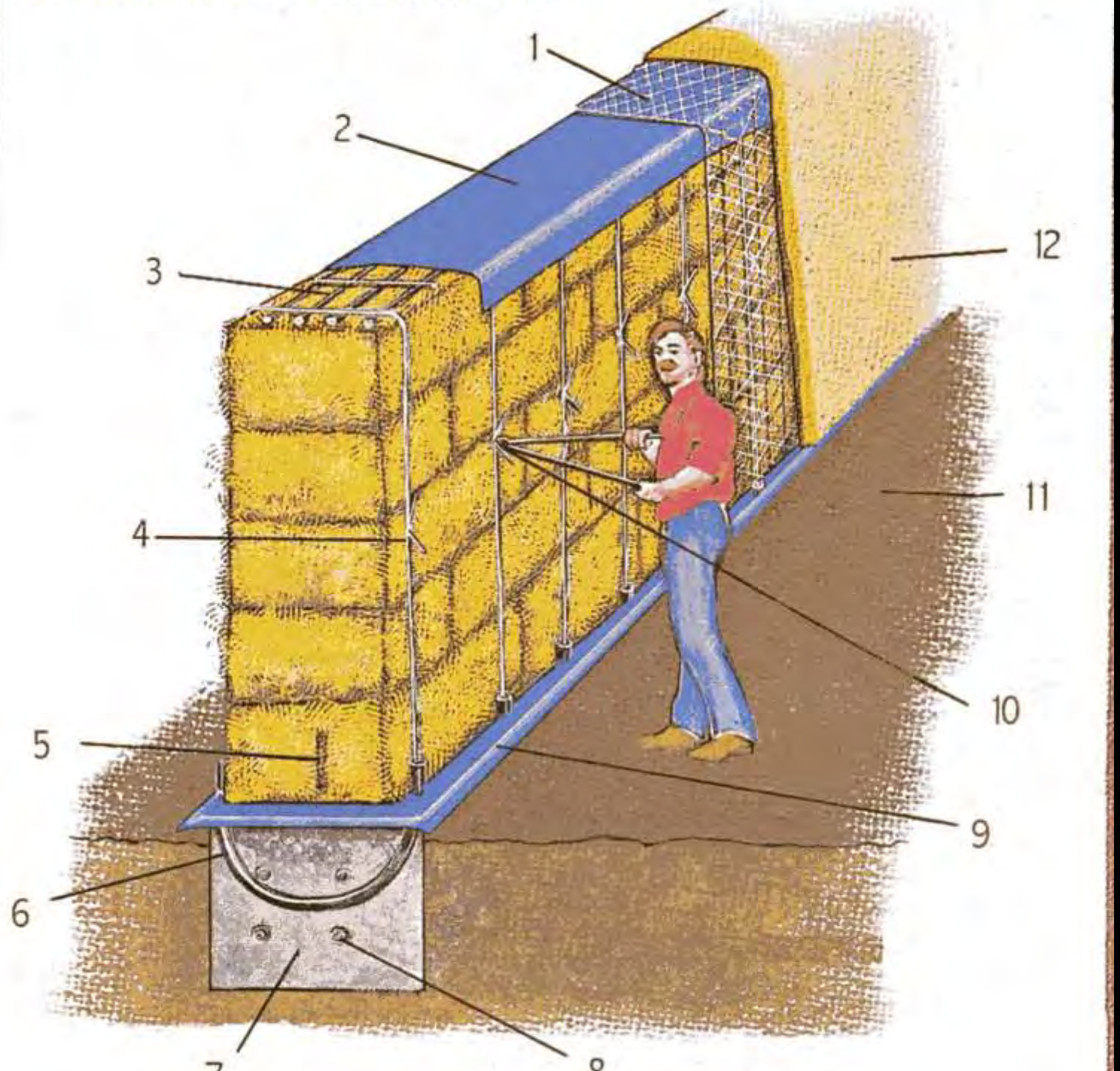

cultivating community
Community Gardens
Community Gardens
If you live here and want your own garden space, phone Cultivating Community on 9415 6580.
Cultivating Community supports tenants in Community Gardens.
社區花園
如果您在此居住，想有自己的花園地塊，
請與Cultivating Community，電話9415 6580，
Cultivating Community在社區花園中
向租戶提供支持。


