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# A RESILIENCE BASED ASSESSMENT METHOD FOR PRIMARY STORMWATER MANAGEMENT SYSTEMS URBAN FLOOD CONTROL

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**ENGINEERING**



# Why Resilience



*Urbanization and Changing Natural Hydrological Process*

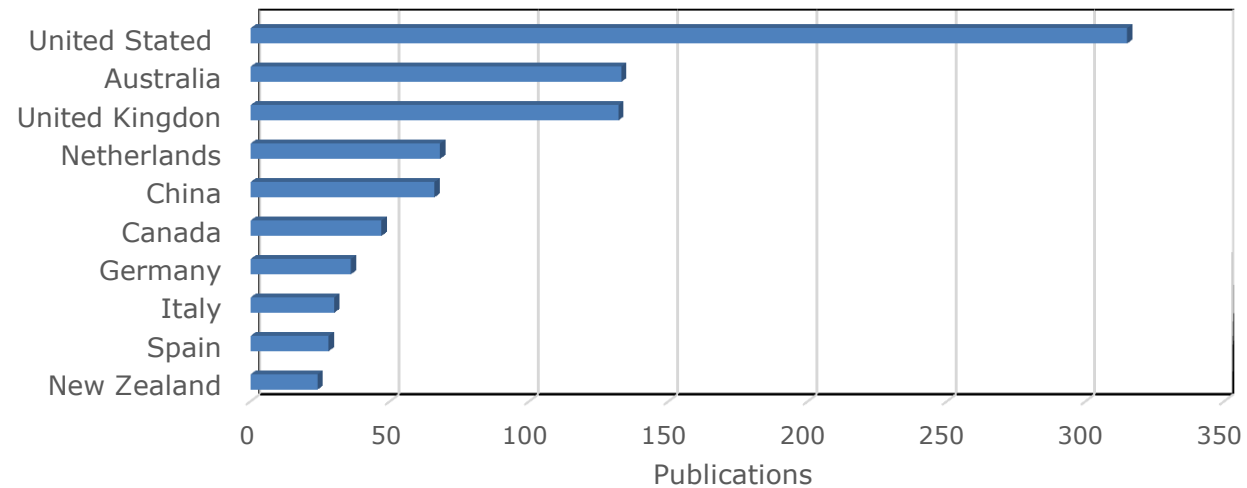


*Increasing Population*



*Climate Change*

### Number of Publications in Stormwater system Resilience (2010-2018)



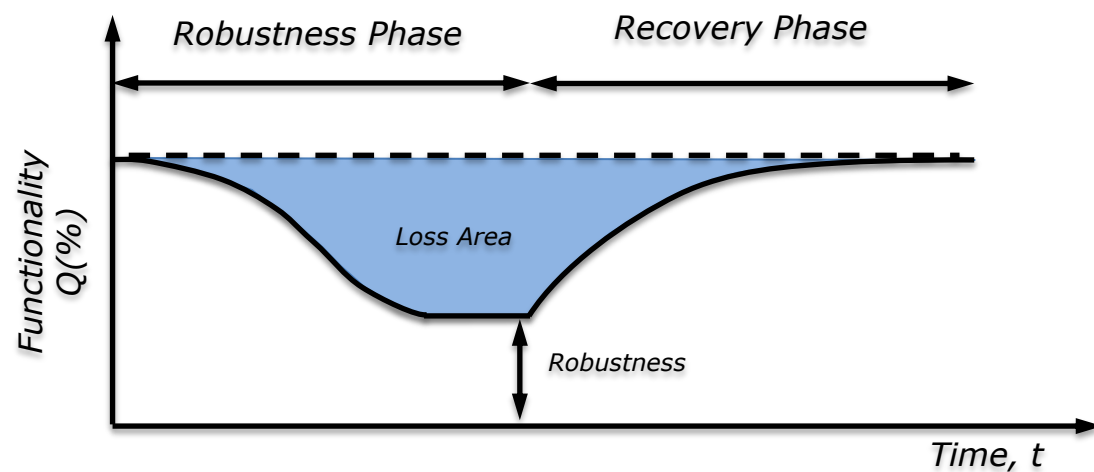
**Source:** Scopus citation database (May 2018)

