

# OASIS

WATERWORKS CO. REPORT  
FOR AITKEN CREEK



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# Aitken Catchment Site

- 2.593km<sup>2</sup> catchment in the northern suburbs of Melbourne, adjacent to Craigieburn.
- Aitken Creek runs through the development and drains to the south-east corner.
- Located in an Urban Growth Zone, with areas of environmental and cultural significance.
- Temperate climate, consistent rainfall, experiences increase in urban heat and heat vulnerability.
- Within the Victorian Volcanic Plains with significant biodiversity value, including habitat for the Growling Grass Frog and Golden Sun Moth.
- 50% population growth forecasted.
- Low housing diversity in the surrounding suburbs.





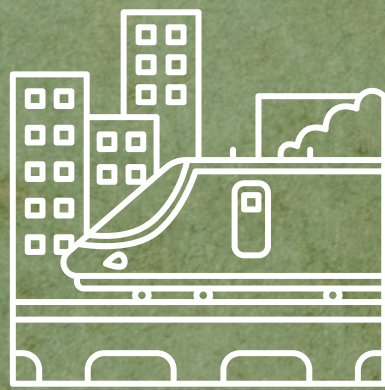
# Our Vision and Objectives

Meet the required project objectives in the base case and the alternative case

## A RESILIENT COMMUNITY



HEALTHY PLACE



AFFORDABLE LIVING



HEALTHY PEOPLE





## AFFORDABLE LIVING

- Offers mixed housing options
- The homes are energy and water efficient
- Minimises the cost of home maintenance and upkeep

- 5.5% medium density housing 94.5% low density housing for different household sizes and budgets



- % reduction water bills for the average household
- % reduction in electricity bills for the average household (efficient appliances and cooling benefits of GS)





## HEALTHY PEOPLE

- Promotes the health and wellbeing of residents
- Socially connected community
- Diverse and integrated community



- Green spaces (max 250m from dwellings)
- community garden plot
- active transport (looped paths)
- exercise opportunities
- centrally located dwellings (500m Max from amenities)



- Refuge from extreme heat events --> accessible cool zones
- Canopy cover: 60% in non built areas, 40% in built areas.

- All buildings designed for accessibility.
- 10% housing reserved for high accessibility requirements.





## HEALTHY PLACE

- Minimises disturbances to natural assets
- Improves and restores natural assets
- Designed to protect biodiversity
- Protects water quality and instream health

- design for biodiversity-->retain AND enhance remnant ecosystems.
- --->protect corridor connectivity with surrounding area.

- Within the developed area, landscape with indigenous species to enhance biodiversity and connectivity.

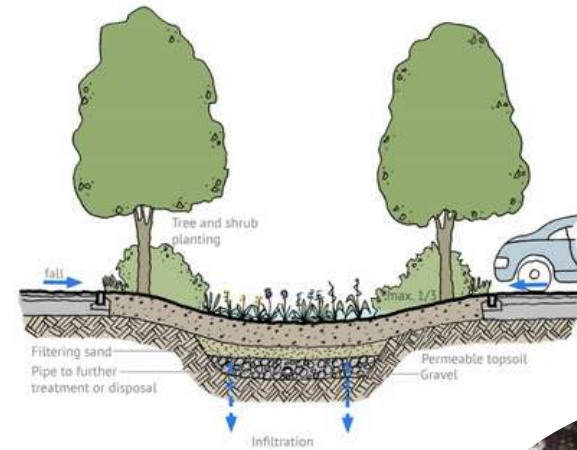
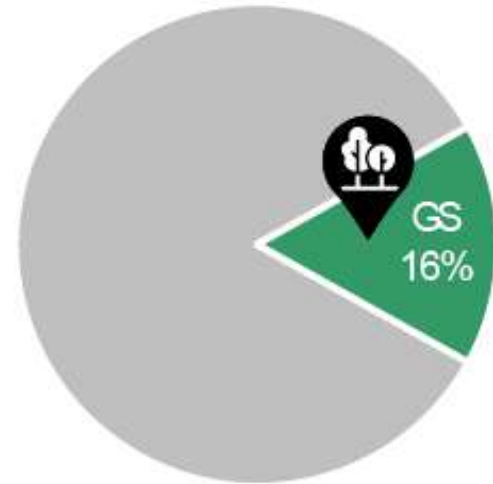
- Manage stormwater on site and minimise water entering Aitken Creek
- Treatment train to protect water quality
- Reduce potable water needs --> use of grey water and storm water





# Base Case Scenario

- Business as usual
- Low Density, Houses
- 2595 dwellings
- 16% hectares of usable open Space
- Parks with standard vegetation and amenities
- Rainwater tanks per dwelling
- Swales along every street







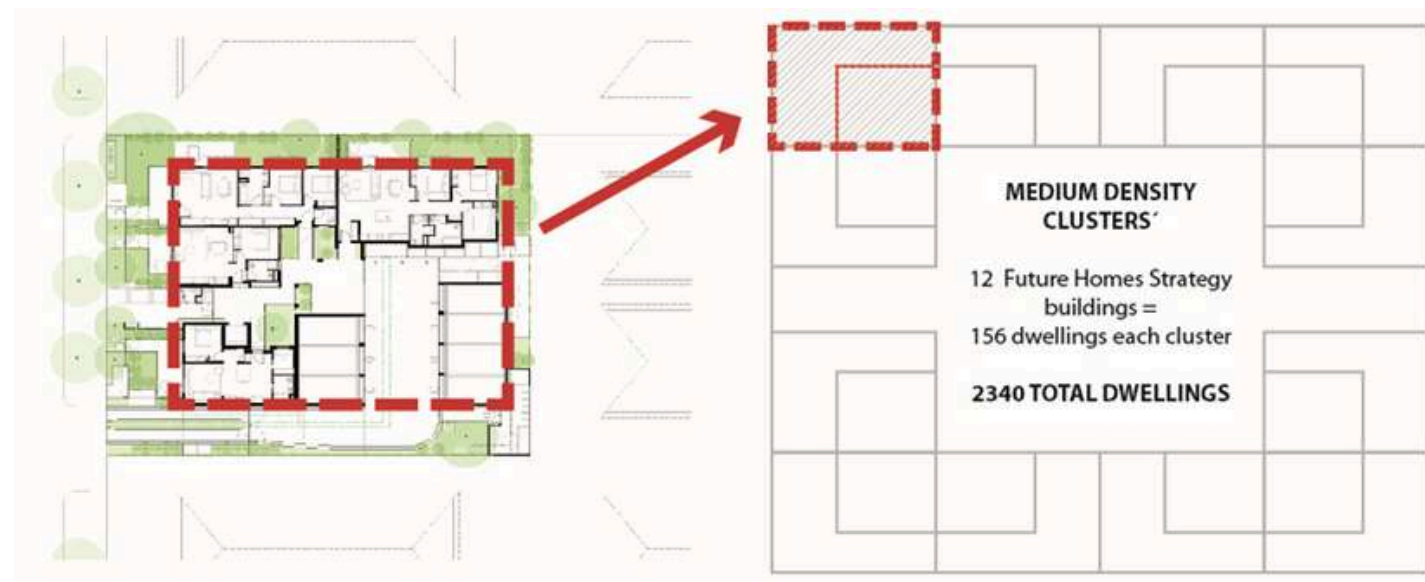


# 1 Medium Density

- Predesigned Buildings from the Future Homes Strategy (VicGov)
- Clustered in 15 bigger buildings with an interior Open Space
- Community Gardens and Cooling areas
- Recycled Greywater for Irrigation
- Social Interaction and Resilience



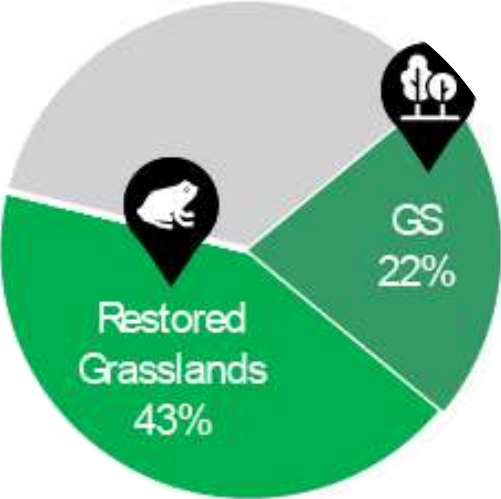
**Community Gardens**



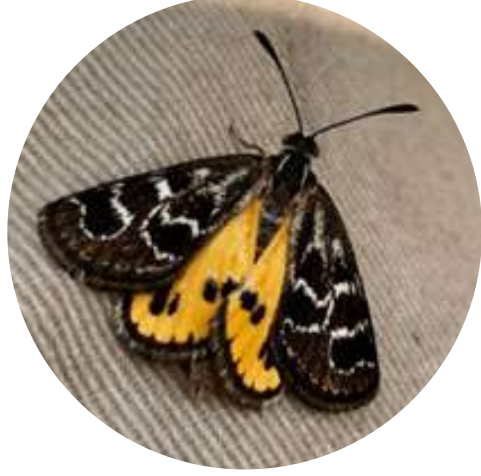


# 2 Nature Reserve

- 1/3 of the site (112 hectares)
- Designed for critically endangered species
- Restored Grasslands + Wetlands + Chain of ponds
- Co-managed by the Community and Melbourne Water



