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Flux Towers in Banksia woodland, Gnangara, WA

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Oz Flux



We are here



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OZ Flux

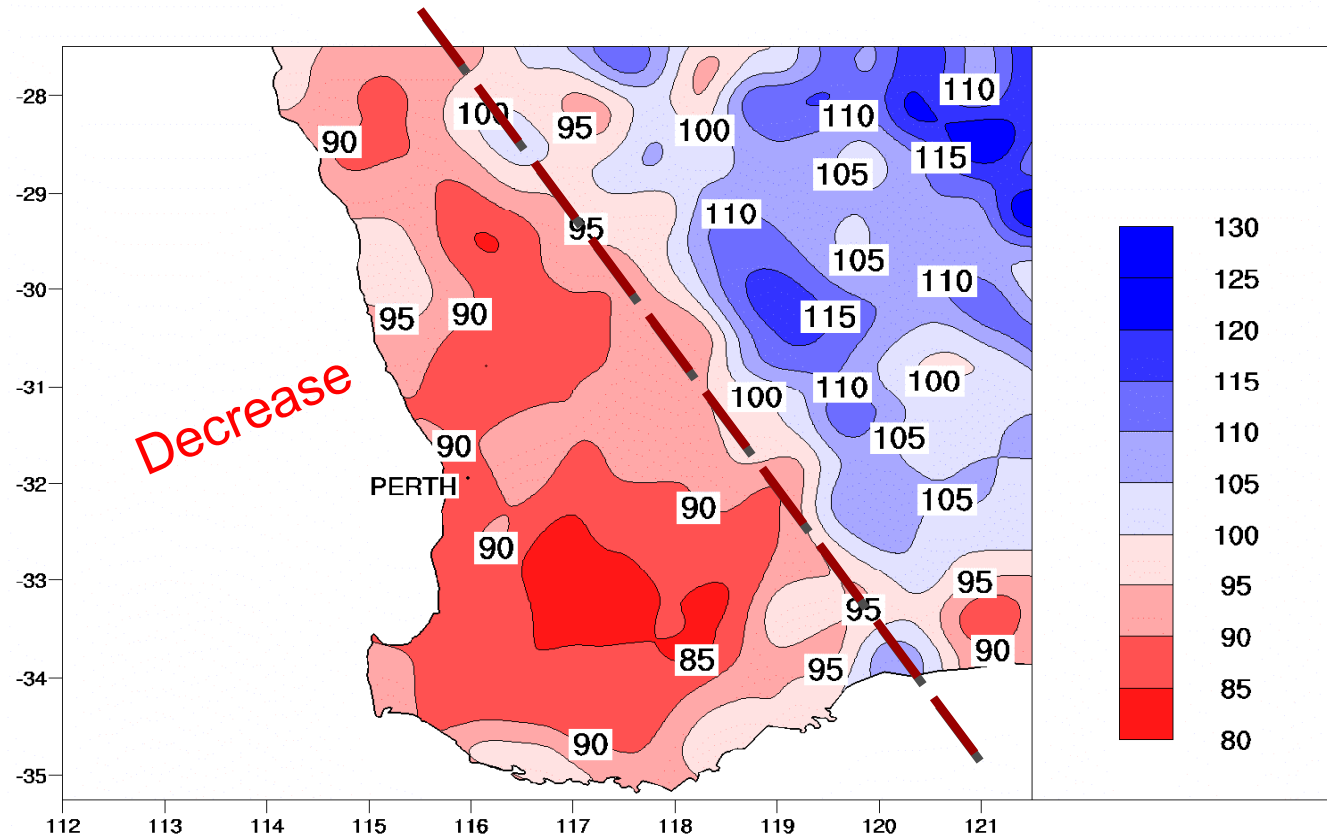
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Local issues - declining rainfall

- Major reduction in rainfall over extensive areas of the south-west

Last quarter century winter rain as % of previous 75 years



Local Issues

- Drying climate is drying forest soils, reducing recharge and stream flow, threatening aquatic ecosystems
- Changing forest structure – thinning or thickening?
- Changing evaporation-transpiration balance, and changing carbon balance, are both symptoms and causes
- Declining surface water has moved dependence to groundwater and now seawater desalination



Local Issues

- Coastal sandplain woodland is the major cover on the recharge area for Perth's most important water resource
- South-west WA is international Biodiversity "hotpot"
- Internationally significant wetlands under threat from warming and drying climate, and increased water demand.
- Long-term groundwater monitoring shows decline in aquifer storage at 50GL/yr ~ \$1b NPV based on next available water source (sea-water desalination)

Local Opportunity

- Build on (\$7M) Gnangara Sustainability Strategy
- Builds on research on recharge after fire
- Monitor ecosystem change as well as physical and chemical fluxes
- Comprehensive ground data to test new theories and models for vegetation monitoring and remote sensing monitoring techniques
- Assist development of spatial and temporal models of ecosystem response to climate, fire, etc