Definition

Standard Framework



# Stormwater System Resilience

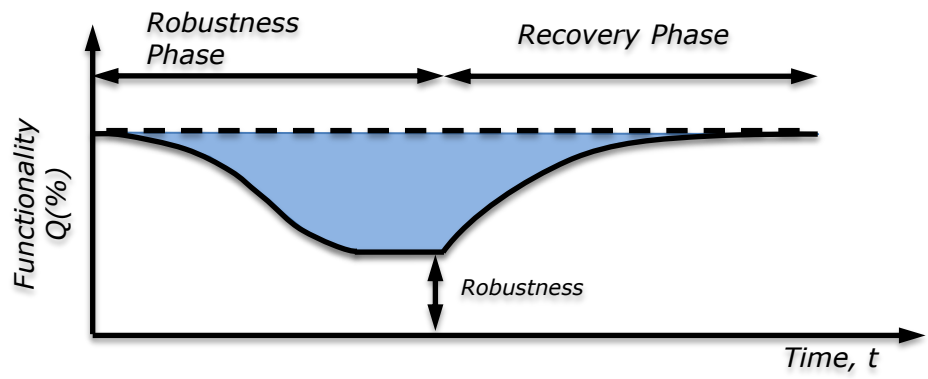


Magnitude of Flood Generated(**Robustness**)

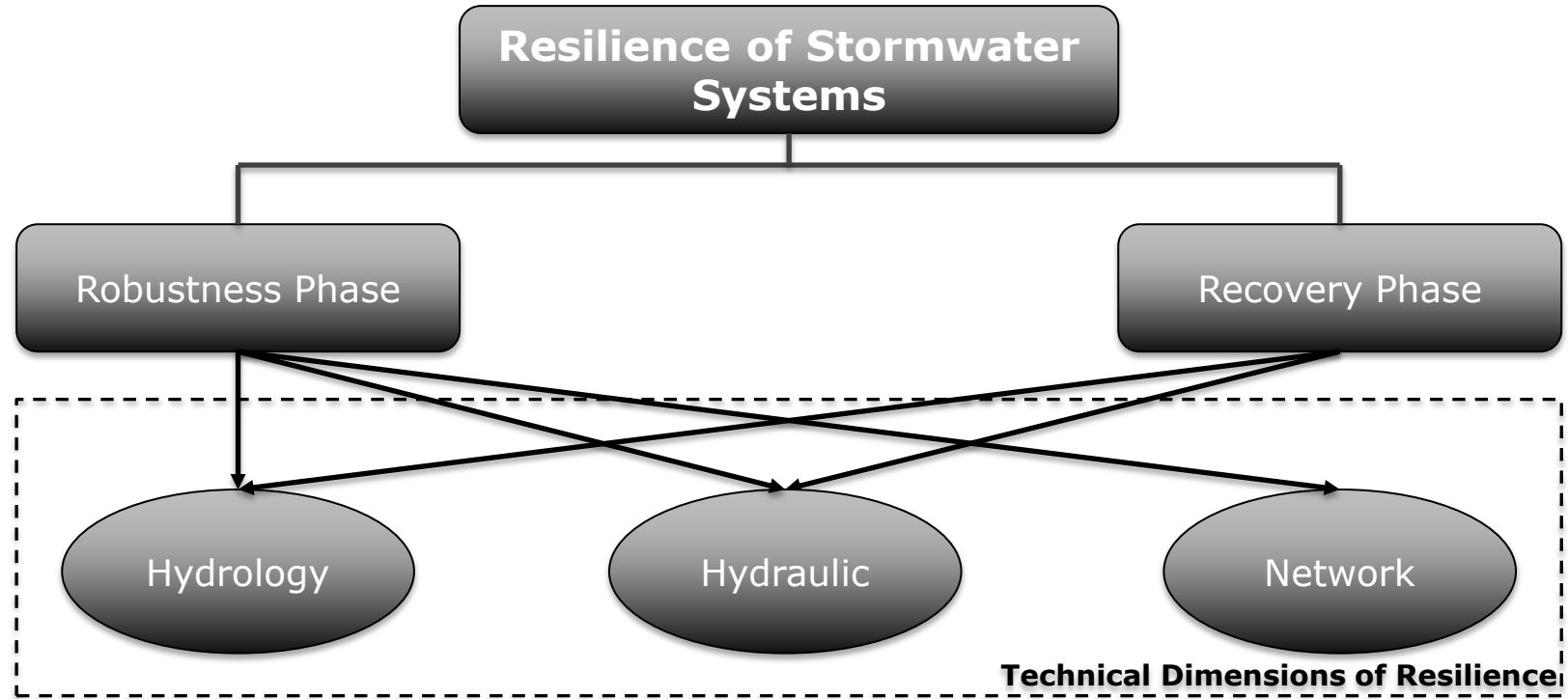
How Fast Recovers (**Rapidity**)