**Growling Grass Frog**



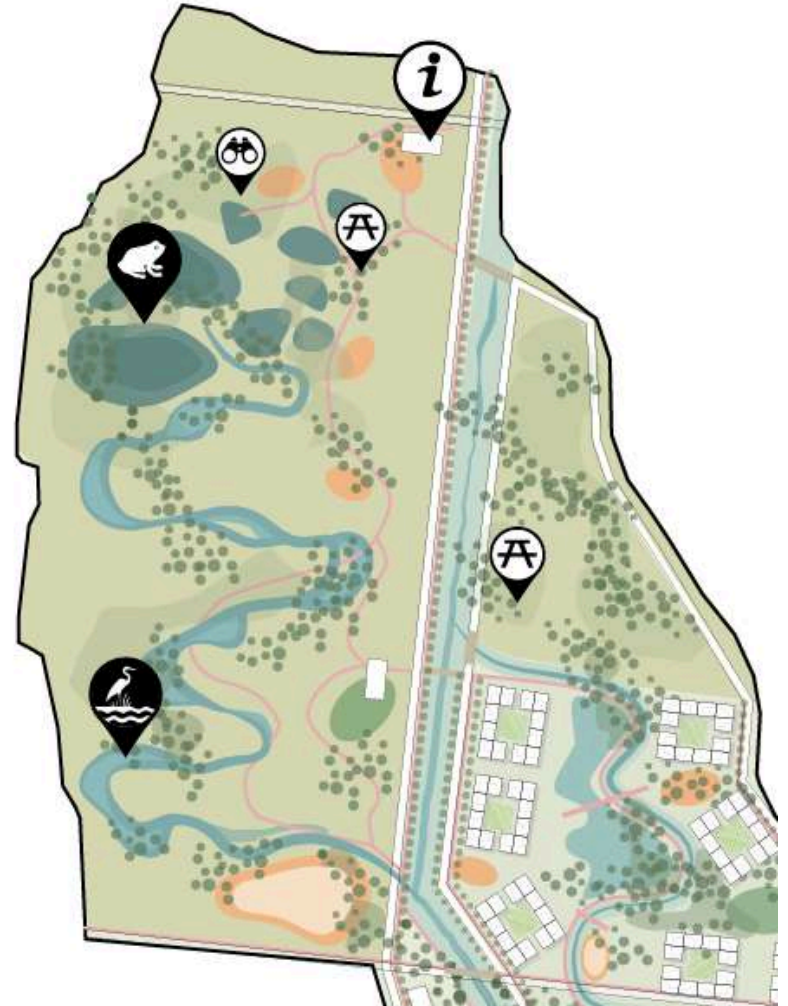
**Golden Sun Moth**



**Tourism and Recreation**



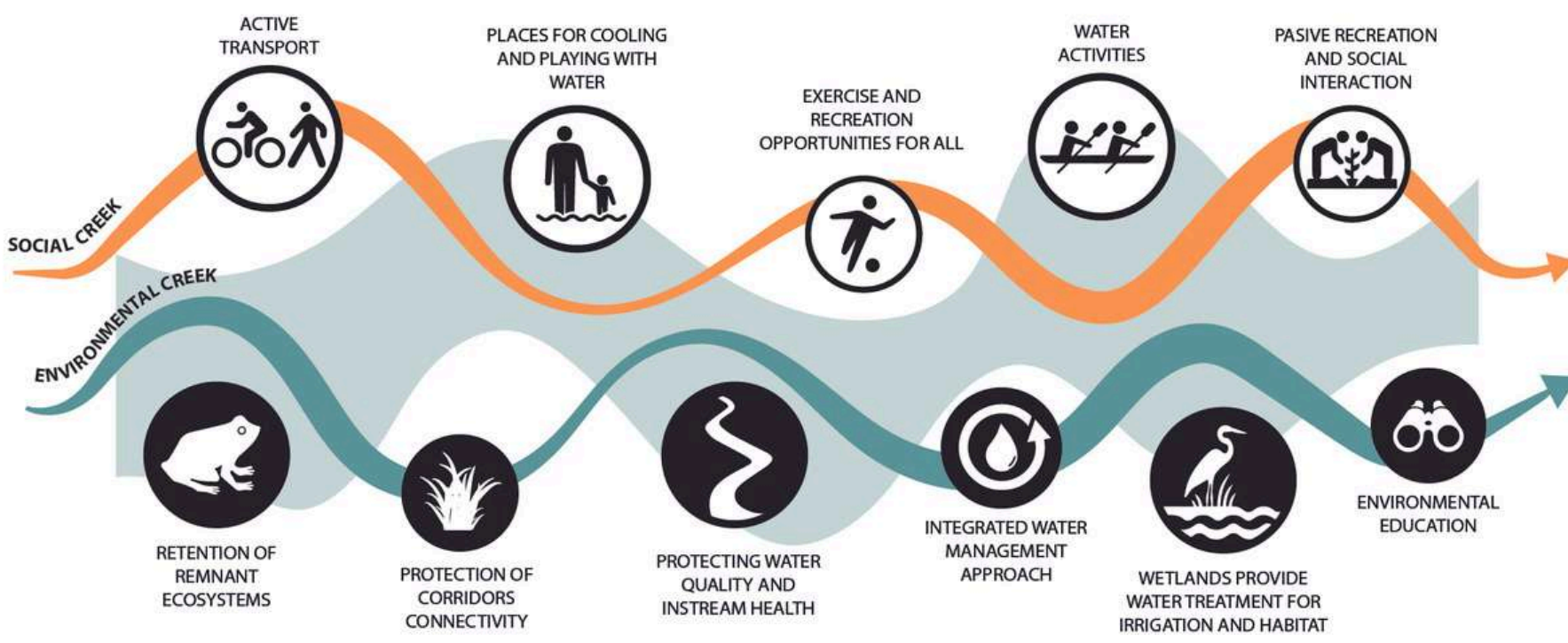
**Educational Signage and Wayfinding**





# 3 Social Creek

- Parallel waterway to Aitken Creek offering Social amenities and Stormwater Management
- Manages Stormwater runoff and treated Greywater
- 3 Treatment Wetlands along this creek
- Detention Basin





# 3

# Social Creek



Nature Play



Interacting with water



Biking and Walking Paths



Oases for Cooling and Recreation



Multiuse Detention Basins



Recreational Lake

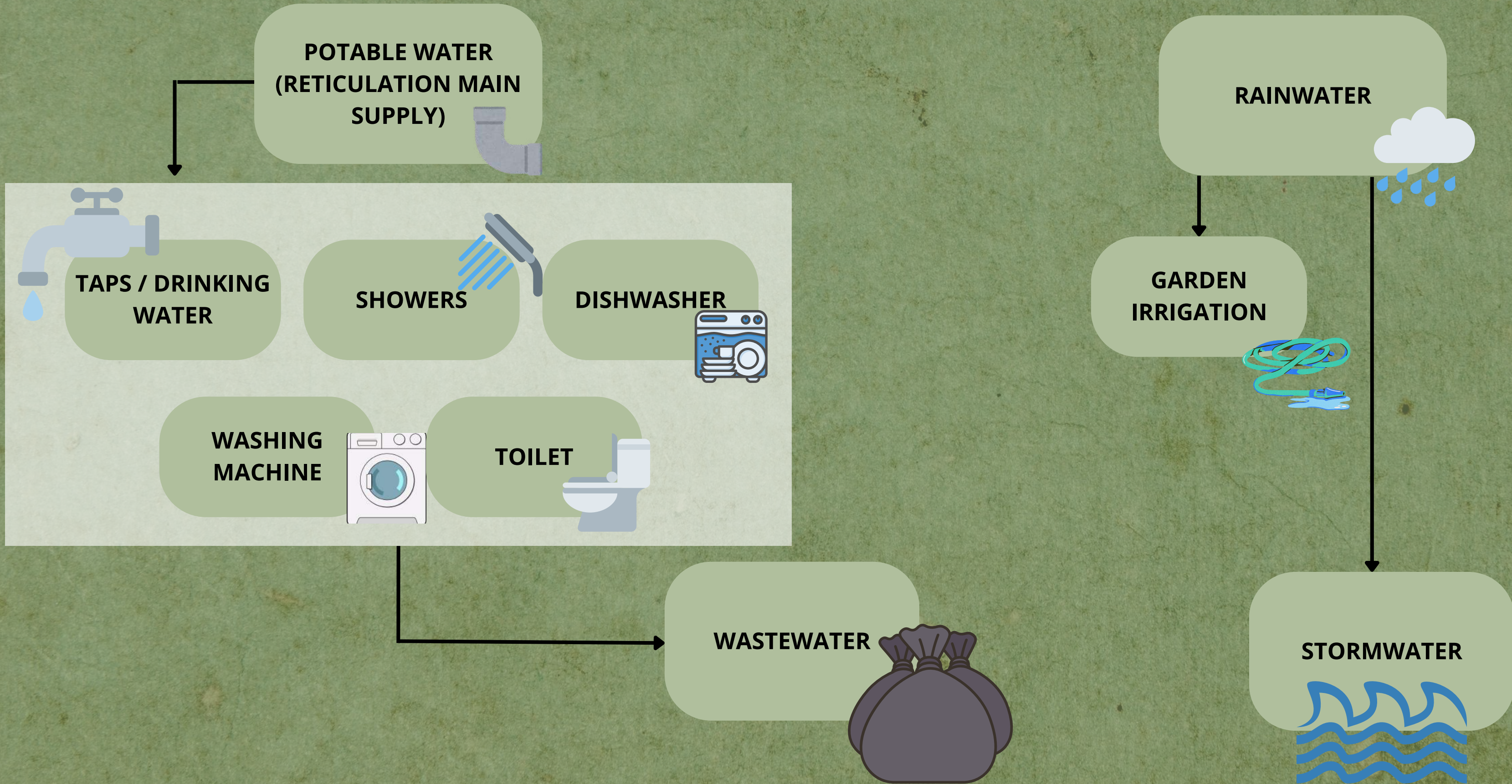


Wetlands



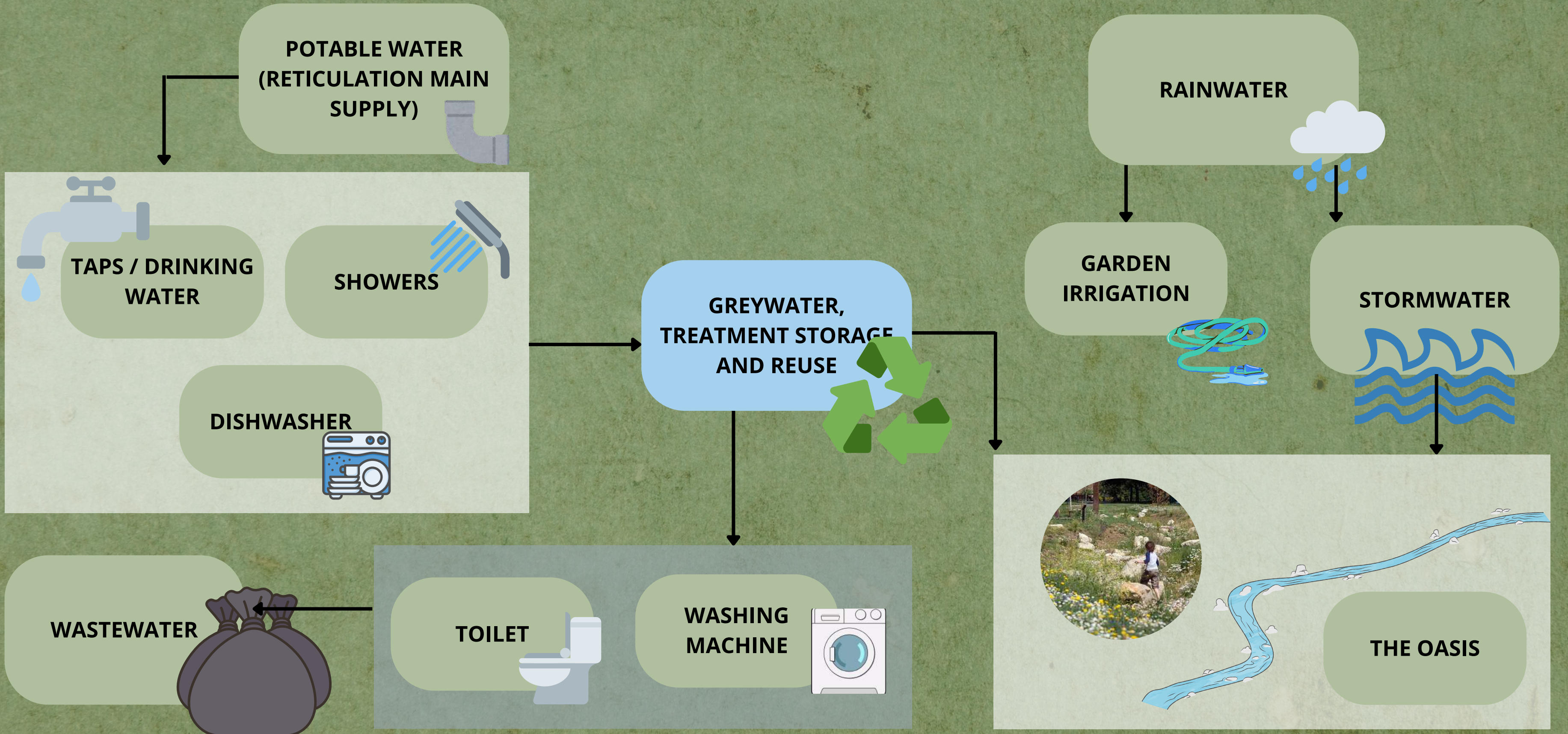


# Water Use - Base Case





# Water Use - Alternative





# Water Balance - Household



3-STAR WELS RATING

Personal yards and backyards

vs.

