Appendix D (1 of 3)

Porirua
Catchment Characteristics
DRAFT

Introduction

This appendix presents the catchment characteristics for the stormwater catchments in three sections – Te Awarua-o-Porirua, Te Whanganui-a-Tara: Wellington Harbour and Te Whanganui-a-Tara: Te Awa Kairangi / Hutt River Catchment.

Each section provides an overview of the catchment locations, urban stormwater network and waterways of significance. This is followed by a summary of water quality based on the monitoring results from the Stage 1 Global Stormwater Discharge Consent and one page summaries of each sub-catchment.

This appendix is draft, and the final SMS will provide more detail as well as links to publicly available online maps to illustrate this information.

Te Awarua-o-Porirua Whaitua

The Te Awarua-o-Porirua Whaitua encompasses all of Porirua including Pukerua Bay at the northern end and the residential areas of Whitby to the east, as well as the northern suburbs of Wellington as shown in Figure D 1 to Figure D 3.

There are seven sub-catchments and over 275 km of streams in Te Awarua-o-Porirua Whaitua. Two of these sub-catchments primarily discharge to the western coastal areas of Porirua, three sub-catchments which primarily flow into the two arms of the Porirua Harbour and two of these sub catchments that have discharges to both the coast and harbour. The largest streams are the Porirua (including Kenepuru Stream), Pauatahanui and Horokiri Stream. Descriptions of each sub-catchment can be found below.

Most of the urban area lies within the Onepoto Arm catchment, with other areas located along the fringes of the Pauatahanui Arm and within the Titahi Bay, Pukerua Bay and Taupō Stream catchments. These urban areas provide for a mix of residential, commercial, and industrial land uses.

