Collaborations

Subject:	Provisional PC1 Rural Sediment Scenarios
Attention:	Greater Wellington Regional Council
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1 Introduction

This memorandum provides results for additional sediment-focussed scenarios modelled using the PC1 contaminant load model. The model context, development, architecture, and limitations are described in the 'PC1 Annual Contaminant Load Modelling' technical report (Collaborations, 2025).

The baseline model estimates annual average contaminant loads for Te Awarua-o-Porirua (TAoP) and Te Whanganui-a-Tara (TWT) Whaitua (the PC1 area). The baseline approximates contaminant loads in 2012, roughly aligned with the water quality objective setting period. A notified PC1 future development state (PC1-FDS) scenario was developed to account for urban growth from 2012 to 2024 and projected urban growth to 2053 based on the most recent regional predictions (Collaborations, 2025). Certain provisions in PC1 were represented in the PC1-FDS scenario using load reduction factors based on published literature.

Two different scenarios are presented here and compared against the baseline. The scenarios have been designed with input from GWRC and are intended to provide support to S42a authors and the PC1 process by testing different mitigations and levels of implementation with a focus on rural provisions aimed to reduce sediment load. The scenarios account for future urban development and urban provisions as per the PC1-FDS scenario (see Collaborations, 2025). The two scenarios requested are:

- **Provisional Scenario 1: PC1-FEPs**
  This scenario assesses sediment load reductions that may be achieved through mitigations associated with Farm Environment Plans (FEPs). The scenario estimates catchment sediment load changes following increasing levels of assumed farm-scale load reductions. Farm-scale load reductions are generic and are not associated with specific mitigations. The ability of individual farms to achieve the modelled reductions has not been assessed.

- **Provisional Scenario 2: PC1-CFL**
  This scenario assesses sediment load reductions that may be achieved by extrapolating the current rate of retirement and revegetation implemented under the Wellington Region Erosion Control Initiative (WRECI). This is aligned with the current funding level (CFL), assumed to

continue to the year 2040. Modified riparian provisions to those applied in the PC1-FDS scenario are also implemented.

2 Provisional Scenario 1: PC1-FEPs

This scenario assesses sediment load reductions that may be achieved through mitigations associated with FEPs. Sediment load reduction factors (LRFs) have been applied to all sediment sources (streambank, surficial, and landslide processes) on properties with more than 20 hectares in pasture that include any area of land mapped as 'potential erosion risk' (see Collaborations, 2023[1]). These properties are referred to as 'FEP-modelled farms' and are summarised in Table 1. Eight properties that contain more than 20 hectares of pasture have not been included because they do not include any potential erosion risk area. Broad-scale LRFs of 10%, 15%, 20%, 30%, and 40% have been assessed. No specific mitigations have been tested; the type of mitigation suitable to be applied on an individual farm basis is likely to vary widely.

Table 1. Provisional Scenario 1 - PC1-FEP modelled farm summary.

Scenario metric	Unit	Te Whanganui-a-Tara	Te Awarua-o-Porirua	Total
Number of FEP-modelled farms	#	84	62	146
Area of pasture in FEP-modelled farms	ha	9,696	6,764	16,461
Total area of pasture	ha	16,931	8,503	25,434
Proportion of total pasture in FEP-modelled farms	%	57%	80%	65%

2.1 Results

Results are summarised for Target Attribute Site (TAS) catchments in Table 2 and Porirua Harbour catchments in Table 3. Results show an expected trend of greater catchment-scale reductions with higher farm-scale LRFs. Some catchments that do not contain any FEP modelled farms do not show any change across the scenarios, and some reduction is achieved in all scenarios for urban catchments due to the LRFs modelled for infill and greenfield developments applied as for the PC1-FDS scenario. Results may be compared to other scenarios that have tested specific mitigations. For example, in the Porirua Harbour the 40% LRF scenario applied to properties requiring an FEP results in sediment reductions comparable to the PC1-FDS scenario which modelled specific riparian, retirement, and space-planting mitigations (Collaborations, 2025).

[1] In Collaborations (2023) the 'potential erosion risk' land is referred to as 'highest-risk in pasture'. Potential erosion risk land is the top 10% of pastoral land by modelled surficial erosion rate that is also at potential risk of shallow land-slides.

Table 2. Provisional Scenario 1: PC1-FEP sediment results for TAS catchments.

