

TE AWARUA-O-PORIRUA HARBOUR AND CATCHMENT JOINT COMMITTEE

*Minutes of a meeting held in the Council Chambers, Administration Building, Hagley Street,
Porirua on Thursday 12 March 2015 at 5.02pm.*

PRESENT: Cr B E Kropp (Chairperson)
Cr A K Baker
Mr T Parai
Cr B Donaldson
Cr M Sparrow

OFFICERS:
Porirua City Council P Bailey General Manager Asset Management and Operations
W Walker General Manager Strategy and Planning
M Trlin Manager Environment and City Planning
K Calder Porirua Harbour Strategy Coordinator
S Mika Committee Advisor
Greater Wellington T Porteous
J Fagan
Wellington City Council N Wood

9/15 CONFIRMATION OF MINUTES

Meeting held 30 October 2014.

RESOLVED (Cr Kropp / Cr Baker)

That the minutes be confirmed as a true and complete record.

CARRIED

10/15 REVISED TE AWARUA-O-PORIRUA HARBOUR AND CATCHMENT
STRATEGY AND ACTION PLAN

Report #1080999 of the General Strategy and Planning dated 12 February 2015.

RECOMMENDED (Cr Kropp / Cr Baker)

That Te Runanga o Toa Rangatira and the Council:

1. **Receives the report**
2. **Approve and adopt the revised Te Awarua-o- Porirua Harbour and Catchment Strategy and Action Plan 2015**
3. **Note that the release of the revised Strategy will be arranged for April 2015 in consultation with the Joint Committee Chairperson.**
4. **Delegate the responsibility to the Porirua City Council Chief Executive to correct any errors and approve any minor changes to the Strategy.**

CARRIED

11/15 FINAL PORIRUA STREAM MOUTH AND ESTUARY ENHANCEMENT
CONCEPT PLAN AND BEGINNING IMPLEMENTATION

Report #1082219 of the Team Leader Strategy and Advice Biodiversity, Greater Wellington Regional Council dated 19 March 2015.

RECOMMENDED (Cr Kropp / Cr Baker)

That the Council:

- 1. Receives the report**
- 2. Approves the final concept plan**
- 3. Approves the Porirua City Council and Greater Wellington Regional Council to commence implementation of the concept plan.**

CARRIED

12/15 TE AWARUA O PORIRUA SEDIMENT REDUCTIONS PLAN

Report #1082221 of the Team Leader Strategy and Advice Biodiversity, Greater Wellington Regional Council dated 19 March 2015.

RECOMMENDED (Cr Kropp / Mr Parai)

That Te Awarua-o-Porirua Harbour and Catchment Joint Committee recommend that the Council:

- 1. Receives the report**
- 2. Notes plan content and anticipated timeline for completion subject to Greater Wellington Regional Council Long Term Plan determinations.**
- 3. Endorses Greater Wellington Regional Council developing the plan.**

CARRIED

13/15 HARBOUR SCORECARD – PORIRUA HARBOUR TRUST

Report #1084335 of the General Strategy and Planning dated 25 October 2014.

RESOLVED (Cr Baker / Cr Sparrow)

That Te Awarua-o-Porirua Harbour and Catchment Joint Committee:

- 1. Receives the report**
- 2. Note the Porirua Harbour Trust Harbour Scorecard for 2014.**

CARRIED

The meeting closed at 5.30pm.

Approved and adopted as a true and correct record.

.....
CHAIRPERSON

.....
DATE

Report	Community Engagement and Education Initiatives in the Te Awarua-o-Porirua Harbour catchment
Date	28 May 2015
Committee	Te Awarua-o-Porirua Harbour and Catchment Joint Committee
Author	Jennie Marks

1. Purpose

The purpose of this report is to inform the Te Awarua-o-Porirua Harbour and Catchment Joint Committee of the community engagement and education work programmes and activities being undertaken in response to the Te Awarua-o-Porirua Harbour and Catchment Strategy and Action Plan (the Strategy).

Recommendations

That the Te Awarua-o-Porirua Harbour and Catchment Joint Committee:

1. **Receives** the report.
2. **Endorses** the work programmes outlined for the 2015/16 financial year.