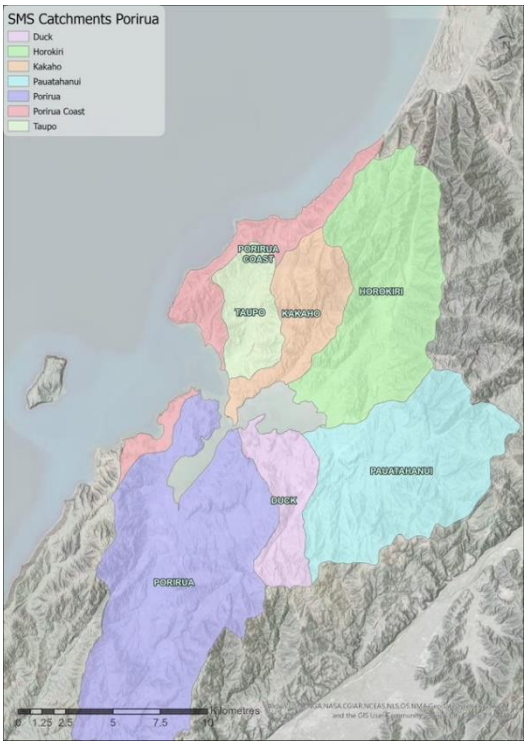


Figure D 1 Map showing the Stormwater network Porirua

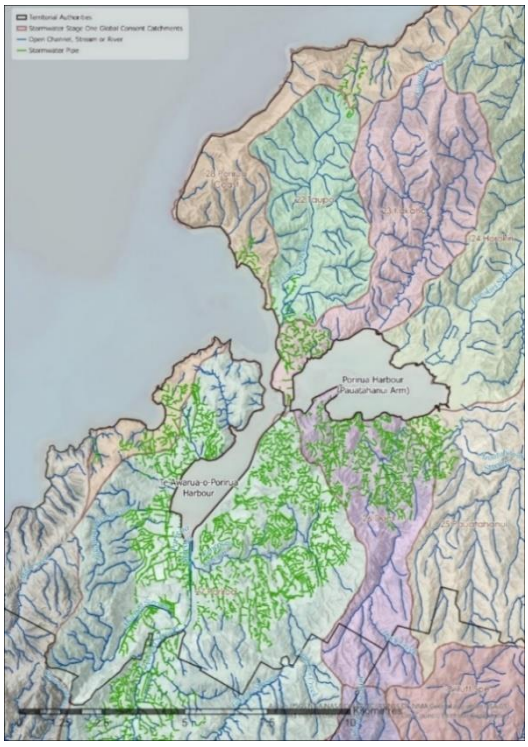


Figure D 2 Map showing the Stormwater in network in Porirua

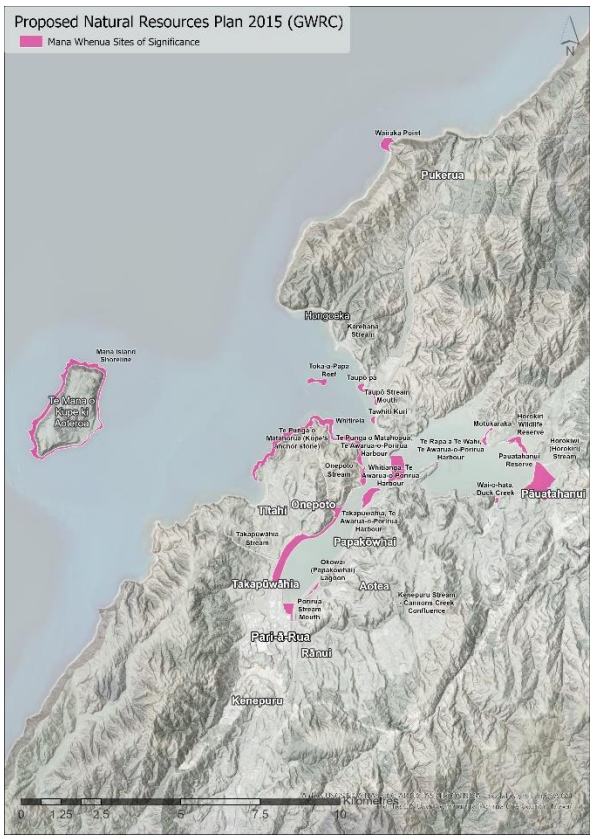


Figure D 3 Map showing the outstanding water bodies, Ngā Taonga Nui-a-Kiwa and aquatic sites with significant mana whenua values identified (Sch A-C of NRP).

Current State

There are multiple pressures on water bodies throughout Te Awarua-o-Porirua – some historical and others new. In urban areas, impervious surfaces created by roofs, roads, parking lots and driveways increase water volumes and flow peaks when it rains, flooding streams and causing streambank erosion.

Many of the lower urban reaches of streams have been modified, channelised, straightened, piped, and offer limited habitat for aquatic life. Stream mouths have been modified by reclamation, earthworks and the building of the railway line and state highways, resulting in the loss of important spawning, nursery and feeding grounds for freshwater and marine life as well as birds.

Under Schedule H2 of the NRP waterways that are prioritised for improvement of fresh and coastal water quality for contact recreation and mana whenua customary use include, Titahi Bay at South Beach Access Road, and Te Awarua-o-Porirua Harbour (Onepoto Arm) at Rowing Club

Excessive rates of sedimentation in the harbour are a considerable problem, where the main source of sedimentation in the harbour is terrestrial, originating from erosion prone land, stream bank erosion, and development of urban and rural areas. This sedimentation has adverse effects on the aquatic flora and fauna, amenity values, social and cultural values, and general water quality.

Monitoring results [1] from the Stage 1 Global Stormwater Discharge Consent shown in Figure D 4 **Error! Reference source not found.** coli, copper, zinc and nutrients, as shown below in Table D 1 **Error! Reference source not found.**

