Unpacking the Myths, Misunderstandings & Opportunities with Stormwater Retention

Could Someone Please Turn Down the Volume ?

Stu Farrant – Water Sensitive Design Lead

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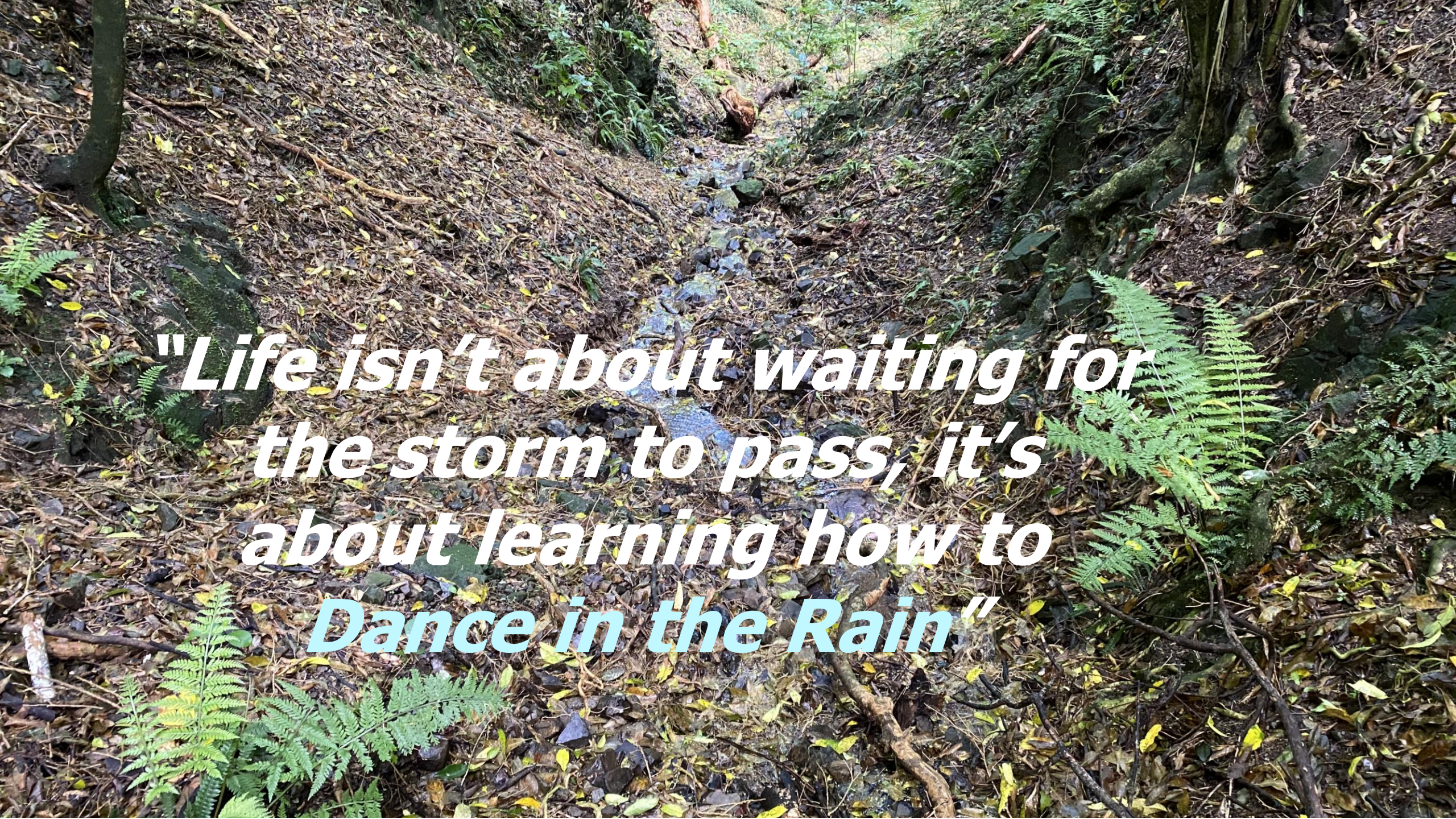

"Life isn't about waiting for
the storm to pass, it's
about learning how to
Dance in the Rain"

The on-site stormwater management objectives to achieve the above stream channel protection objectives ~~when site development is considered~~ are to:

- not increase total volumes of stormwater runoff from the existing or greenfield conditions