ABONOS
VERMITAS
FRUTAS
PAPEL
ESTIERCOL
ARROZ
PLANTAS VIEJAS
NO
CUIDAMOS
EL JARDIN


Image © 2008 DigitalGlobe
©2008 Google
138°26'14.40" E
elev 13 m
Feb 10, 2008
Eye alt 385


Light Rail
Heavy Rail
Interchange
Bus
Bike Corridor
Community Gardens & Urban Orchards
Farmers Markets
Stormwater Capture & Aquifer Recharge
Sewerage Treatment & Recycling Plants
Green & Food Waste Recycling Depots
Farm

Sustainable buildings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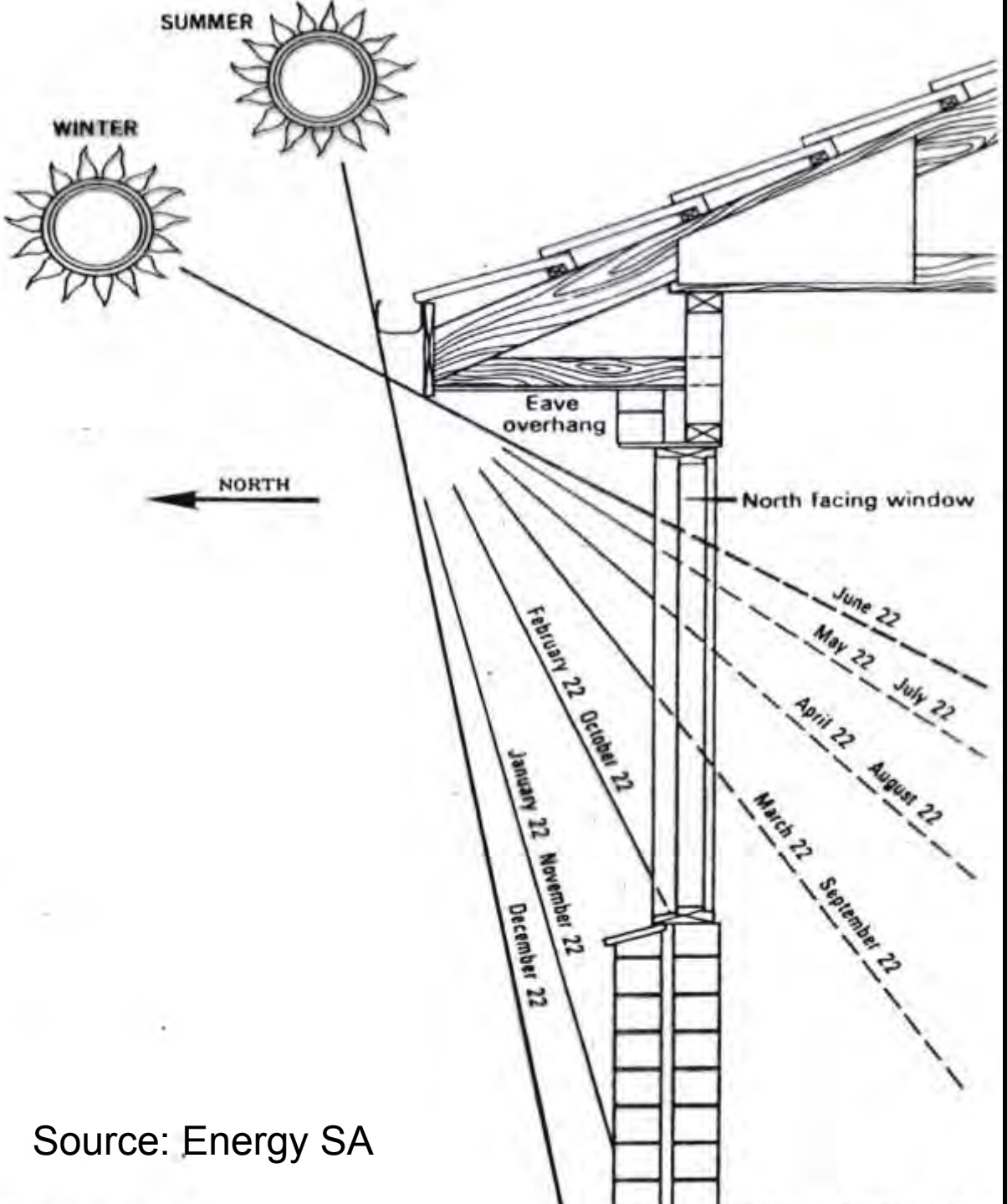
Teaching Area
Compost toilet