[1] *Stormwater Monitoring Plan Annual Report 2020-2021*

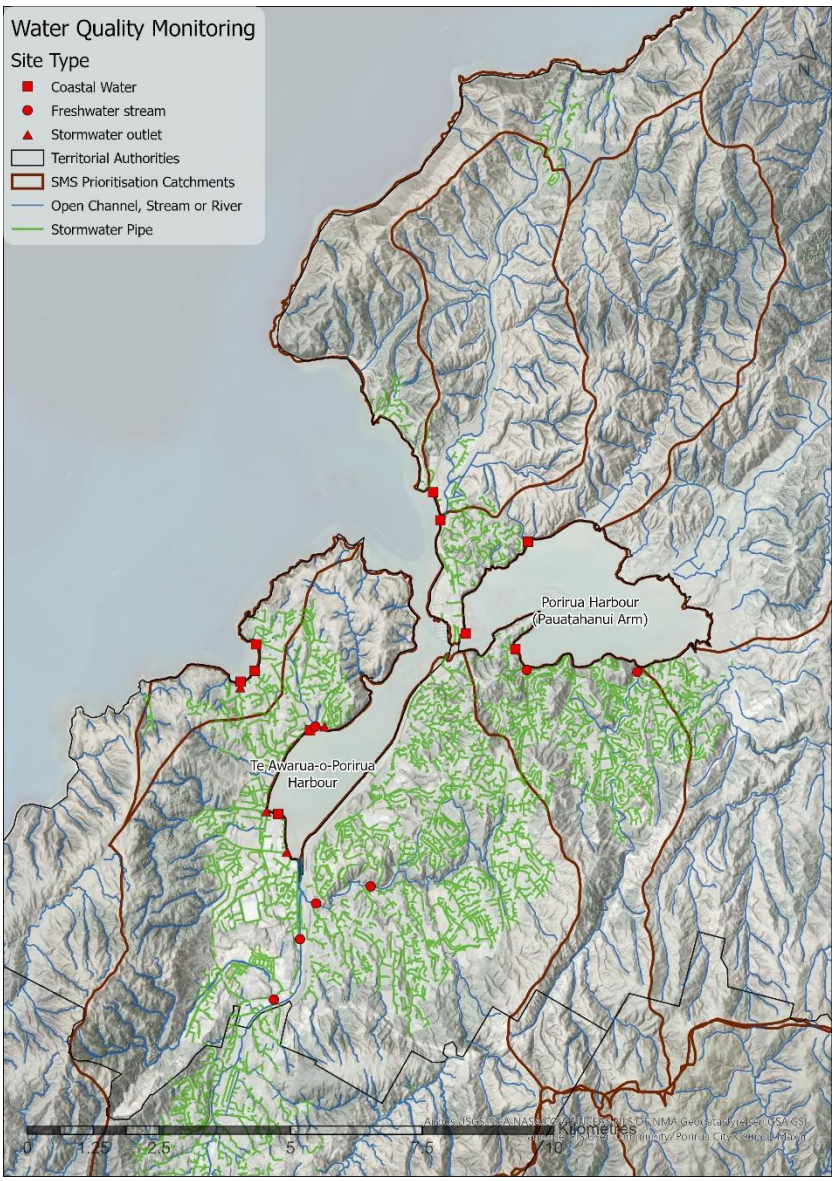


Figure D 4 Monitoring locations for the Stage 1 Global Stormwater Discharge Consent in Te Awarua-o-Porirua Whaitua.

Table D 1 Overview of receiving environment water quality across the Porirua catchments, based on monitoring data collected for the Stage 1 Global Stormwater Monitoring consent (Stormwater Monitoring Plan Annual Report 2021-2022).

Water Quality parameter	Porirua	Kakaho	Duck	Taupo Stream	Porirua Coast
E. coli (freshwater, NPS attribute state)	E	E	E	E	NM
E. coli (freshwater, NRP O18-95%ile <540)	Not met	Not met	Not met	Not met	NM
Enterococci (coastal water recreation, NRP 018-95%ile <540)	Not met (Onepoto)	Met (at 1 of 2 sites)	Not met (at 1 of 1 sites)	NM	Met (at 2 of 3 sites Titahi Bay) Not met (Plimmerton Beach)
Dissolved reactive phosphorus (NRP attribute state)	D	NM	NM	D	NM
Nitrate-N (nutrient, ANZG 2018)	Not met	NM	NM	Not met	NM

Water Quality parameter	Porirua	Kakaho	Duck	Taupo Stream	Porirua Coast
Nitrate-N (toxicity NPS attribute state)	A	NM	NM	A	NM
Ammonia-N (toxicity NPS attribute state)	B	NM	NM	B	NM
Dissolved copper (ANZG 2018)	Not met	Not met	Not met	Not met	NM
Dissolved zinc (ANZG 2018)	Not met	Not met	Not met	Met	NM

Note: The current state summary provided above is an indicative assessment based on the results of one or more individual sites reflecting the dominant condition of the waterbody. As instream conditions may differ between sites within a water body the reader is directed to the source document for site specific benchmarking against the NRP, NPS and ANZG. NM=Not measured.