2. Background

Community engagement is an important part of the Te Awarua-o-Porirua Harbour and Catchment Strategy (the Strategy). The Strategy recognises general and targeted education and awareness programmes as one of the broad priorities.

Education and awareness initiatives can be an effective means to inform the community about harbour values and threats to harbour health. Such initiatives can also provide opportunities for the community to become involved and invested in actions and projects contributing to improving the health of the harbour.

An important focus of community engagement and education initiatives is reconnecting the community with their harbour and its catchment. Effective community, business and agency involvement and stewardship is one of the principles applied across all components of the Strategy.

Target audiences for engagement programmes and activities are schools, community restoration groups, businesses, and the general public.

3. Community engagement and education initiatives in the Te Awarua-o-Porirua Harbour catchment

There are various education and awareness activities undertaken in the catchment. The Strategy partners (Greater Wellington Regional Council, Wellington City Council, Porirua City Council and Ngati Toa Rangatira) play an important role in these, but a number other agencies and groups such as Enviroschools, Sustainable Coastlines, the Porirua Harbour Trust, and Guardians of the Pauatahanui Inlet, also lead and deliver initiatives. The Strategy partners work with these organisations to ensure a collaborative approach to this work.

The following two tables below summarise the programmes and initiatives undertaken in the current financial year (Table 1) and the activities planned for the next financial year (Table 2). The work programme is divided into focus areas:

- Community ecological restoration
- Community engagement
- School education, and
- Business

While the tables provide the operational budgets for these areas, the significant investment in staff time required to administer and coordinate these activities is not included here. The key Strategy partners represented in the tables below are Greater Wellington Regional Council (GWRC), Wellington City Council (WCC), Porirua City Council (PCC) and Te Rūnanga o Toa Rantira (TRoTR).

Table 1: Community engagement and education initiatives in the 2014/15 financial year. Financial figures are provided for operational budget and are indicative only. Investment in staff time required to administer and coordinate these activities is not included here. Greater Wellington Regional Council = GWRC, Wellington City Council = WCC, Porirua City Council = PCC, Te Rūnanga o Toa Rantira =TRoTR.

Focus area	Project	Budget
Community ecological restoration	Support for community groups: <ul style="list-style-type: none"> • Development of a contestable fund (GWRC) • Ongoing support of groups with plants and advice (WCC & PCC) • Mana Whenua engagement and support for community restoration groups (TroTR) 	(GWRC) \$5K (WCC) \$29K (TroTR) \$20K
	Landowner support: <ul style="list-style-type: none"> • Phone advice for private landowners about biodiversity (GWRC) 	
	Initiatives: <ul style="list-style-type: none"> • Takapūwāhia Streams Restoration (TRoTR) 	Total = \$54K
Community engagement (education and awareness)	Engagement events and initiatives: <ul style="list-style-type: none"> • Seaweek 2015 regional coordination, including events in the Porirua Harbour catchment (GWRC) • Whitieria Park public snorkelling event (GWRC) • Bothamley Park Stream Extreme event (GWRC, PCC) • Support for Restoration Day 2015 open to all community volunteers undertaking environmental restoration projects, including those in the Porirua Harbour catchment (GWRC, WCC) • Presentations to community and school groups (PCC, WCC) • Printing of Samoan-language version of the Porirua Harbour Trust Living Waters school resource Moata I le Talafatai – Home to Harbour (GWRC & PCC) • Develop a health risk communications plan for Porirua Harbour (RPH & PCC) • Installed ‘Drains to Harbour/Streams’ plates on targeted street sumps (PHT, WCC, PCC) 	(GWRC) \$18K (PCC) \$12K (WCC) \$4K
	Published materials: <ul style="list-style-type: none"> • Publication of four advertorials in the Kapi Mana News also available to schools as posters(PCC) • Produced Water Sensitive Urban Design Guide (WCC) 	