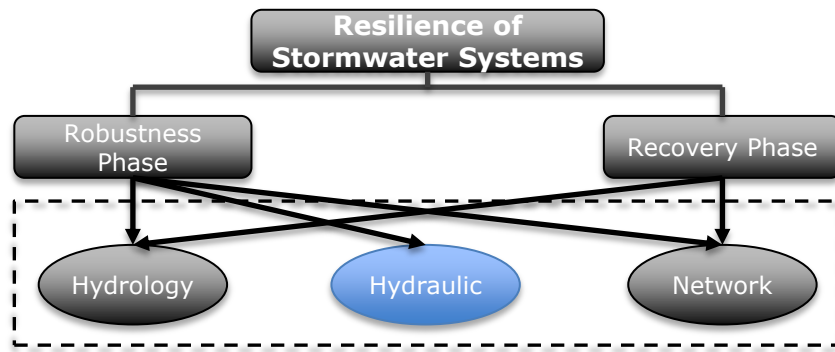




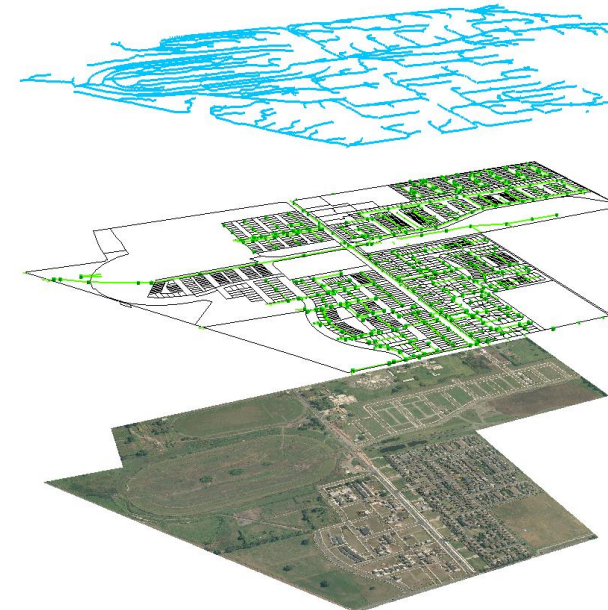
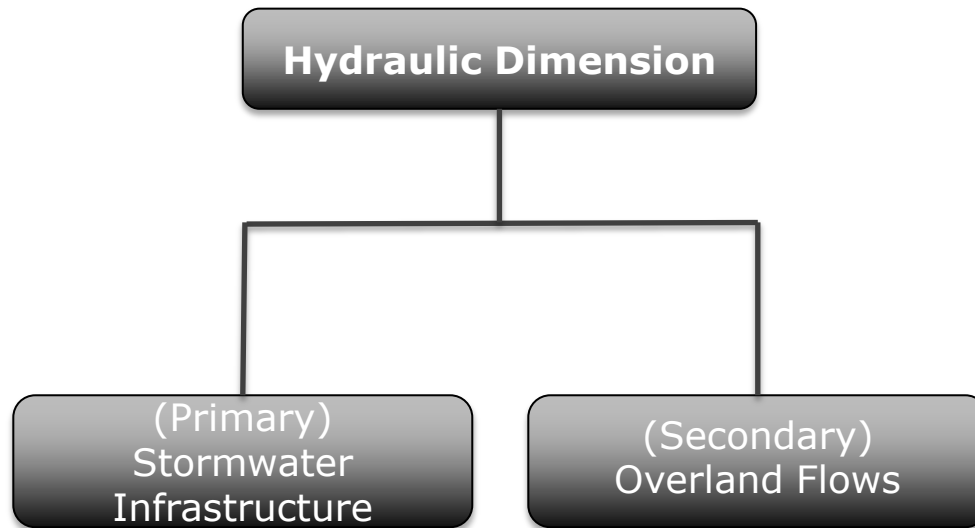


