



Proud of our Past... Building the Future



STORMWATER REUSE INNOVATION DOWN UNDER:

Are the challenges in Alberta really that different?

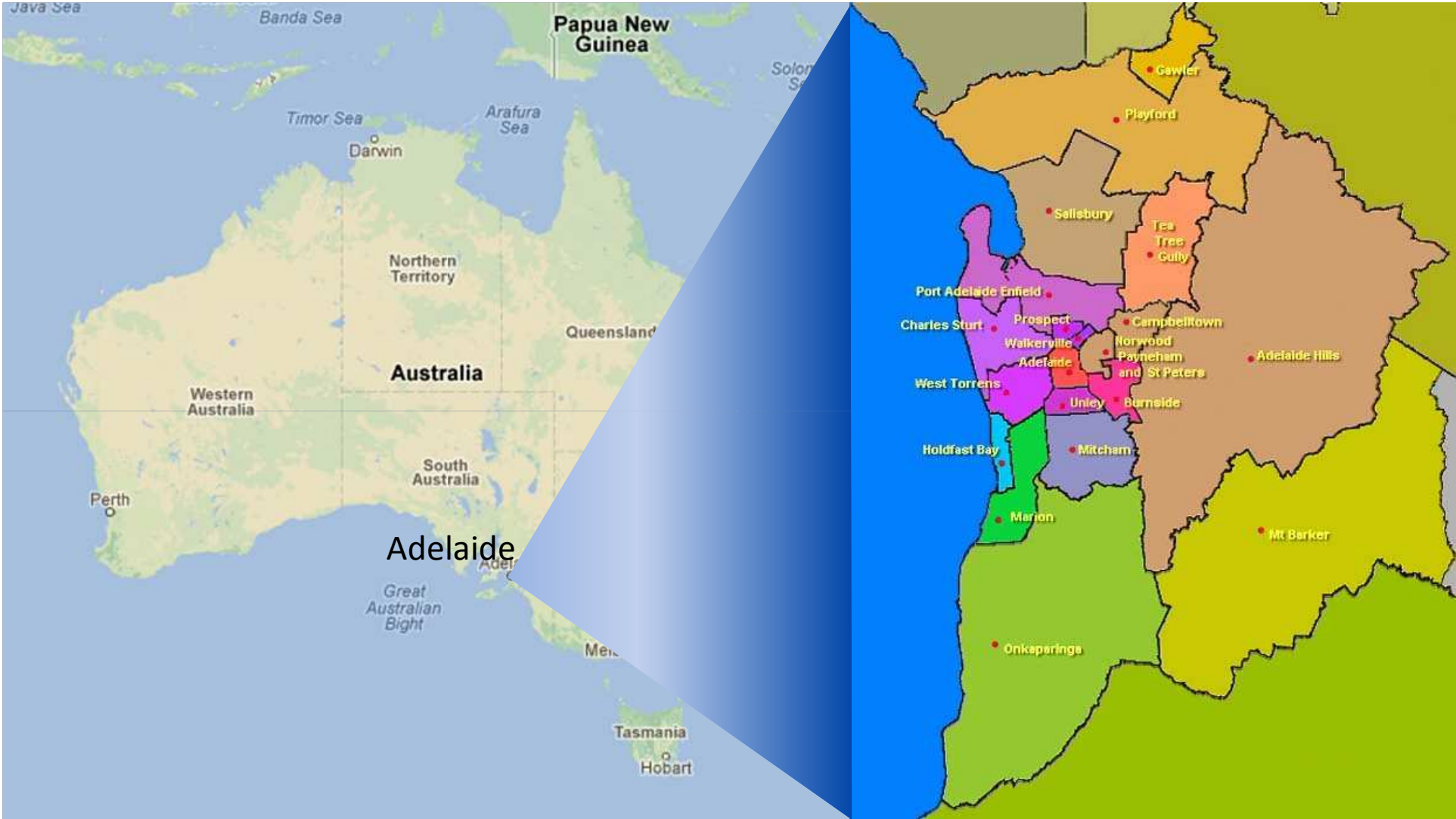
David Seeliger, Corporate Lead Stormwater Management
Vice President, Alberta Low Impact Development Partnership
Alberta Water Council Symposium 2014

Presentation Outline

- ❑ What are the similarities?
- ❑ Visionaries and early adopters
- ❑ Implications of the extreme drought (2003- 2010)
- ❑ “Waterproofing” strategies
 - Harvest potential and targets
 - Example projects
 - Research & innovation
- ❑ Summary

Acknowledgements

- ❑ Michael Hood, Aurecon – Waterproofing the West
- ❑ Baden Myers, Goyder Institute for Water Research, University of South Australia
- ❑ Ben Hall, City of Onkaparinga – systems operations
- ❑ Robin Allison, Design Flow - Unity Park Bioretention



What are the similarities?

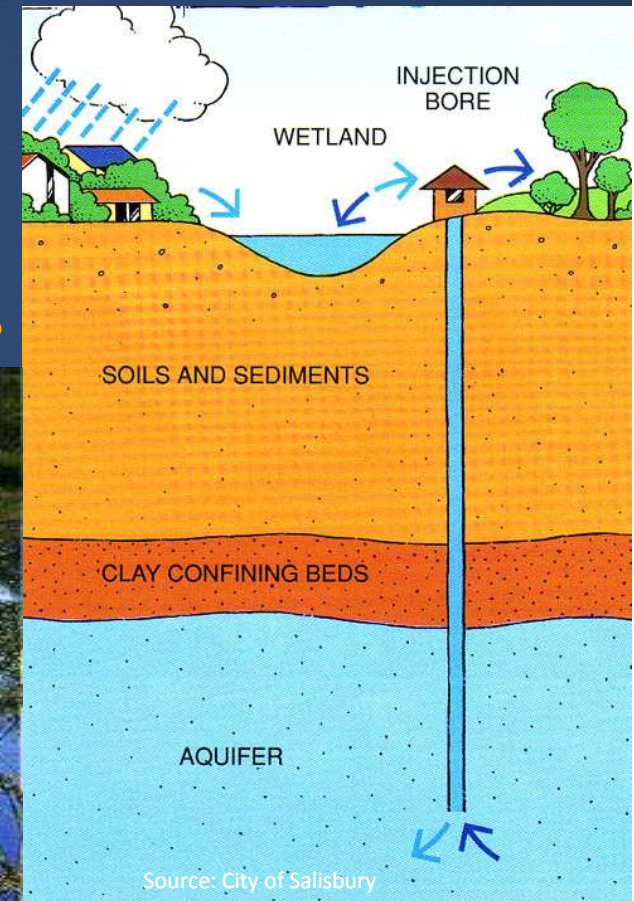
	Adelaide Metro	Calgary
Population (M)	~1.2	~1.2
City municipalities (#)	20	1
Potable water price (\$/m ³)	3.30 - 3.59	2.20 - 2.72
Pot. E.T. (mm)	~1700	~1000
Ave precipitation (mm)	420 - 600	410 - 445
Rainfall deficit (months)	5 - 7	2 - 3
Weather / rainy season	Hot / Winter	Cold / Summer
Potable water source	River Murray & Mt Lofty Ranges	Glacier & snow melt - Bow and Elbow Rivers