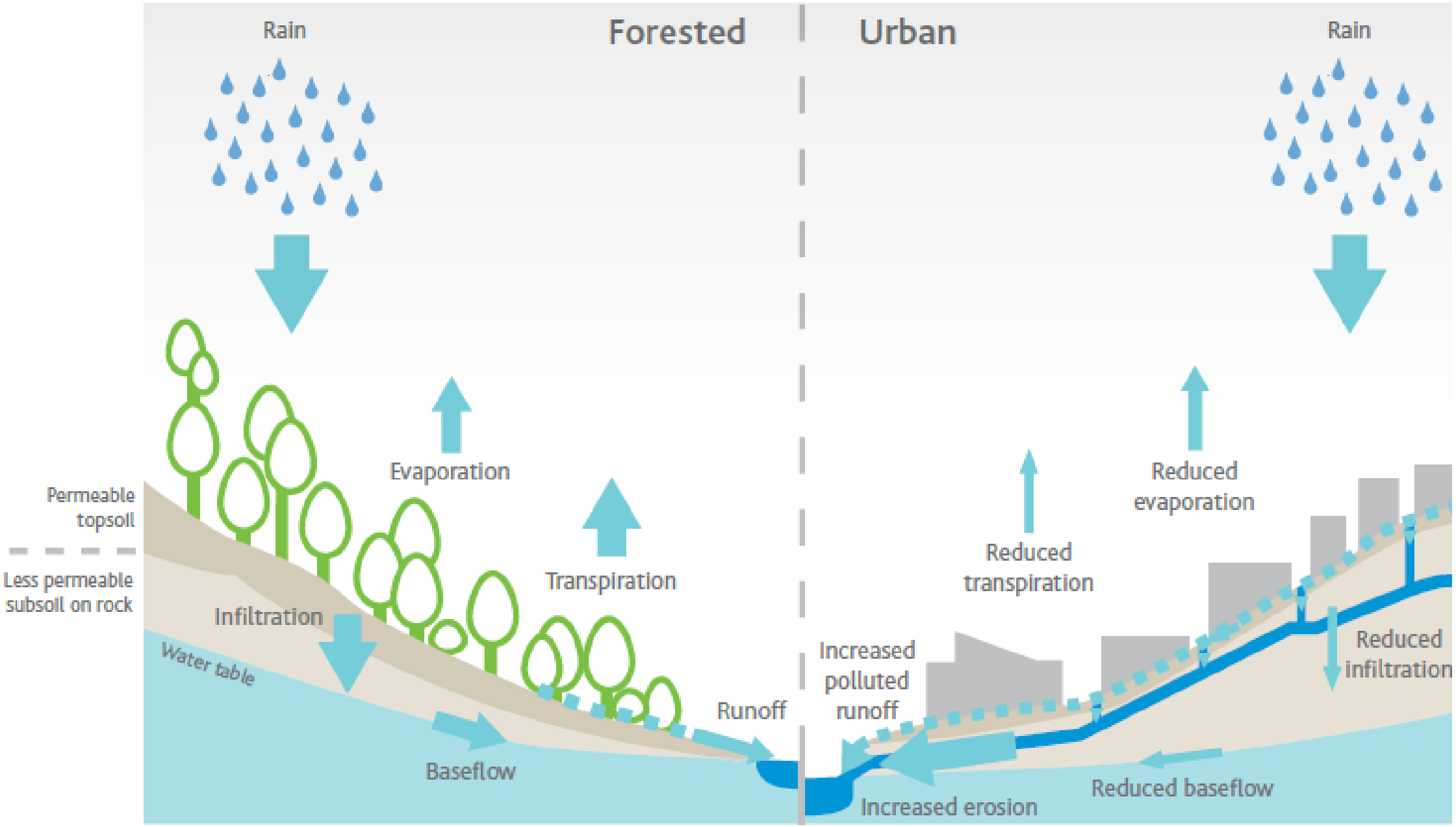
Baseflow contribution	10% of mean annual rainfall volume to contribute to baseflow (Note: 2, 4, 5)
Flow reduction	50 – 90% reduction in mean annual total runoff volume in priority areas for enhanced stormwater management (Note: 2, 3, 7)
Flow reduction	25% reduction in mean annual total runoff volume in areas that have not been identified as priority areas for enhanced stormwater management (Note: 2, 3)