TAS Catchment*	Baseline Load	FEP sediment LRF				
		10%	15%	20%	30%	40%
	t/year	% change from baseline	% change from baseline	% change from baseline	% change from baseline	% change from baseline
Hutt River at Boulcott	80712	-3%	-4%	-5%	-8%	-11%
Hutt River at Te Marua Intake	21973	-7%	-10%	-13%	-20%	-27%
Korokoro Stream at Cornish St Bridge	1395	-2%	-3%	-4%	-5%	-7%
Mangaroa River at Te Marua	11850	-3%	-4%	-6%	-9%	-12%
Taupo Stream at Plimmerton Domain	1135	-5%	-8%	-11%	-17%	-23%
Duck Creek at Tradewinds Drive Bridge	1386	-8%	-12%	-15%	-22%	-29%
Horokiri Stream at Snodgrass	3926	-6%	-9%	-12%	-18%	-24%
Pauatahanui Stream at Elmwood Bridge	3898	-6%	-9%	-12%	-18%	-23%
Porirua Stream at Milk Depot	4358	-3%	-4%	-5%	-7%	-9%
Whakatikei River at Riverstone	7486	-2%	-3%	-4%	-6%	-8%
Mākara Stream at Kennels	9374	-7%	-11%	-15%	-22%	-29%
Hulls Creek adjacent Reynolds Bach Drive	784	0%	0%	0%	0%	0%
Wainuiomata River Downstream of White Bridge	15230	-2%	-3%	-4%	-6%	-8%
Waiwhetu at Whites Line East	799	0%	0%	0%	0%	0%
Karori Stream at Makara Peak Mountain Bike Park	538	0%	0%	0%	0%	-1%
Black Creek at Rowe End Parade	822	0%	0%	0%	0%	0%
Kaiwharawhara Stream at Ngaio Gorge	1293	0%	0%	0%	0%	0%

*TAS catchments are nested, e.g. the Hutt River at Boulcott includes Hutt River at Te Marua Intake, Mangaroa River at Te Marua, and Whakatikei River at Riverstone sites.

Table 3. Provisional Scenario 1: PC1-FEP sediment results for Porirua Harbour catchments.

Porirua Harbour Catchment	Porirua Harbour Arm	Baseline Load	FEP sediment LRF				
			10%	15%	20%	30%	40%
		t/year	% change from baseline	% change from baseline	% change from baseline	% change from baseline	% change from baseline
Whitireia at Mouth	Onepoto	81	0%	0%	0%	0%	0%
Onepoto Fringe at Elsdon		63	-1%	-1%	-1%	-1%	-1%
Hukatai Stream at Mouth		49	-16%	-17%	-18%	-20%	-22%
Porirua at Mouth		6180	-7%	-8%	-9%	-12%	-14%
Direct to Onepoto mid		97	-6%	-6%	-6%	-6%	-6%
Direct to Onepoto North		80	-6%	-6%	-6%	-6%	-6%
Direct to Onepoto South		74	-54%	-54%	-54%	-54%	-54%
Kahotea Stream (Onepoto Park)		82	-19%	-19%	-19%	-19%	-19%
Next to Mahinawa		42	-16%	-16%	-16%	-16%	-16%
Total - Onepoto		**6748**	**-8%**	**-9%**	**-10%**	**-12%**	**-14%**
Horokiri and Motukaraka at Mouth	Pauatahanui	4452	-6%	-9%	-11%	-17%	-23%
Kakaho at Mouth		1956	-10%	-15%	-19%	-28%	-37%
Ration at Mouth		363	-1%	-1%	-2%	-3%	-4%
Motukaraka		35	-8%	-13%	-17%	-25%	-34%
Pauatahanui at Mouth		4207	-6%	-8%	-11%	-16%	-22%
Pauatahanui village		18	0%	0%	0%	0%	0%
Browns Bay		175	-3%	-3%	-3%	-3%	-3%
Direct to Pautahanui (mid)		30	6%	5%	3%	0%	-3%
Lower Duck Creek at Mouth		1470	-8%	-11%	-14%	-21%	-27%
Total - Pauatahanui		**12704**	**-6%**	**-9%**	**-12%**	**-18%**	**-24%**
Total - Porirua Harbour		**19452**	**-7%**	**-9%**	**-11%**	**-16%**	**-21%**

3 Provisional Scenario 2: PC1-CFL

This scenario models the retirement and native planting of 1,916 ha of potential erosion risk land across the PC1 area. This is approximately equivalent to the current funding level (CFL) of ~130 ha per year within the PC1 area, extrapolated out to the year 2040[2] (Peryer, 2025). The 1,916 ha of retirement was also modelled in the PC1-FDS scenario alongside other mitigations and covers the most erodible pastoral land based on mapping in Collaborations (2023). Sediment loads have been reduced for the retired rural areas in the PC1-FDS scenario with LRFs described in the 'PC1 Annual Contaminant Load Modelling' technical report (Collaborations, 2025). Note that urban development has not been scaled to 2040, and for simplicity has been modelled as per previous scenarios which is based on estimates to the year 2053.