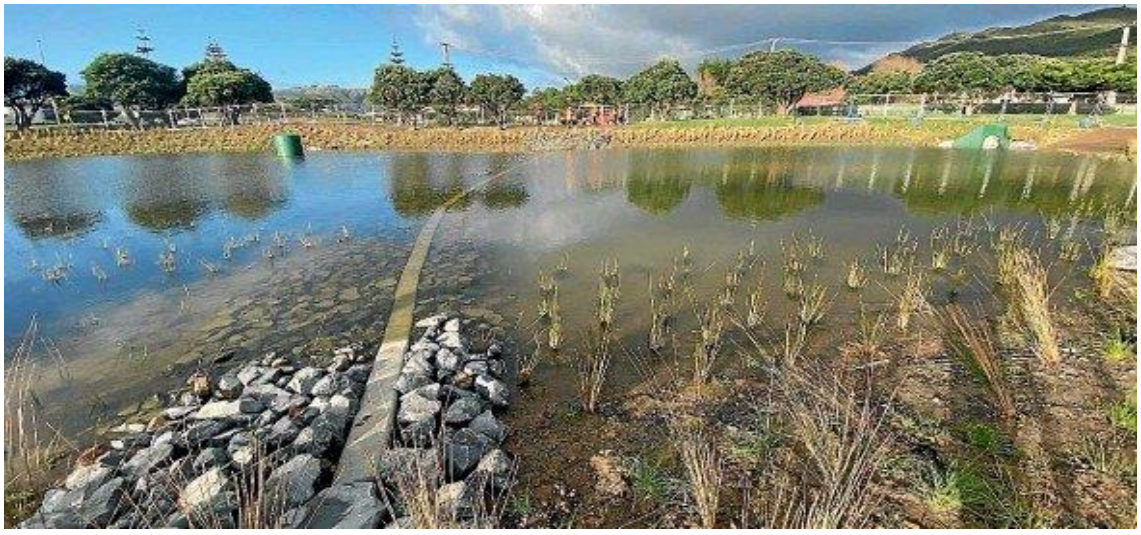
What is currently being done to support our journey to wai ora?

A transformational programme to improve the water quality and biodiversity of Porirua's stream began in 2021 that involves that implementation of a stream management and planting programme throughout the Porirua district. The programme has the vision to improve the mauri of Te Awarua-o-Porirua/Porirua Harbour and its waterways, and their biological and ecological health by planting the banks of all the streams that run into the harbour, from the top of Paekakariki Hill in the north, to Churton Park and Newlands in the south.