School education	<p>School support:</p> <ul style="list-style-type: none"> • Response to school requests for advice (GWRC, WCC, PCC, TRoTR) • Development of Stream Testing Kits to education providers for schools to borrow (GWRC) • Coordination of 12-14 planting events for schools (GWRC, WCC, TRoTR) • Arbor Day planting event at Battle Hill Forest and Farm Park for schools (GWRC) • Support sustainable transport initiatives like Moving March and school travel plans for schools (GWRC, WCC) 	<p>(GWRC) \$53.5K (WCC) \$25K (TRoTR) \$140K Total = \$218.5K</p>
	<p>Education programmes:</p> <ul style="list-style-type: none"> • Funding for the Healthy Harbours Porirua programme (GWRC) • Mana Whenua support and engagement for Healthy Harbours Porirua Programme (TRoTR) • Ongoing financial and logistical support for Enviroschools (GWRC, WCC, PCC) • Support for the Porirua Harbour Trust coordinator (GWRC) • Meetings for education providers in the catchment to collaborate on school support (GWRC) • Waitech waka ama youth development programme (TRoTR) 	
	<p>Published Materials:</p> <ul style="list-style-type: none"> • ECE/Primary Resource pack promoting history and culture of Ngāti Toa in relation to Te Awarua o Porirua Harbour (TRoTR) 	
Business	<p>Take Charge programme:</p> <ul style="list-style-type: none"> • Delivery of Take Charge business education and monitoring programme in the Porirua Harbour catchment (GWRC) 	<p>Staff time only</p>
<p>Grand total budget = \$327.5K</p>		

Table 2: Community engagement and education initiatives planned for the 2015/16 financial year. Financial figures provided represent operational budget and are indicative only. Investment in staff time required to administer and coordinate these activities is not included here. Greater Wellington Regional Council = GWRC, Wellington City Council = WCC, Porirua City Council = PCC, Te Rūnanga o Toa Rantira =TRoTR.

Focus area	Project	Budget
Community ecological restoration	Support for community groups: <ul style="list-style-type: none"> Administration of contestable fund (GWRC) Ongoing support of groups with funding and advice (GWRC) Ongoing support of groups with plants and advice (WCC) Training for community volunteers as required (WCC, GWRC) Mana Whenua engagement and support for community restoration groups (TroTR) 	\$29K (GWRC) \$29K (WCC) \$20K (TRoTR)
	Landowner support: <ul style="list-style-type: none"> Phone advice for private landowners about biodiversity (GWRC) 	Total = \$78K
Community engagement (education and awareness)	Engagement events and initiatives: <ul style="list-style-type: none"> Seaweed 2016 regional coordination, including events in the Porirua Harbour catchment (GWRC) Whitiera Park public snorkelling event (GWRC) Other Porirua Harbour event, yet to be determined (GWRC) Support for Restoration Day 2016 open to all community volunteers undertaking environmental restoration projects, including those in the Porirua Harbour catchment (GWRC, WCC) Presentations as required (PCC, WCC) Produce Rural Guidelines for landowners and managers (PCC) Review, enhance and implement building site guidelines (PCC, WCC) Install 'Drains to Harbour/Streams' plates on targeted street sumps(PHT, PCC) Review and promote building site guidelines (PCC, WCC) Develop a 'community education' programme for stormwater awareness (WWL) Promote sustainable farm and forest management (GWRC) Develop relevant commercial and industry guidelines – eg painters (PCC) 	\$35K (GWRC) \$20K (PCC) \$12K (WCC) \$10K (TRoTR)
	Published materials: <ul style="list-style-type: none"> Display for community events (GWRC) Interpretation (signs) around the harbour and streams (GWRC, PCC, WCC, TRoTR) Maintaining and improving websites regarding Porirua Harbour content (GWRC, PCC, WCC) Promoting community groups (WCC, GWRC) 	Total = \$77K