Source: Energy Architecture



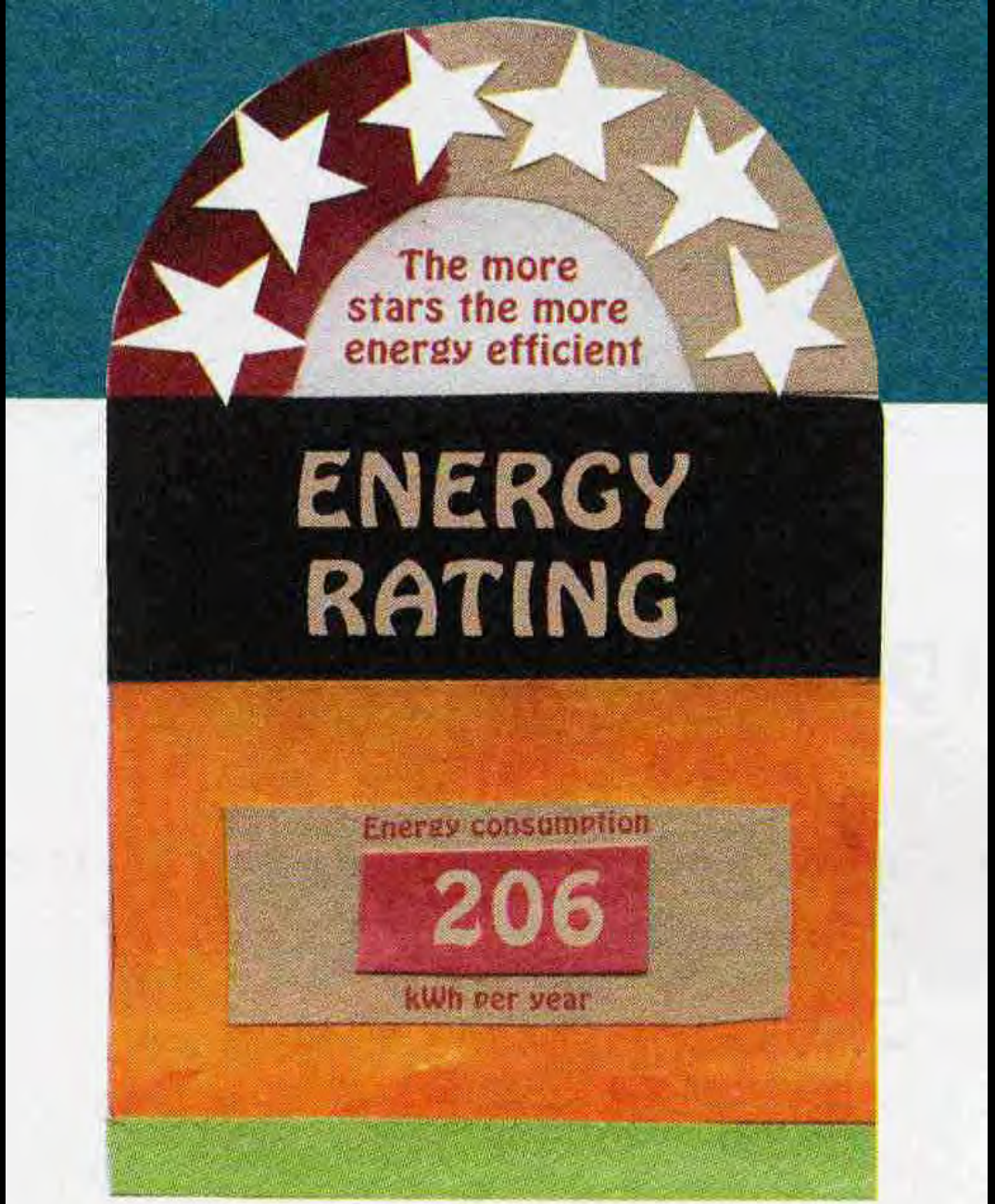
Source: Energy SA

Passive Solar Design

Large North facing windows. Winter sun

