Te Awarua o Porirua

Porirua Harbour Scorecard - 2015

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Background

The two water systems of the harbour (the Pauatahanui Inlet and the Onepoto Arm) once supported a bountiful supply of fish and shellfish. In addition to the marine species, rich forests surrounded the harbour and were the source of many birds. Flax was abundant in the swamps.

From the 1820s Europeans began to settle in Porirua. From the 1850s onwards, major impacts on the harbour system were caused by forest clearance propelled initially by an increasing demand for timber. Forest clearance proceeded rapidly so that within some 40 years lowland Porirua was transformed from a mostly forested into a mostly pastoral landscape. Interestingly, there is more vegetation around the harbour system now than there was at the end of the 19th Century.

The progressive clearance for pasture resulted in a massive increase in sediment, which started filling the harbours at a rate of 2 – 4mm/year from a pre European background inflow of 1mm/yr.

The next big effect was urban development. This increased sediment movement and deposition and, together with the effects of roads, railways and reclamations, dramatically altered the shoreline and the tidal prism (the amount of tidal water that could move in and out of the harbour system). Sediment rates increased substantially so that by the mid 70s the average rate was estimated to be between 6 and 9mm/yr. In parts of the Pauatahanui Inlet it may have reached up to 10-15mm/yr. If continued, these rates would result in the Inlet being in filled and becoming a swamp in 145 - 195 years and the Onepoto Arm in 290 – 390 years. (Gibb, 2009, 2011).

In addition to sediment, urban development added chemical and biological contaminants and nutrients, together with toxins from urban run off. Agricultural chemicals and industrial run off in the post Second World War era added further pollution which is now embedded in harbour sediments and affects its shellfish and fish stocks.

Fortunately, this legacy of contamination is now being addressed by the three authorities responsible for the harbour and it catchments – Porirua City, Wellington City, and Greater Wellington Regional Council. Together with Ngati Toa and other organisations and agencies, these authorities have drawn up a Porirua Harbour and Catchment Strategy and Action Plan. This sets out directions, actions and targets designed to arrest the decline in harbour condition and return it to a healthy and resilient state. The Action Plan is the touchstone and guide towards a brighter future for the harbour.

Te Awarua O Porirua Harbour and its catchment are significant to the people of Porirua City as well as those across the Wellington region.

- It is the focal point and defining feature of Porirua City
- It is a gateway to Wellington City from the Kapiti Coast and points north.
- It is a much valued recreational playground for the city and the region
- It is a regionally significant bird and fish habitat and includes a wildlife reserve of national importance
- It is a significant resource for local iwi, Ngati Toa.

This scorecard serves to raise awareness and report on long term progress in meeting the objective of a healthy and protected harbour.

The Porirua Harbour Trust

The Trust (*Porirua Harbour and Catchment Community Trust* but marketed as the *Porirua Harbour Trust*) was established in 2011 with representation from the three councils, Ngati Toa and community members. Two of our key objectives are to:

- Advocate for the sustainable management of the harbour and its catchment; and
- Foster an understanding of ecological and environmental issues within the harbour and its catchment through research, education and community awareness.

The Trust has undertaken to report annually with reference to a set of "State of the Harbour" indicators with the aim of tracking progress towards a healthy harbour. To this end a review panel of two Trust members and two independent observers has been established. The panel considers data available from the Councils as well as the Trust's own surveys and projects and uses this to report on five key indicators of the health of the harbour.

The review panel comprises:

Grant Baker, Chairperson of the Porirua Harbour Trust
Lindsay Gow, Trustee of the Porirua Harbour Trust
Dr John McKoy, Marine Scientist
Clive Anstey, Landscape and Resource Planner.

The annual scorecard on the health of the Porirua Harbour will be available each February.

The Scorecard for 2015

The Porirua Harbour Trust (PHT) has an important role in supporting the community, the councils, Ngati Toa and agency action to make positive changes to the ecosystems of the catchment and harbour, ensuring the Porirua Harbour and Catchment *Strategy and Action Plan* is implemented.

This scorecard for the 2015 year is the third in an annual series that PHT will produce. The scorecard maps and assesses five indicators related to the harbour and catchment using a five point scale for each one. (5 being excellent and 1 being poor).

The scores highlight changes in key aspects of harbour and catchment quality, sample some users' views on harbour condition, and give an indication each year of progress on the *Strategy and Action Plan*.

The five indicators are:

1. **Agency Action** – a review of local authority and agency progress with implementing the *Strategy and Action Plan*;
2. **Sedimentation** – a summary of data from the Greater Wellington Regional Council's sedimentation records from 18 recording plates in the Onepoto Arm and Pauatahanui Inlet;
3. **Education and Recreational Usage** – feedback from recreational groups using the harbour waters, water quality records from key beaches and the number of schools involved in the catchment eduation programme;
4. **Ecological Health** – a summary of data from Greater Wellington's records on the quality of major streams entering both arms of the harbour and on harbour quality;
5. **Waste** – recording the changing volumes of large rubbish items collected from the harbour at the Porirua Stream mouth by the Trust.