School education	<p>School support:</p> <ul style="list-style-type: none"> • Response to school requests for advice or expert speakers (GWRC, PCC, WCC, TRoTR) • Maintaining Stream Testing Kits and delivering training to teachers and education providers on their use (GWRC) • Support sustainable transport initiatives like Moving March and school travel plans for schools (GWRC, WCC) 	
	<p>Education programmes:</p> <ul style="list-style-type: none"> • Funding for the Healthy Harbours Porirua programme (GWRC) • Mana Whenua support and engagement for Healthy Harbours Porirua Programme (TRoTR) • Ongoing financial and logistical support for EnviroSchools (GWRC, WCC) • Support for the Porirua Harbour Trust coordinator as required (GWRC) • Coordination of meetings for education providers in the Porirua Harbour to collaborate on school support in the catchment (GWRC) • Coordination of school planting events including regional park Arbor Day plantings (GWRC, WCC, TRoTR) • Waitech waka ama youth development programme (TRoTR) 	<p>\$53.5K (GWRC) \$25K (WCC) \$100K (TROTR)</p> <p>Total = \$178.5K</p>
Business	<p>Take Charge programme:</p> <ul style="list-style-type: none"> • Delivery of Take Charge business education and monitoring program in the Porirua Harbour catchment (GWRC) 	<p>Staff time only</p>
Grand total budget = \$333.5K		

Report No. PCC #1103574
Date prepared 4 May 2015
Committee Te Awarua-o-Porirua Harbour and Catchment Joint Committee
Authors Juliet Milne, Team Leader, Aquatic Ecosystems & Quality
Dr Megan Oliver, Environmental Scientist – Coast

Te Awarua-o-Porirua Harbour and catchment – science update

1. Purpose

To provide a summary of science-related work carried out in Te Awarua-o-Porirua Harbour (Porirua Harbour) and catchment between mid-2011 and 2015 to date.

1.1 Recommendations

That the Committee:

- 1. Receives the report.*
- 2. Notes the content of the report.*

2. Background

Greater Wellington Regional Council (GWRC) carries out a wide range of ‘routine’ environmental monitoring in the Porirua Harbour and catchment (see Appendix 1). Some of this monitoring has been in place for over 20 years and forms part of GWRC’s regional State of the Environment (SoE) and recreational water quality monitoring programmes.

During the development of the Porirua Harbour and Catchment Strategy and Action Plan (the Strategy) in 2011, some specific scientific research and monitoring were identified to support successful implementation of the Strategy. To help prioritise the core science needs and fulfil the subsequent actions assigned to GWRC in the Strategy, GWRC has convened four Porirua Harbour and catchment science workshops since 2011. These workshops have been multi-agency and multi-disciplinary, engaging a range of terrestrial and aquatic scientists, as well as policy, consents and catchment management staff from GWRC, WCC and PCC.

A report consolidating the science-related work carried out in Porirua Harbour catchment between 2011 and 2015 is near completion¹. The report was prepared to inform both the recent review of the Strategy and the commencement of the

¹ Oliver M D. 2015. *Te Awarua-o-Porirua Harbour and Catchment Programme: Summary of scientific monitoring and research undertaken in fulfilment of the Porirua Harbour and Catchment Strategy and Action Plan, 2011–2015. In prep.*

whaitua process, and is supported by a suite of technical reports (Appendix 2). This paper summarises the core science work documented in the report.

3. Science work

The primary science focus since the development of the Strategy has been the issue of sedimentation and determining from where and how much sediment is entering the harbour. Other work has included targeted stream water quality monitoring, faecal plume modelling in the harbour and seagrass condition assessment.

3.1 Harbour and catchment sediment modelling

To achieve the sedimentation targets proposed in the Strategy and prioritise science and management needs for the harbour and catchment, two mathematical models were used to estimate how much sediment was entering Porirua Harbour from the surrounding catchments and where within the harbour that sediment might be depositing.

Although these models will require ongoing validation, or ground-truthing, they were valuable for identifying which catchments and associated land-uses contribute the most sediment to the harbour and highlighting where sediment from respective subcatchments settle in the estuary. For example, the subcatchment of Pauatahanui contributes approximately 8 kilotonnes of sediment per year to the harbour, predominantly from pasture and steep erosion-prone land, and this sediment is deposited throughout the intertidal and subtidal areas of the Pauatahanui Arm. In contrast, the Browns Bay catchment contributes much less sediment and this smaller amount of sediment deposits largely in the immediate Browns Bay area.

It is envisaged that these models will be used to test scenarios for various catchment sediment mitigation efforts (eg, pasture retirement). Turbidity (discussed in Section 3.2) and harbour sedimentation rate monitoring are ongoing to validate and refine both of the models.