In addition to retirement, riparian provisions have also been modelled based on information provided by GWRC. Modelling includes the Natural Resources Plan (NRP) provisions as per the PC1-FDS scenario, and updated S42a Hearing Stream 3 provisions that require riparian management on streams greater than 1m wide, on properties with more than 20 hectares in pasture, in the Mākara TAS catchment.

3.1 Results

Results are summarised for TAS catchments in Table 4 and Porirua Harbour catchments in Table 5. Results show a greater variation in load reductions between catchments compared to previous scenarios due to the localised nature of the potential erosion risk land and riparian provisions. As for the PC1-FEP scenario (Collaborations, 2025), some sediment reduction is achieved for urban catchments due to the LRFs modelled for infill and greenfield developments.

[2] Advice from GWRC, based on the previous 2 years of the WRECI programme as per Peryer (2025).

Table 4. Provisional Scenario 2: PC1-CFL sediment results for TAS catchments.

TAS Catchment*	Baseline	PC1-CFL Scenario	Scenario Change in Load
	t/year	t/year	% change from baseline
Hutt River at Boulcott	80712	76859	-5%
Hutt River at Te Marua Intake	21973	21748	-1%
Korokoro Stream at Cornish St Bridge	1395	1332	-5%
Mangaroa River at Te Marua	11850	9841	-17%
Taupo Stream at Plimmerton Domain	1135	1094	-4%
Duck Creek at Tradewinds Drive Bridge	1386	932	-33%
Horokiri Stream at Snodgrass	3926	3494	-11%
Pauatahanui Stream at Elmwood Bridge	3898	3576	-8%
Porirua Stream at Milk Depot	4358	4164	-4%
Whakatikei River at Riverstone	7486	7343	-2%
Mākara Stream at Kennels	9374	7291	-22%
Hulls Creek adjacent Reynolds Bach Drive	784	729	-7%
Wainuiomata River Downstream of White Bridge	15230	14694	-4%
Waiwhetu at Whites Line East	799	801	0%
Karori Stream at Makara Peak Mountain Bike Park	538	537	0%

Table 5. Provisional Scenario 2: PC1-CFL sediment results for Porirua Harbour catchments.

Porirua Harbour Catchment	Porirua Harbour Arm	Baseline	PC1-CFL Scenario	Scenario Change in Load
		t/year	t/year	% change from baseline
Whitireia at Mouth	Onepoto	81	81	0%
Onepoto Fringe at Elsdon		63	62	-1%
Hukatai Stream at Mouth		49	42	-15%
Porirua at Mouth		6180	5559	-10%
Direct to Onepoto mid		97	91	-6%
Direct to Onepoto North		80	76	-6%
Direct to Onepoto South		74	34	-54%
Kahotea Stream (Onepoto Park)		82	66	-19%
Next to Mahinawa		42	35	-16%
Total - Onepoto		**6748**	**6047**	**-10%**
Horokiri and Motukaraka at Mouth	Pauatahanui	4452	3975	-11%
Kakaho at Mouth		1956	1641	-16%
Ration at Mouth		363	362	0%
Motukaraka		35	35	0%
Pauatahanui at Mouth		4207	3880	-8%
Pauatahanui village		18	17	0%
Browns Bay		175	170	-3%
Direct to Pautahanui (mid)		30	32	9%
Lower Duck Creek at Mouth		1470	1015	-31%
Total - Pauatahanui		**12704**	**11129**	**-12%**
Total - Porirua Harbour		**19452**	**17176**	**-12%**

4 References

Collaborations, 2023. Erosion Risk Mapping for Te-Awarua-o-Porirua and Te-Whanganui-a-Tara Rev 2. September. Prepared for Greater Wellington Regional Council.

Collaborations, 2025. PC1 Annual Contaminant Load Modelling. Rev4. Prepared for Greater Wellington Regional Council.

Peryer, J. 2025. Statement of Technical Evidence for HS3 – Environmental Restoration. Prepared for Greater Wellington Regional Council for PC1.