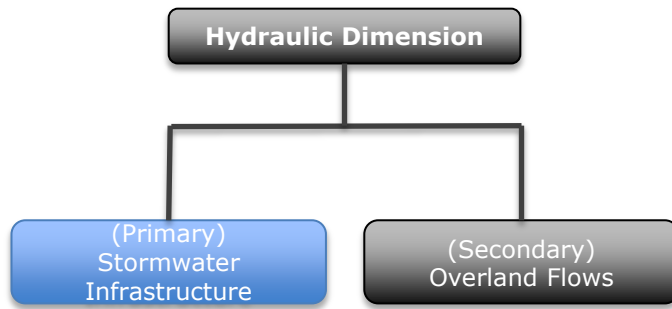
# Method



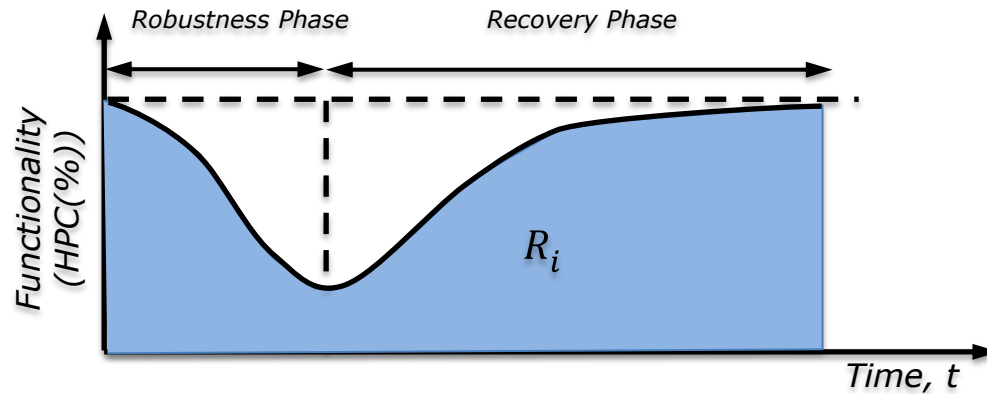


# Hydraulic Dimension



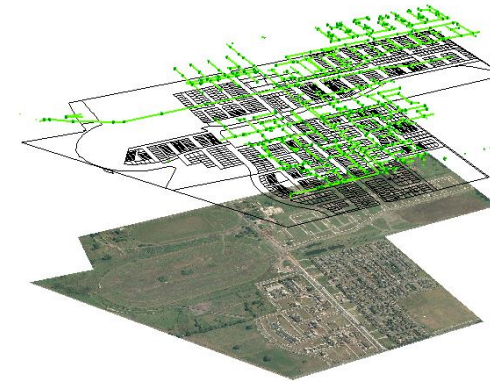


# Hydraulic Dimension (Primary)

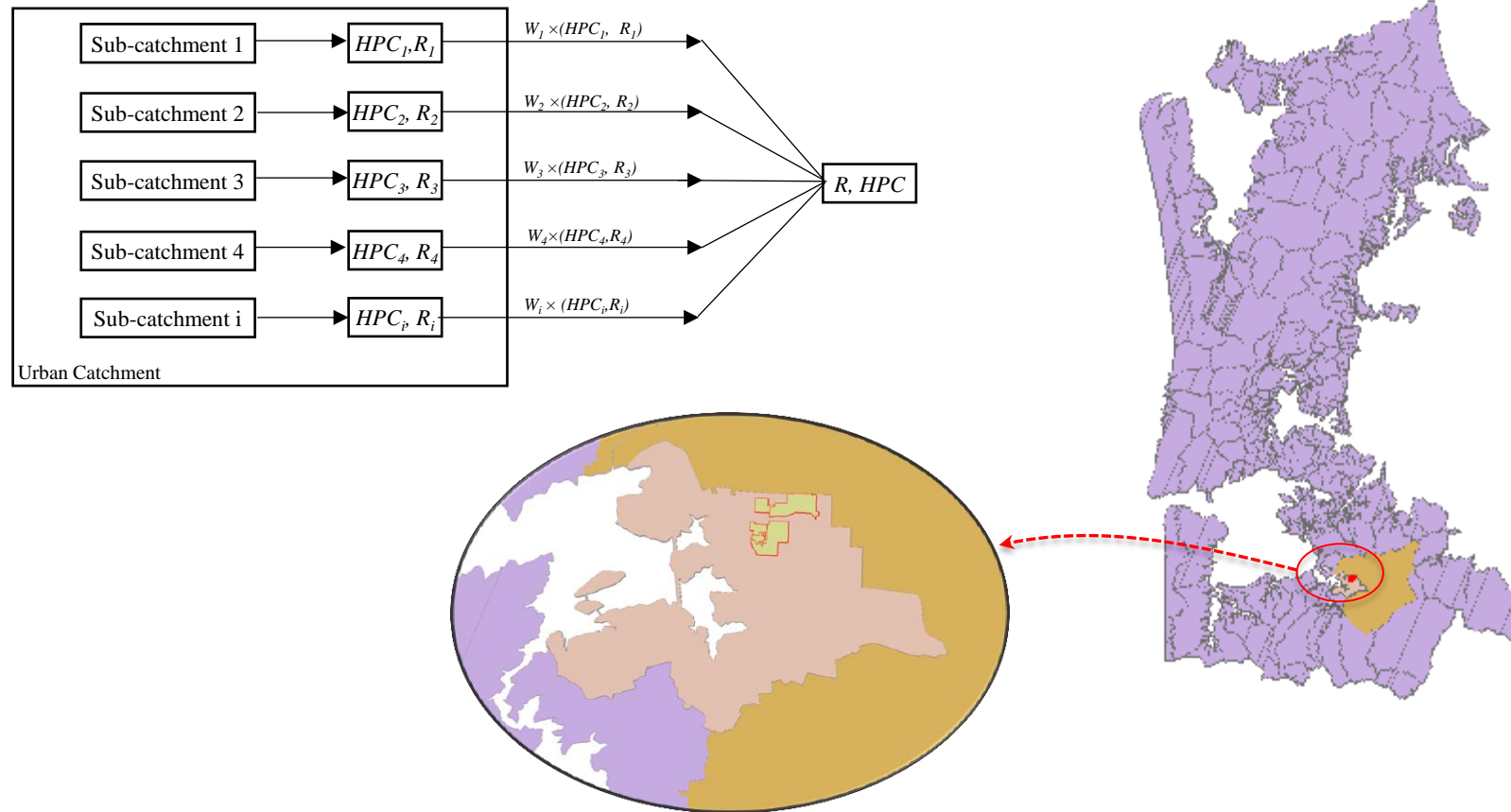