Visionaries – City of Salisbury

- 1970's - constructed first stormwater wetland
- 1990's - stormwater for irrigation
- Aquifer Storage Recovery (ASR) trials



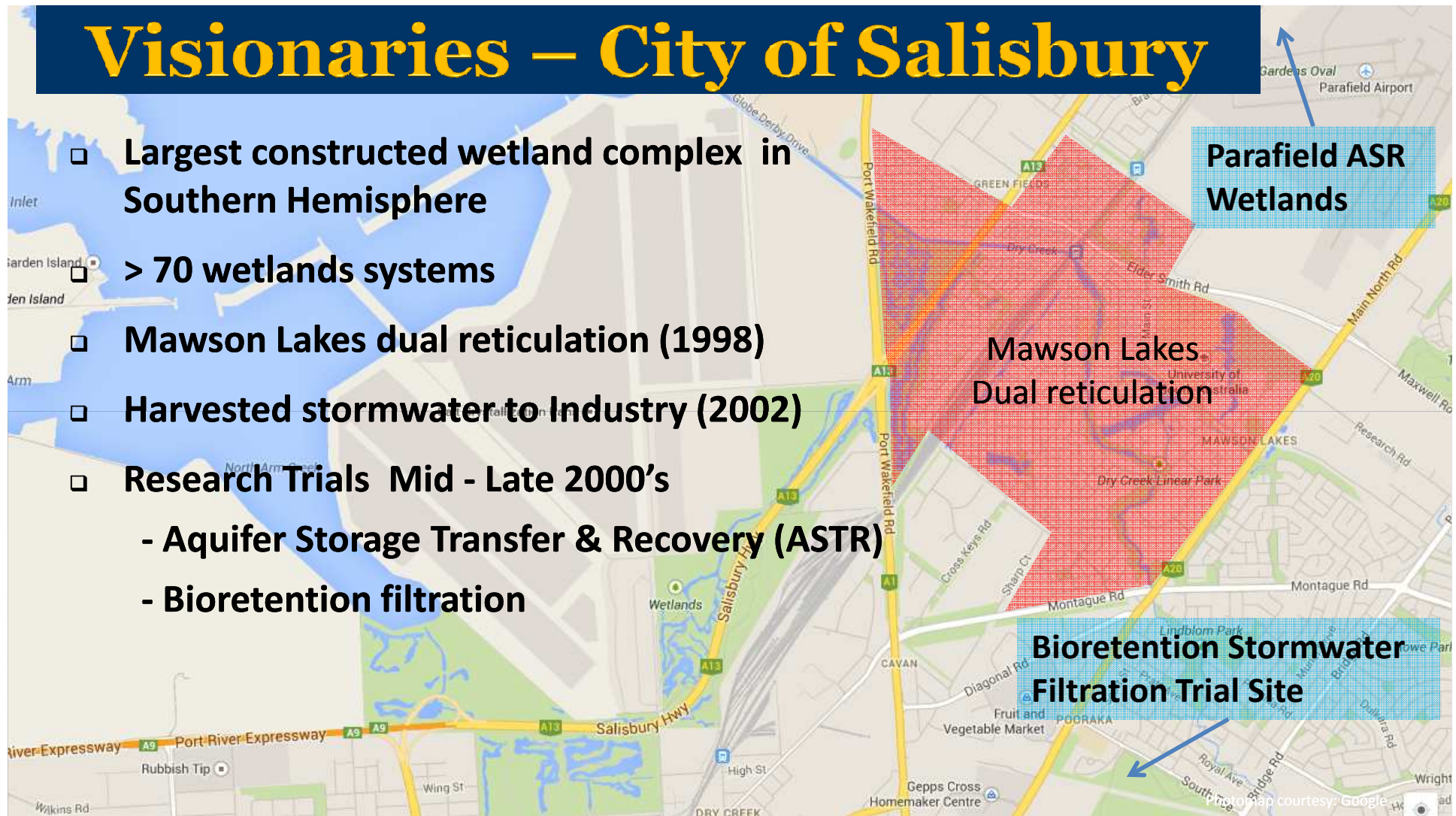
Photos: City of Salisbury



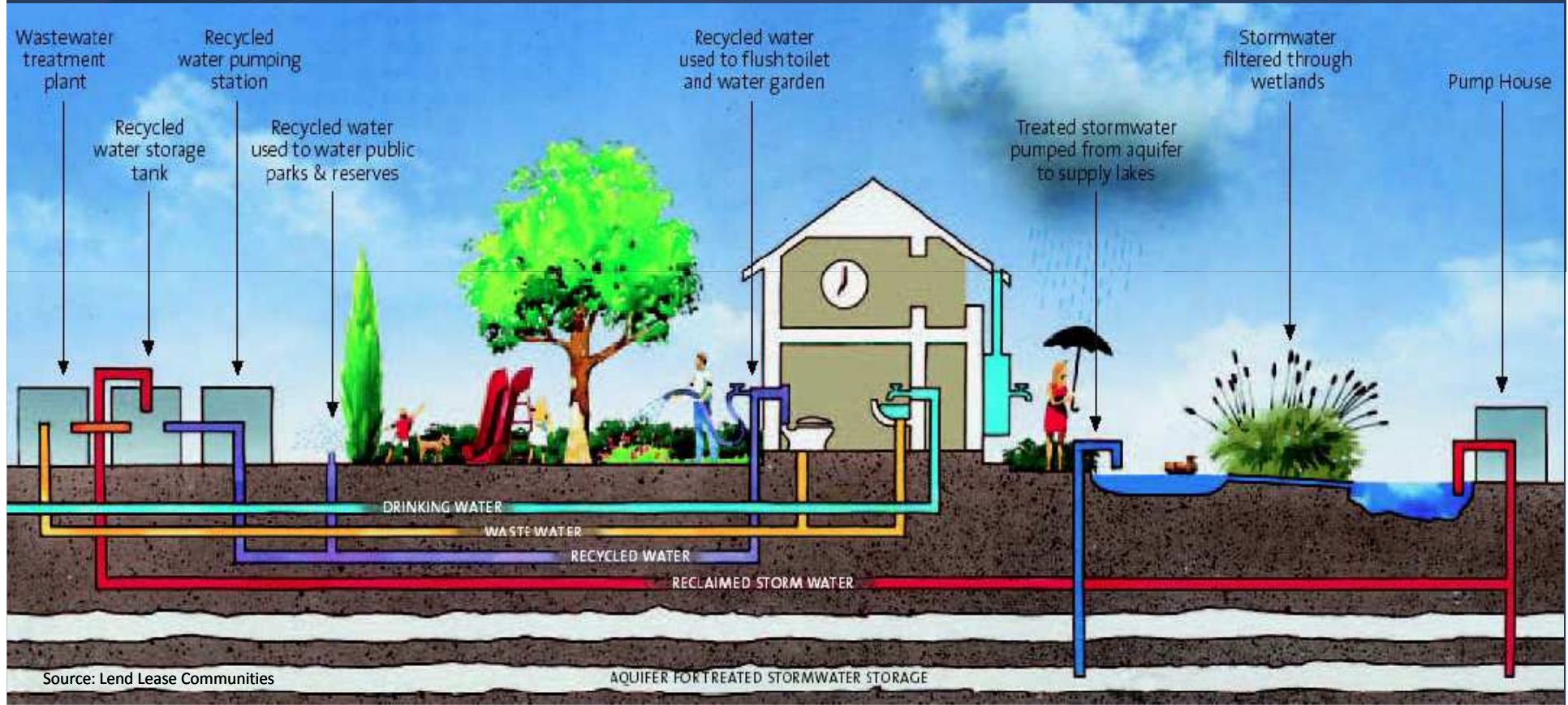
Source: City of Salisbury

Visionaries – City of Salisbury