An education component has been added to the third indicator (Education and Recreational Usage) which now also measures the uptake of the Porirua Harbour Trust catchment education programme across the 50 schools in the catchment.

The review panel recognizes that data collection in the harbour and catchment has been underway for many years, but only recently has a more comprehensive set of data been collected. The review panel has taken the approach of only reporting on matters with at least three years of comparable data available. This is because data gathered for just one or two years might result in one off events overly influencing the longer term average.

The review team acknowledges the strong and helpful support received from the monitoring team at Greater Wellington Regional Council in making the data available.

The criteria for each indicator being measured, the five point scale explanation and the full results are included in Appendix 1.

The 2015 Results

The 2015 "State of the Harbour" scorecard is the third for the Trust and reports against the baseline established for each of the five indicators being measured in our first report in 2013. While it is still too early to see trends appearing across the five indicators our key concerns are the increase of mud in the Pauatahanui Arm, the ecological health of the harbour and streams and water quality on our swimming beaches.

Our key findings are:

Agency Action:
We are seeing a strong, coordinated and increasing commitment from Councils and agencies for the harbour strategy programme and this indicator has been given a Good rating up from Fair in previous years.

Sedimentation:
Sedimentation rates for the 2015 were excellent with the Harbour Overall, the Onepoto Arm (subtidal) and Pauatahanui Inlet (intertidal) and (Subtidal) all receiving a rating of Excellent. However, and as discussed in the comments below, there is a growing concern about the volumes of fine mud being deposited in parts of the harbour and particularly in the Pauatahanui Inlet

Education and Recreational Usage:
Recreational Water Quality at all of our major swimming sites in the harbour are either Fair or Poor with only the Karehana Bay beach getting a Good - *being suitable for swimming for most of the time*. This is a key concern over the summer months.

Ecological Health of the harbour:
All of the streams measured in the catchment are showing a slow decline in health with only two of the four measuring points receiving a Good rating over the last three year period. However all four measuring points received only a Fair in this year's result and the trend is a decline in ecological health over time.

The ecological health of the harbour is Fair to Good and while there continues to be an increase in mud, particularly in the upper Pauatahanui Inlet, the sand-dominated habitats appeared to be in good (healthy) ecological condition.

Waste:
The result for Waste, large rubbish items collected from the Porirua Stream area of the Onepoto Arm has improved from a rating of Very Poor in 2013 to a Fair in the last three years, however the number of large items, predominantly tyres still getting into the harbour is a worry. The Harbour Committee needs to consider why residents dump large items in the harbour each year and what steps can be taken to mitigate this occurrence.

Reported below are the full results and the commentary for the five indicators.

1. AGENCY ACTION

What is being measured:

An Annual Review of progress by all agencies against the Porirua Harbour Detailed Action Plan

This includes a comparison of what was stated in the Detailed Action Plan with what was funded and planned and achieved through outputs and outcomes.

Rating 2013	Rating 2014	Rating 2015	Comment
3	3	4	In the 2015 year the Trust notes there has been a generally strong, coordinated and increasing commitment from agencies for harbour strategy programme actions and outcomes.

Comment:

The *Strategy and Action Plan* has been in place since March 2012 and councils have continued to include in their annual and long term planning the funding required to carry out the work identified in the plan. 2015 was the year in which the long term, 10 year plans were reviewed – this happens every three years.

The Trust was pleased to see affirmative actions by Porirua City and Greater Wellington Regional Councils in their 10 year plans.

Examples of work both underway and committed includes Porirua planning for and implementing network upgrades for waste water and stormwater (working through the newly established Wellington Water Limited), and completing its stormwater bylaw and commencing the associated community education programme.

Greater Wellington has implemented its "Take Charge" business/industry pollution prevention programme, and it has decided to have a dedicated land management officer working in the Porirua catchment. It continues to commit significant research and monitoring resources to the harbour and catchment..

The catchment based "Whaitua" Committee has now been established by Greater Wellington. This committee is working to collect and relay environmental, mana whenua, economic and cultural/recreation information, and community knowledge between the community, Porirua and Wellington cities, and the Regional Council.

The Whaitua Committee is made up of a capable group of local community, tangata whenua, expert and council representatives. Its overriding purpose is to develop a specific chapter and related priorities and management requirements for Porirua's freshwater management for inclusion in the regional plan. The Trust strongly endorses this work and looks forward to the outcomes from the committee

Wellington City has adopted water sensitive urban development guidelines. Unfortunately it didn't have any specific Porirua Harbour or catchment initiatives identified in its Long Term Plan.

There are a number of joint council activities: a sediment reduction plan is underway, as is a range of ecological restoration initiatives, a full time in-house Land Management Officer has been appointed by Greater Wellington Regional Council to work with rural landowners in the Porirua catchment to reduce the volume of sediment eroding from their land, and harbour and catchment research and monitoring has been increased. There is also increased and coordinated work on community education and engagement – the Trust is pleased to have made a significant contribution in this area to school education.

The Te Awarua-o-Porirua Joint Harbour Committee Harbour Committee has overseen the first three year review of the Harbour Strategy. The review concludes that the Strategy and Action Plan continues to gain momentum. The Committee has affirmed the original objectives, priorities, targets and timeframes.