*Unit performance  $(n_i(t)) = f(\text{flow rate, flow depth})$*

$$HPC_i = \left( \frac{\sum n_i}{\sum \frac{L_i}{L_t}} \right) \times 100$$



# Hydraulic Dimension (Primary)





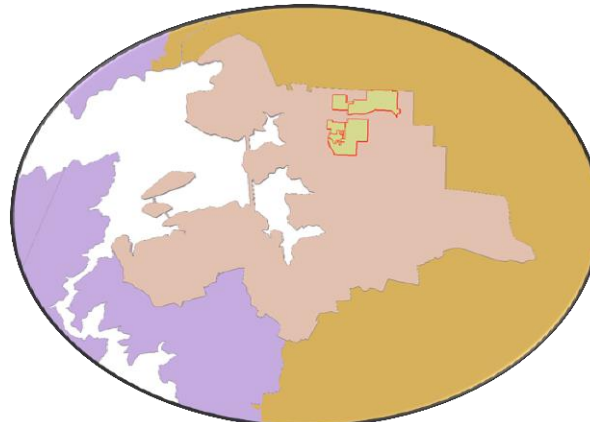
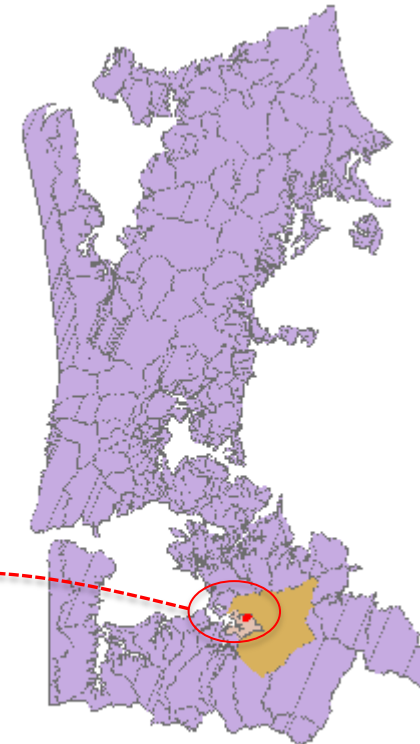
# Application Scenarios