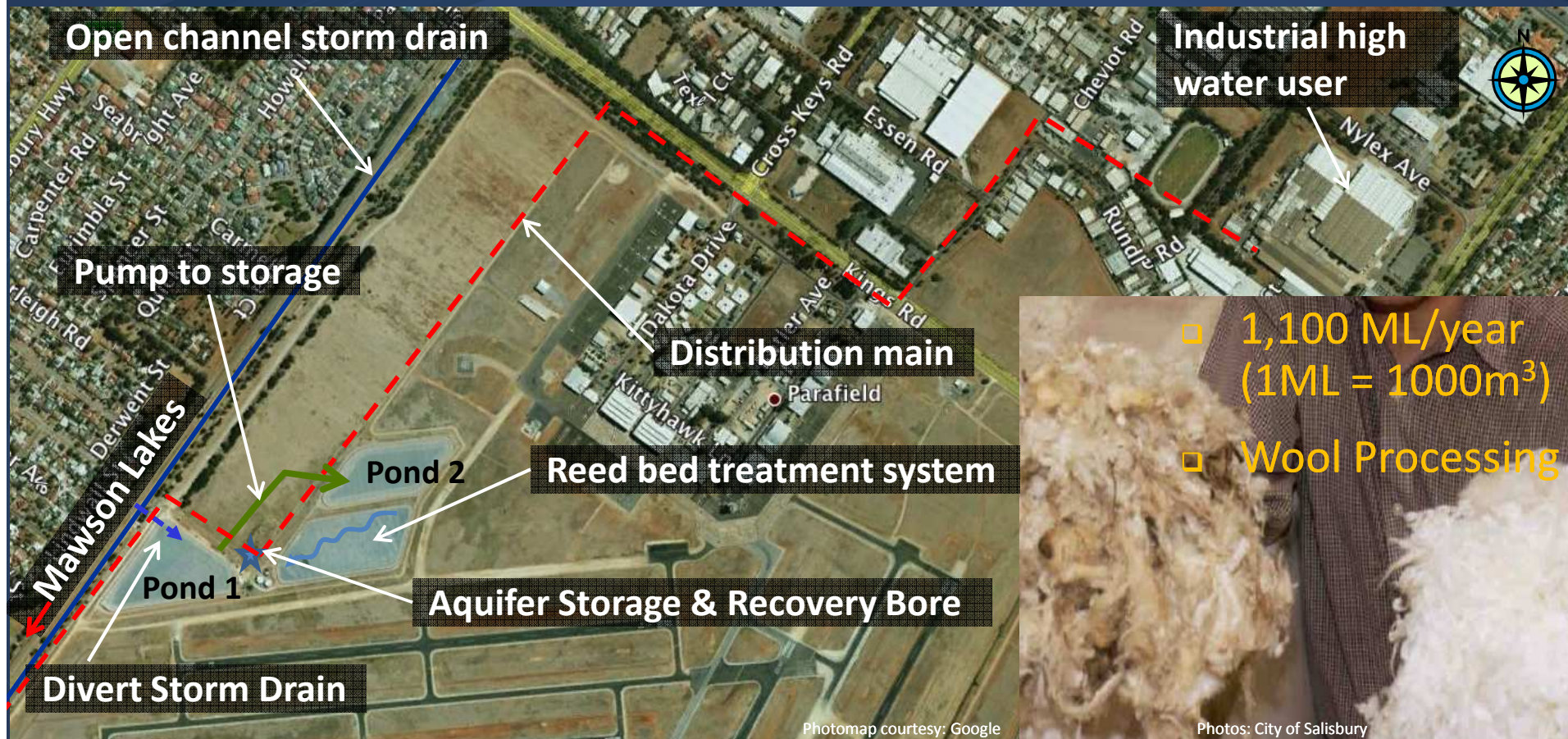
- ❑ Largest constructed wetland complex in Southern Hemisphere
- ❑ > 70 wetlands systems
- ❑ Mawson Lakes dual reticulation (1998)
- ❑ Harvested stormwater to Industry (2002)
- ❑ Research Trials Mid - Late 2000's
 - Aquifer Storage Transfer & Recovery (ASTR)
 - Bioretention filtration