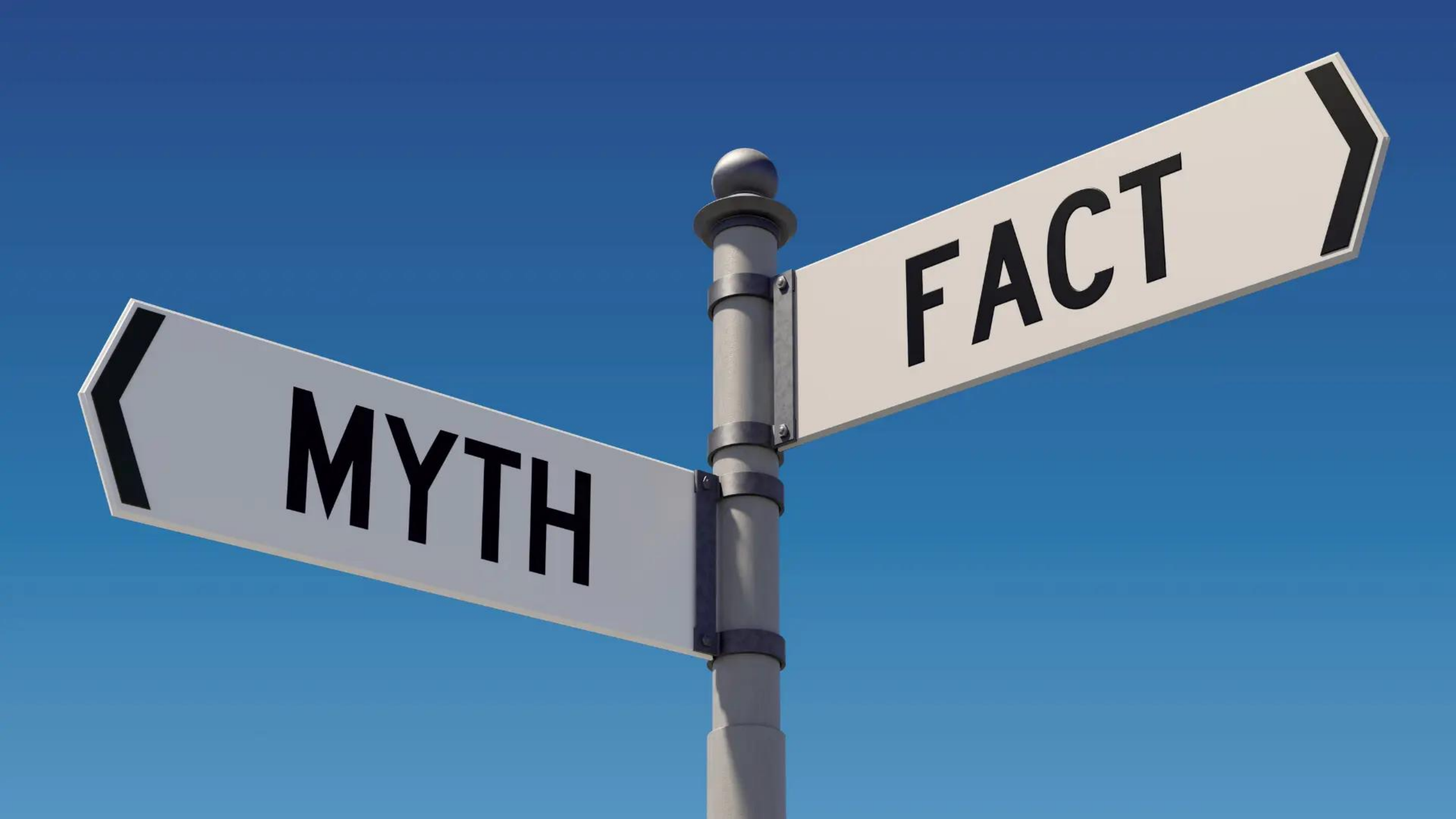
Volume reduction techniques

The importance of volume reduction become apparent as more and more urban surfaces developed and more stormwater overwhelmed receiving waters. Clearly stormwater management needs to include volume control.

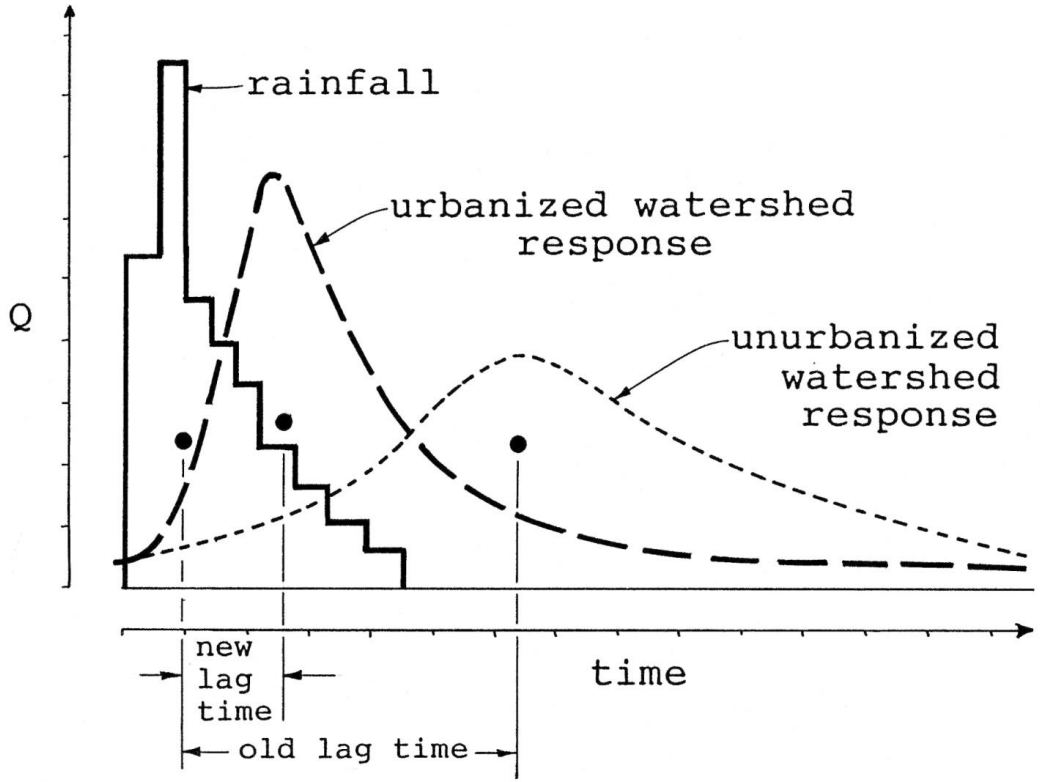
Managing land use impacts	Manage the stormwater volume not just peak flows Avoid or minimise scour and erosion of stream beds, banks and coastal margins	Land use, subdivision and development, including stormwater discharges, shall be managed so that runoff volumes and peak flows:

Stormwater Code Language	References
SMC 22.805.080.B.2 – *The post-development discharge durations shall match the discharge durations of a pre-developed forested condition for the range of pre-developed discharge rates from 50 percent of the 2-year peak flow to the 50-year peak flow.*	• *Volume 3, Section 3.4* – BMP Selection for Flow Control • *Volume 3, Section 4.1* – Sizing Approach • *Appendix F* – Hydrologic Analysis and Design


Rain
Forested
Urban
Rain
Evaporation
Transpiration
Permeable topsoil
Less permeable subsoil on rock
Infiltration
Water table
Runoff
Baseflow
Reduced transpiration
Reduced evaporation
Increased polluted runoff
Reduced infiltration
Increased erosion
Reduced baseflow

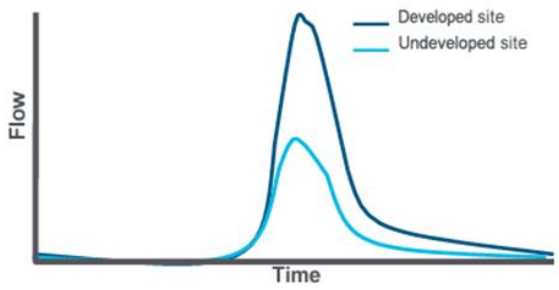

FACT
MYTH

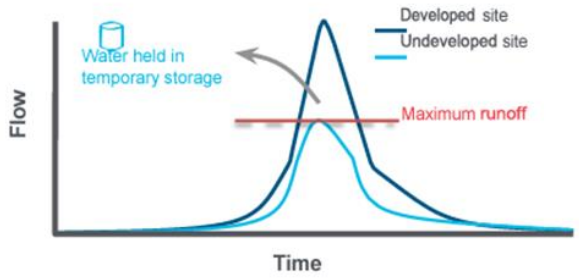
1. ***In stream scour, slumping and erosion is the result of infrequent large rainfall events in isolation***
    - Increased frequency of minor flows
    - Increased frequency of flushing flows
    - Rapid wet-dry conditions on stream banks
    - General instability and loss in resilience

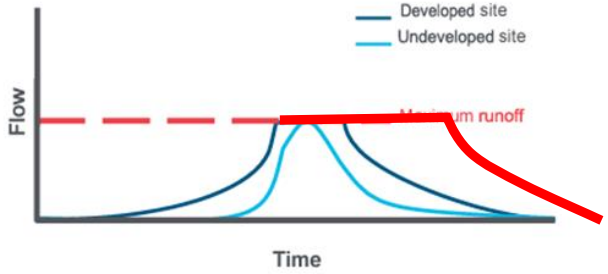


1. *In stream scour, slumping and erosion is the result of infrequent large rainfall events in isolation*

2. *Stormwater detention provides ecological protection*







- Extended discharge at historical peak rate
- Beyond threshold of biota
- Flushing of invertebrates and other food
- Instream scour and mass sediment loads
- Impacts can be worsened through catchment context

1. *In stream scour, slumping and erosion is the result of infrequent large rainfall events in isolation*
2. *Stormwater detention provides ecological protection*
3. ***Streams depend on stormwater to sustain base flows***