warming up the concrete slab….

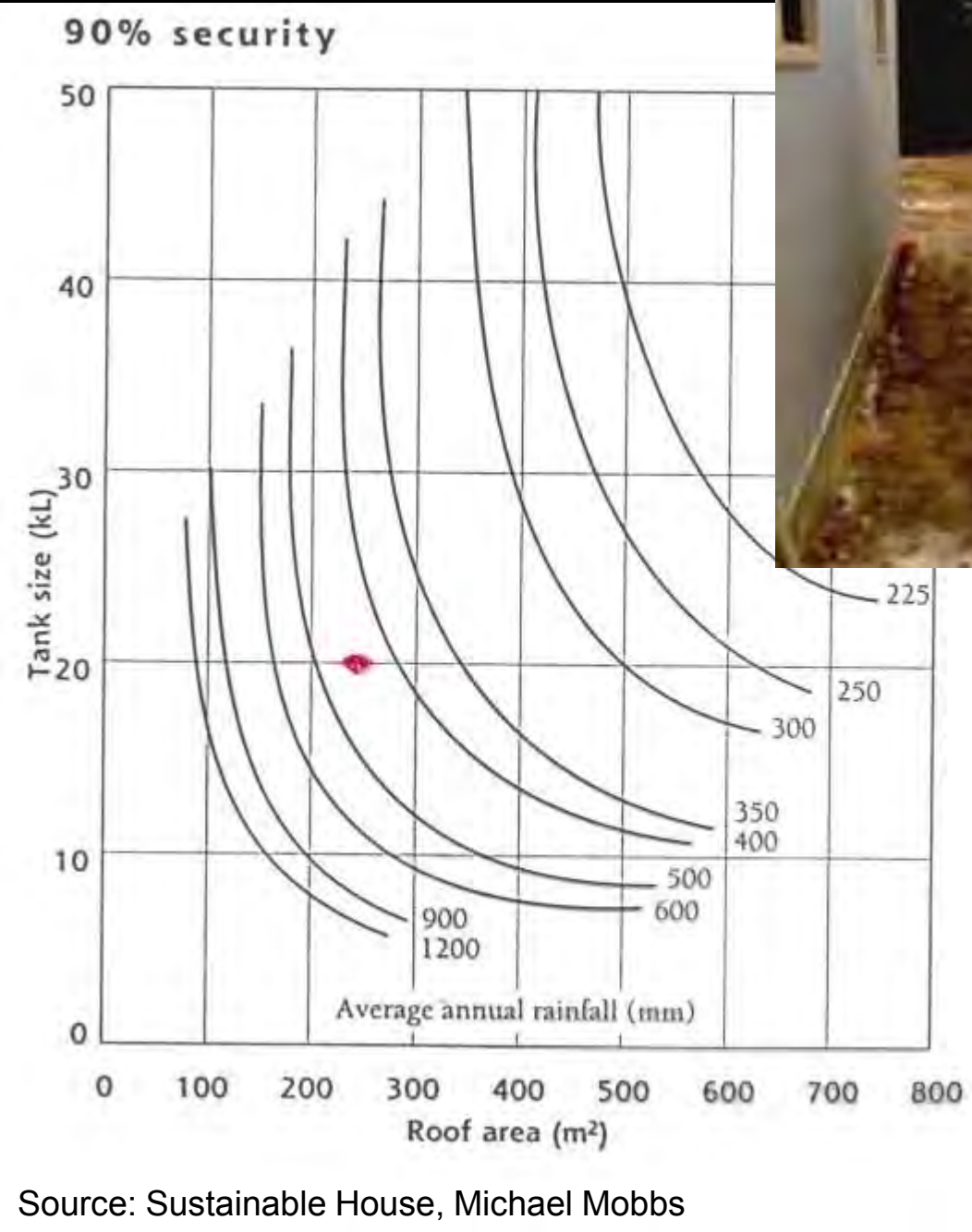
Photovoltaic panels (left), solar hot water panels (right)