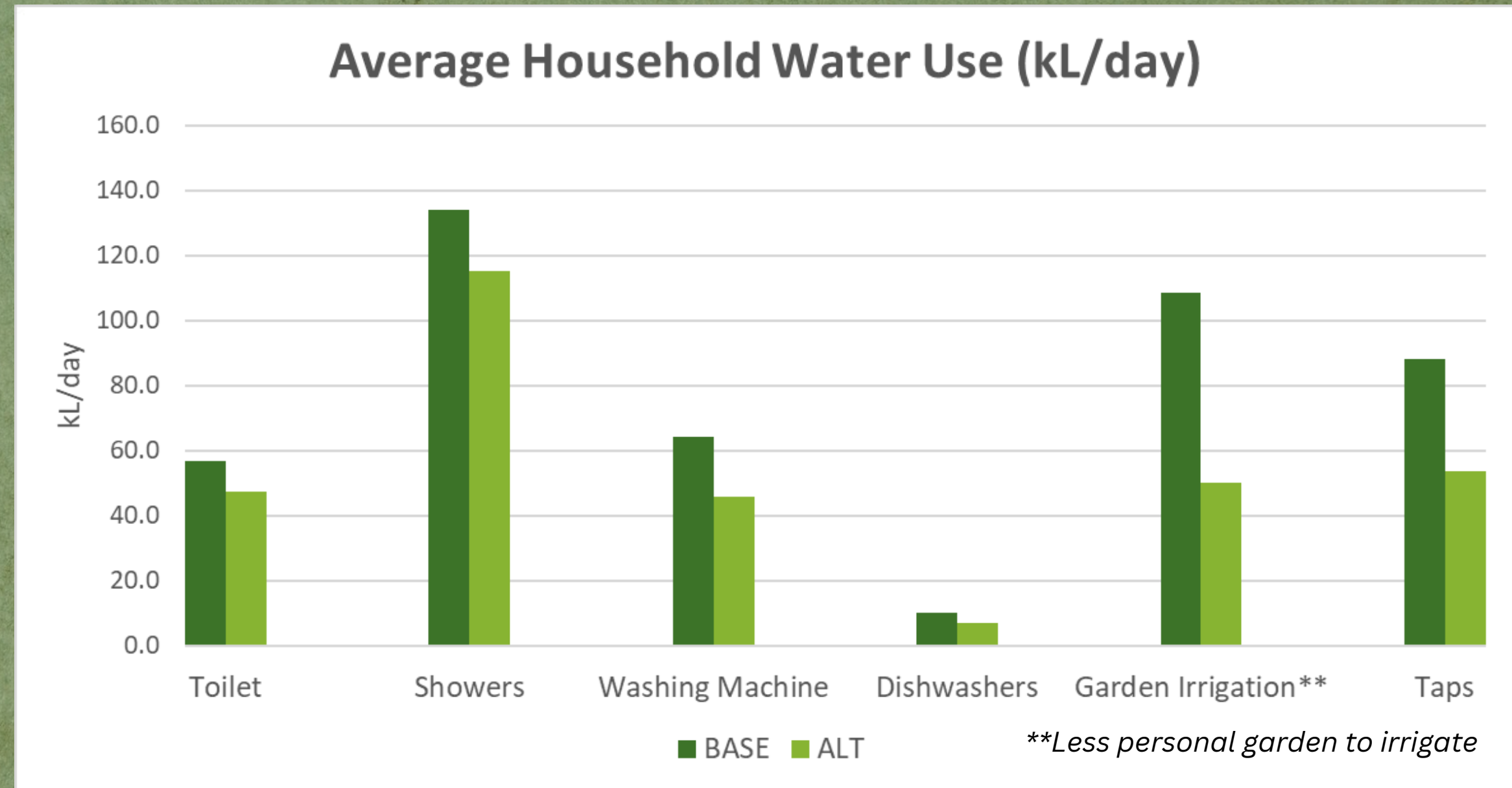


5-STAR WELS RATING

Community Green Space + Greywater Use

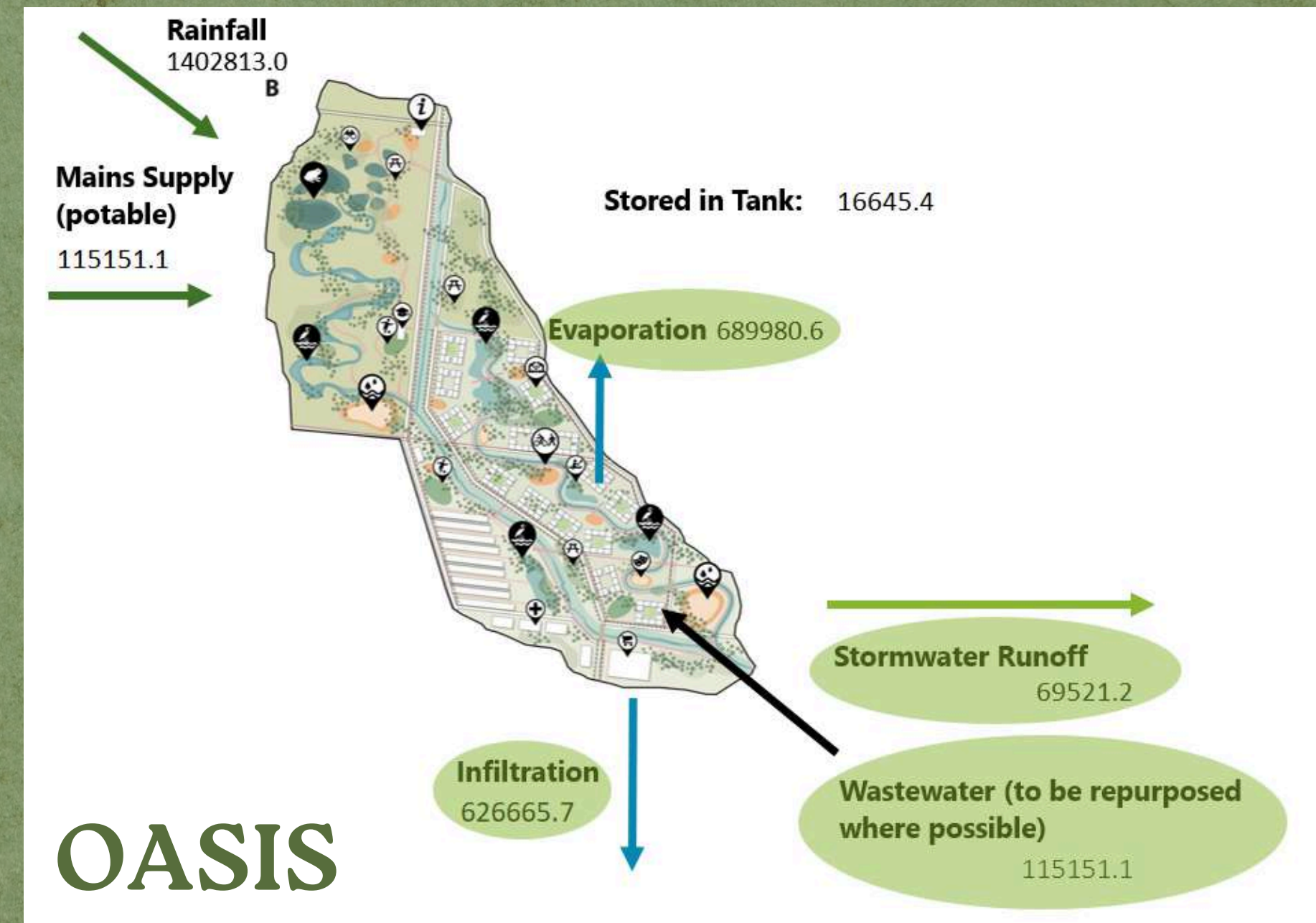
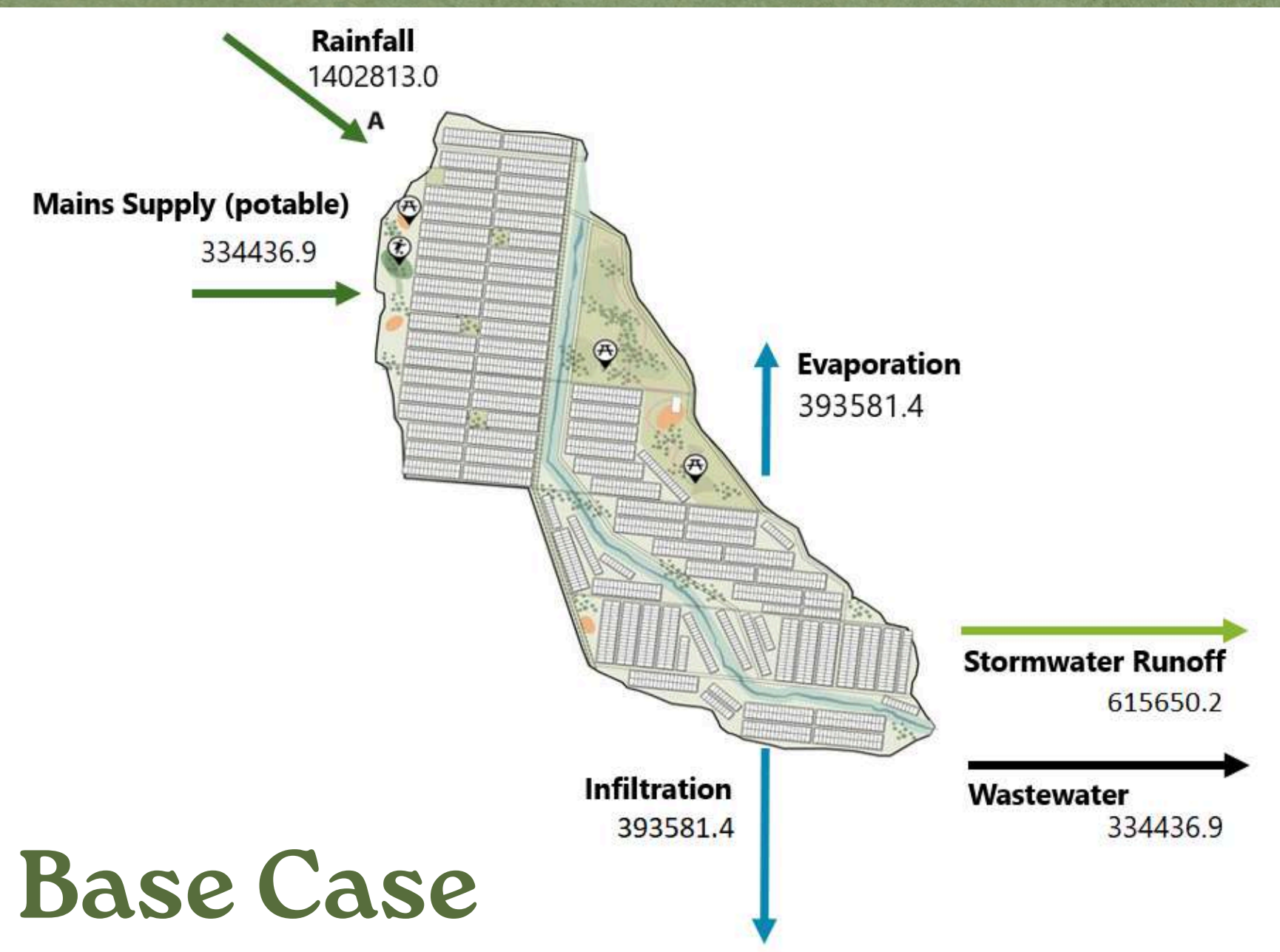
54% **LESS** household water demand in OASIS