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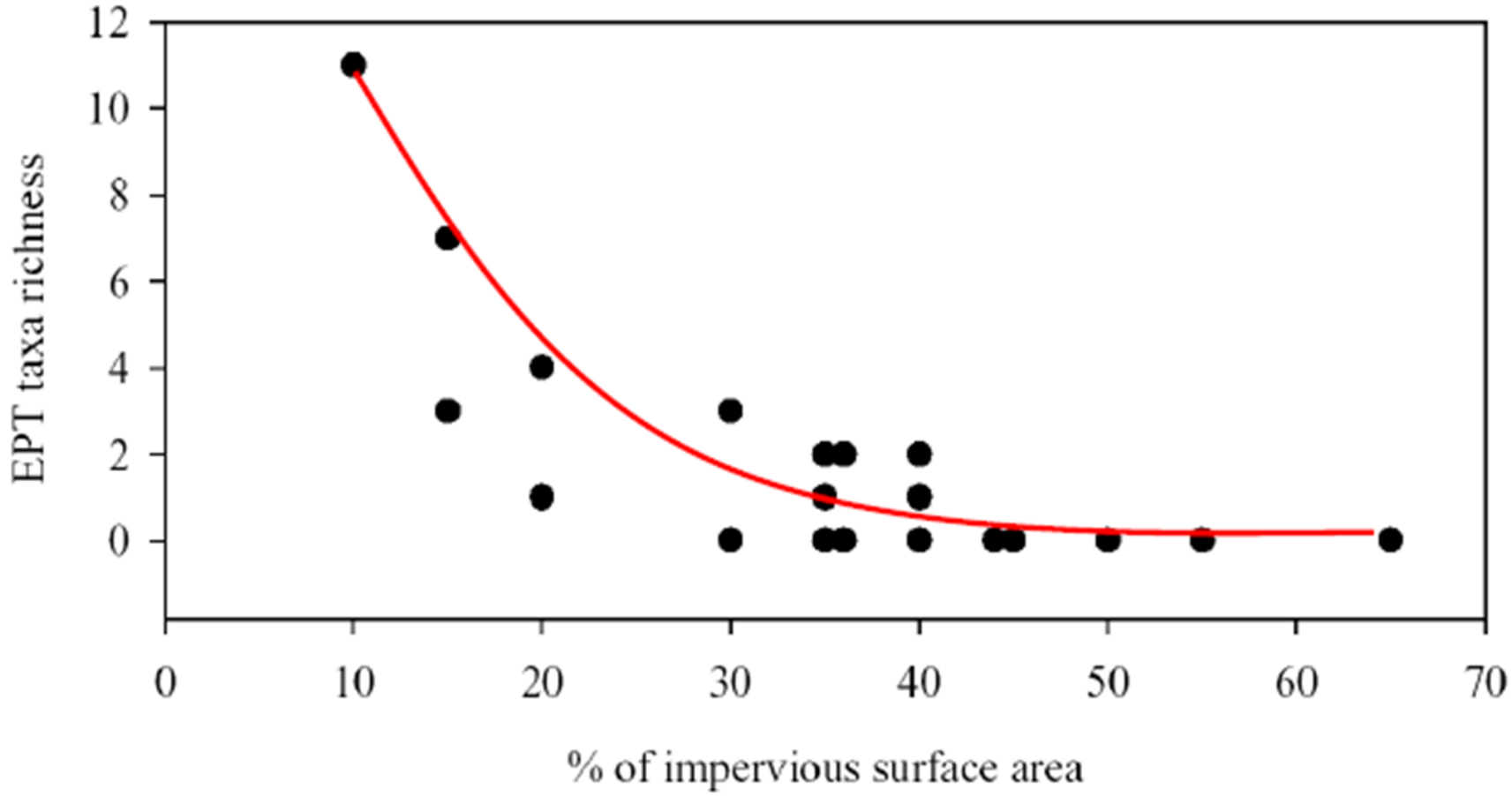
4. ***Rainwater reuse is cost prohibitive***

1. *Indigenous biodiversity impacted by frequent disturbance in small to moderate events*

Figure A4 Relationship between the number of sensitive species living in a stream system and the percentage of impervious cover (Alibone *et al.*, 2001)



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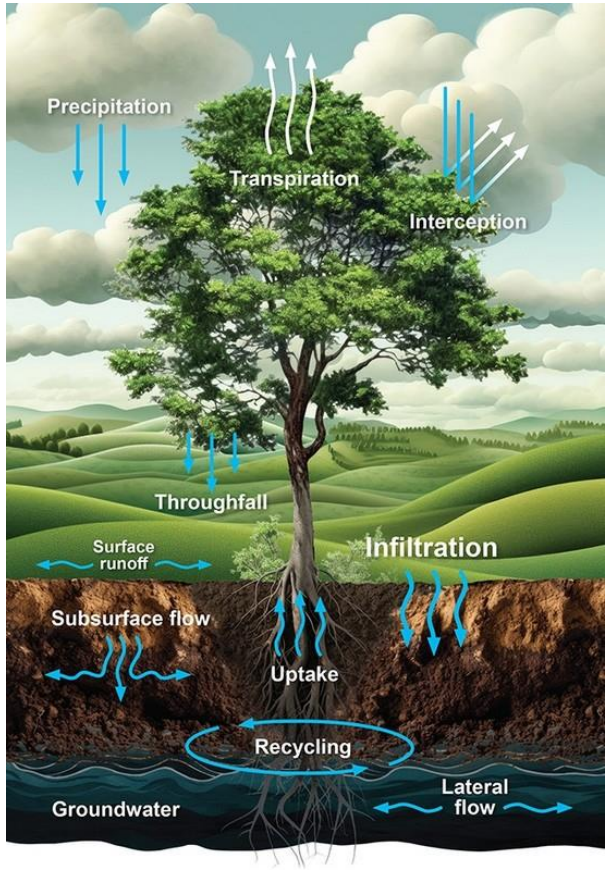
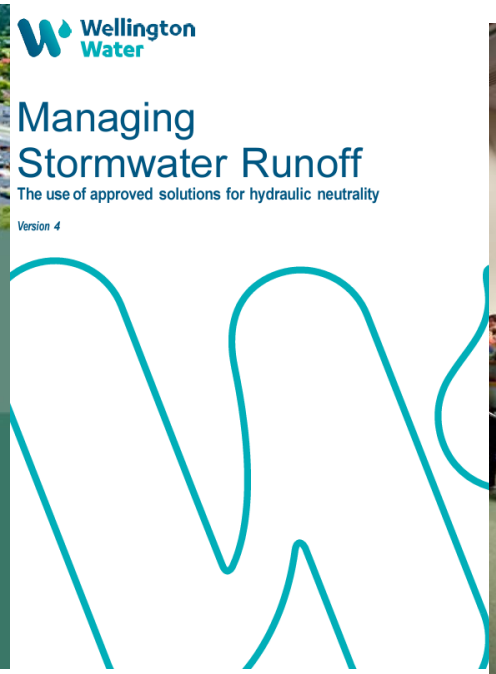