Mawson Lakes

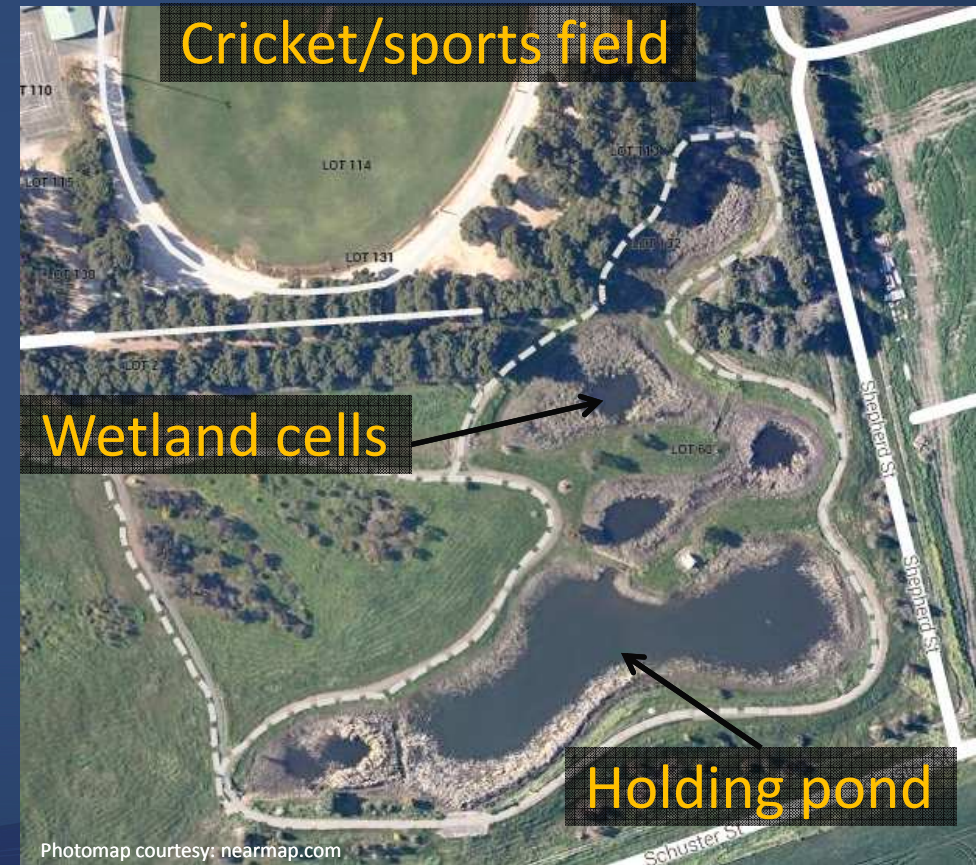


Parafield ASR Wetlands

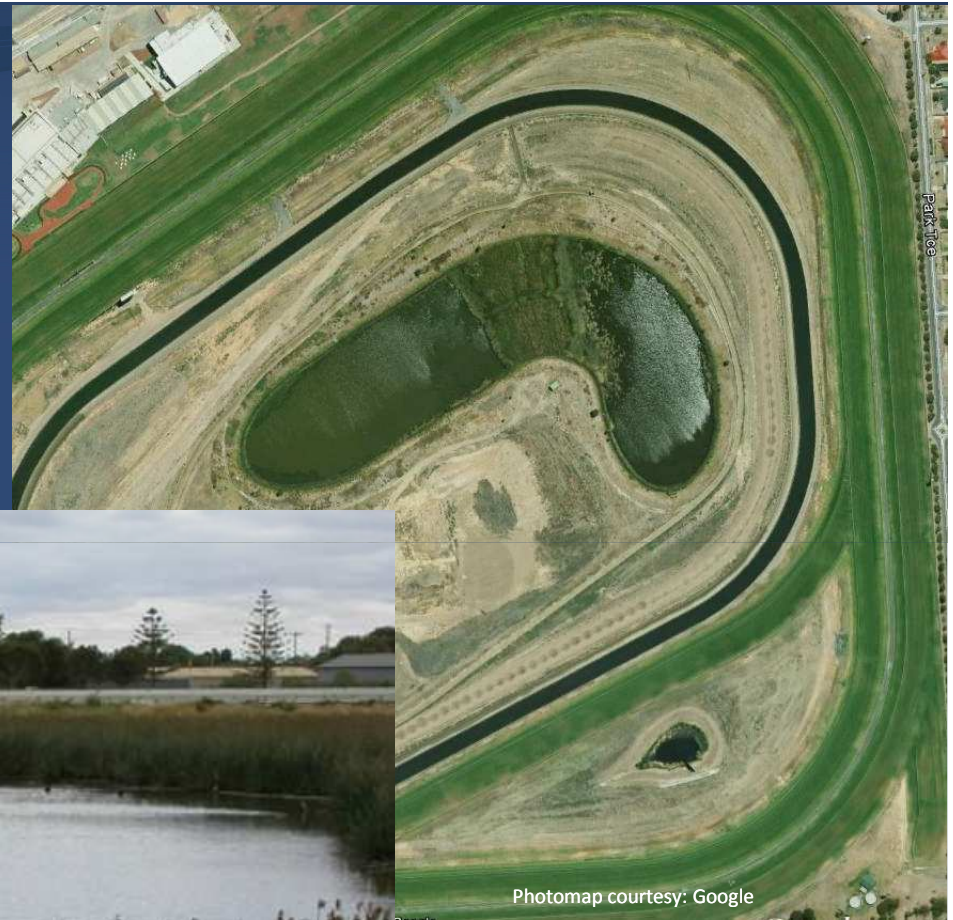


Early Adopters – DC of Light

- ❑ Freeling - small rural town
- ❑ 1998 - Constructed stormwater wetland
- ❑ Irrigate town “oval” from holding pond



Racecourses



Photomap courtesy: Google



Morphettville Racecourse Wetlands

Source: Adelaide Mt. Lofty Ranges Natural Resource Management Board

Golf courses



Implications of the Drought

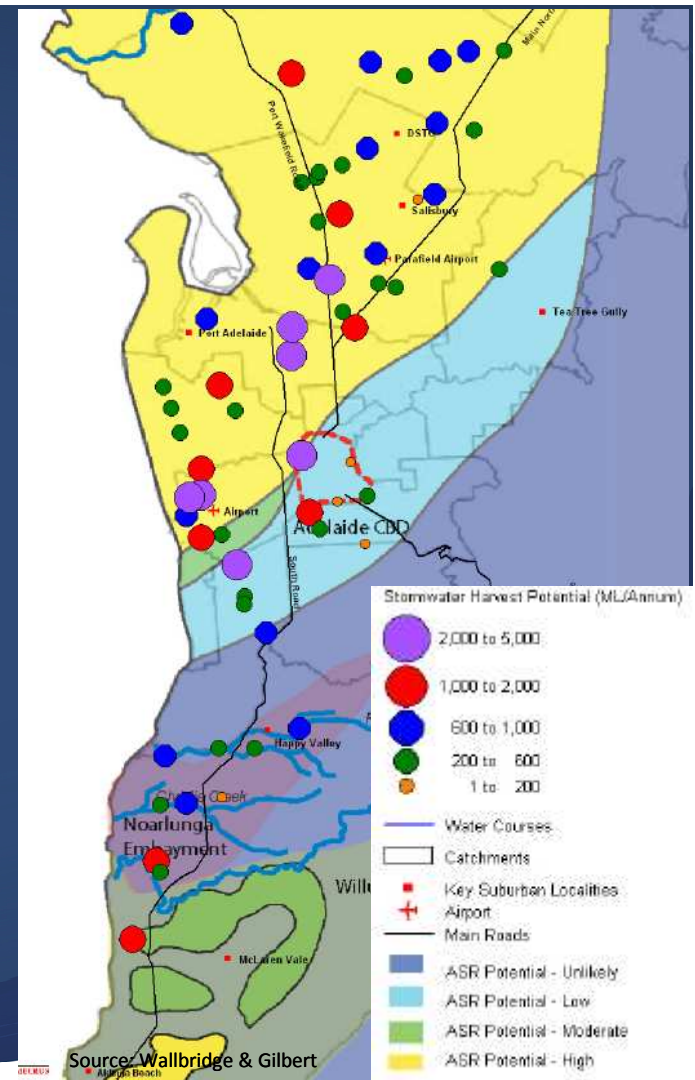
- ❑ The River Murray - most reliable source dried up
- ❑ Most parks, schools and sporting grounds stopped being irrigated
- ❑ Severe water restrictions, limited hand watering permitted
- ❑ Trees were stressed and many died
- ❑ Alternative water sources explored
- ❑ Potable water price increased by more than 3x