It is still too early to comment on all the first, short-term tranche of Strategy outcomes: a number of these fall due this year – 2016. But the more significant targets and outcomes are not surprisingly the longer term ones which fall due in 2021 and beyond. Nevertheless, the review and revised Strategy and Action plan shows completion of many scheduled activities, some of which are ongoing and many of which involve new studies, reporting, and process related monitoring. Ongoing initiatives reflect the commitment to adaptive management.

The Trust is pleased to note that the revised Strategy and Action Plan now includes identified priorities. We look forward to the Harbour Committee putting some focus on the delivery of these priorities.

The review conclusion says progress to date shows some, at least short term improvements in harbour quality, especially in relation to continuing low sedimentation rates, some ecosystem improvements (such as increases in cockle counts), and a reduction in litter collected around the harbour edge.

The Trust is seeing a generally strong, coordinated and increasing commitment from agencies for the Harbour Strategy programme. For these reasons, we have raised the overall rating for the 2015 year to 4.

The Trust will continue to engage with the councils, the Joint Harbour Committee and other agencies to ensure work is planned and implemented as per the *Strategy and Action Plan*.

2. SEDIMENTATION

What is being measured:

2.1 Harbour Sedimentation. Indicates the Mean Annual sedimentation rate from the 18 sedimentation plates, (9 in the intertidal and 9 in the sub tidal) in the Onepoto Arm and Pauatahanui Inlet. A separate rating is shown for subtidal and intertidal in each inlet and for the harbour as a whole.

Results for each year:

Rating 2013	Rating 2014	Rating 2015	Comment
5	5	5	Onepoto Arm subtidal
1	5	3	Onepoto Arm intertidal
3	4	5	Pautahanui Inlet subtidal
3	5	5	Pauatahanui Inlet intertidal
-	4	5	Harbour Overall

Data used:

To measure sedimentation rates, Greater Wellington Regional Council (GWRC) has buried concrete plates at 18 sites throughout Porirua Harbour. The most recent of these plates (8 subtidal, 1 intertidal) were installed in February 2013 and were measured for the first time in early 2014. (Sub tidal means harbour areas always covered with water; intertidal means areas that are exposed at low tide but covered with water at high tide)

It is important to note that the sedimentation rate in any single year does not necessarily reflect the overall pattern of sedimentation in the harbour. For this reason the review panel has taken the approach of only using data where a minimum of three years is available to ensure that one off events do not overly influence long term trends.

For example, the sedimentation rate on the intertidal flats of Onepoto Arm near the Paremata Railway Station was 14.3 mm in 2012/13 (Table 1), negative 4.3mm in 2013/14 and 1.5mm in 2014/15. However, there are six years of sedimentation rate measurements for this site and these measurements range from -4.5 to 14.3 mm (mean=1.4 mm/yr), indicating that there can be large inter-annual variation.

Table 1: Sedimentation rate data for selected locations in Porirua Harbour
(Source: **Oliver MD. 2015.** ***Coastal state of the environment monitoring programme: Annual data report 2014/15.***)

Indicator	Onepoto Arm							Pauatahanui Arm										
	Intertidal			*Subtidal*				*Intertidal*						*Subtidal*				
Site no.	1	2	3	S6	S7	S8	S9	6	7	8	9	10	11	S1	S2	S3	S4	S5
Sedimentation rate (mm) (2012/13)	14.3	12.3	4.3	-	-	-	-14	3.5	9.3	2.0	-0.8	-3.0	-	-	-	-	-	-
Sedimentation rate (mm) (2013/14)	-4.3	-0.3	1.8	0.0	-6.0	-8.0	0.0	-2.0	-4.0	-2.5	4.5	14.8	-30.0	6.6	26.4	8.0	11.0	9.2
Sedimentation rate (mm) (2014/15)	1.5	2.3	2.3	5.0	-92.0	-93.0	4.0	-3.0	-2.0	1.3	-2.5	-5.5	4.0	2.0	18.0	-12.0	-4.0	-10.0

From the data the review team has taken the readings for each part of the harbour and averaged these each year to arrive at an index to indicate what is happening in each part of the harbour on an annual basis. This is then rated using the criteria as defined in Appendix One to show the annual results. The overall target is to have sedimentation at a rate of less than 1mm per year.

Table2: Sedimentation Index for each part of the Porirua Harbour

Indicator	Onepoto Arm		Pauatahanui Arm		Total Harbour
	Intertidal	*Subtidal*	*Intertidal*	*Subtidal*	
Sedimentation Index rate (mm) (2012/13)	10.3	-14.0	2.2	-	-
Sedimentation Index rate (mm) (2013/14)	-0.9	-3.5	-3.2	12.2	1.2
Sedimentation Index rate (mm) (2014/15)	2.0	-44	-1.3	-1.2	-11.3

Our Comment:

The sedimentation rates vary considerably on a year to year basis but in the main the news is good with the overall sedimentation rate for the 2015 year being a negative 11.3mm across the total harbour, mainly driven by the significant loss of sediment in the Onepoto subtidal area.