Performance of SW system in different storm events

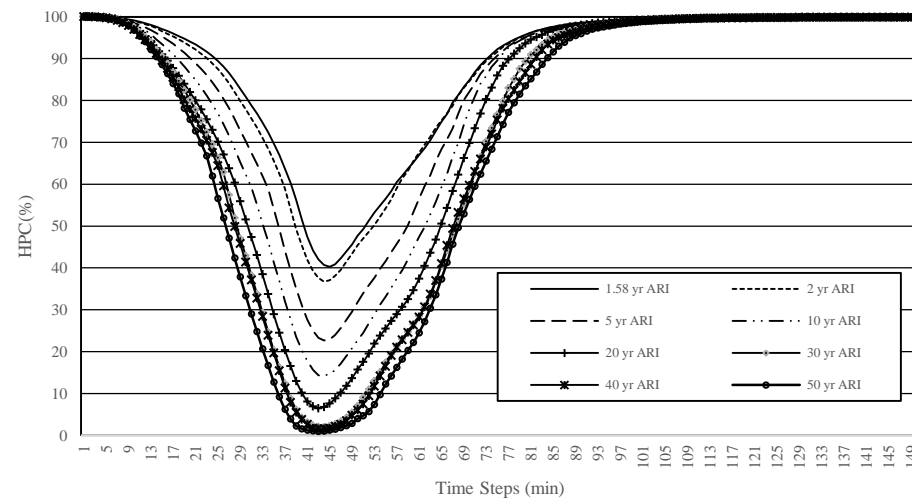
Pipeline aging impact on degree of resilience

Volume Control effect on SW piped network

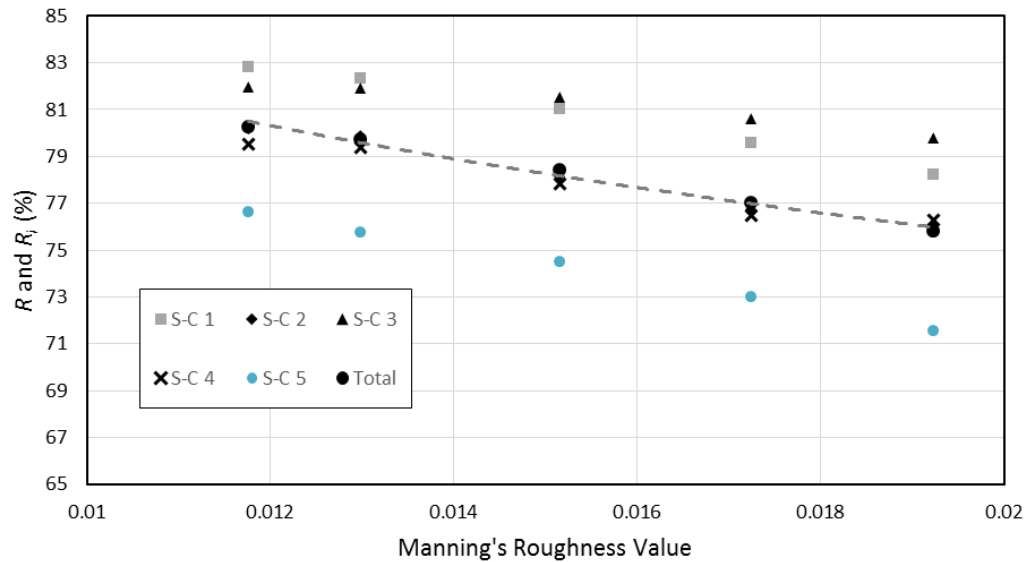
Peak flow Control effect on SW piped network