- 20 – 40% of annual rainfall volume is evapotranspired
- Varies depending on vegetation and climate
- 40- 80 % of all rainfall is intercepted and does not contribute to surface runoff
- Varies depending on soils

1. *Indigenous biodiversity impacted by frequent disturbance in small to moderate events (analogy of Picnic at Lyall Bay in gale force southerly)*
2. *Stream stability is directly linked to stable riparian margins which provide resilience to peak flows (photos from lower Papawai and Upper Waimapihi)*
3. *Interception and evapotranspiration comprise a major component of natural watercycle*
4. ***Detention and Retention are fundamentally different concepts***



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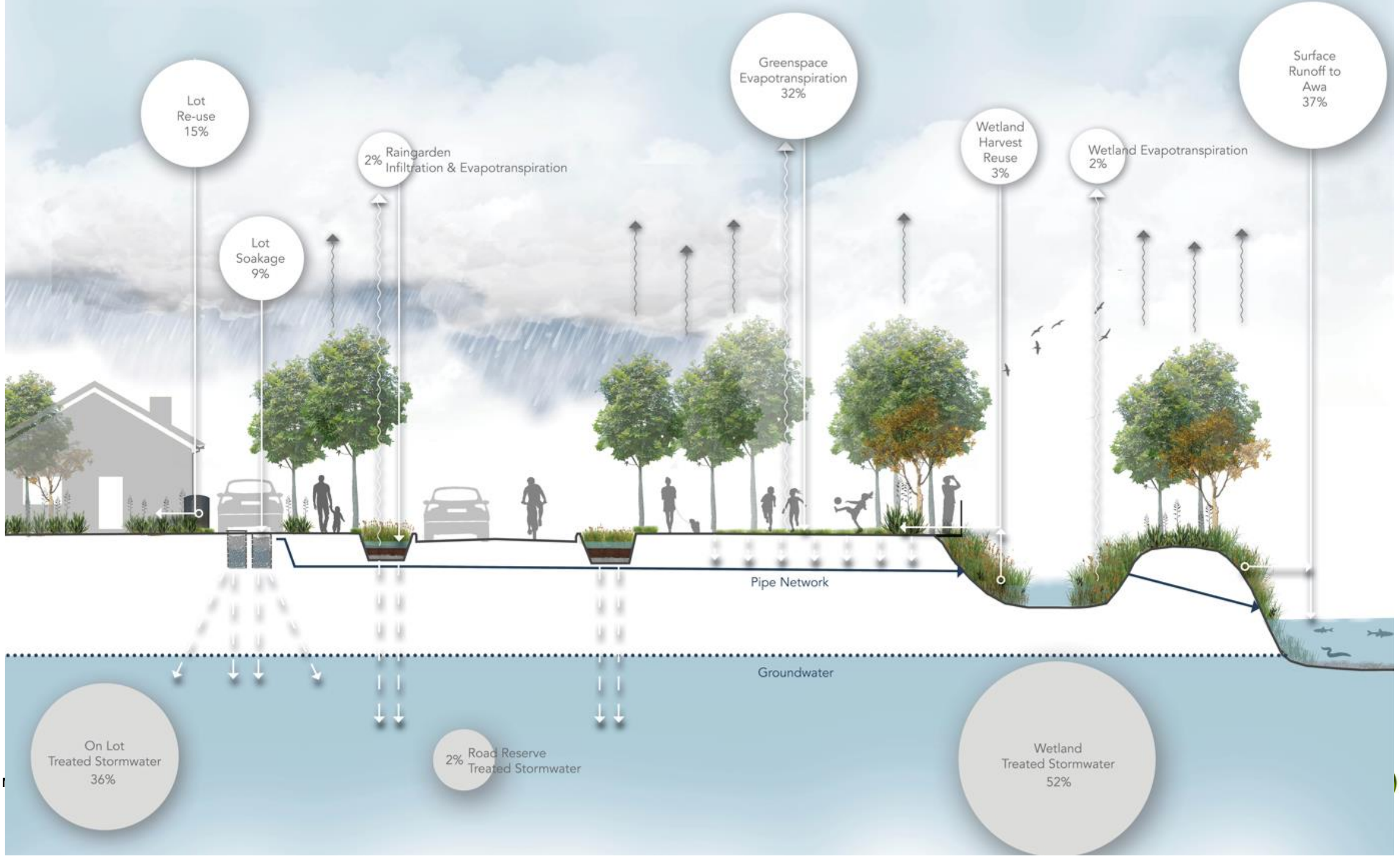
6. ***Static retention depths (such as AC UP) are themselves inherently complicated and don't appropriately reflect natural variability etc***


Lot
Re-use
15%
Lot
Soakage
9%
2% Raingarden
Infiltration & Evapotranspiration
Greenspace
Evapotranspiration
32%
Wetland
Harvest
Reuse
3%
Wetland Evapotranspiration
2%
Surface
Runoff to
Awa
37%
Pipe Network
Groundwater
On Lot
Treated Stormwater
36%
2% Road Reserve
Treated Stormwater
Wetland
Treated Stormwater
52%