The sedimentation rate for the Onepoto Arm (subtidal), and Pauatahanui Inlet (intertidal) and (Subtidal) are all rated as Excellent, having achieved the target of less than 1mm per year.

The measurements in the subtidal areas of the Pauatahanui Arm show a variation of increases and decreases across the measuring points and it will be interesting to see how these continue to change as we move into the Transmission Gully project construction period. However, with only two year's data collected, it is too early to say what the longer term trend will be. The predicted land disturbance, particularly from Transmission Gully construction, forest harvesting and urban development is likely to have further impacts on the harbour in the years ahead.

The high Horokiri (S2) rates in the last two years is possibly caused by wave dominated re-deposition of sediment from other parts of the inlet and are not necessarily indicative of average sedimentation inflows from these particular catchments into the harbour. Sediment measures in the stream are however recorded as very high.

While sandy sediments dominate the intertidal sites with a mean mud content of 7.2% in the Pauatahanui Arm and 5.5% in the Onepoto Arm, there is increasing concern in the subtidal sites which show increasing and significant deposits of soft muds. Mud content ranged from 8 - 42% in the Onepoto Arm, with a mean of 18% and 17 - 78% in the Pauatahanui Arm with a mean of 59%.

There is a large increase in mud in the Pauatahanui Arm with the mean mud content increasing from 40%, to 49% and then 59% in the last three years. This is particularly evident in the Kakaho and Horokiri stream mouth area where deep soft mud in the shallow sub tidal area has extended 20 – 30m closer to shore in the last 12 months.

Mud causes problems for harbour life as it creates conditions where oxygen and nutrients are reduced. The result is a smelly, unhealthy layer that reduces diversity of plants and sea life. Soft mud also gets moved around the harbour and causes noticeable reductions in water clarity and quality.

Strategy partners have a produced a Sediment Management Plan outlining how they will address ways to reduce the sediment inflows and to work on achieving the long term target set in the Harbour Strategy of less than 1mm/year on average. Reducing the fine-grained mud component from catchment run off is important, and this will be a particular challenge given the potential impact of the predicted land disturbances that will occur in the immediate years ahead.

3. EDUCATION AND RECREATIONAL USAGE

What is being measured:

3.1 Recreational usage of the Harbour.

Feedback from recreational groups on the quality of the harbour in satisfying their recreational expectations. A separate score for each inlet.

Rating 2013	Rating 2014	Rating 2015	Onepoto Arm	Pauatahanui
4	4	NA	**Good** For current activities	**Good** For current activities

Comment:

A survey of recreational users of the Porirua Harbour was sent out in December 2015. Surveys were sent to the yachting, boating, rowing, outrigger canoeing and kayak clubs, however there was no response this year from the clubs. This is unfortunate because the experience of harbour user groups is a good indicator of aspects of harbour health.

Given no response to the Trust's survey this year, we will look at alternative ways of measuring the recreational user satisfaction in the next report.

What is being measured:

3.2 Recreational Water Quality

Water Quality at our beaches using the National Recreational water quality monitoring.

Rating 2013	Rating 2014	Rating 2015	Sites	Comment
4	4	3	Pauatahanui Inlet at Paremata Bridge	generally suitable for swimming with care
3	3	4	Karehana Bay at Cluny Rd	suitable for swimming for most of the time
3	3	3	Pauatahanui Inlet at Water ski club;	generally suitable for swimming with care
3	3	3	Plimmerton Beach at Bath Street	generally suitable for swimming with care
2	2	2	South Beach at Plimmerton	water quality is not always suitable for swimming
2	2	2	Porirua Harbour at Rowing Club	water quality is not always suitable for swimming

Data Used:

GWRC and PCC jointly monitor microbiological water quality at 10 coastal sites in Porirua, six of which are located either within the harbour or on its outer margins. The monitoring programme comprises weekly water sampling for 20 weeks between mid-November and the end of March (monthly sampling also occurs outside of this period).

Table 3 below lists a summary of compliance with the surveillance, alert and action levels of the national microbiological water quality guidelines for recreational waters (MfE/MoH 2003) for data collected over summer 2014/15,

as reported by Morar and Greenfield (2015). It also lists the current Suitability for Recreation Grade (SFRG) assigned to each site. This grade describes the general condition of the water at any given time from a public health perspective.

Table 3: Summary of microbiological water quality data for the 2014/15 summer at selected coastal monitoring sites in Porirua
(Source: Morar & Greenfield 2015)

Bathing site	*n*	No. sample results (Enterococci/100mL)			Beach grading (2008/09–2014/15 data)		
		Surveillance (≤ 140)	Alert (141–280)	Action (>280)	SIC Grade	MAC Grade (95th%-ile value)	SFRG
Karehana Bay at Cluny Rd	20	20	0	0	Moderate	B (115)	Good
Plimmerton Beach at Bath St	20	18	2	2	Moderate	C (430)	Fair
South Beach at Plimmerton	20	19	0	1	Moderate	D (1050)	Poor
Pauatahanui Inlet at Water Ski Club	20	19	1	0	Moderate	C (260)	Fair
Pauatahanui Inlet at Paremata Bridge	20	20	0	0	Moderate	C (321	Fair
Porirua Harbour at Rowing Club	20	16	3	1	Moderate	D (820)	Poor

Comment:

The results from the sampling leave much to be desired and there is little to no improvement since the first report in 2013. As is shown in the table above, most sites sampled rate only a "fair" or, in two cases, a "poor". One of those rated "poor" is South Beach at Plimmerton – which is popular as a swimming beach. Effectively, this rating means it is not always suitable for swimming. The cause of the problem is faecal contamination on the beach and outflows from the Taupo Stream.

