

# Nutrient and organic matter removal efficiency of stormwater control measures



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## What is a stormwater control measure?

- Device that is designed to treat &/or control stormwater runoff
- Often referred to as **SCMs** (Stormwater Control measure)
- Come in many different forms;
  - Constructed artificial wetlands
  - Rain gardens
  - Gross pollutant traps (GPT)
  - Filters/stormwater pit insert baskets
  - HumeCeptor®
- Often multiple types used in conjunction with one another
- Mandatory for many new developments today

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## Quantifying the effectiveness of SCMs

- SCMs often not performing as modelled
- Previous DPE work shows:
  - Wet weather
    - 63% TN | 25% TP | 69% TSS
  - Dry weather
    - 36% TN | **-52% TP** | **-94% TSS**
- Highlights importance of monitoring and assessment to understand device performance

**Dry weather Before maintenance**

**Wet weather Before maintenance**

**Legend:**

- TN: Total nitrogen
- NH<sub>4</sub>: Ammonia
- NO<sub>x</sub>: Oxidised nitrogen
- DON: Dissolved organic nitrogen
- PN: Particulate nitrogen
- TP: Total phosphorus
- PO<sub>4</sub>: Phosphate
- DOP: Dissolved organic phosphorus
- PP: Particulate phosphorus
- TSS: Total suspended sediment

**Percent pollutant removal efficiency net treatment**

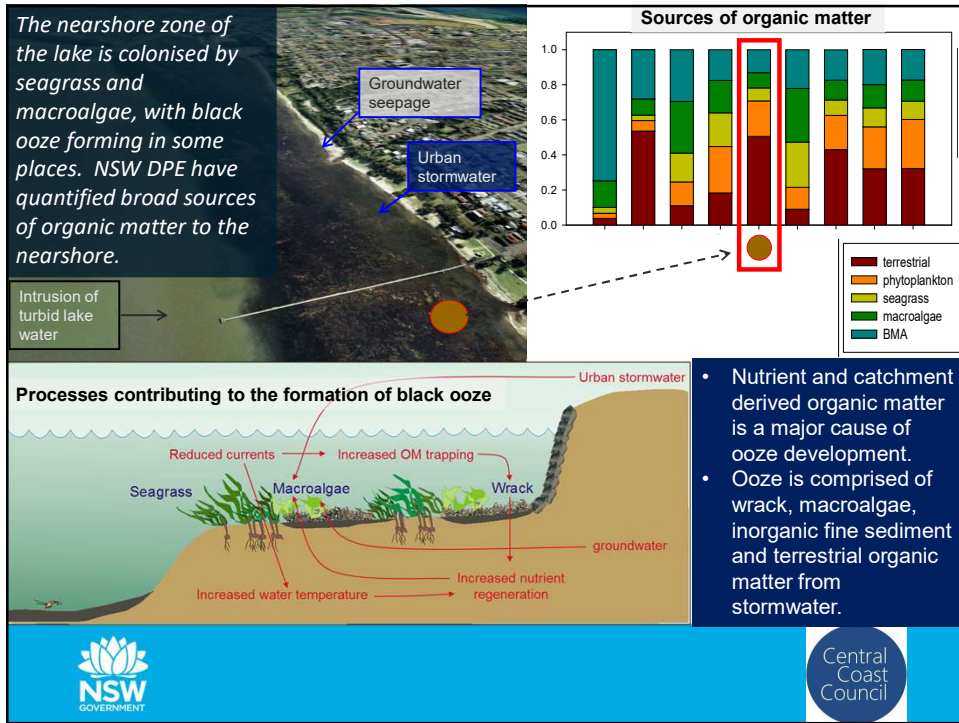
- 0 - <20%
- >20 - <40%
- >40 - <60%
- >60 - <80%
- >80 - <100%

**net export**

- <-500%
- 200 - <500%
- 100 - <200%
- 0 - <100%

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### Organic matter in urban stormwater

- Organic matter (OM) consists of a diverse array of particulate and dissolved forms
- OM can be highly bioavailable in receiving waters
- Urban runoff is a major transport mechanism delivering OM to waterways
- Quantity and composition of OM can determine bioavailability

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**The role of SCMs at removing, transforming and degrading organic matter in urban stormwater is mostly unknown.**







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**Determining the effectiveness of SCMs**

**Aims**

- To assist in optimising Central Coast Council’s management of stormwater
- Determining the effectiveness of SCMs
- Gain better understanding of nutrient and organic matter removal efficiency of SCMs



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## Sampling design

- 2 constructed wetland.
- Minimum 18 months period
- Range of event sizes.
- Automatic samplers installed in inlets and outlets; programmed to collect samples when water levels rise during runoff events.
- Manually collect samples during baseflow conditions.
- Water level and flow velocity sensors installed at inlet and outlet to calculate flow volumes.



Autosampler with solar panel setup at the inlet of Sorrento Way SQID



Pump with plumbing to autosampler, flow meter and depth sensor install in the inlet pipe



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## Sampling design

- $RE\% = \left( \frac{EMC\ out - EMC\ in}{EMC\ in} \right) \times 100$
- Variables
  - Total suspended solids
  - N & P (total & dissolved)
  - Organic mater.
  - Discharge



Pump with plumbing to autosampler, flow meter and depth sensor install in the low flow outlet pipe



Pump with plumbing to autosampler, flow meter and depth sensor install in the medium flow outlet weir



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### Outcomes- Questions we hope to answer?

- Are SCMs source or sink for organic material & nutrient?
- How effective are these devices?
- Are they more effective at removing some things than others?
- Do all devices perform the same?
- How can we optimise management of stormwater?
- Can they possibly be designed better?

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## Organic matter in urban stormwater - research

Expanding council collaborative project under MEMS Action 1.5: *Landuse pressures on the marine estate* in collaboration with UTS and Monash University

*Sampling additional OM and carbon-based indicators in 4 categories*

Comparisons between treated and untreated stormwater (inlet and outlet)

Findings will enhance conceptual understanding of OM dynamic in urban stormwater and treatment

**Quantity** – total organic carbon, dissolved organic carbon, organic N and organic P

**Composition** – optical properties, dissolved:particulate ratio, C:N ratio

**Source** -  $\delta^{13}\text{C}$ -POC and  $\delta^{15}\text{N}$ -PN isotopes, C:N ratio

**Lability** – optical properties, bioavailability incubation assays, biochemical oxygen demand



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