66% **LESS** potable water





# Water Balance - Development



*All values in kL/yr*



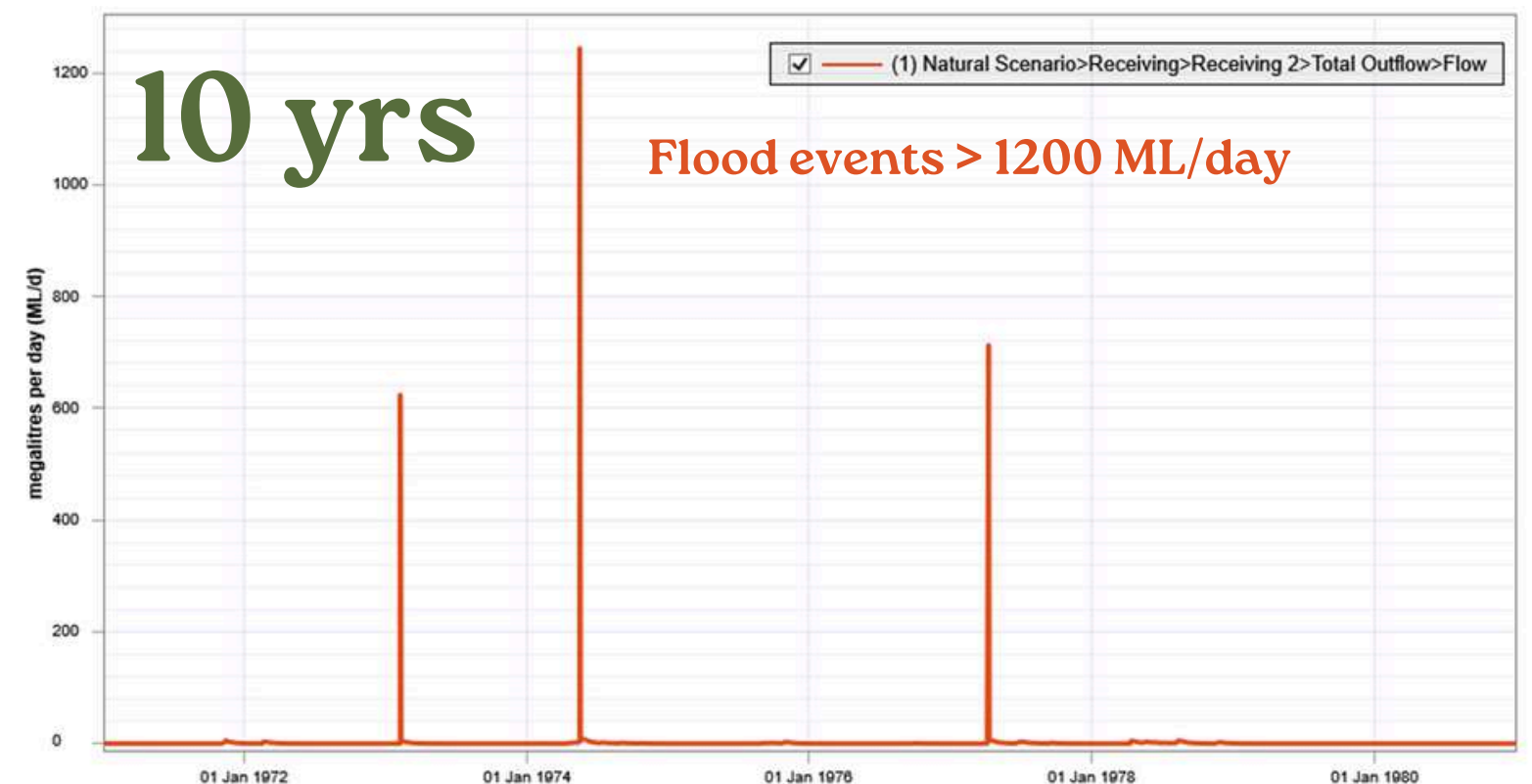
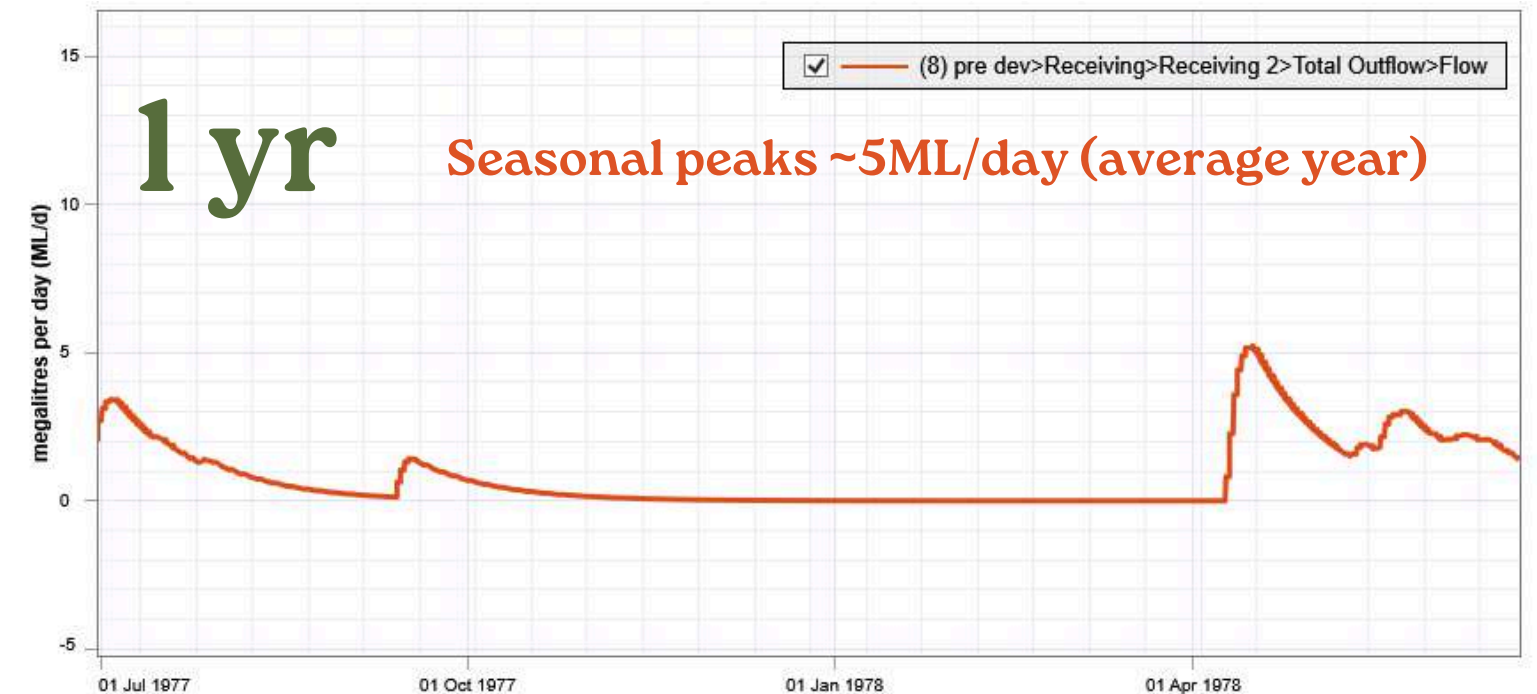
# MUSIC

## Pre-Development

### Requirements

- Pre-development flow of 178 ML/yr
- Major flood event every 3-4 years approx.
- Generally low flows, periods of dry