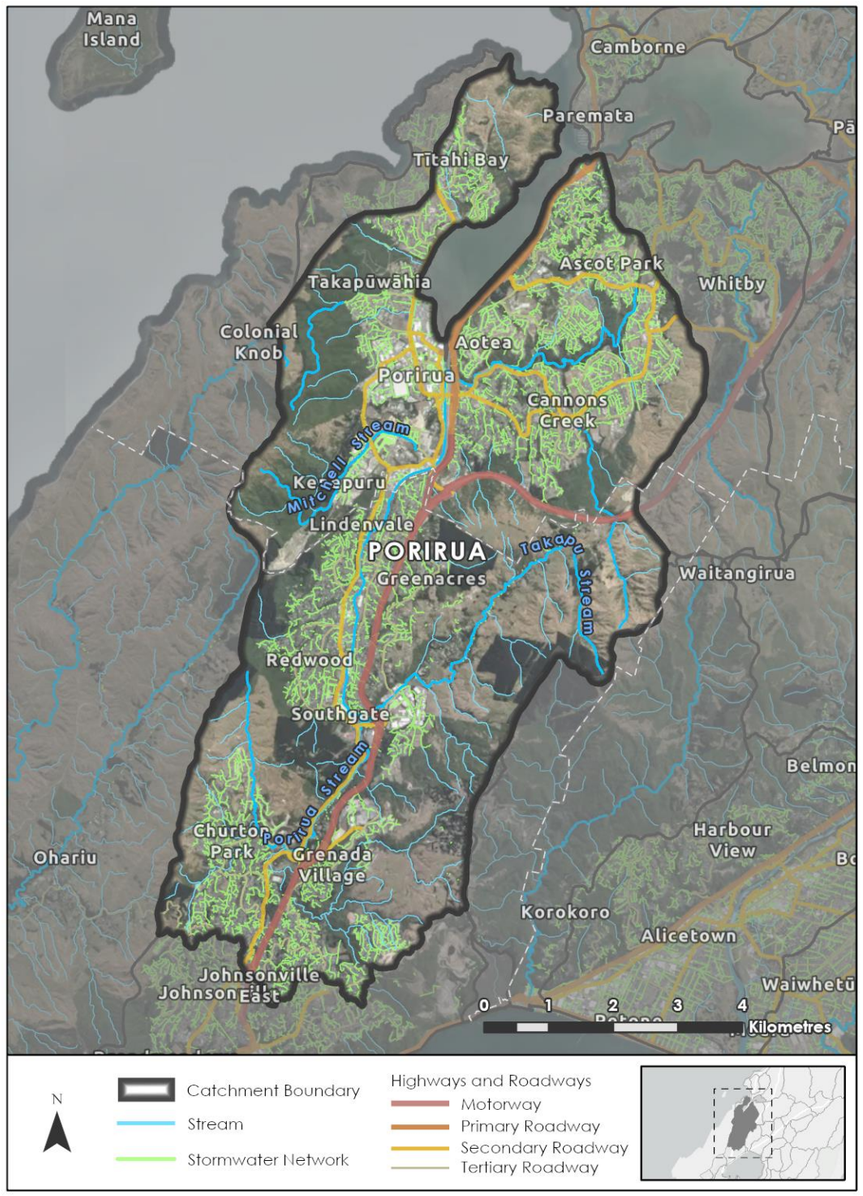
Case Study 3: Te Kukuwai o Toa - Elsdon Park Stormwater improvement

This wetland is an important part of the journey to wai ora in Te Awarua o Porirua. The whenua in which the wetland now sits was a significant site for Ngāti Toa in the past where they gathered kai moana and essential resources for the iwi. Te Kukuwai o Toa when translated means The Wetlands of Toa in reference to its presence in the heart of Takapuwahia.

The wetland has been developed in partnership between Wellington Water, Porirua City Council and Ngāti Toa with funding from the MfE Freshwater Improvement Fund. It will help reduce flooding and naturally filter stormwater before it runs into Te Awarua-o-Porirua Harbour.



Stormwater Catchment	Priority Ranking
Porirua	1 (highest)



Key Issues for Stormwater Management

- The catchment is bisected by State Highway 1 and State Highway 59
- Highly urbanised (modified) zones which include operating railway areas, industrial zones, and significant commercial and community infrastructure.
- Operating landfill (Spicers Landfill)
- Closed landfills (Porirua Hospital, Northern Landfill, Sievers Grove and Churton Park).
- Te Awarua-o-Porirua (Porirua Harbour, including contributing streams) is listed as Ngā Taonga Nui a Kiwa (wai tai) in Schedule B of the NRP
- Kenepuru Stream, Porirua Stream mouth, Okowai (Papakowhai) Lagoon, Onepoto Stream, Karehana Stream and Takapūwāhia Stream are listed in Schedule C of the NRP as sites of significance to mana whenua.
- Te Awarua-o-Porirua at the Rowing Club is identified in Schedule H2 (Contact recreation and Māori customary use) of the NRP.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Rural	24	**SLUR sites (%)[2]**	20
Open Space	18	**Predominant HAIL activities**	• Cemeteries and waste recycling, treatment, and disposal. The dominant sites included within this category are the landfills – Spicer Gully (still in operation), Sievers Grove (closed in 1976), Northern (closed), Churton Park (closed). • Chemical manufacture, application, and bulk storage. The largest sites under this category are associated with Kenepuru Hospital and a Packaging corporation • Mineral extraction, refining and reprocessing, storage, and use. • Vehicle refuelling, service, and repair.
Outer residential	12		