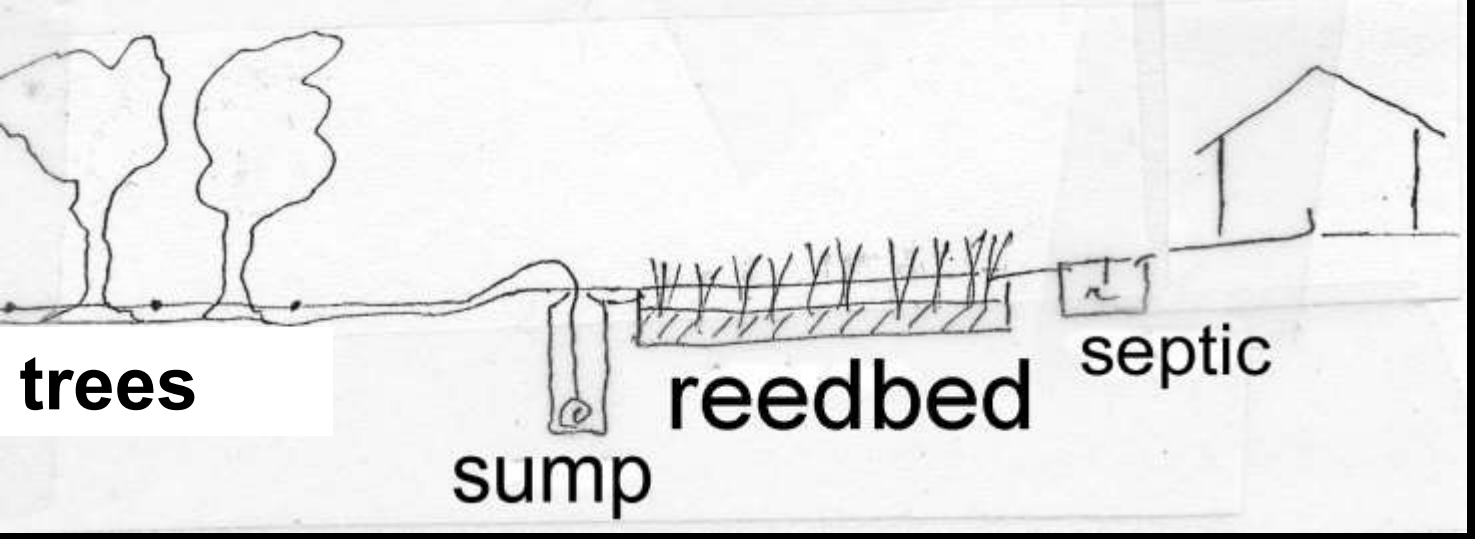
Visit www.energyrating.gov.au

WATER CATCHMENT

Water should be captured on site and stored for use



Source: Sustainable House, Michael Mobbs



Data collected in collaboration with SA Dept of Health shows a significant drop in:

- **E.coli**
- **Suspended Solids**
- **Nitrogen & Phosphorus**
- **BOD**

Key authors

- Bill Mollison www.tagari.com
- David Holmgren www.holmgren.com.au
- Christopher Alexander
- Richard Heinberg
- www.richardheinberg.com.au

- Food Forest Website

www.foodforest.com.au

Roberto Perez, Cuba