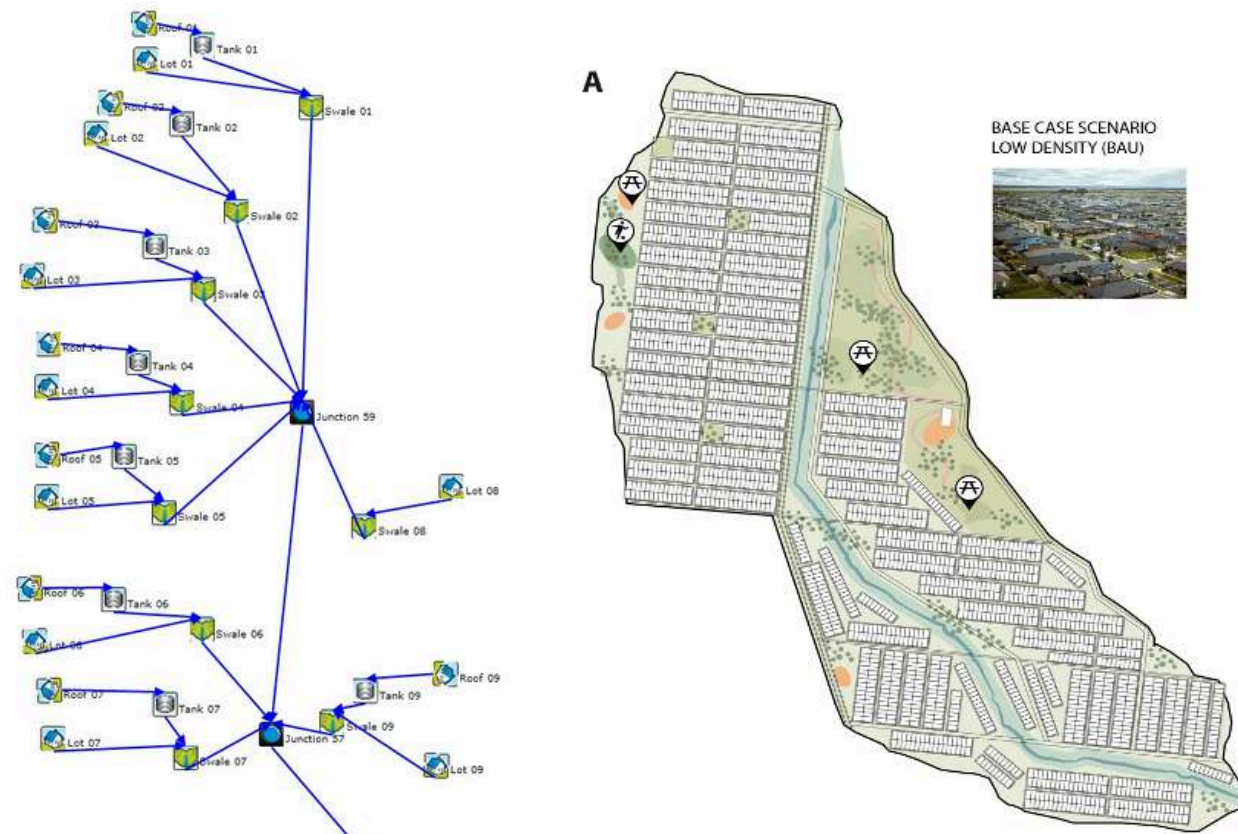
### Total System Outflow



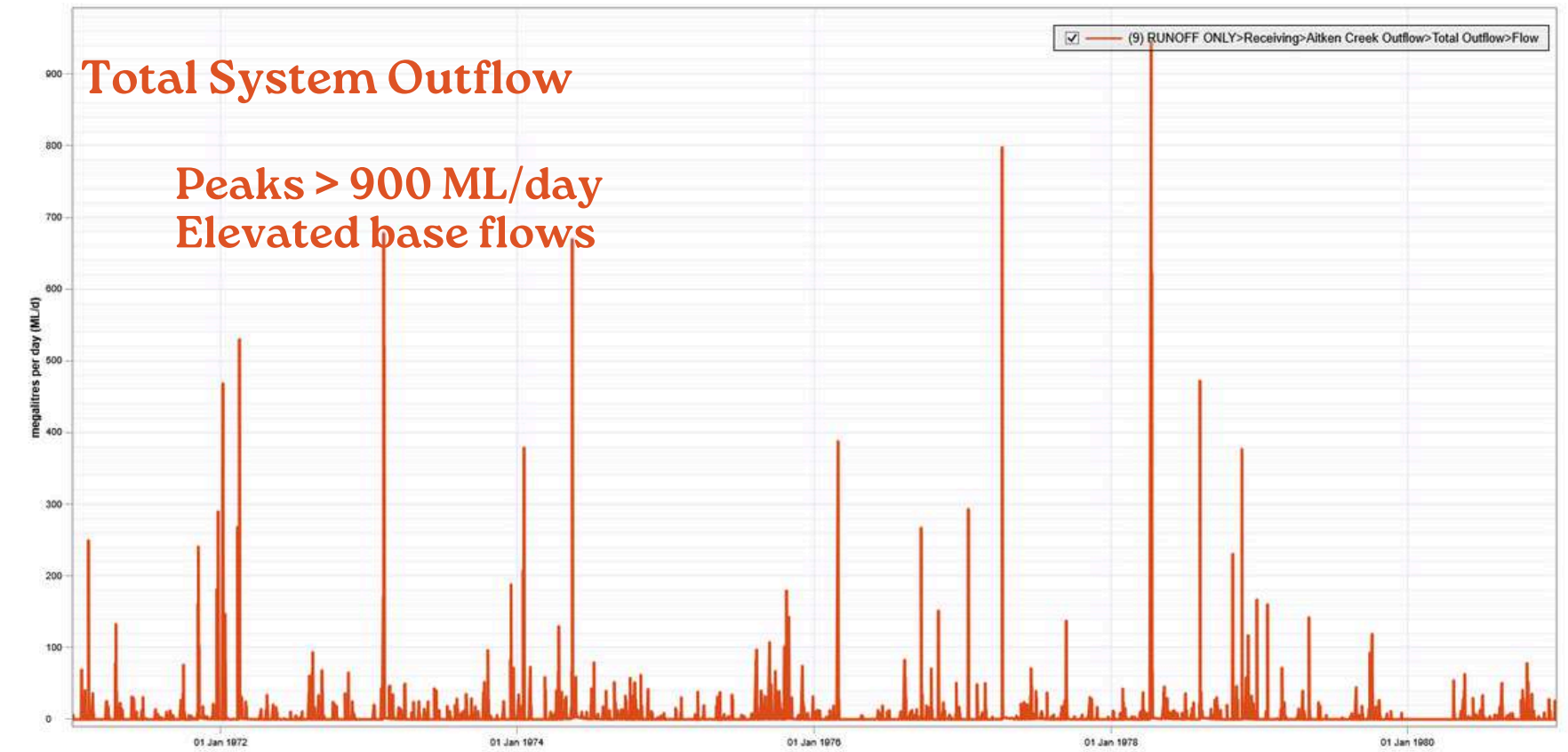
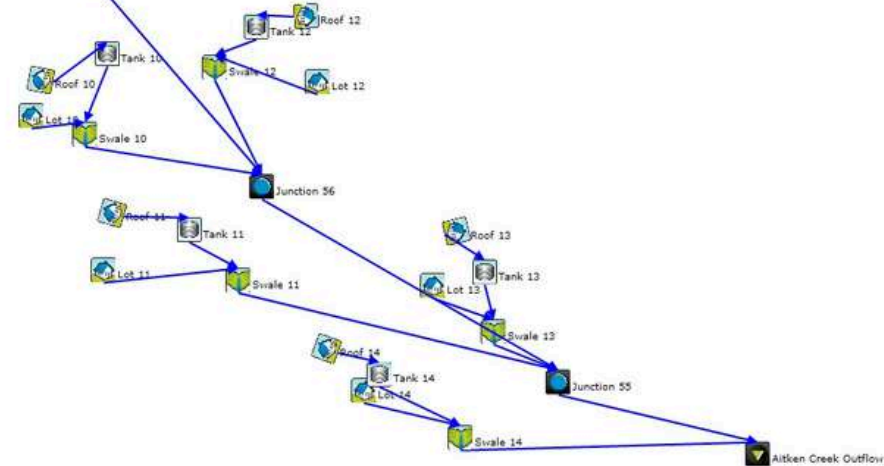
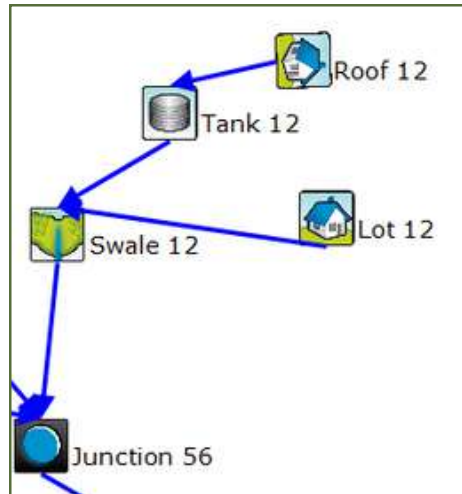


# MUSIC

## Base Case



Typical Sub-Catchment Setup



Treatment Train Effectiveness				
Component	Sources	Residual Load	% Reduction	Target
Flow (ML/yr)	688.1	557.9	18.9	Reduced Load
Total Suspended Solids (kg/yr)	129220	11952	90.7	80% Reduction
Total Phosphorus (kg/yr)	270.67	79.12	79.63	45% Reduction
Total Nitrogen (kg/yr)	1937.11	948.8	51.1	45% Reduction
Gross Pollutants (kg/yr)	25630	0	100	70% Reduction



# MUSIC

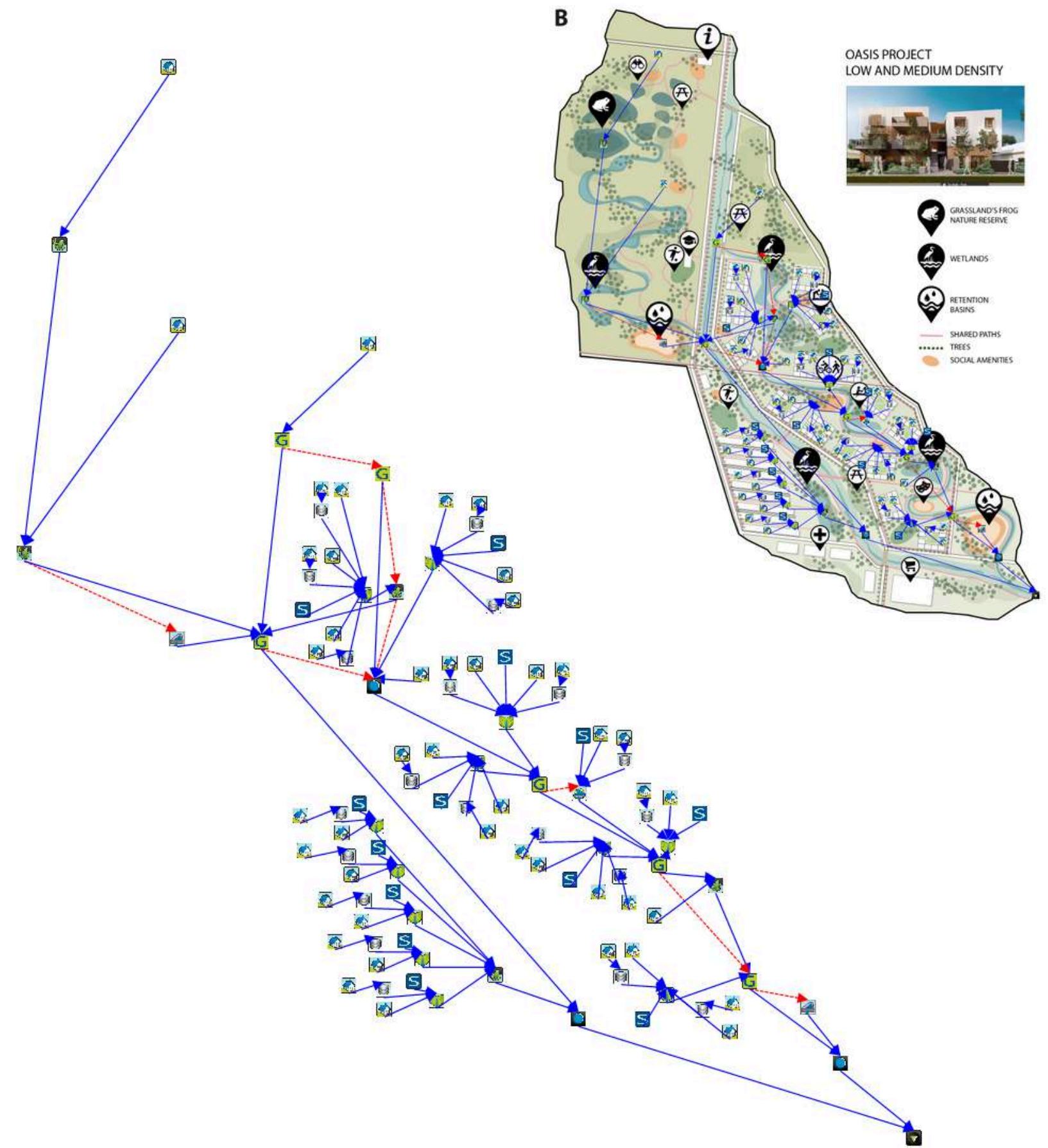
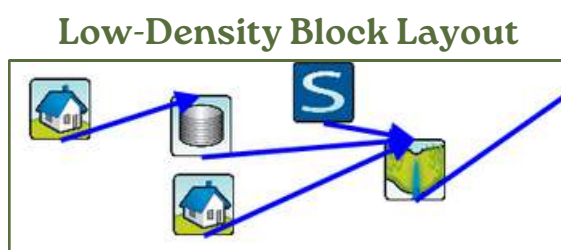
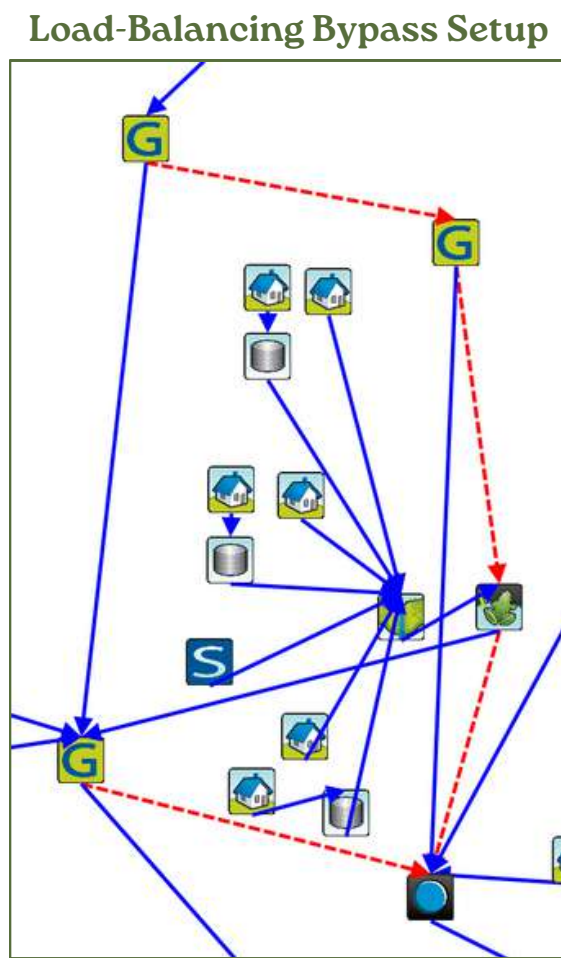
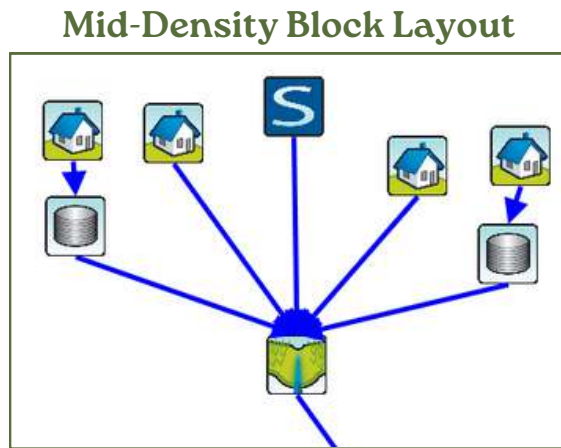
## Alternative Case Design