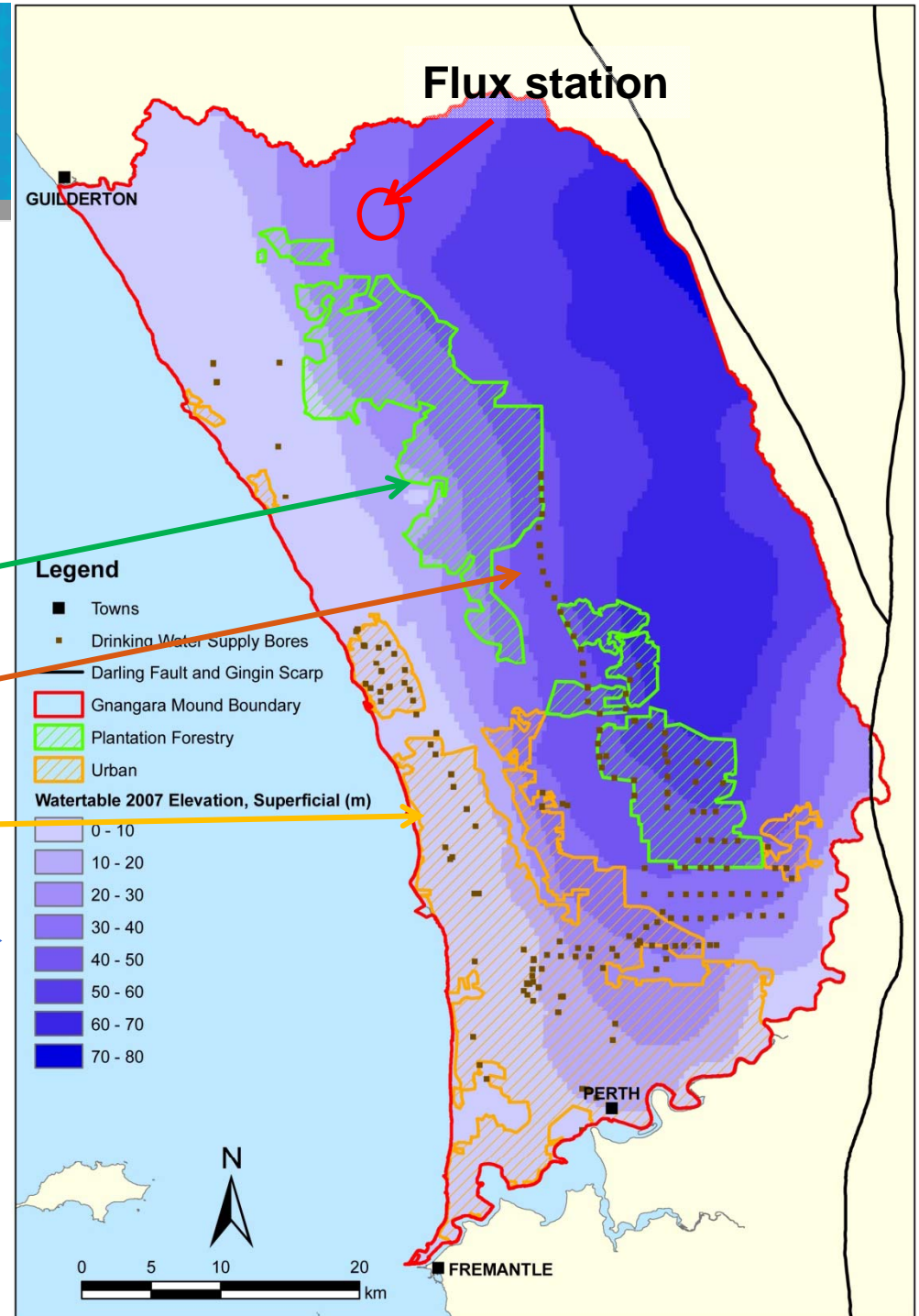
Gnangara Mound

Pine plantations

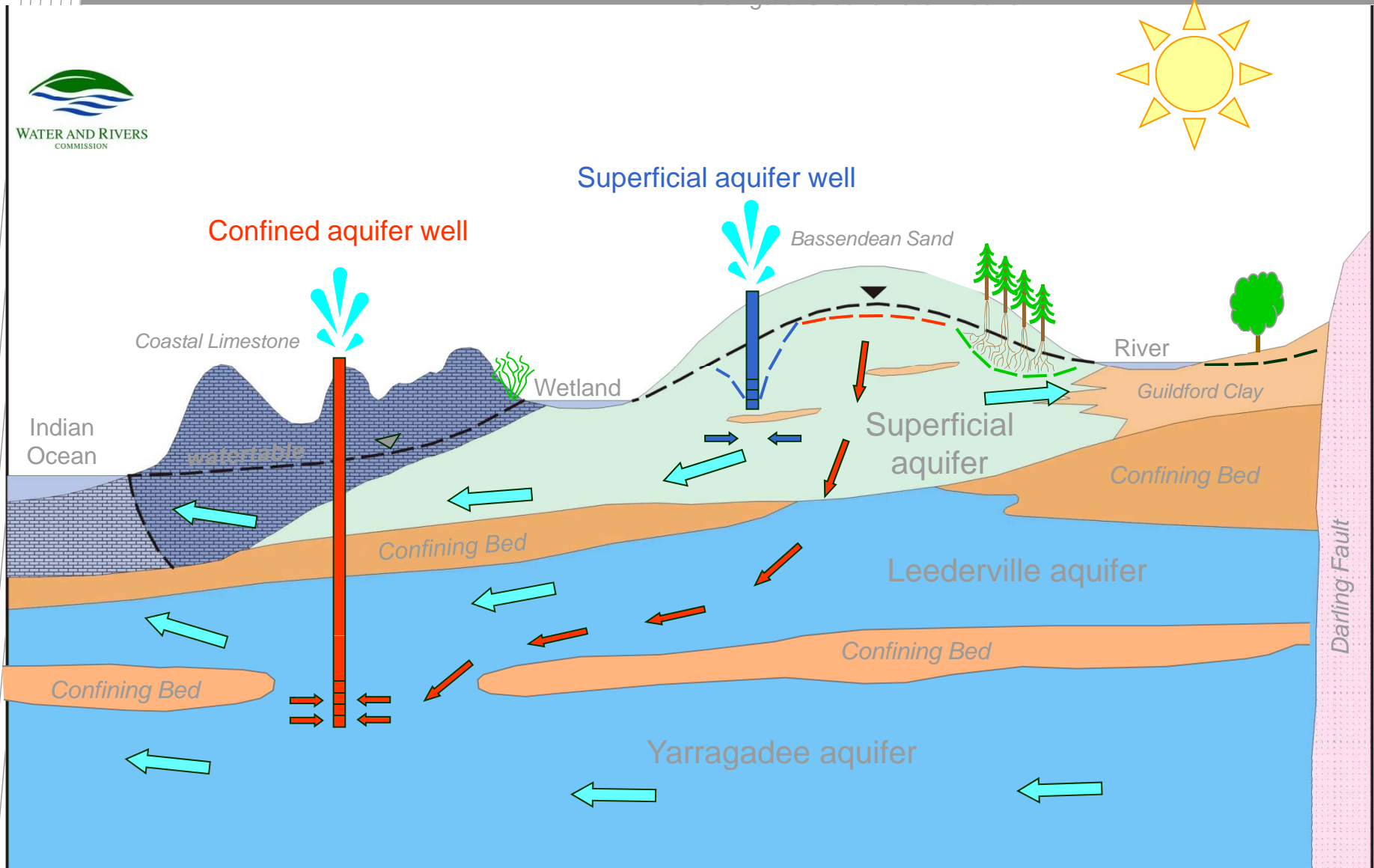
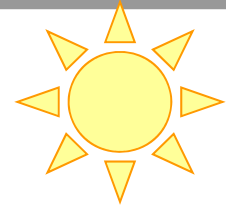
Water Corporation bores