EXIT 26B
MISSED
OPPORTUNITY

1. *Avoid costs for expensive in stream retaining*

- Development impacts passed to ratepayers
- Cumulative impacts
- Extending compounded impacts

1. *Avoid costs for expensive in stream retaining*
2. ***Avoid costs for downstream water quality treatment (~$2,000/100m2 roof)***

- Dual benefit of hydrology and water quality
- Cost savings persist through lifecycle

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2. *Avoid costs for downstream water quality treatment (~$2,000/100m2 roof)*
3. ***Realise co benefits of rainwater reuse***

Leaving water in the river

Connection with Water **Resilience** Behaviour Change

Te Mana o Te Wai Vibrant Greenspaces

Evaporative Cooling **Water Quality**

Hydrology

1. *Avoid costs for expensive in stream retaining*
2. *Avoid costs for downstream water quality treatment (~$2,000/100m2 roof)*
3. *Co benefits of rainwater reuse*
4. ***Lock in long term uplift of mauri of freshwater streams***

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3. *Co benefits of rainwater reuse*
4. *Lock in long term uplift of mauri of freshwater streams*
5. ***Support unique, endemic and remarkable biodiversity***

- Ki uta ki tai – mountains to the sea
- 85 % endemic
- 75 % at risk of decline or threatened

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3. *Co benefits of rainwater reuse*
4. *Lock in long term uplift of mauri of freshwater streams*
5. *Support unique, endemic and remarkable biodiversity*
6. ***Connect communities with water cycle at property scale and biodiversity at a neighbourhood scale***





INANGA·LOVE·PARK·
·GIANT·KOKOPU·
·BANDED·KOKOPU·

1. ***Educate the industry on the fundamentals of natural water cycle and the importance of the small frequent rainfall events***

2. ***Educate planners and other development professionals on the difference between detention and retention***

3. ***Seek national consistency with rules and guidance to support retention to achieve easy to implement volumetric outcomes***

4. ***Be brave and engage in the required tough conversations with clients around the need to change practice***