### Design Requirements:

- Comprehensive input modelling
- Realistic input-staging
- Flexible load distribution
- Peak-load moderation

### Distinguishing Features:

- Treated greywater injection
- Geographically tethered inputs
- Load-balancing bypass networks
- High-capacity treatment chain





# MUSIC

## Alternative Case Results

### Key metrics:

- Treatment train effectiveness
- Peak-load moderation
- Potable water demand reduction
- Provision of habitat
- Provision of recreational amenity

### Modelled Performance:

- Residual flows within 6% of natural state
- Outperforms all pollutant reduction targets

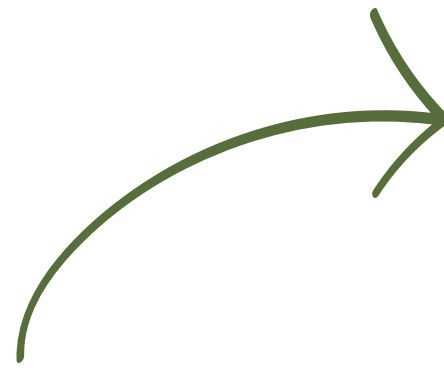
- Central Wetland peak flows moderated:

- Inflow: peaks >70 ML/day
- Outflow: peaks <1.5 ML/day

- 100% greywater reuse/treatment
- 96 - 100% rainwater demand met

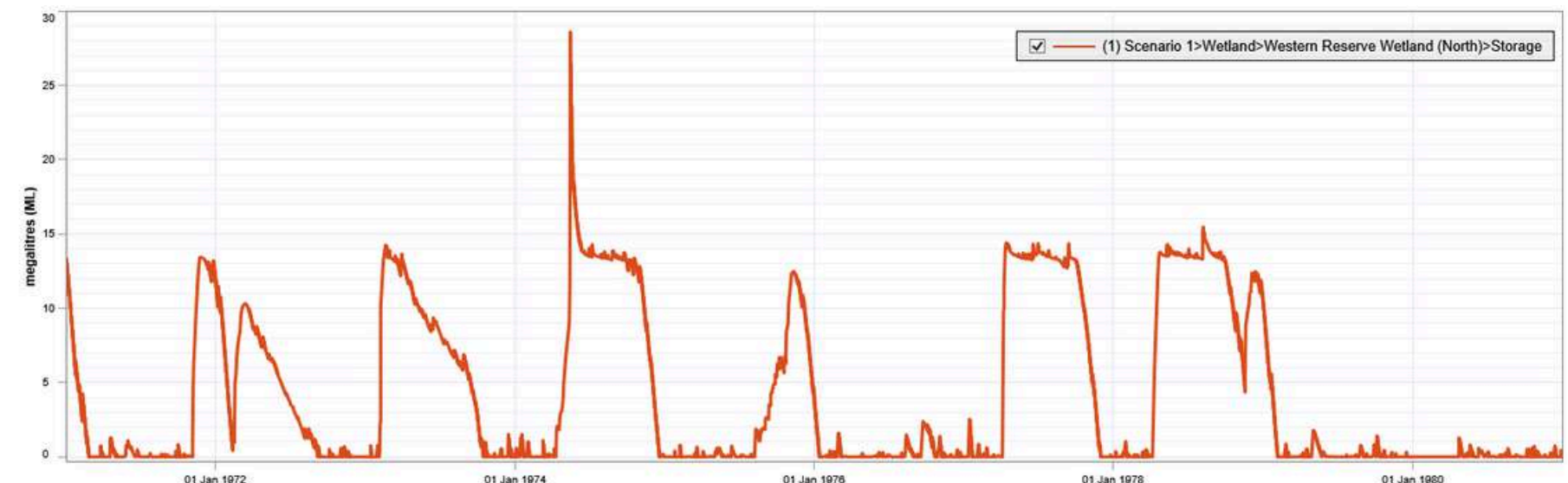
- Frog wetland mimics natural condition

- Recreational Pond consistently holds ~5 ML storage



Treatment Train Effectiveness				
Component	Sources	Residual Load	% Reduction	Target
Flow (ML/yr)	331.74	188	43.33	178 ML Residual Load
Total Suspended Solids (kg/yr)	13392.52	2012.13	84.98	80% Reduction
Total Phosphorus (kg/yr)	252.94	14.03	94.45	45% Reduction
Total Nitrogen (kg/yr)	952.61	213.21	77.62	45% Reduction
Gross Pollutants (kg/yr)	5312.93	166	96.88	70% Reduction

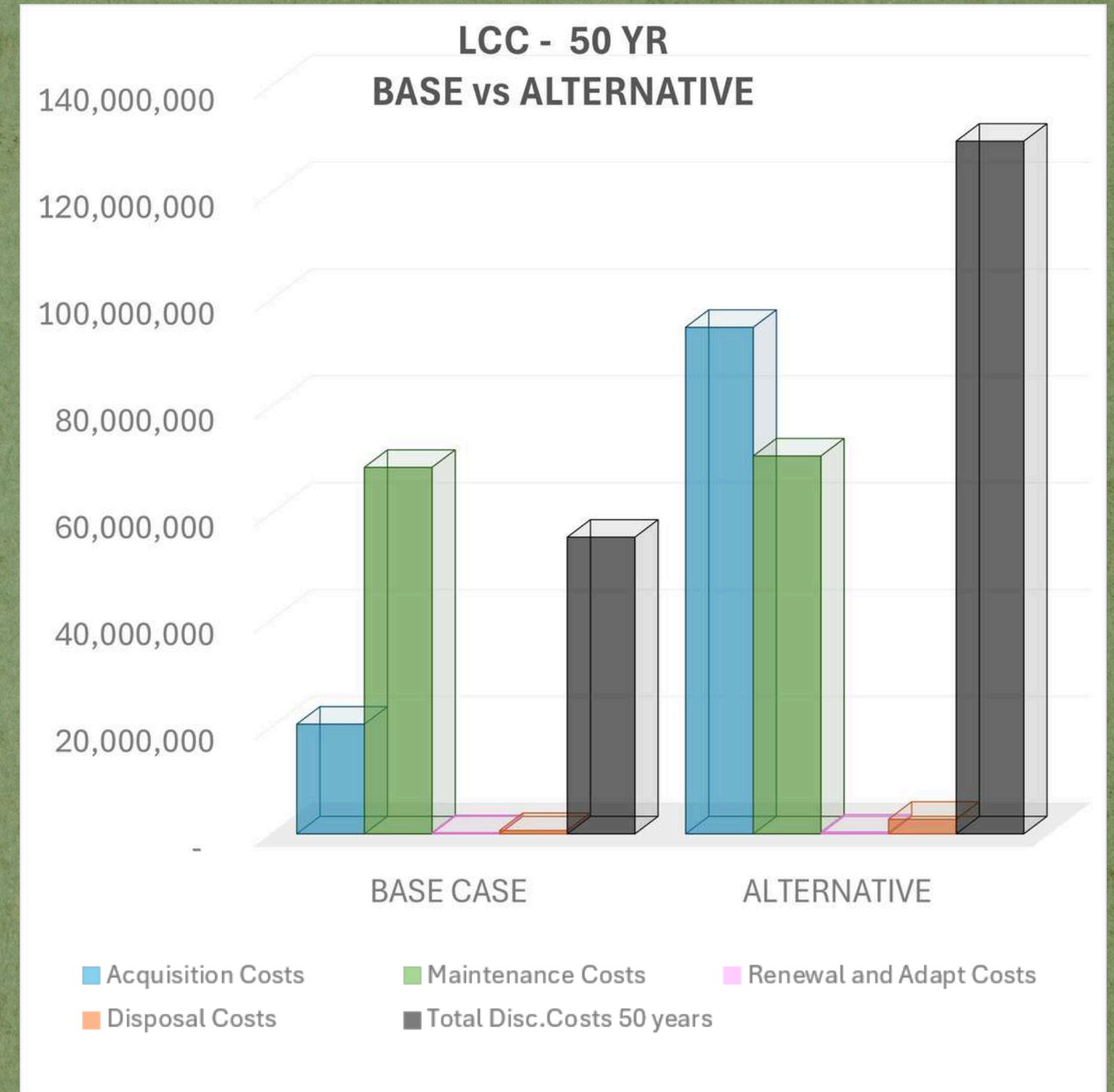
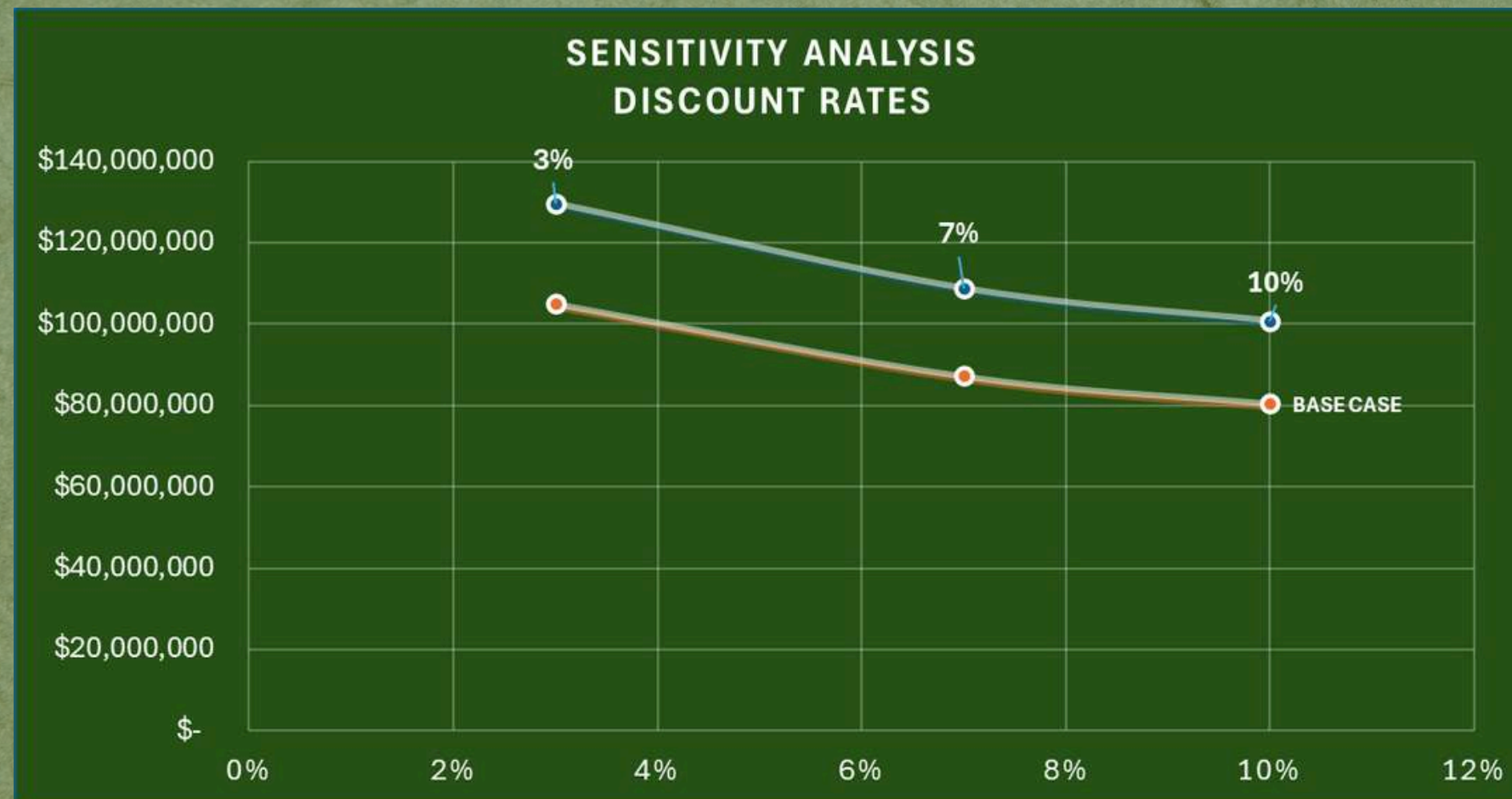
## Ephemeral Frog Wetland Storage