Urban area

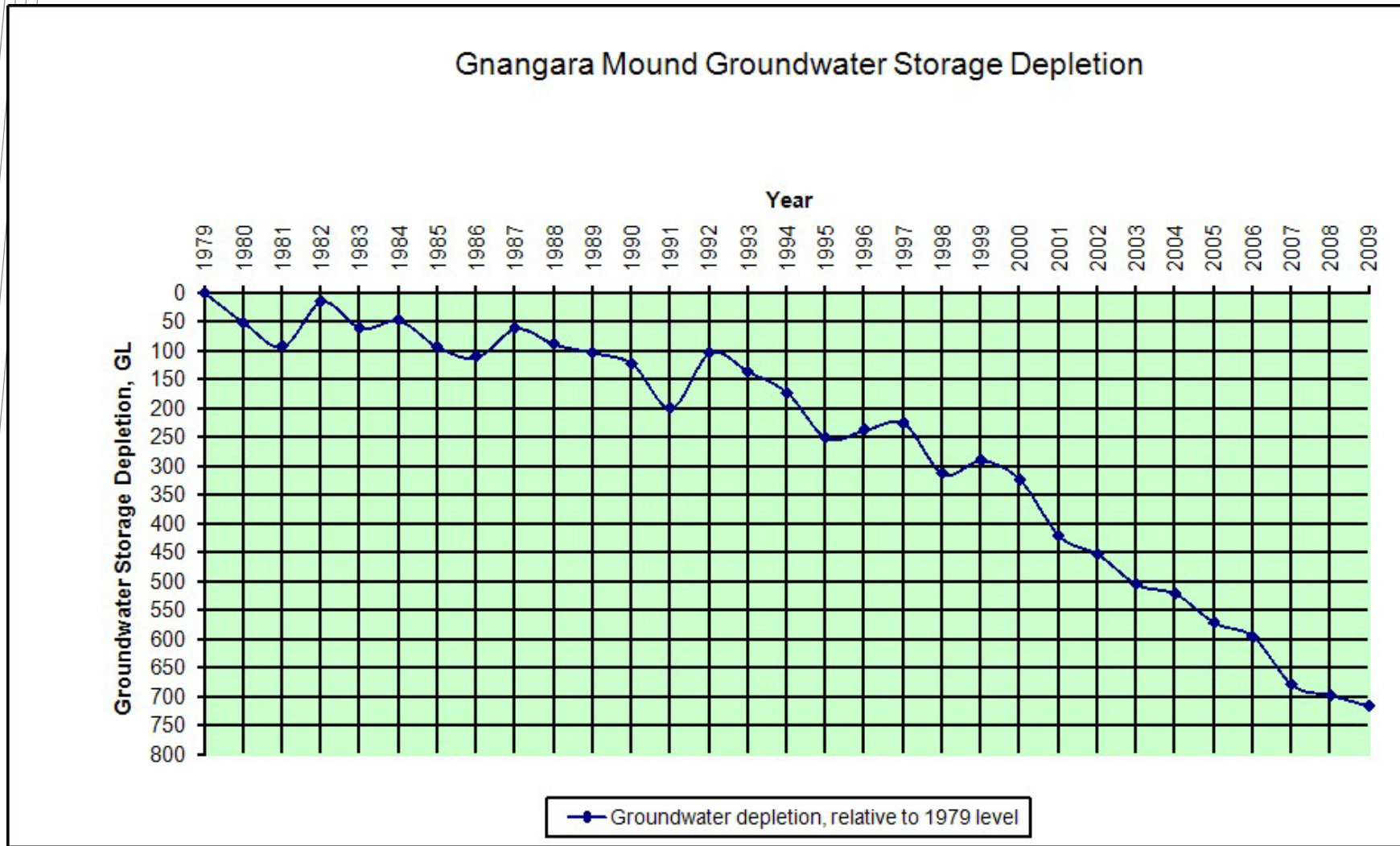
Watertable level



Gnangara Mound is really the top of a 3 layered groundwater system



Aquifer storage declines 45 GL/yr ~ 10% of our annual use

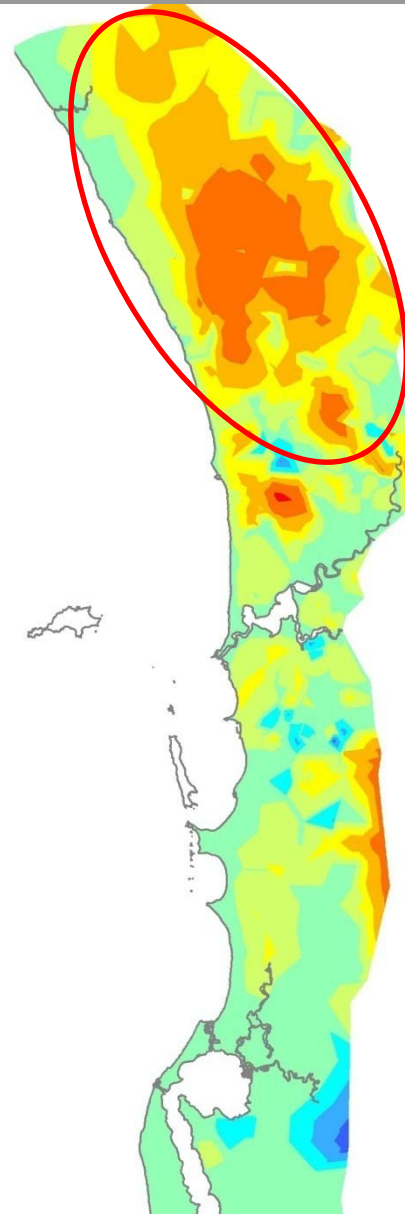
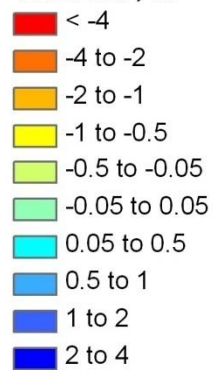


Decline in watertable 1998-2007



20 km

Watertable change
1998-2007, m



After Smith and Pollock (2010)