Implications of the Drought

- ❑ Source water security and reliability “waterproofing” strategies
- ❑ Considered potential sources in developing the strategy
 - Rainwater, treated stormwater & wastewater, seawater (desalination), groundwater and increasing storage capacity in reservoirs
 - Stormwater was an important part of an integrated strategy
- ❑ New policies requirements on rainwater reuse
- ❑ Significant funding available - federal and state governments
- ❑ Municipalities developed plans around stormwater reuse

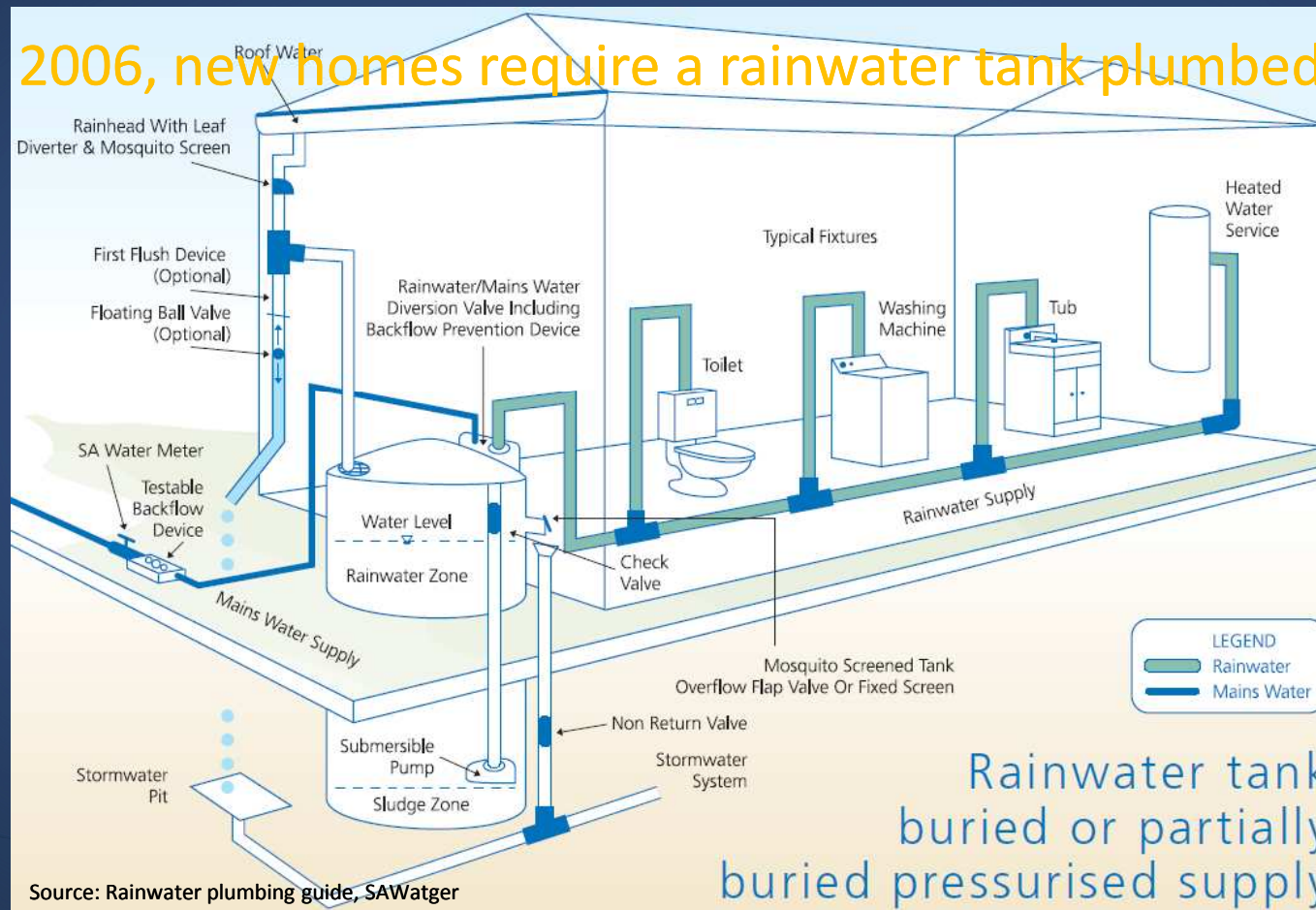
Stormwater Opportunities

- 2009 options study for Adelaide
 - Sustainable yield 106,000 ML/annum
 - Constructed/planned 18,000 ML/annum
 - Additional identified sites 42,000 ML/annum
 - Estimated cost \$700M
- State Government “Water For Good” stormwater reuse goal
 - 35,000 ML/annum by 2025
 - 60,000 ML/annum by 2050 (30% of current of metro Adelaide potable water supply)



Rainwater Reuse

- 2006, new homes require a rainwater tank plumbed into house



< RAINWATER >



Rainwater tank
buried or partially
buried pressurised supply

Rainwater Harvesting Examples

- Lochiel Park Eco-village
 - Rainwater for Hot water
 - Treated stormwater for toilet flushing, washing machine cold tap, public & private irrigation
 - Reduce potable water use by 87%

- Royal Adelaide Show Grounds
 - 3.5ML storage under main building supplies 50% of all water needs
 - Used for toilet flushing, irrigation and ornamental features