Faecal source tracking investigations undertaken at the two coastal sites graded 'poor' in the 2014/15 bathing season suggested a range of faecal contamination sources including human sewage and wildfowl at both sites, and dog faeces at South Beach, Plimmerton. Water quality at South Beach should show significant improvement following work by Porirua City Council during 2015 to find and repair broken sewer pipes in the Taupo Stream.

There are no sites that rate "very good". The only "good" rating is for Karehana Bay at Cluny Road which is in the outer harbour. The Paremata Bridge area near the entrance to the Pauatahanui Inlet has been down graded from good to fair from last years report.

What is being measured:

3.3 Education Resource Usage

Engagement with schools in the catchment through the PHT Education programme

Rating 2015	Number of Schools in the catchment engaged in the PHT programme
3	26 of 50 schools in the catchment engaged in the first year of the programme

Comment:

The PHT has produced a curriculum based resource for teachers based on the *Living Waters* series of short documentaries

The programme commenced in November 2014 with a full-day teacher workshop which was very successful. The resource is presented in three themes, each with a specific curriculum focus including ecology of the harbour with a science focus; the harbour as a taonga with a social studies focus, and the human impact on the harbour with a focus on both science and social studies.

Each theme includes a field trip that focuses on aspects of the harbour and catchment. While the "*Living Waters"* documentaries bring learning to life for students, experiencing the harbour first hand will add enormous value to their understanding and appreciation.

This year at least 26 schools in the catchment (out of total of 50 schools) are aware of the education resource and Living Waters documentaries and further workshops are planned to cover the other schools in the catchment. A significant number of these schools are actively using the resources as part of their learning programme, or planning to use them during the year.

The Trust is keen to see additional school involvement in this programme and its educational benefits.

4. ECOLOGICAL HEALTH

What is being measured:

4.1 Regular Testing of ecological health of streams

Uses the Macroinvertebrate Community Index (MCI) for the three main streams with the mean score for the last three years.

Rating 2013	Rating 2014	Rating 2015	Sites
4	4	4	Horikiri Stream at Snodgrass
4	4	4	Porirua Stream @ Glenside
3	3	3	Porirua Stream at Wall Place
4	3	3	Pauatahanui Stream @Elmwood Bridge

Data Used:

The indicator we have used for stream health is the Macroinvertebrate Community Index (MCI) which measures the abundance of organisms like worms, insects, flies, beetles and snails. It is a nationally accepted index of macroinvertebrate health that is sensitive to a range of environmental variables.

Macroinvertebrate sampling was undertaken at four sites in the Porirua Harbour catchment in 2015 as part of GWRC's Rivers State of the Environment (RSoE) monitoring programme. The MCI scores derived from this sampling are listed in Table 4. Under the RSoE programme a single macroinvertebrate sample is collected at or adjacent to each RSoE water sampling site during late summer/early autumn. The timing of sampling is determined at random, although macroinvertebrate sampling is, where practicable, avoided within two weeks of any flood event (ie, flows greater than three times the median river flow).

We have also included the MCI mean score for the last three years and have used this rolling three year mean in determining the MCI Mean Quality Class.

Table 4: MCI scores for RSoE sites in the Porirua Harbour catchment sampled during 2014

(Source :) **Keenan L and Morar SR. 2015.** ***Rivers State of Environment monitoring programme: Annual data report, 2014/15.***

Site no.	Site name	MCI 2013	MCI 2014	MCI 2015	MCI Mean 2013 -15	MCI Mean quality class
RS13	Horokiri S at Snodgrass	116.5	115	98.3	109.4	Good
RS14	Pauatahanui S at Elmwood Bridge	100.0	105.6	92.5	98.0	Fair
RS15	Porirua S at Glenside	118.6	104.4	94.4	104.7	Good
RS16	Porirua S at Wall Park (Milk Depot)	93.7	87.0	80.9	88.2	Fair

Key to quality classes (Stark & Maxted 2007): Excellent ≥ 120, Good 100–119, Fair 80–99, Poor <80

Comment:

Stream condition is sampled for three streams: the Porirua stream at Glenside and Wall Place entering into the Onepoto Arm, and the Horokiri and Pauatahanui streams entering into the Pauatahanui Inlet. Overall, stream health shows slow

and steady decline during 2015 with all sites having a lower MCI compared with previous years.

All three streams score a "fair" rating for the 2015 year, however, looking over the last three years, the Horokiri and Porirua Stream at Glenside achieve a "good" rating, with both the Pauatahanui and Porirua Stream at Wall Park being "fair". The recent readings may indicate a decline in stream health and this is of concern longer term.