# Impact of Storm Event



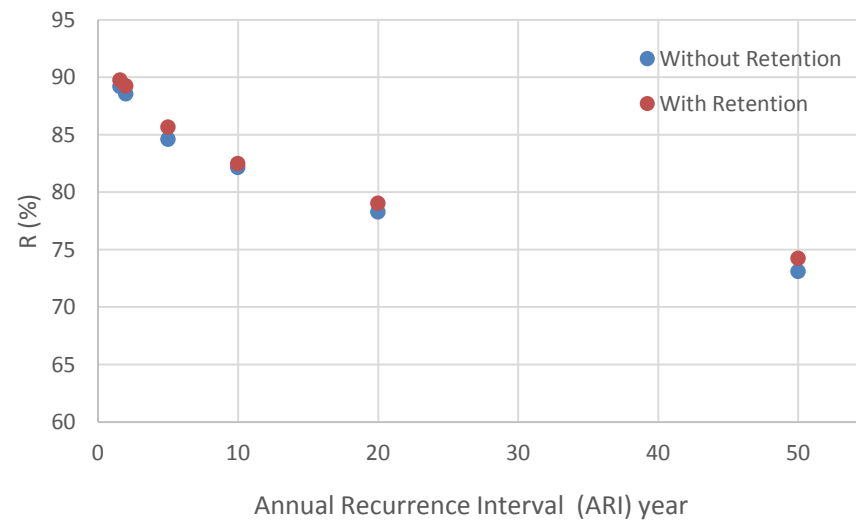
# Impact of Pipe Condition



# Impact of Volume Control

Objectives for Volume Control in SWM

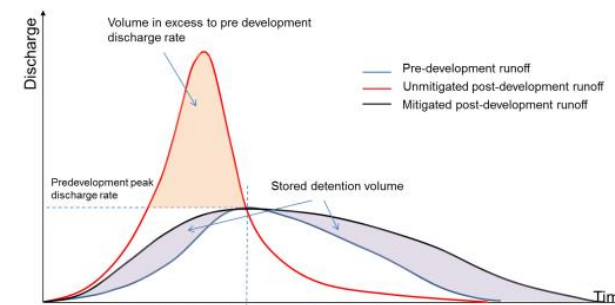
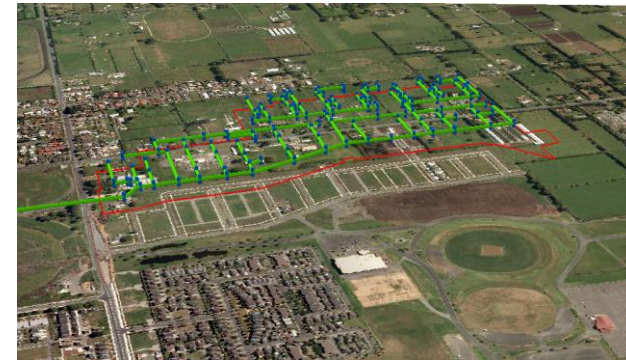
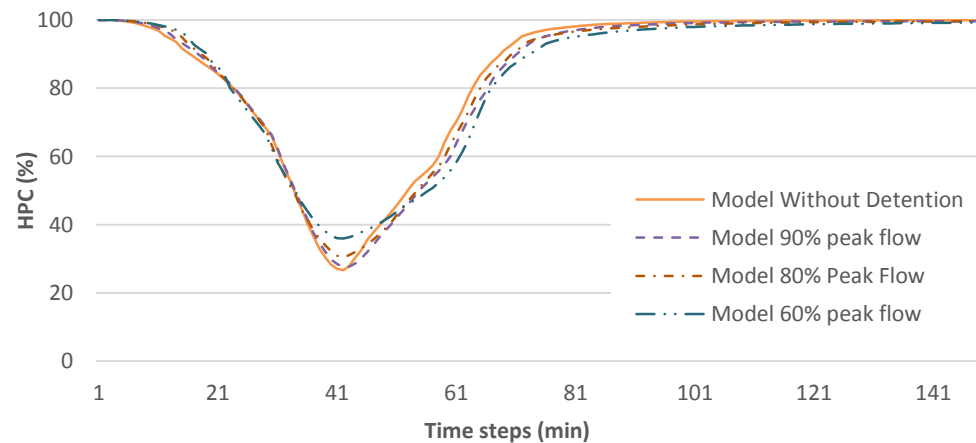
Volume control effect on *HPC* and *R* in Primary SWM



# Impact of Peak Flow Control

Objectives for Peak flow Control in SWM

Peak flow control effect on *HPC* and *R* in Primary SWM



Source: SWM Device in Auckland Region (GD217/001)



# Conclusion

Approach is able quantify functionality and resilience degree

Index for quantifying network conveyance

Able to assess the primary SW functionality under different scenarios

A comparative approach to quantify improvement of resiliency



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Thank you  
Questions?