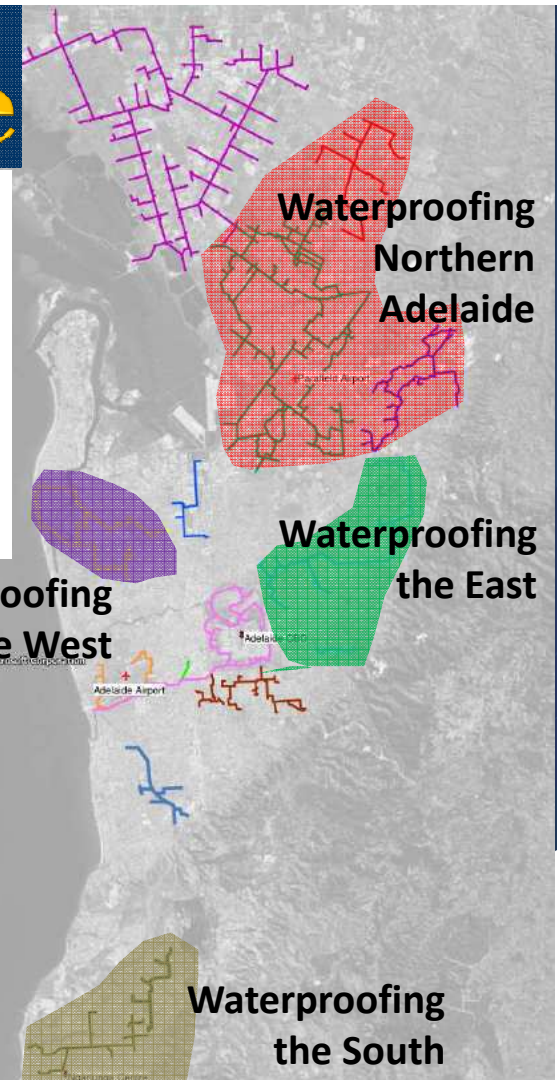
Photo: lochielpark.com.au



Photos: aeec.com.au

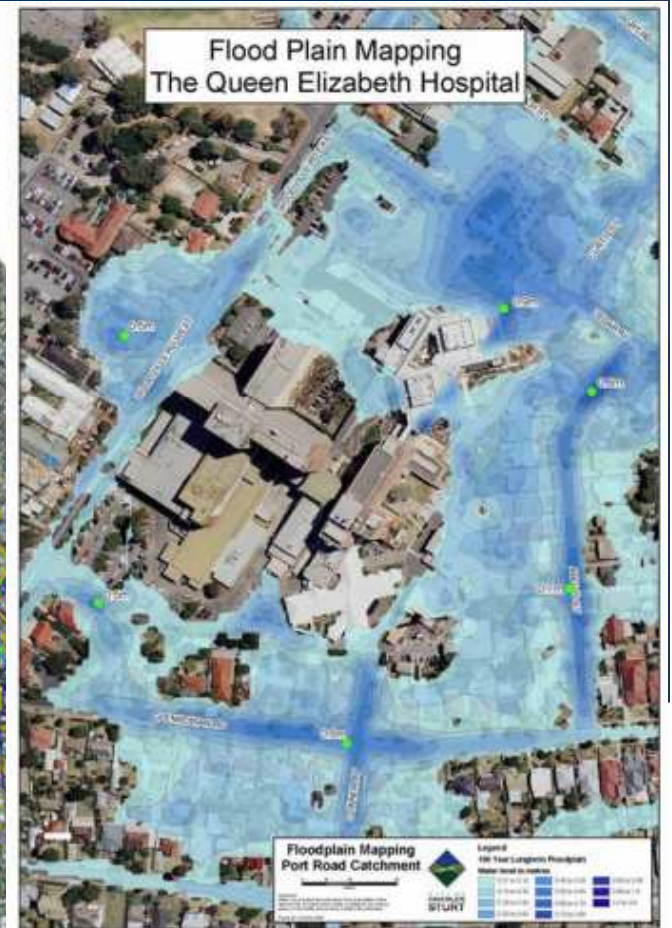
Waterproofing Adelaide

- ❑ Current stormwater reuse capacity 26,000 ML/annum
- ❑ Waterproofing Strategies
- ❑ > \$350M spent on capital projects
- ❑ Recycle 30% of wastewater effluent (Horticulture, Residential –Mawson Lakes, Airport, Adelaide City Parklands)



Source: Wallbridge & Gilbert

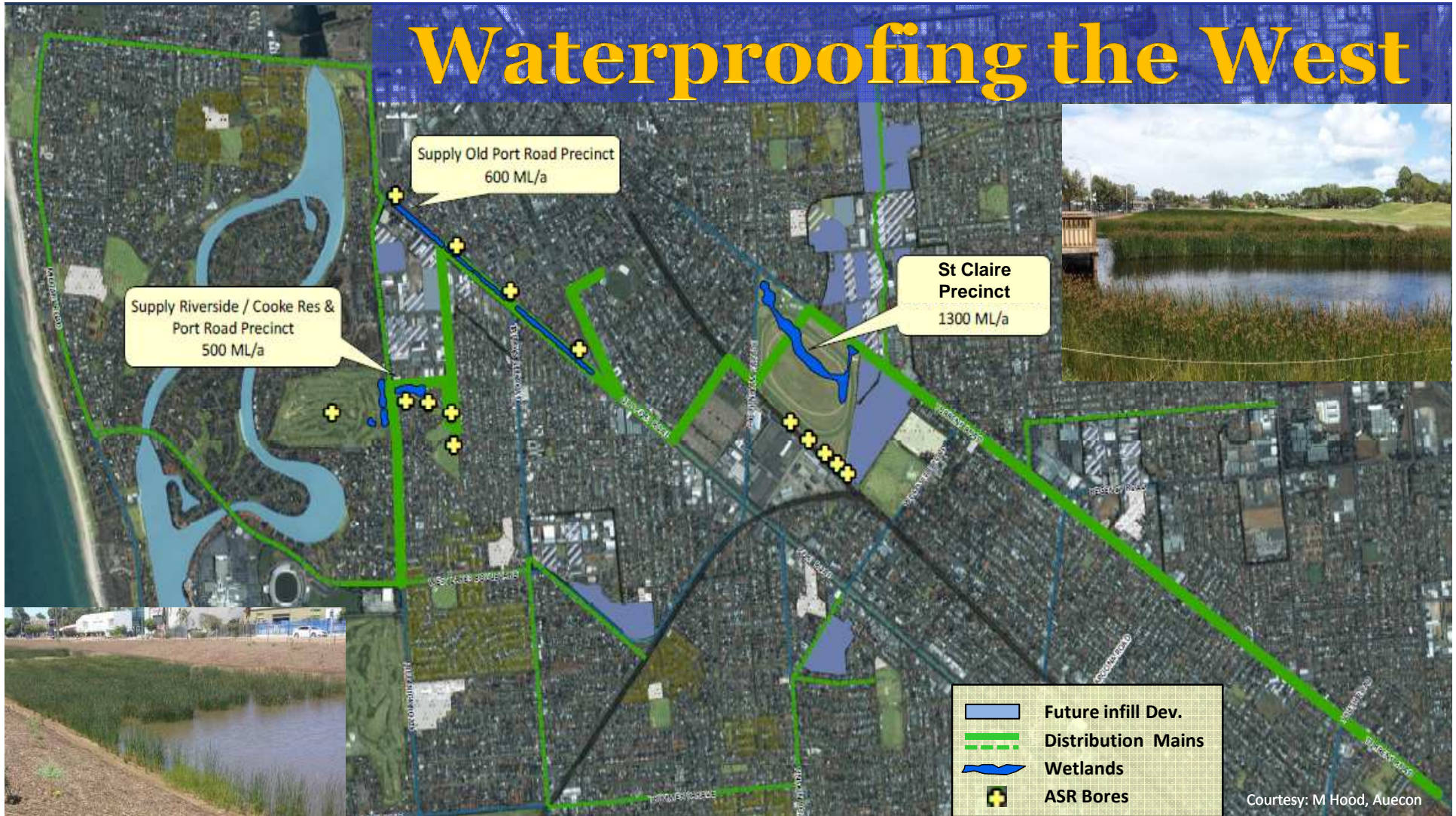
Waterproofing the West



Waterproofing the West: Stage 1

- ❑ Project driver water restrictions, but flood management, water quality, environment and aesthetics were important benefits
- ❑ 11 different funding partners
- ❑ Commonwealth, state and municipal governments, agencies, private developers (infill development)
- ❑ Stage 1 - \$70M for 2,400 ML/annum
- ❑ Includes wetlands, biofiltration, ASR, distribution mains