Existing Monitoring

18 monitoring sites (2 coastal sites, 3 stormwater discharge sites, 13 freshwater sites)

Preferred Management Approach

The Porirua sub-catchment has moderate residential and commercial development and therefore will require management options that can be applied to both brownfield and greenfield developments. Management approaches that are preferred for consideration in brownfield developments in Porirua include:

- Raingardens to improve stormwater quality, detention, and amenity. These can be applied in urban and industrial areas.
- Tree-pits and planter boxes, as part of street-scale upgrades, to slow surface water flow and improve stormwater quality and general amenity
- Infiltration trenches /basins with adjoining filter strips to improve stormwater quality and reduced flow velocity. These options are suitable for precinct sizes areas and in both high- and low-density zones where space to implement management options is limited.

Management approaches that are preferred across greenfield development in Porirua include:

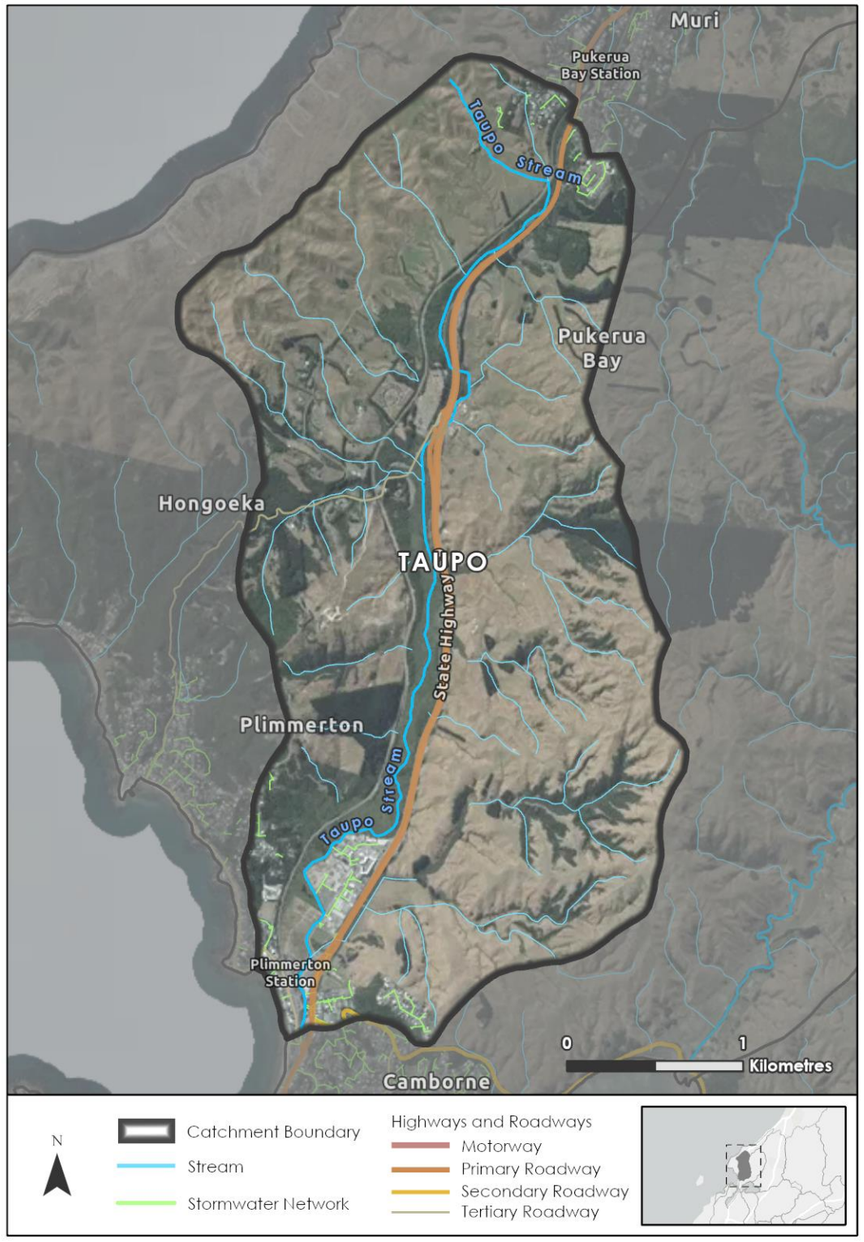
- Infiltration soakage methods such as infiltration basis, permeable pavements, and filter strips to improve infiltration and improve stormwater quality.
- Rainwater collection tanks in urban and commercial zones to improve water harvesting and re-use and provide for a detention and slow-release function which has been shown to reduce stream erosion.
- Bioretention (raingardens, tree pits etc) to improve stormwater quality and add amenity and ecological value.