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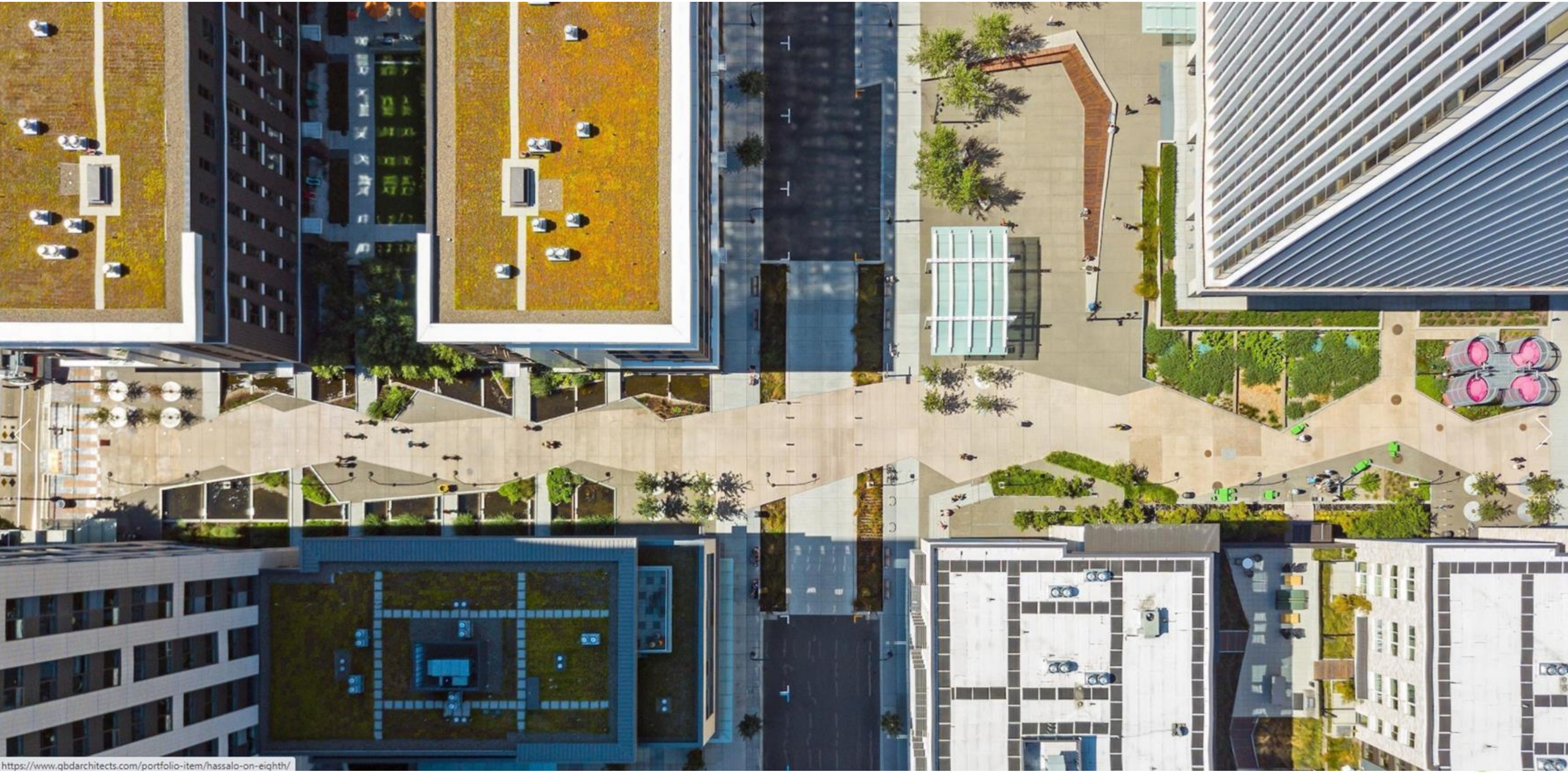
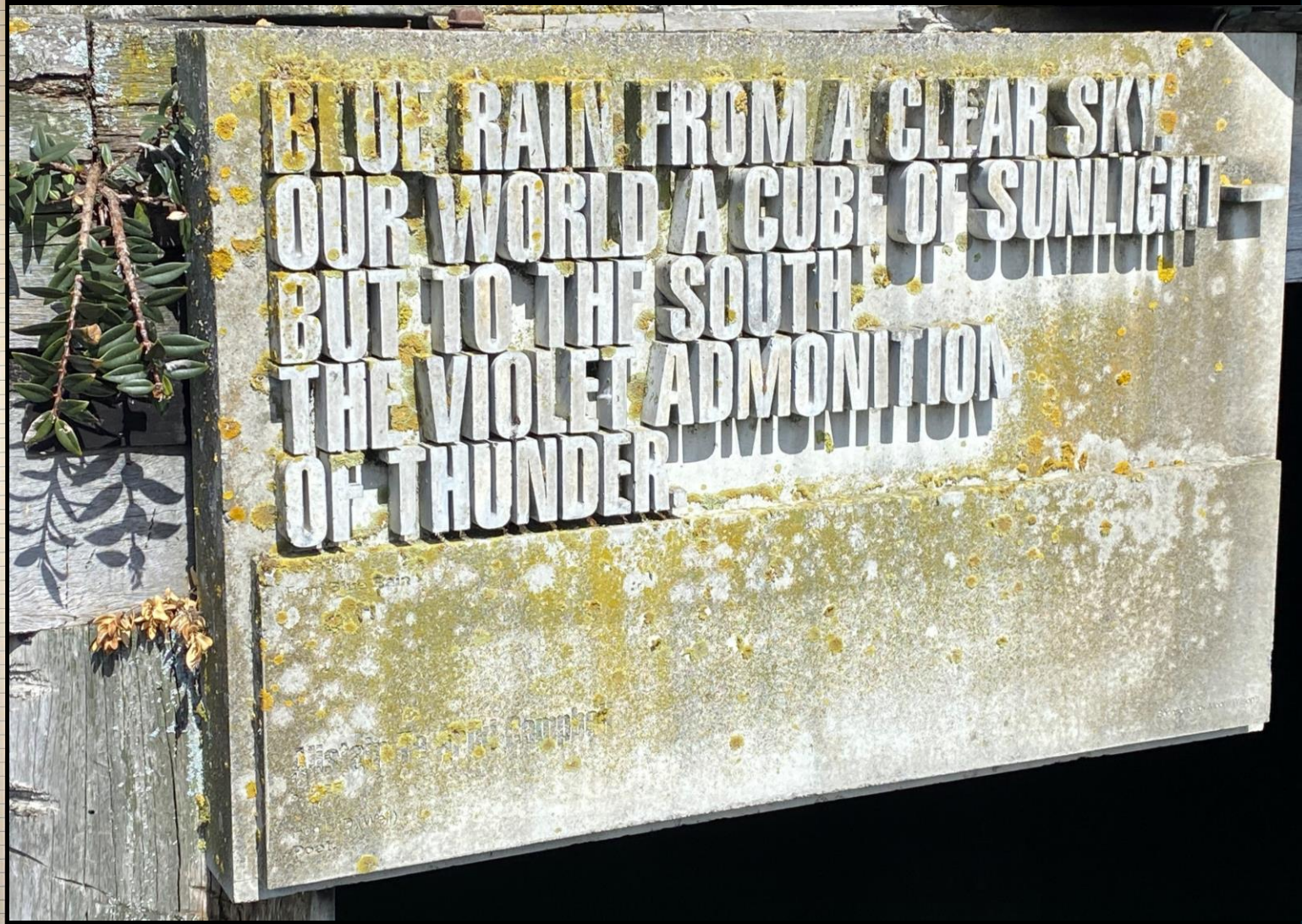


https://www.qbdarchitects.com/portfolio-item/hassalo-on-eighth/


SLUTTERED MED NATUREN
SAVE THE RAIN
EACH RAINDROP IS
A KISS FROM HEAVEN


BLUE RAIN FROM A CLEAR SKY
OUR WORLD A CUBE OF SUNLIGHT
BUT TO THE SOUTH
THE VIOLET ADMONITION
OF THUNDER