# Life Cycle Costing

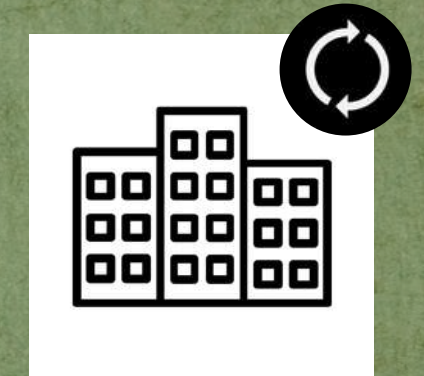
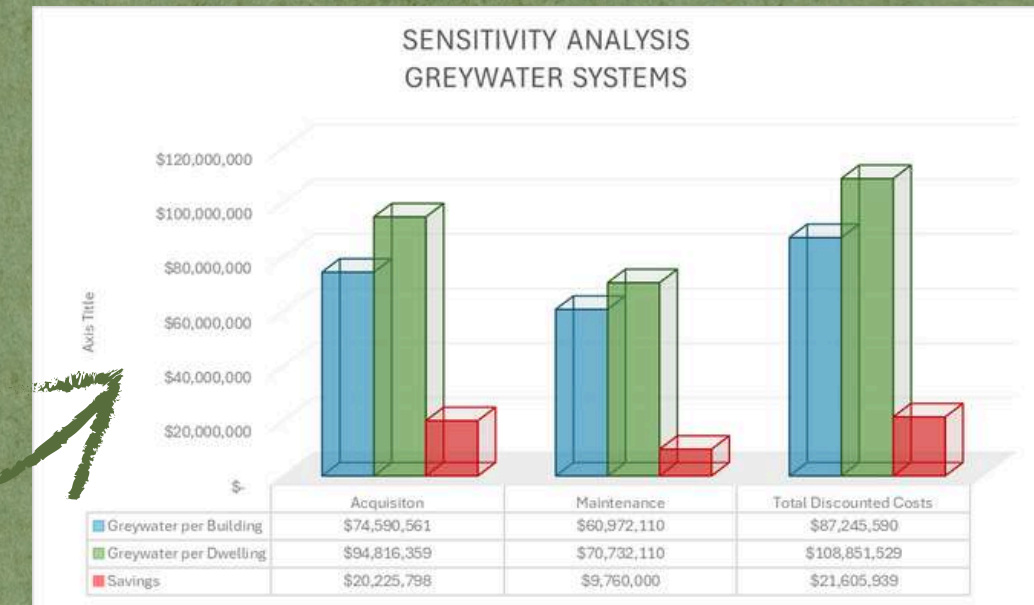
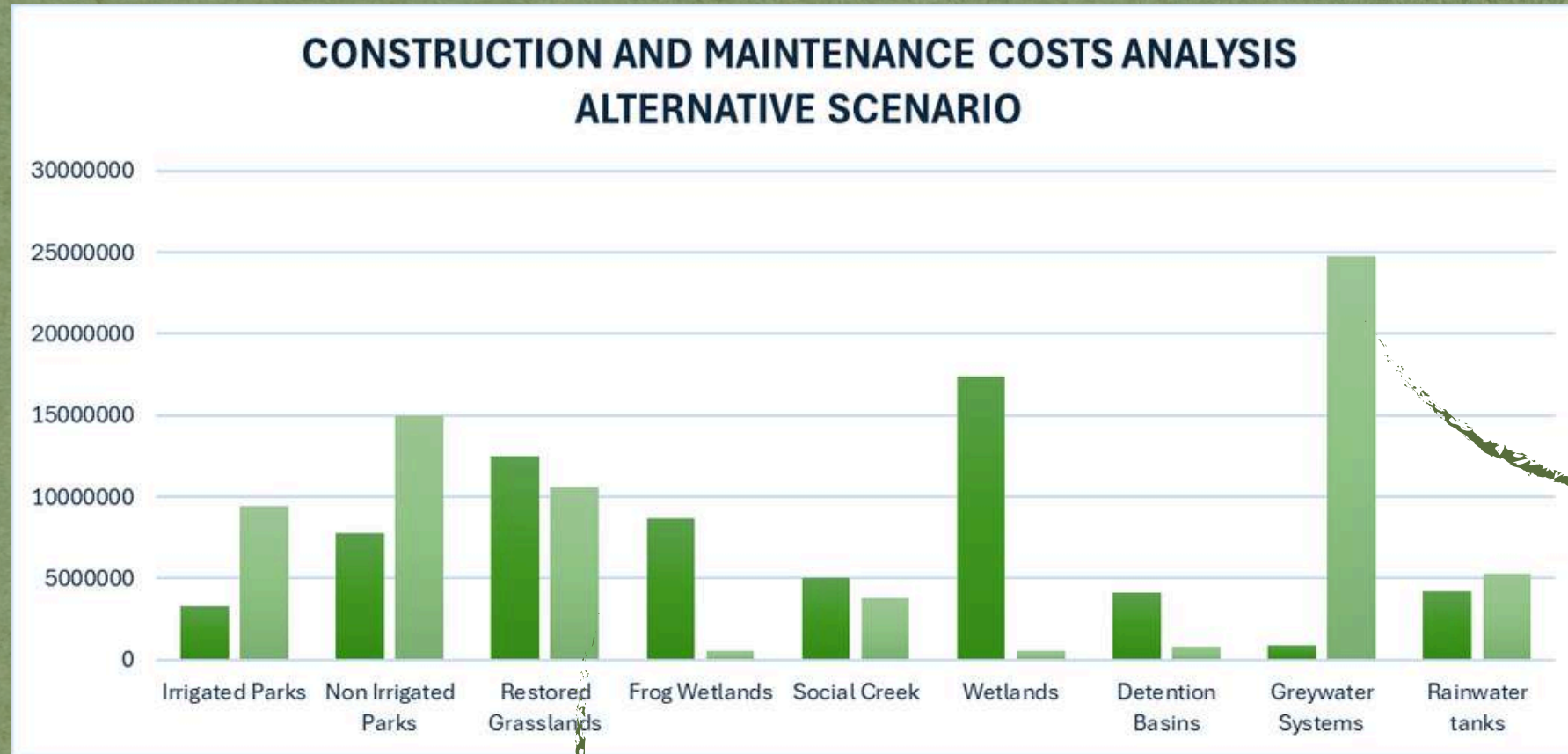
- Significant Difference in Acquis. (\$20M vs \$94M)
- Maint. Costs are Similar (\$68M vs \$70M)
- Total Disc. Costs over 50 years (\$55M vs \$129M)
- Disc. Rates generate dif. of +30%



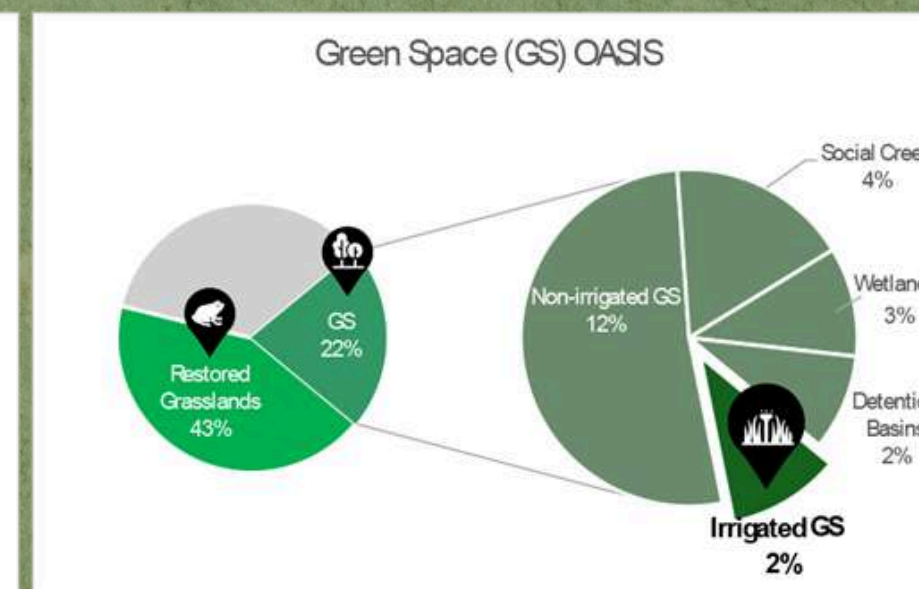
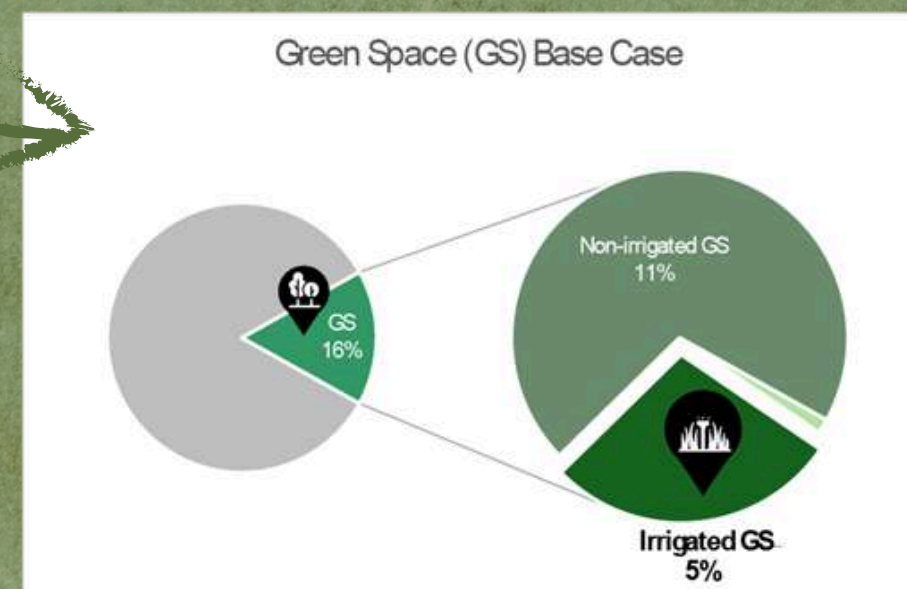


