

Practical AS WELL AS PRETTY

How Waitangi Park wetlands treat stormwater and protect the harbour
Nicci Wood, Wellington City Council

1 Introduction

Waitangi Park is Wellington's newest, most exciting, urban park, covering some 3 hectares of the waterfront.

The park has won international and national landscape design and architecture awards that recognise its sustainable, ecological and social attributes and its sophisticated design. The park is named after the Waitangi Lagoon that existed nearby until the mid-19th century. Fed by the Waitangi Stream, it was an important food source for local Maori – but largely disappeared after the huge 1855 earthquake.



2 Stormwater Issues

One of Wellington's largest urban stormwater catchments drains into the harbour through a culvert that runs through Waitangi Park. The 448 ha catchment, of which 262 ha is impervious, includes the suburbs of Mt Victoria, Newtown and Mt Cook. Waitangi Stream was piped during construction of the city's oldest stormwater system from 1859 onwards.

Urban stormwater quality can be influenced by the condition of the wastewater assets within the catchment and other contaminants including nutrients, sediment, heavy metals and hydrocarbons.

The build-up of heavy metals and hydrocarbons in the marine sediments in the vicinity of the stormwater outfall has been a concern for years.



1. Diversion Pump: Stormwater from the culvert is 'daylighted' via a pumping system about 100m upstream of the park. The pump has been linked to level and salinity sensors to exclude seawater at high tide.

2. Sub-surface Wetland: Water enters a sub-surface wetland designed to reduce turbidity in the stormwater to levels suitable for UV disinfection (<10-15mg/L). Any grease, solids and silts are removed here.

3. UV Disinfection: Disinfection of flows prior to entering the wetland results in 90-99% reduction in bacterial levels (faecal coliforms).

4. Waitangi Stream Wetland: Flows within the Waitangi Stream wetland are treated through filtration, absorption and biological/chemical transformation before entering Wellington Harbour.

Irrigation Reuse: Treated stormwater from the wetland is used to irrigate the park and the neighbouring grounds of Te Papa.

As well as the wetlands, a series of 'planters' around the park catch stormwater runoff from the roads and pavements, clearing away most pollutants before they reach the stormwater culvert.

4 Results

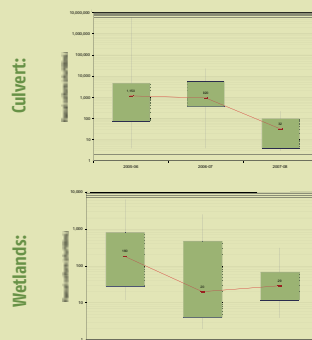
Microbiological: Test results show a significant improvement between the culvert sample and the wetland sample.

Annual median faecal coliform values reduced from 920 cfu/100ml in the culvert to 20 cfu/100ml in the wetland. The 75-percentile value declines from 5500 to 466 cfu/100ml between the same sample sites.

Particle size: It is intended to monitor heavy metal and silt accumulation in the sub-surface wetlands to detect changes in sediment and heavy metal concentrations temporally and spatially to identify long-term trends and maintenance requirements.

Only initial samples have been taken so no data was available at time of publication.

Box and whisker plots showing annual faecal coliform maximum, minimum, medians, 25th and 75th percentiles (July 1 to 30 June)



Heavy metals: Chemical water quality monitoring is undertaken biannually at two sites – one from the culvert upstream of the diversion pump and a second in the wetlands stream.

Contaminant	OPT	Wetland	ANZECC Water quality guidelines T.2.1
As, mg/L	0.003	<0.002	< 0.050
Cd, mg/L	<0.001	<0.001	< 0.002
CN, mg/L	0.01	<0.01	< 0.005
Cr, mg/L	0.002	0.002	< 0.050
Cu, mg/L	0.069	0.005	< 0.005
Fe, mg/L	0.6	<0.1	No recommended value
Hg, mg/L	<0.001	<0.001	< 0.0001
Mn, mg/L	0.026	0.005	No recommended value
Ni, mg/L	0.015	0.001	< 0.015
Pb, mg/L	0.013	<0.001	< 0.005
Phosphorus (Total), mg/L	0.039	0.09	No recommended value
TKN, mg/L	1.5	1.2	
Total Suspended Solids, mg/L	13	<5	No recommended value
Zn, mg/L	0.067	0.043	<0.050

5 Conclusions

The subsurface and UV treatment significantly improve water quality by removing bacteria, trace metals and sediment from the stormwater.

Although the quantity of water being treated is small compared to the overall flows through the culvert, it is a means by which the public awareness is raised and can be considered educational.

The urban green spaces and wetlands offer other ancillary benefits, such as wildlife habitat and aesthetic benefits as well as being an important element in sustainable urban drainage and in encouraging biodiversity.

The wetlands are a practical means of addressing ecological and cultural concerns relating to stormwater management.