Waterproofing the West



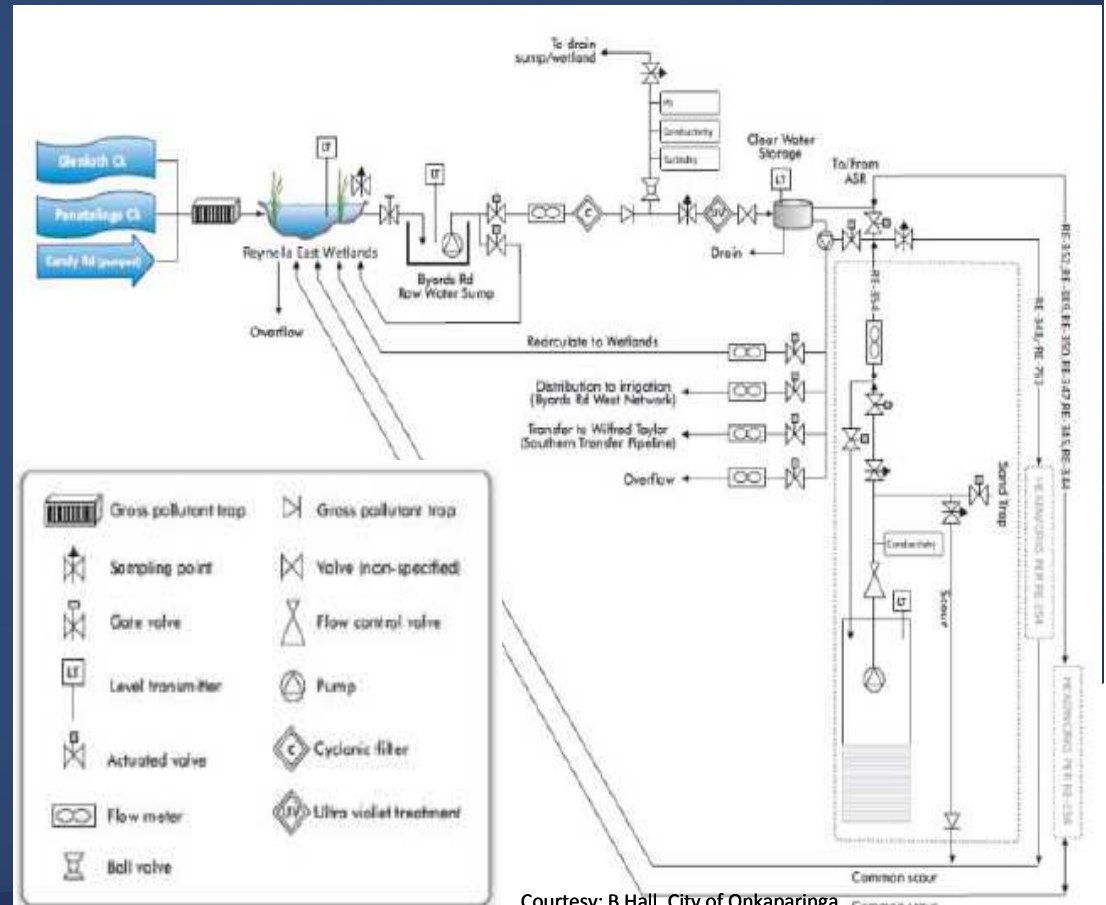
- ❑ Public space irrigation - No disinfection if irrigate between 9pm and 6am
- ❑ Unrestricted, high dose UV ($79\text{mJ}/\text{cm}^2$) or low dose UV ($12\text{mJ}/\text{cm}^2$) and chlorination
- ❑ Domestic non-potable use – chlorination & UV
- ❑ Turbidity < 10 NTU



Photos: M Hood, Auecon

Treatment Processes

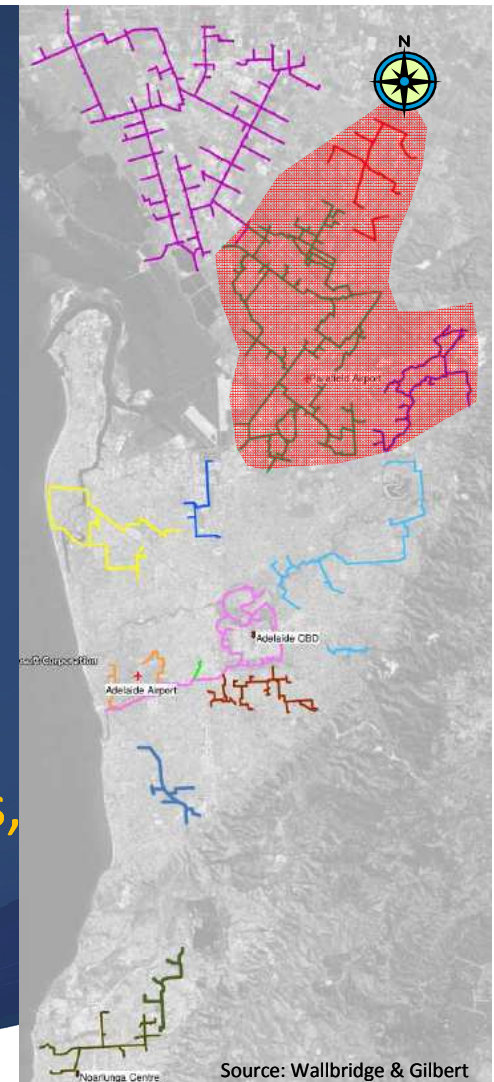
- Continuous monitoring:
 - conductivity
 - pH
 - turbidity
 - Stop if do not meet criteria > 30 mins
- Stop if Lab. Parameter criteria exceed
- Off-line wetlands treatment preferable
 - Turbidity issues
 - Poor WQ in summer