Given the high portion of open space in the Porirua catchment consideration should also be given to the following management options where space is permitted:

- Constructed wetlands for water quality treatment, and detention ponds to help control quantity of stormwater. These could be implemented together as community scale devices.
- Stream daylighting to improve natural values, peak flows and storage capacity as well as adding amenity a community value.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Taupō	2



Key Issues for Stormwater Management

- The catchment is bisected by State Highway 1 and State Highway 59
- Being predominantly rural land, the catchment is prone to runoff from pasture and shrubs
- The Taupō Swamp complex is identified as an outstanding water body (wetland) in Schedule A of the NRP and identified in Schedule F1 (Rivers and lakes with significant indigenous ecosystems) of the NRP.
- South Beach at Plimmerton is identified in Schedule H2 (Contact recreation and Māori customary use) of the NRP.
- Te Awarua-o-Porirua is listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP
- Taupō Stream is identified in Schedule F1 (watercourse with significant indigenous ecosystem value) of the NRP

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
Rural lifestyle	24	**SLUR sites (%)[2]**	21
Future urban	18	**Predominant HAIL activities**	• Cemeteries and waste recycling, treatment, and disposal (including the closed (1975) Pukerua Bay Landfill which is now a Pony Club and the Whenua Tapu cemetery and crematorium) • Vehicle refuelling, servicing, and repair
General rural	11		

Existing Monitoring

5 monitoring locations (3 coastal sites, 1 stormwater discharge site, 1 freshwater site)