What is being measured:

4.2 Regular Testing of ecological health of the Harbour

Harbour condition based on the GWRC nutrient richness (eutrophication) measures for each inlet.

What is being Measured	Rating 2013	Rating 2014	Rating 2015	Sites
Ecological Health of the harbour *RPD*	3	3	3	Onepoto Arm – intertidal
Ecological Health of the harbour *RPD*	3	3	3	Pauatahanui - intertidal
Ecological Health of the harbour *Low Density Macroalgal cover*	3	3	3	Onepoto Arm – intertidal
Ecological Health of the harbour *Low Density Macroalgal cover*	3	3	3	Pauatahanui - intertidal
Ecological Health of the harbour *High Density Macroalgal cover*	3	4	4	Onepoto Arm – intertidal
Ecological Health of the harbour *High Density Macroalgal cover*	3	4	4	Pauatahanui - intertidal

Data Used:

GWRC assesses the ecological condition of the intertidal habitat within each arm of Porirua Harbour using a combination of broad and fine scale measures that target the common estuarine issues of sedimentation, eutrophication (nutrient enrichment) and toxic contamination. As sedimentation is already included separately in our scorecard, the review team has based the harbour estuarine health assessment on measures relating to eutrophication.

Increased nutrient richness (eutrophication) in estuaries can stimulate the abundance of fast growing green and red macroalgae. The resulting blooms can have significant effects on water and sediment quality. Annual indicators of eutrophication include a broad scale assessment of the change in the area of nuisance macroalgal growth and measurements of sediment oxygenation (as determined by the depth of the redox potential discontinuity (RPD) layer)*. This is the layer below which oxygen is severely reduced, as a result of which the diversity of life reduces.

Table 5: Eutrophication indicator results for selected locations in Porirua Harbour assessed in early 2015 (subtidal RPD data also included for completeness). RPD cells shaded in yellow and amber equate to rankings of moderate and poor, respectively
(Source:)

Indicator	Onepoto Arm							Pauatahanui Arm										
	Intertidal			*Subtidal*				*Intertidal*						*Subtidal*				
Site no.	1	2	3	S6	S7	S8	S9	6	7	8	9	10	11	S1	S2	S3	S4	S5
RPD (cm) 2014	1.5	3	1	1	3	5	5	3	2	1	1.5	3	3	1	1	1	3	3
RPD (cm) 2015	1	2	1	2	2	2	3	1	1	1	1	3	3	1	1	1	1	1
Low density macroalgal cover	Moderate			Not assessed				Moderate						Not assessed				
High density macroalgal cover	Low			Not assessed				Low						Not assessed				

Comment:

The low density macroalgal growth cover was rated as moderate for 2015 - reflecting widespread low growth across much of the harbour. The high density macroalgal cover for 2015 was rated as low with 3.5% of the estuary experiencing dense (>50%) growths compared with 8% in 2013. Assuming this continues, it is good news.

In relation to the Porirua Harbour, the RPD results for 2015 show that the sediments were generally well to moderately oxygenated despite their often muddy nature. Throughout the estuary, sediment was relatively well oxygenated, had a low total organic carbon and sulphur content, and did not support nuisance macroalgal growths. These results provide a preliminary indication that Porirua Harbour sediments were in the "low" to "moderate", rather than "high" (or poorly oxygenated) category, and likely reflect the combined influence of relatively low organic content, and the process of currents or wave action pumping oxygenated water into the sediments. Overall, the sand-dominated habitats appeared to be in good (healthy) ecological condition.

Habitats with a very high terrestrial mud content do not exhibit symptoms of excessive eutrophication. The dominant stressor, and therefore a key management priority, is never the less the excessive fine sediment within the subtidal estuary settling basins. As the movement of sediment within the two arms of the harbour makes it difficult to determine the origin there is a need to monitor sediment levels for each of the streams entering the harbour. Stevens and Robertson do however suggest that the Kakaho and Horokiri streams appear to be major sources of sediment. Water quality for the Horokiri and Pauatahanui Streams is recorded as only Fair. High levels of biomass are also recorded at the mouth of the Pauatahanui Stream. The Harbour and Catchment Sediment reduction plan highlights the upper catchments of all of these streams as a significant source of sediment.

The concentration of opportunistic macroalgae near the mouth of major streams entering the estuary (e.g. Porirua, Pauatahanui, Horokiri, Kakaho) suggest catchment nutrient inputs are the most likely driver of the observed growths.

Combined with ongoing mud deposition both macroalgal growth and increasing muddiness remain continuing concerns within Porirua Harbour.

Ongoing and potentially increasing mud deposition, macroalgal growth, and related eutrophication risks remain continuing concerns within Porirua Harbour.

5. WASTE

What is being measured:

5.1 Record of large items of waste collected in the intertidal and tidal area

Number of large items of rubbish collected each November in the Porirua Stream area of Onepoto Arm.

Rating 2013	Rating 2014	Rating 2015	Comment
3	4	4	85 – 90 large items identified

Data Used:

Information is collected by the Porirua City Council and an annual inspection is carried out in January 2015 at low tide of the area from the mouth of the Porirua Stream across the harbour from Wineera Point to the railway line on the east.