3.2 Catchment turbidity monitoring

In 2012/13 GWRC set up turbidity monitoring sites in the lower reaches of the Horokiri, Pauatahanui and Porirua Streams; previous catchment sediment modelling had identified these three subcatchments as contributing the largest amount of sediment to Porirua Harbour (see Section 3.1). The equipment at these sites takes continuous measurements of water flow and turbidity, or cloudiness. Water samples are also collected periodically and analysed for suspended sediment with a view to converting the turbidity record to a record of suspended sediment concentration and calculating exactly how much sediment is entering the harbour from the surrounding land.

The inaugural turbidity monitoring report was completed in early 2015 and presented the data from the first two years of turbidity monitoring. Overall, the highest turbidity values and suspended sediment concentrations were recorded in the Pauatahanui Stream during both low flows and wet weather events. Monitoring will be required for several years to measure sediment concentrations across a range of wet weather events.



Porirua Stream at Town Centre flow monitoring site. Automatic water sampler in its housing and the turbidity sensor deployed in the stream (left) and (right) a close-up of the turbidity sensor deployed in the stream

3.3 Targeted stream water quality monitoring

3.3.1 Mitchell and Kenepuru streams

Water quality was assessed monthly in the lower reaches of Mitchell and Kenepuru streams between July 2011 and June 2012 while sampling GWRC's two Porirua Stream SoE monitoring sites. Little was known about these two tributaries, in particular:

- the potential contribution of metals from the Mitchell Stream subcatchment which drains Spicers Landfill; and
- whether water quality in the Kenepuru Stream was better or worse than that at GWRC's long-term Porirua Stream monitoring site at Wall Park (this site is located upstream of the Kenepuru Stream confluence so does not fully represent the quality of water entering the harbour).

Mitchell Stream recorded the best water quality of the four monitoring sites during the monitoring period, with metal concentrations much lower than those typically recorded downstream in Porirua Stream. This suggests alternative or additional source(s) of copper and zinc to the stream (eg, from adjacent industry and the main northern railway line).

Kenepuru Stream exhibited very poor water quality. While concentrations of some nutrients were similar to those recorded at both Porirua Stream sites, the water tended to be less oxygenated, dirtier (more turbid) and *E. coli* contamination was particularly prominent (median 800 cfu/100mL and maximum of 110,000 cfu/100mL).

3.3.2 Wet weather water quality monitoring

Since mid-2012 targeted wet-weather stream sampling has been carried out by GWRC to identify contaminant 'hotspots'. A particular focus has been placed on the Porirua Stream catchment to date because, compared with the predominantly rural Pauatahanui and Horokiri stream catchments, the Porirua

Stream catchment comprises a mixture of urban and rural land, including land undergoing residential (and other) development (eg, Stebbings Valley).

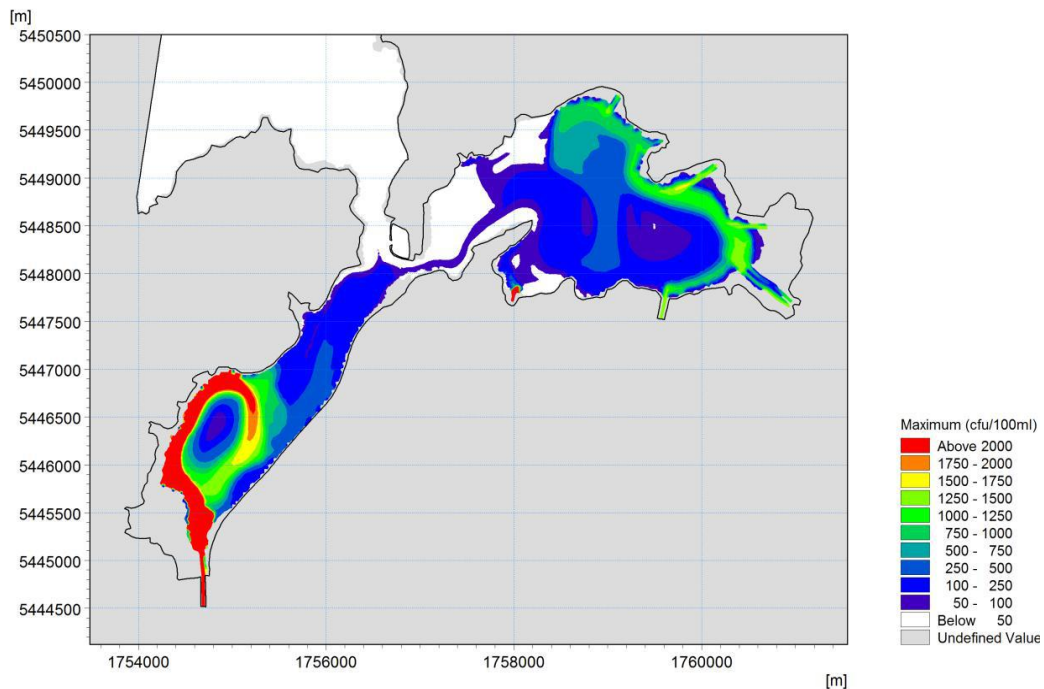
It has been difficult to establish any clear patterns in sediment or nutrient concentrations across sampling events but significant *E. coli* contamination exists in wet weather across all sites – including rural streams such as Takapu and Pauatahanui streams. The highest *E. coli* results were recorded in samples from Kenepuru Stream at Mephram Place; on four separate occasions *E. coli* counts exceeded 10,000 cfu/100mL.