Salisbury Water

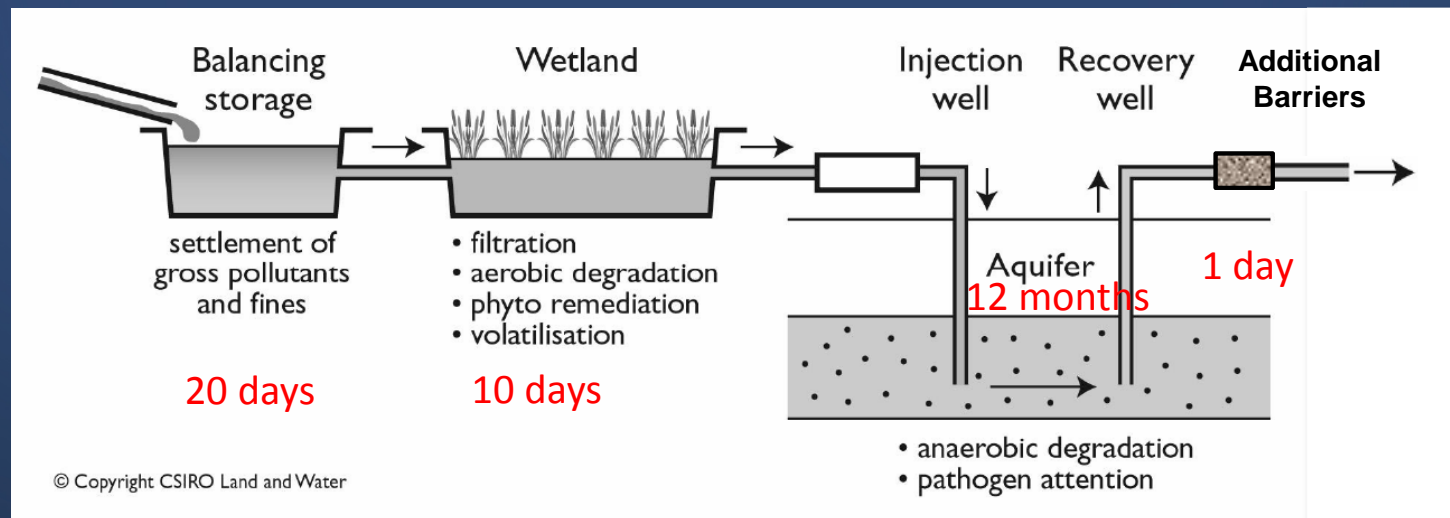
- Customers (2012):

	#
○ Schools	31
○ municipal reserves / parks	45
○ Business	41
○ Residential (potential)	670 (2500)
○ External Dev. Residential	2500
○ Mawson Lakes (SW & WW)	4300
- Currently supply capacity > secured demand
- Expand distribution network to supply new users, other municipalities
- ~ \$400M to provide dual reticulation in Salisbury



Parafield ASTR

- Aquifer Storage, Transfer and Recovery (ASTR) Trial (4+ years)
- Can aquifers treat stormwater to meet drinking water quality?
- Pathogen die-off: bacteria & protozoa was rapid, virus very slow.
- Augmenting potable supplies – understanding risks, net public benefit and strong community support



ASR Stormwater Use Options Study

- Extensive WQ risk and economic assessment of stormwater reuse options
- 5 options (of 16) were more economic than using potable mains water alone:
 - Public open space irrigation with and without wastewater blending.
 - Potable supply using local treatment or indirect via reservoir
 - Dual (purple) pipe non potable supply to households blended with recycled water.
- ASR enables 2x harvestable volume at 30 – 50% lower unit cost than surface storage
- Low Impact Development in the catchment is important in managing water quality and provides attenuation

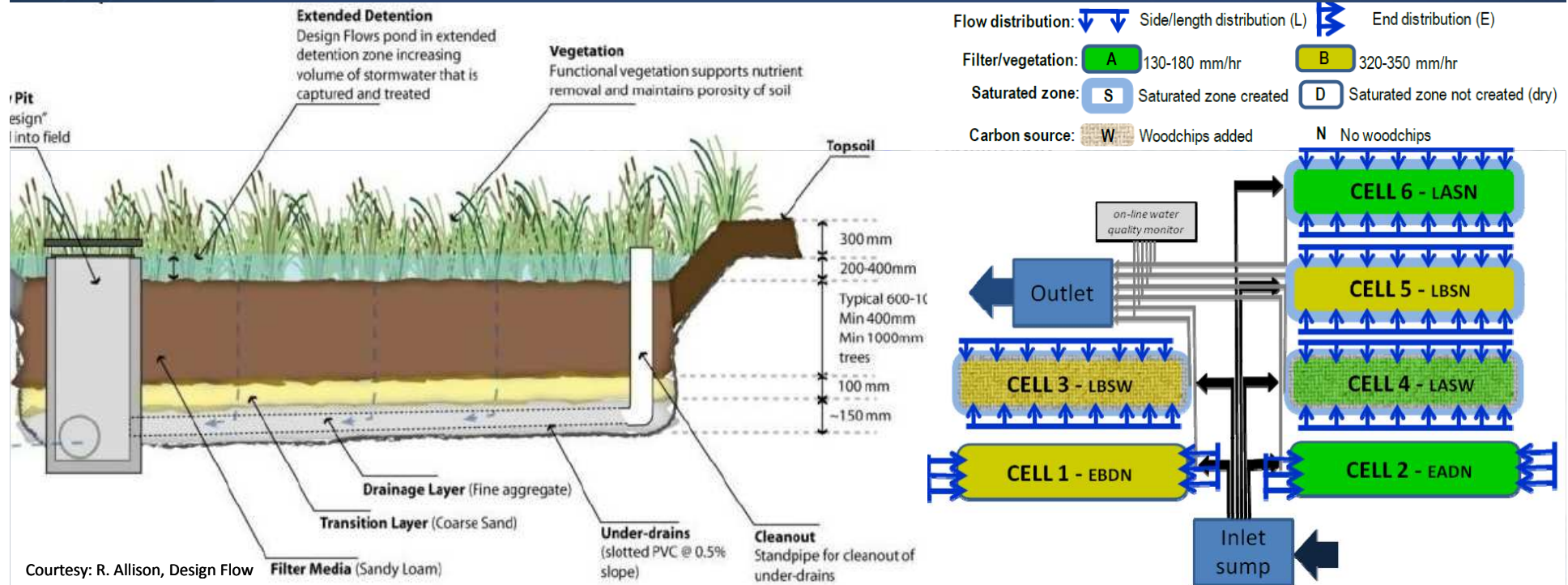
Alternative Water Supplies

Alternative Source	Capital (\$M/1000 ML)	Operating (\$/m ³)
Stormwater	10 - 30	0.55
Wastewater	30 - 50	0.70
Desalination	22	1.30

- Survey of public indicated acceptance of using treated stormwater as a potable supply option – but needed adequate consultation

Unity Park Stormwater Treatment Trial

- Uses bioretention cells to treat stormwater
- Trial different media and layout configurations



Unity Park Stormwater Harvesting

- Bioretention smaller treatment area (10 % wetland)
- Capital - 3 to 5 times lower than wetlands
- Important for future stages as land availability becomes limiting



Courtesy: R. Allison, Design Flow

Summary

- ❑ Stormwater & rainwater is a valuable and economically viable resource
- ❑ Developing a networked distribution system provides flexibility and not reliant on specific users
- ❑ ASR increases stormwater capture efficiency and reduces capital costs
- ❑ Bioretention treatment of stormwater for reuse is an important emerging technology

Summary

- ❑ Technologies and approaches are applicable to Alberta provided cold climate issues are addressed

Thought to ponder? Could the Calgary region ever experience similar events to Adelaide?

Questions?



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Alberta Low Impact Development Partnership: Vice President