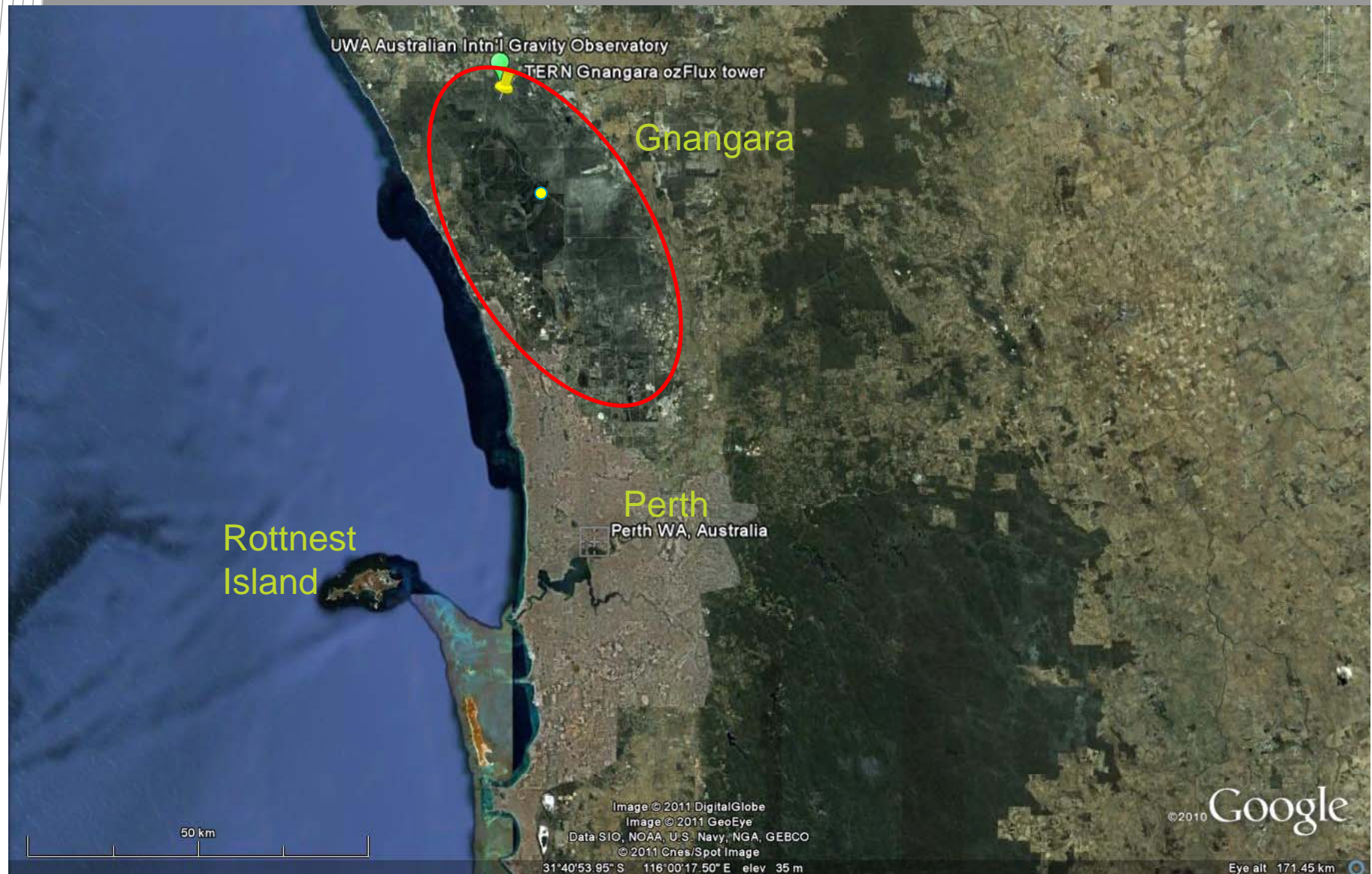
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Flux