3.4 Faecal plume modelling

In late 2014, DHI were commissioned to model the dispersal of faecal contaminants within Porirua Harbour. The purpose of the modelling was to predict which areas of the harbour are at greatest risk from faecal contamination, and to understand which rain and wind conditions may make the harbour unsuitable for contact recreation or shellfish gathering.

The key findings of the preliminary modelling include:

- Wind, as opposed to tide, drives the movement of water and thus the dispersion of faecal contaminants within both arms of the harbour.
- In windy conditions, eddies develop within the main basins of each harbour arm which have a major role in the transport and retention of faecal contaminants within the harbour (see figure below).



An example of the faecal plume model output during south-easterly wind conditions showing that the incoming plume from Porirua Stream travels along the CBD and Elsdon foreshores and circulates within the Onepoto Arm of the harbour

- Porirua and Kenepuru streams dominate the resulting faecal coliform concentrations that occur within the Onepoto Arm, while within the Pauatahanui Arm the resulting concentrations are from numerous sources.

More specifically, the following sites are influenced by the corresponding freshwater inputs within the harbour:

- Ivey Bay – Porirua, Kenepuru, Pauatahanui and Horokiri streams
- Browns Bay – Browns Stream
- Water Ski Club – Pauatahanui, Kakaho and Horokiri streams
- Rowing Club – Porirua and Kenepuru streams
- Waka Ama launch – Porirua and Kenepuru streams
- Parameta shellfish collection site – Porirua and Kenepuru streams

Further data collection and validation of the model are planned.

3.5 Seagrass condition assessment

Seagrass meadows perform a vital role as nursery and feeding grounds, as well as stabilising sediment and acting as an effective indicator of ecosystem health. Historically Porirua Harbour supported large areas of seagrass meadows but they have been in decline since the mid-1900s (eg, current intertidal seagrass cover is 5 and 6% for the Pauatahanui and Onepoto arms, respectively). This study, undertaken as part of the Victoria University 2014/15 summer scholarship programme and co-funded by GWRC, was designed to assess seagrass condition, across a range of different sites in the harbour.



Seagrass (*Zostera muelleri*) in Porirua Harbour

Overall, the results indicated that the remaining seagrass meadows are in a reasonable condition throughout both arms of the harbour and they are not compromised by the variable sediment quality. A seagrass restoration feasibility study carried out by NIWA in 2012 concluded that light availability was sufficient to support seagrass growth, though nitrogen levels in inner harbour waters may cause toxicity symptoms in seagrass. Small-scale seagrass transplant trials are now underway in areas of the harbour previously known to support healthy meadows.