+++ Greatest Maint. Costs come from GW Systems and Open Spaces

Shared Greywater Systems within buildings can save up to \$20M in 50 yrs



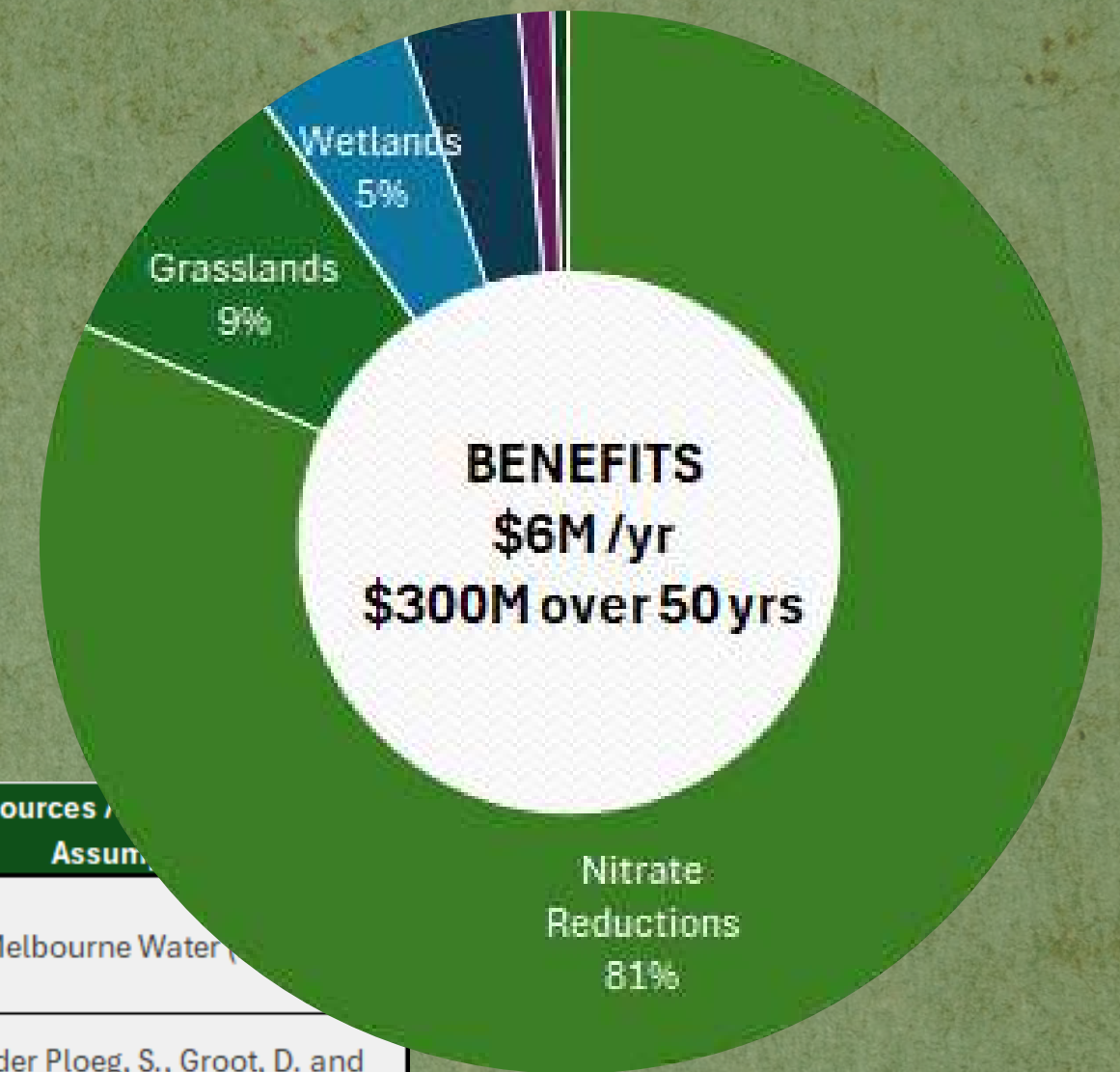
16% vs 65% GS (half irrigated areas, but large non-irrigated GS).





# Co-Benefits

- Substantial Economic Benefits from Ecosystem Services (\$6M/yr and \$300M/50yr)
- Important savings in Nitrate removal from the waterway and the Bay (\$4.9M annual and \$245M over 50 years)



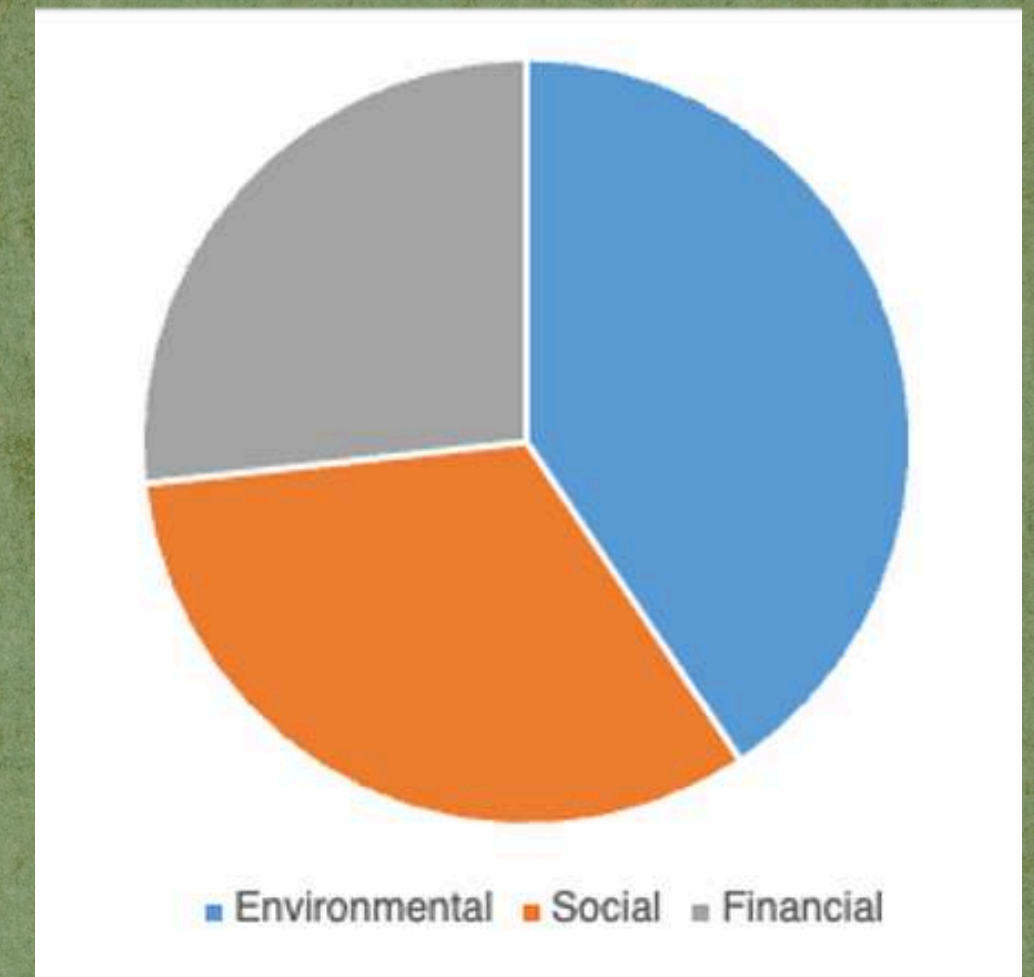
Benefits	Unit Value	Cost Unit	No. Units	Total Value Benefits / yr	Total Benefits / 50 years	Beneficiary	Sources / Assumptions
Reduction in nitrate to waterways	\$ 6,645	kg N reduced/yr	739.0	\$4.9M annual	\$245M	Entire Region	Melbourne Water (2023)
Grasslands Total Value of Ecosystem Services	\$500 - \$5000	\$/ha/yr	106	\$53k - \$500k annual	\$2.5M - \$26M	Entire Region	Van der Ploeg, S., Groot, D. and Wang, Y. (2010)
Inland Wetlands Total Value of Ecosystem Services	\$10,000 - \$70,000	\$/ha/yr	6.1	\$40k - \$270 annual	\$1.9M - \$14M	Entire Region	Van der Ploeg, S., Groot, D. and Wang, Y. (2010)
Avoided Energy Costs for cooling in summer	\$47 - \$81	\$/hh/yr	2,595.0	\$120k - \$210k annual	\$6M - \$10.5M	Residents	CRC for Water Sensitive Cities (2016)
Recreation Benefits - WTP for visiting an urban waterway (Assuming 1 visit each 2 months)	\$5-\$36	\$/trip	0	\$53k - \$500k annual	\$300K-\$1.6M	Entire Region	Van der Ploeg, S., Groot, D. and Wang, Y. (2010)
Health Benefits	\$ 300	\$/pp	10,380	-	\$3M	Residents	Melbourne Water et al. (2023)





# Triple Bottom Line Assessment

- Key issues were public concern regarding design, health and safety, and cost.
- Created a deliberative panel that was representative of the demographics of Craigieburn



Criterion	Category	Weight	Base Case Performance	Score	Alternative Case Performance	Score
Security of Supply - non potable	Environment	5.75%	3	0.17	4	0.23
Area of valuable habitats within the development site	Environment	10.22%	2	0.2	3	0.31
Reduction of wastewater discharge by 40% from base-case	Environment	7.35%	2	0.15	3	0.22
Maintenance of pre-development base flows to Aitken Creek	Environment	7.67%	2	0.15	4	0.31
Pollutant loads entering Aitken Creek	Environment	10.22%	5	0.61	5	0.61
Integrated value - housing mix	Social	7.03%	4	0.28	5	0.35
Connected value - distance to urban centre	Social	9.27%	1	0.09	2	0.19
Recreational value - access to open space	Social	9.58%	3	0.29	5	0.48
Public safety and wellbeing	Social	7.35%	2	0.15	2	0.15
Water costs for resident's dwellings	Financial	6.39%	4	0.26	5	0.32
Total acquisition costs of WSUD features	Financial	5.43%	2	0.11	1	0.05
Annual maintenance costs of WSuD features	Financial	7.35%	1	0.07	1	0.07
Lifecycle cost of WSUD elements of design	Financial	6.39%	3	0.18	1	0.06
		100.00%		2.71		3.35



# Conclusion



Your dream **OASIS** is within reach

- Validated with water balance, MUSIC
- Innovative water-sensitive development
- Greater upfront capital costs, but with extensive improvements to lifestyle, environment
- More socially and environmentally sustainable than a traditional approach

## What's next...?

- Detailed design for flood
- Cost optimisation
- Tourism
- Real-time control education