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Gnangara eddy flux station



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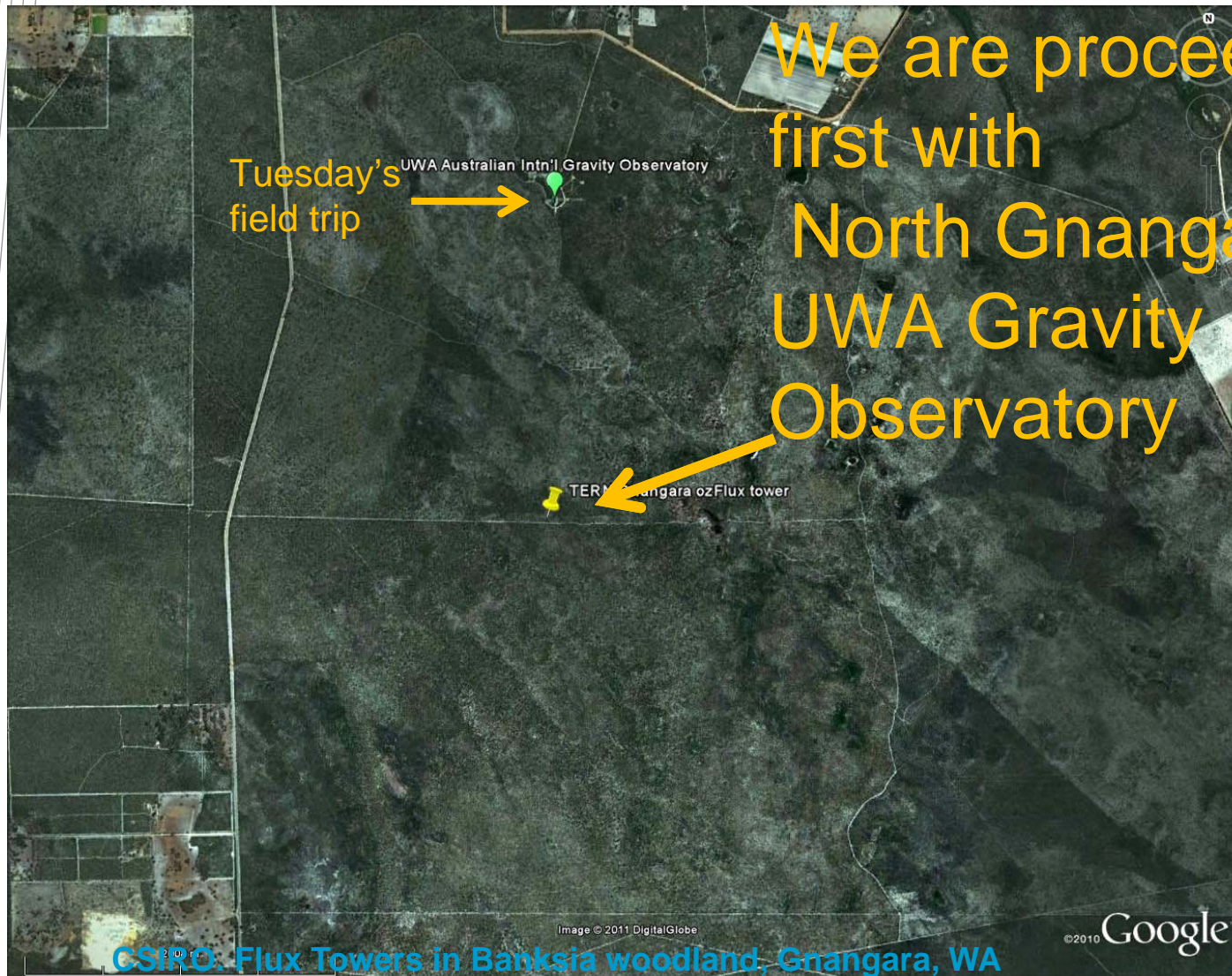
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Gnangara eddy flux station