4. Looking ahead – 2015/16

A work programme for 2015/16 is currently being finalised and is expected to include:

- Ongoing turbidity monitoring to accurately calculate incoming sediment loads and validate catchment sediment modelling;
- Further event-based water quality and flow monitoring in selected tributaries (eg, Kenepuru Stream);

- Investigation of the source(s) of elevated copper and zinc in the lower Porirua Stream;
- Development of real-time harbour microbiological water quality forecasting; and
- Monthly water quality monitoring in Pauatahanui Arm to support the seagrass transplant trials. These trials are a citizen science project and the success, or otherwise, of these transplants is being monitored each month by members of the Guardians of Pauatahanui Inlet.

5. Communication

All technical reports and the summary report, once completed, will be made available on GWRC and PCC's websites. A science seminar covering all of the work presented in this paper was delivered to Strategy partners in December 2014.

Report prepared by:



Juliet Milne
Team Leader, Aquatic
Ecosystems & Quality



Dr Megan Oliver
Environmental Scientist –
Coast



Report approved by:

Graham Sevicke-Jones
Manger, Environmental Science

Appendix 1: Routine monitoring in the Porirua Harbour catchment

The monitoring outlined here relates to water quality, sediment quality and ecological health. GWRC also carries out air and soil quality monitoring in the Porirua Harbour catchment.

Catchment monitoring

- Rainfall and stream flows are measured continuously (logged at 15-min intervals) at three locations in the catchment. The flow recorders are located on the lower reaches of Taupo, Porirua and Horokiri streams. NIWA monitors flow on the lower reaches of the Pauatahanui Stream and GWRC has access to their data.
- Stream water quality is assessed at monthly intervals at the following four locations as part of our region-wide Rivers State of the Environment (RSoE) Monitoring Programme: Porirua Stream at Glenside, Porirua Stream d/s of Mitchell Stream, Horokiri Stream at Snodgrass and Pauatahanui Stream at Elmwood Bridge. A range of physical, chemical and microbiological variables are measured such as dissolved oxygen, temperature, pH, conductivity, visual clarity, turbidity, suspended solids, *E. coli*, nutrients. Streambed algae cover is also assessed at each site and water samples from both Porirua Stream sites are also tested for copper and zinc.
- Stream health (at the above four sites) is also assessed through annual biological monitoring, incorporating assessments of periphyton (algal) biomass and aquatic invertebrate communities during stable/low flows in summer/autumn.

Harbour monitoring

- In conjunction with PCC, GWRC currently monitors microbiological water quality at three recreational sites in the harbour: ‘Pauatahanui Inlet at Water Ski Club’, ‘Paremata Bridge’ and ‘Porirua Harbour at Rowing Club’. Monitoring involves weekly water sampling between mid-November and March and monthly sampling outside of this period.
- ‘Broad scale’ aspects of estuary health, including nuisance algal cover, seagrass and saltmarsh cover, and substrate type (sand, mud, etc.) are monitored across the intertidal areas of the harbour. Habitat and vegetation cover are assessed five-yearly while nuisance algal cover is currently mapped annually.
- ‘Fine scale’ ecological health and sediment quality are monitored at four intertidal locations and five subtidal locations (Figure 1). The indicators selected for the intertidal monitoring (eg, benthic invertebrates, sediment mud content, nutrients, heavy metals, etc.) address the common estuary issues in terms of sedimentation, eutrophication (nutrient enrichment) and toxic contamination. The subtidal monitoring sites date back to 2004 and are focussed on assessing stormwater-derived contamination (including metals, PAHs and pesticides). Rates of sedimentation are measured annually at 18 sites throughout both arms of the harbour.