Comment:

The Porirua Stream mouth at the south end of the Onepoto Arm is a collection point for refuse coming down the Porirua and Kenepuru Streams. Over the years there has been a concentrated effort to remove large items from the tidal area of the stream bed. Some 400 plus tyres, road cones, shopping trolleys and other material was taken out of this part of Onepoto Arm by the Porirua City Council in 2009.

In the last three years various groups normally coordinated by Keep Porirua Beautiful and Porirua City Council, have carried out tidal and intertidal clean ups of the Onepoto Arm with the emphasis on removal of large rubbish material in the intertidal zone of the Porirua Stream.

Over the years there has been an improvement in the reduction of large items removed from the Onepoto Arm.

In 2009 there were 400 plus items, in 2012 there were over 260, 2013 there were172 large items, mainly car tyres (132) and road cones (35) and in 2014, 89 large items mainly car tyres (85) with a small number of road cones (3) and 1 shopping cart removed from the the harbour mouth of the Porirua Stream.

In late 2015 the clean up resulted in a further 85 – 90 large items, predominantly car tyres removed from the area.

While the reduction from the peak of 400 in 2009 is commendable it is still of major concern that tyres continue to find their way into the stream and harbour rather than being disposed of in an appropriate manner. We need to find out why people dump tyres and large items in the harbour rather than take them to the rubbish tip and find a solution for the action.

6. Acknowledgements:
The Porirua Harbour Trust acknowledges the strong support from the officers of Greater Wellington Regional Council, Porirua City Council and Wellington City Council in the provision of data and reports to assist the review team in preparing this scorecard.

The review team recognize that in supplying the environmental information Greater Wellington Regional Council has exercised all reasonable skill and care in compiling the contents of the information provided.

7. References

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Appendix One

	Agency Action	Sedimentation	Community and Recreational Usage	Ecological Health	Waste
	An Annual Review of progress by all agencies against the Porirua Harbour Detailed Action Plan This includes a comparison of what was stated in the Detailed Action Plan vs what was funded and planned and achieved through outputs and outcomes.	**Harbour Sedimentation.** Utilising the Mean Annual sedimentation data from the 18 sedimentation plates, (9 in the intertidal and 9 in the sub tidal) in the Onepoto Arm and Pauatahanui Inlet. Separate rating for subtidal and intertidal in each inlet.	**Recreational usage of the Harbour**. Feedback from recreational groups on the quality of the harbour in providing their expectations. Water Quality at our beaches using the National Recreational water quality monitoring. Education success, number of schools in the PHT education programme	**Regular Testing of ecological health within streams and the Harbour** Uses the Macroinvertebrate Community Index (MCI) for the three main streams. Harbour condition based on the GWRC nutrient richness (eutrophication) measures for each inlet.	**Annual Record of waste collected in the intertidal and tidal area** Number of large items of rubbish collected each November in the Porirua Stream area of Onepoto Arm.
5	**All** planned actions in the Action Plan funded and **all agreed** outputs and outcomes achieved and delivered on.	**Very Low** Increase of 0 to 1mm for the year. Measure for each estuary.	**Very Good -** For all current and anticipated future activities **Water Quality Very Good -** Suitable for swimming **45+** schools in the programme	**MCI - Excellent** **Harbour Condition – Very Good** **RPD**	**Very Good** Large items removed <25
4	**All** planned actions in the Action Plan funded and **most agreed** outputs and outcomes delivered on.	**Low** Increase of 1 to 2mm for the year. Measure for each estuary	**Good -** For current activities **Water Quality Good -** Suitable for swimming most of the time **35+** schools in the programme	**MCI – Good** **Harbour Condition – Good** **RPD**	**Good** Large items removed <50
3	**Most** planned actions in the Action Plan funded and **most agreed** outputs and outcomes delivered on.	**Moderate** Increase of 2 to 5mm for the year. Measure for each estuary	**Fair -** For current activities **Water Quality Fair -** Generally suitable for swimming **25+** schools in the programme	**MCI – Fair** **Harbour Condition – Moderate** **RPD**	**Fair** Large items removed <100
2	**Most** planned actions in the Action Plan funded and **some agreed** outputs and outcomes delivered on.	**High** Increase of 5 to 10mm for the year. Measure for each estuary	**Poor -** For current activities **Water Quality Poor -** Not always suitable for swimming **15+** schools in the programme	**MCI – Poor** **Harbour Condition – poor** **RPD**	**Poor** Large items removed <150
1	**Some** planned actions in the Action Plan funded and **some agreed** outputs and outcomes delivered on.	**Very High** Greater than 10mm increase for the year. Measured for each estuary.	**Very Poor -** For current activities **Water Quality Very Poor -** Unsuitable for swimming **<15** schools in the programme	**RPD**	**Very Poor** Large items removed >150