Gnangara eddy flux station



We are proceeding first with North Gnangara near UWA Gravity Observatory

Tuesday's field trip

Watertables are falling

Department of Water

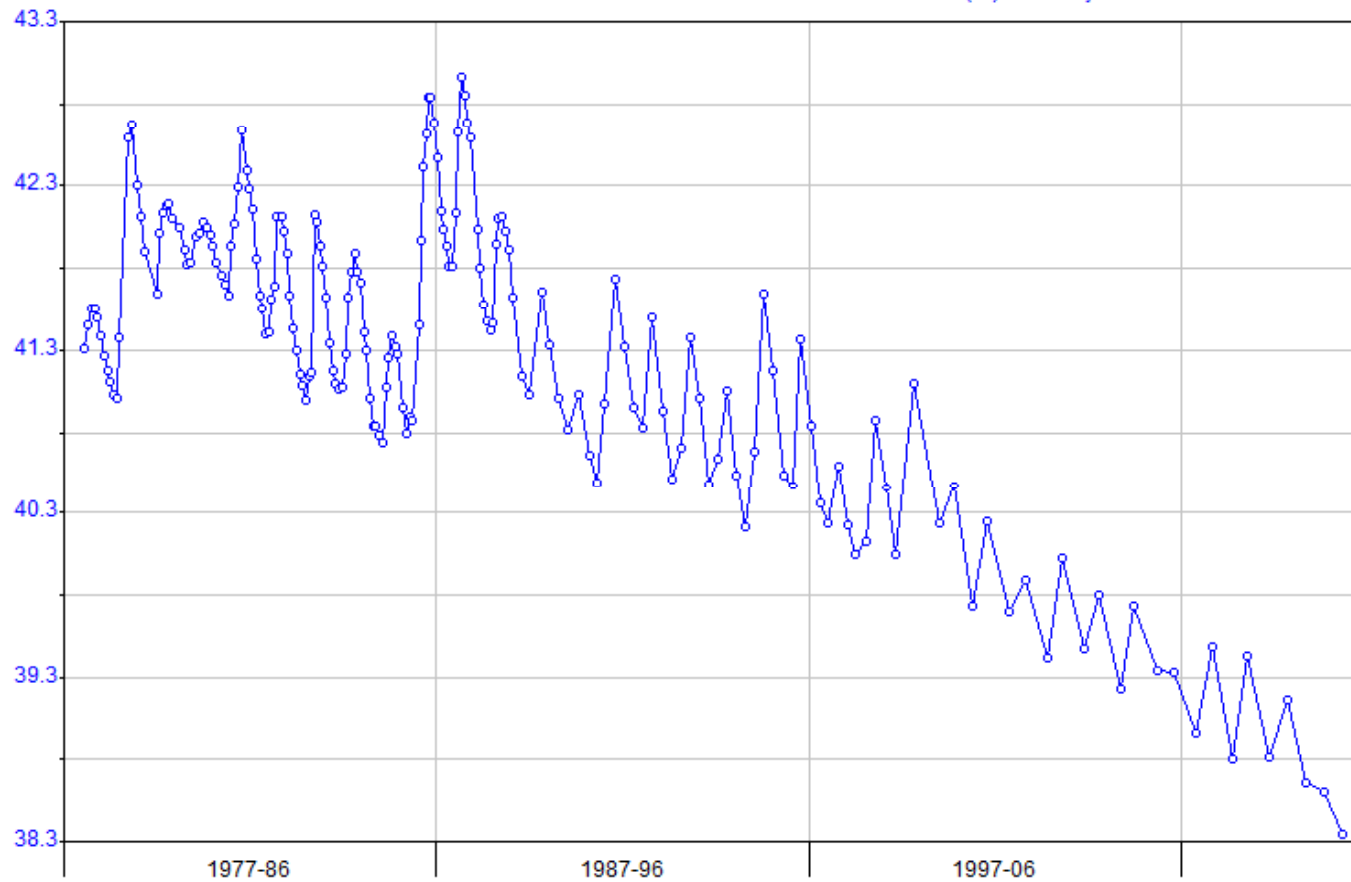
HYPLOT V133 Output 10/06/2011

Period 35 Year Plot Start 00:00_01/01/1977

1977-12

Interval 1 Month Plot End 00:00_01/01/2012

61710077 GB15 6268.00 Line/Point Water Level AHD (m) Primary Archive GWL



Gnangara Banksia woodland

- Approx 7m canopy
 - Rainfall ~ 750mm
 - Average fuel age 10yrs
- LAI ~ 0.8
Recharge ~ 150mm and falling