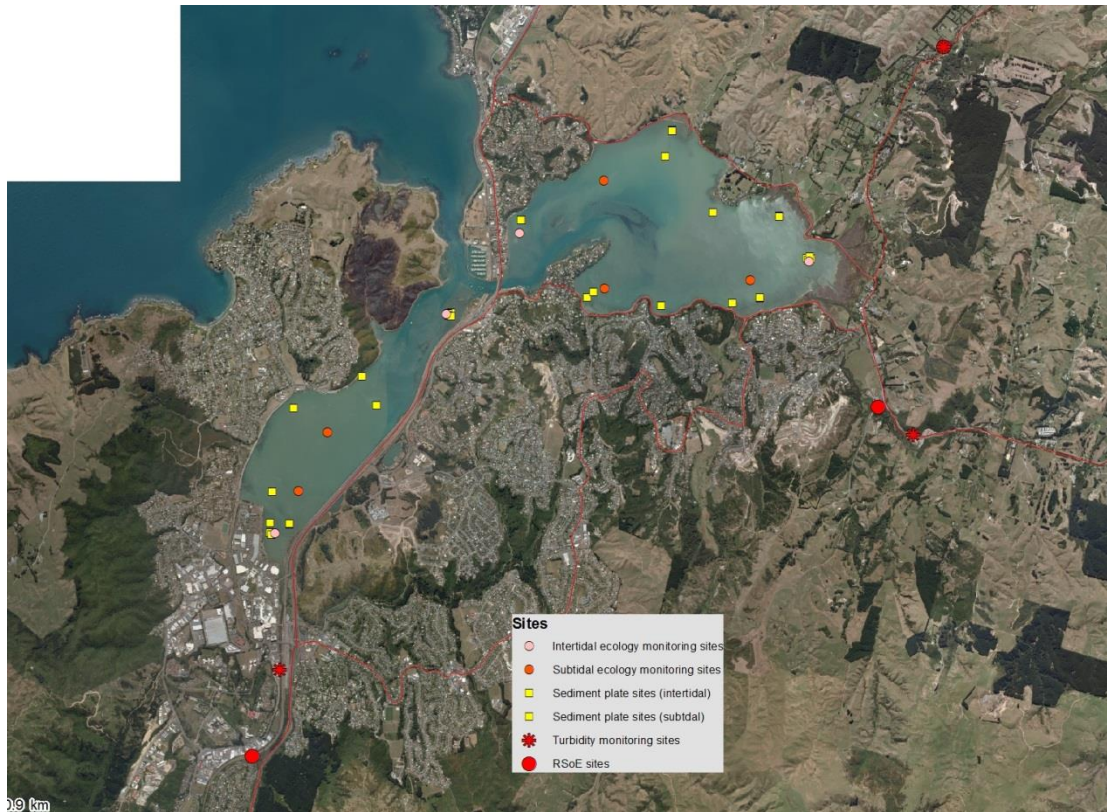


Figure 1: Map showing key harbour sediment monitoring locations. Three of the stream SoE monitoring sites are also shown

Appendix 2: Recently or near completed science-related reports

Note: This does not include routine harbour and catchment monitoring reports.

Duncan A. 2015. *Seagrass condition in Te Awarua-o-Porirua Harbour*. Report prepared for VUW Summer Scholarship Programme 2014/15.

Green M, Stevens L and Oliver MD. 2014. *Te Awarua-o-Porirua Harbour and catchment sediment modelling: Development and application of the CLUES and Source-to-Sink models*. Greater Wellington Regional Council, Publication No. GW/ESCI-T-14/132, Wellington.

Matheson F and Wadhwa S. 2012. *Seagrass in Porirua Harbour: Preliminary assessment of restoration potential*. Report prepared for Greater Wellington Regional Council by NIWA, Hamilton.

Milne JR and Morar S. In prep. *Stream and stormwater quality-related investigations in the Porirua Harbour catchment*. Unpublished internal report, Greater Wellington Regional Council, Wellington.

Morar S, Oliver MD and Purdon W. 2015. *Porirua Harbour catchment turbidity monitoring: Results of continuous turbidity monitoring 2012–2014*. Greater Wellington Regional Council, Publication No. GW/ESCI-T-15/20, Wellington.

Tuckey B. 2015. *Te Awarua-o-Porirua Harbour faecal contaminant plume assessment: Preliminary numerical modelling*. Report prepared for Greater Wellington Regional Council by DHI, Auckland.

Note: NIWA has also recently completed science-related reports for other PH & C Strategy partner organisations, including reports on the December 2013 cockle survey in Pauatahanui Inlet and a 2013 survey of fish species in Porirua Harbour for Ngati Toa. A report by Discovery Marine Ltd on the 2014 Porirua Harbour bathymetric survey and verification of sedimentation rates has also been completed (commissioned by PCC & partially funded by GWRC).

For more information, check out:

<http://www.pcc.govt.nz/Publications/Porirua-Harbour-and-Catchment-Management-Programme>