Appendix Two

	Agency Action	Sedimentation	Community and Recreational Use	Ecological health	Waste
	An Annual Review of progress by all agencies against the Porirua Harbour Detailed Action Plan This includes a comparison of what was stated in the Detailed Action Plan vs what was funded and planned and achieved through outputs and outcomes.	**Harbour Sedimentation.** Utilising the Mean Annual sedimentation data from the 18 sedimentation plates, (9 in the intertidal and 9 in the sub tidal) in the Onepoto Arm and Pauatahanui Inlet. Separate rating for subtidal and intertidal in each inlet.	**Recreational Usage of the Harbour**. Obtain feedback from the recreational users of the harbour, Includes yachting, boating, waka ama, rowing, jet skiing, jet boating etc…. Water Quality monitoring of beaches using the national recreational water quality guideline. Schools utilizing the PHT education resource for the catchment	**Regular Testing of ecological health within streams and the Harbour** Uses the Macroinvertebrate Community Index (MCI) for the three main streams. Harbour condition based on the GWRC nutrient richness (eutrophication) measures for each inlet. .	**Annual Record of waste collected in the intertidal and tidal area** Number of large items collected each November in the Porirua Stream area of Onepoto Arm. This would include a count of large items tyres, road cones and shopping trolleys to indicate the trend toward less rubbish entering the harbour.
	Assessment of the work carried out against the Detailed Action Plan taking into account the annual report provided to the three councils on the Porirua Harbour Action Plan, the annual plans and budgets for the next year and the long term plan commitments of the councils and agencies compared to the Strategy. Will require a pre and post discussion with the Harbour Co-ordinator to ensure full understanding of what is included and excluded from the Detailed Action plan each year.	Utilising the Annual GWRC Porirua Harbour Intertidal Sediment Monitoring report. Using the 2008 data as the base where available and a minimum of two years data for each site. Information to be averaged separately for the Onepoto Arms and Pauatahanui Inlet for both sub tidal and inter tidal zones and each inlet to be reported separately. The result to include commentary on each estuary and granular size as well as mud impacts.	Survey once a year in December of the Harbour recreation user group. Use weekly summer monitoring as provided by GWRC of indicator bacteria levels at harbour beaches and measure against the national recreation grade. Evaluate the PHT education programme at the end of each year and identify the number of schools (primary, intermediate and secondary) - out of the 50 schools in the catchment who are utilisjng the PHT education programme.	Fresh water in the Wellington region is highly valued for a variety of uses, including water supply, irrigation, recreation and aquatic ecosystem health. The Macroinvertebrate Community index measures the health of the streams through an assessment of the health of the macro invertebrate community in each stream. The Harbour condition rating takes into account nutrient enrichment, (organic and nutrient content, sediment oxygenation, nuisance algae cover). There will be separate scores for each estuary.	Each year in November as part of the Love your Coast campaign the PHT will carry out intertidal and sub tidal clean ups around the Porirua Harbour. The Porirua Stream mouth is the main collection point for rubbish in the Onepoto Arm and will be used as the key indicator of rubbish in the harbour. The number of large items removed in the month (tyres, road cones, trolleys bikes etc) will give the annual measure of rubbish.

Appendix Three

	RESULTS FOR 2015																								
	Agency Action	**Sedimentation**				**Community and Recreational Usage**									**Ecological Health**										**Waste**
	An Annual Review of progress by all agencies against the Porirua Harbour Detailed Action Plan This includes a comparison of what was stated in the Detailed Action Plan vs what was funded and planned and achieved through outputs and outcomes.	**Harbour Sedimentation.** Utilising the Mean Annual sedimentation data from the 18 sedimentation plates, (9 in the intertidal and 9 in the subtidal) in the Onepoto Arm and Pauatahanui Inlet. Separate rating for subtidal and intertidal in each inlet.				**Recreational usage of the Harbour**. Feedback from recreational groups on the quality of the harbour in providing their recreational requirements. Water Quality at our beaches using the National Recreational water quality monitoring. Number of schools in the PHT Education programme									**Regular Testing of ecological health within streams and the Harbour** Uses the Macroinvertebrate Community Index (MCI) for the three main streams. Harbour condition based on the GWRC nutrient richness (eutrophication) measures for each inlet.										**Annual Record of waste collected in the intertidal and tidal area** Number of large items collected each November in the Porirua Stream area of Onepoto Arm.
		Onepoto		**Pauatahanui**		**Usage**		**Water Quality**						**PHT**	**Stream Health**				**Harbour Condition**						
		Inter tidal	**Sub tidal**	**Inter tidal**	**Sub tidal**	**Onepoto**	**Pauatahanui**	**South Beach Plimmerton**	**Plimmerton Beach at Bath St**	**Water Ski Clun Pauatahanui Inlet**	**Paremata Bridge Pauatahanui Inlet**	**Porirua Harbour Rowing Club**	**Karehana – Cluny Road**	**Number of Schools in the education**	**Horikiri**	**Pauatahanui**	**Porirua at Glenside**	**Porirua at Wall Place**	**Onepoto Intertidal**	**Onepoto Low density macroalgal**	**Onepoto High density macroalgal**	**Pauatahanui Intertidal**	**Pauatahanui Low density macroalgal**	**Pauatahanui High density macroalgal**	
5																									
4	Most planned actions delivered on.					NA	NA																		
3														26											>85 large items
2																									
1																									

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