The site is chosen to understand the water use and carbon balance of the native bush

and improve management of Gnangara ecosystem and water

	Area (km ²)	mm	GL/yr
Input rainfall	2194	750	1646
Land use	Evaporative Water Use		
Native Bush	1048	600	629
Pines	225	850	200
Wetlands	12	800	10



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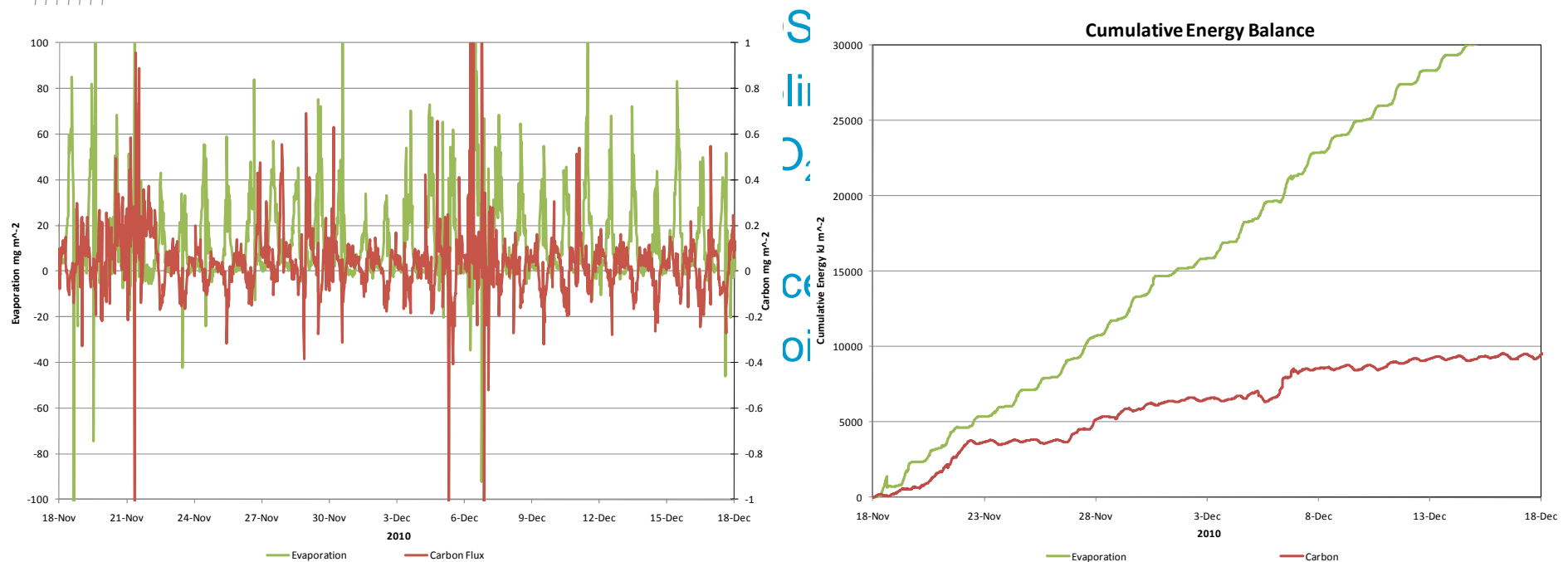
Outputs

- Water – evaporation, and hence recharge, sap flow
- Carbon uptake from and release to the atmosphere
- Ecosystem function
- Water, carbon and ecosystem response as bush regenerates after fire
- Response to infestations

- Other suggestions?

Instrumentation

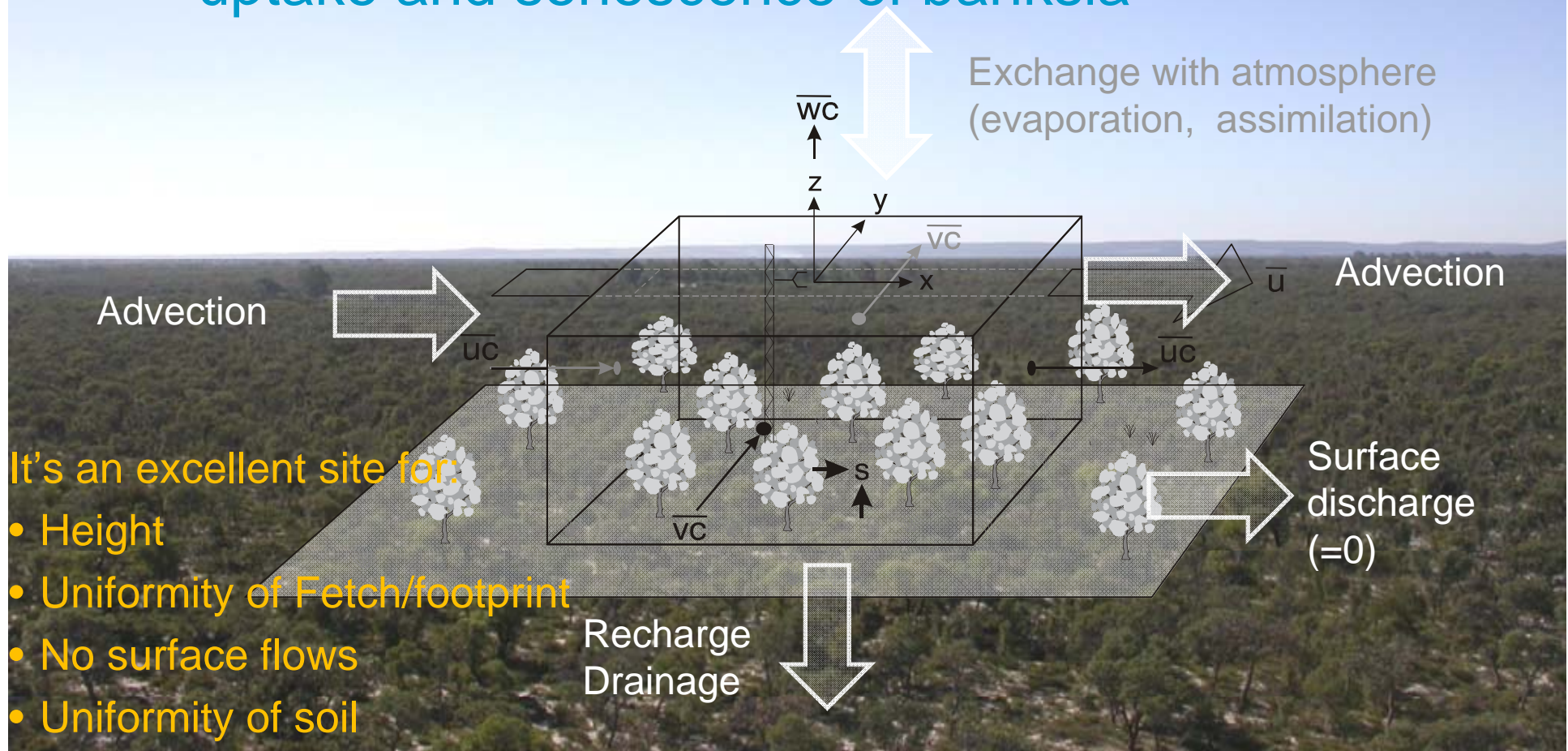
- Eddy fluxes – H₂O, CO₂, momentum
- Energy, G, surface radiative Temp, multispectral reflectance
- Air temp and humidity above and below EC



Examples from the back paddock

Quantifying evaporation from our 'control volume' will enable calculation of recharge

Quantifying CO_2 will enable assessment of uptake and senescence of banksia



Gnangara flux station

- Carbon and hydrological balance
- Ecosystem response to climate and fire
- Feral infestation
- Ground truth for remote sensing of vegetation and evaporation

.... And your suggestions



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Status:

- Station will be installed in next few weeks
- Current budget covers:
 - Installation
 - Operating for 3 years
 - Tech Support 2 years



Thank you – Any questions?

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CSIRO Land and Water

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