Preferred Management Approach

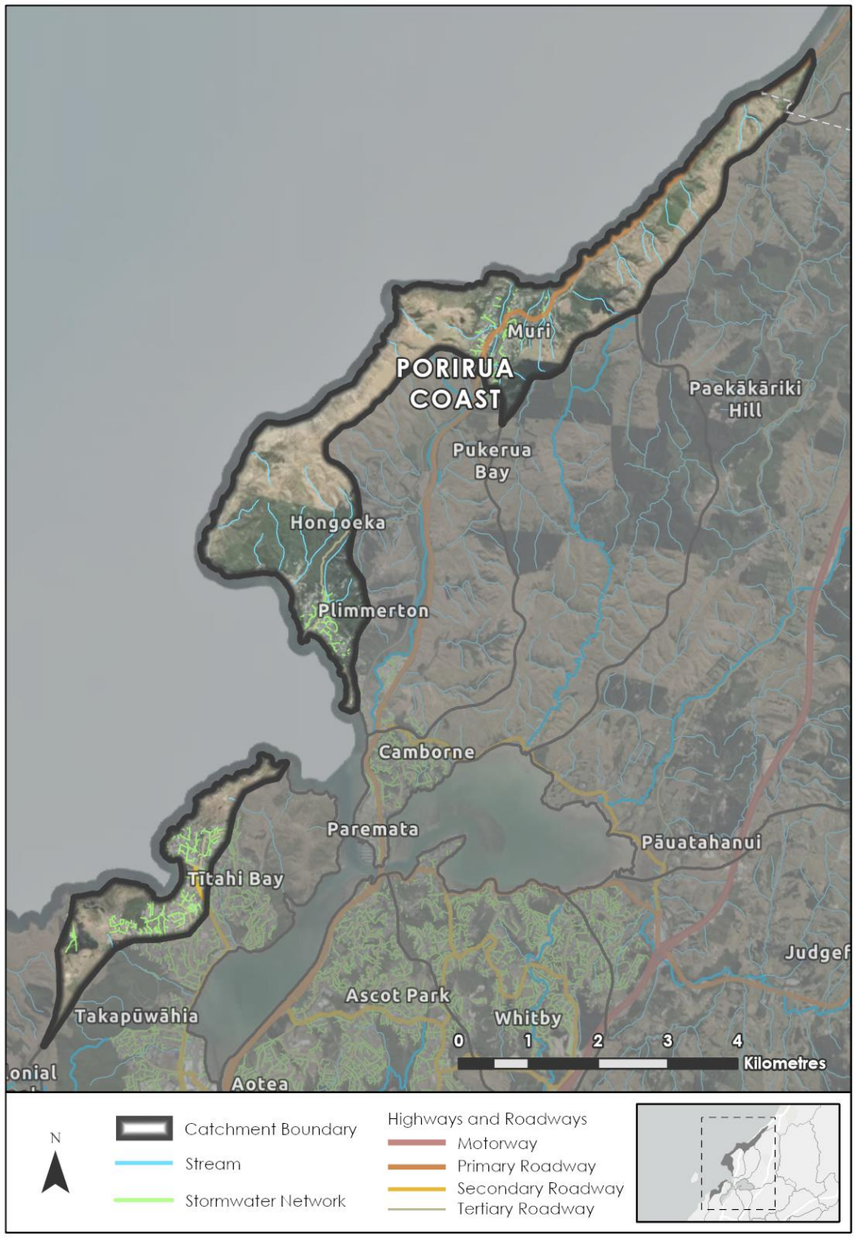
The Taupō catchment provides a great opportunity for the inclusions of WSD management options as it is likely to undergo future growth with greenfield development. The preferred management approaches for the Taupō sub-catchment include:

- Development of community scale devices such as constructed wetlands and ponds at the base of catchments (including large catchments), or in shared areas, to capture, attenuate, and release stormwater in controlled volumes to the receiving environment. Community scale devices also help add amenity and biodiversity value.
- Reducing the degree of imperviousness through infiltration soakage controls in green and brownfield developments such as inclusion of infiltration basins, permeable paving, vegetated swales (in gently sloping or low laying areas), inclusion of filter strips, tree-pits, and planter boxes. Infiltration soakage controls help improve water quality. The inclusion of vegetation and vegetated management controls also plays an important role in sediment and erosion control.
- Riparian planting programmes to help maintain the natural environment and provide protection for streams and rivers by creating a 'buffer' zone.
- Inclusion of water harvest and reuse practices (storage tanks) in urban, commercial, and industrial development areas to add water harvesting and re-use and provide for a detention and slow-release function.

Given the lack of existing infrastructure and development in this catchment WSD should be implemented early on and should include basic principles such as sighting of land that is appropriate for development and working with the natural environment (not against) to maintain natural hydrology and ecological values.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Porirua Coast	3



Key Issues for Stormwater Management

- A collection of minor sub-catchments draining to the west coast.
- The area is partially urbanised, particularly in Tītahi Bay, Plimmerton and Pukerua Bay. Urbanised areas are a significant source of road and vehicle related pollution.
- State Highway 59 passes through the northern part of the catchment
- Tītahi Bay at South Beach Access Road is identified in Schedule H2 (Contact recreation and Māori customary use) of the NRP.

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General rural	42	**SLUR sites (%)[2]**	35
Māori purpose (Hongoeka)[3]	17	**Predominant HAIL activities**	• Cemeteries and waste recycling, treatment, and disposal (primarily the Porirua sewage treatment plant) • Chemical manufacture, application, and bulk storage (primarily Plimmerton quarry)
General residential	17		

Existing Monitoring

3 monitoring locations (all coastal sites)

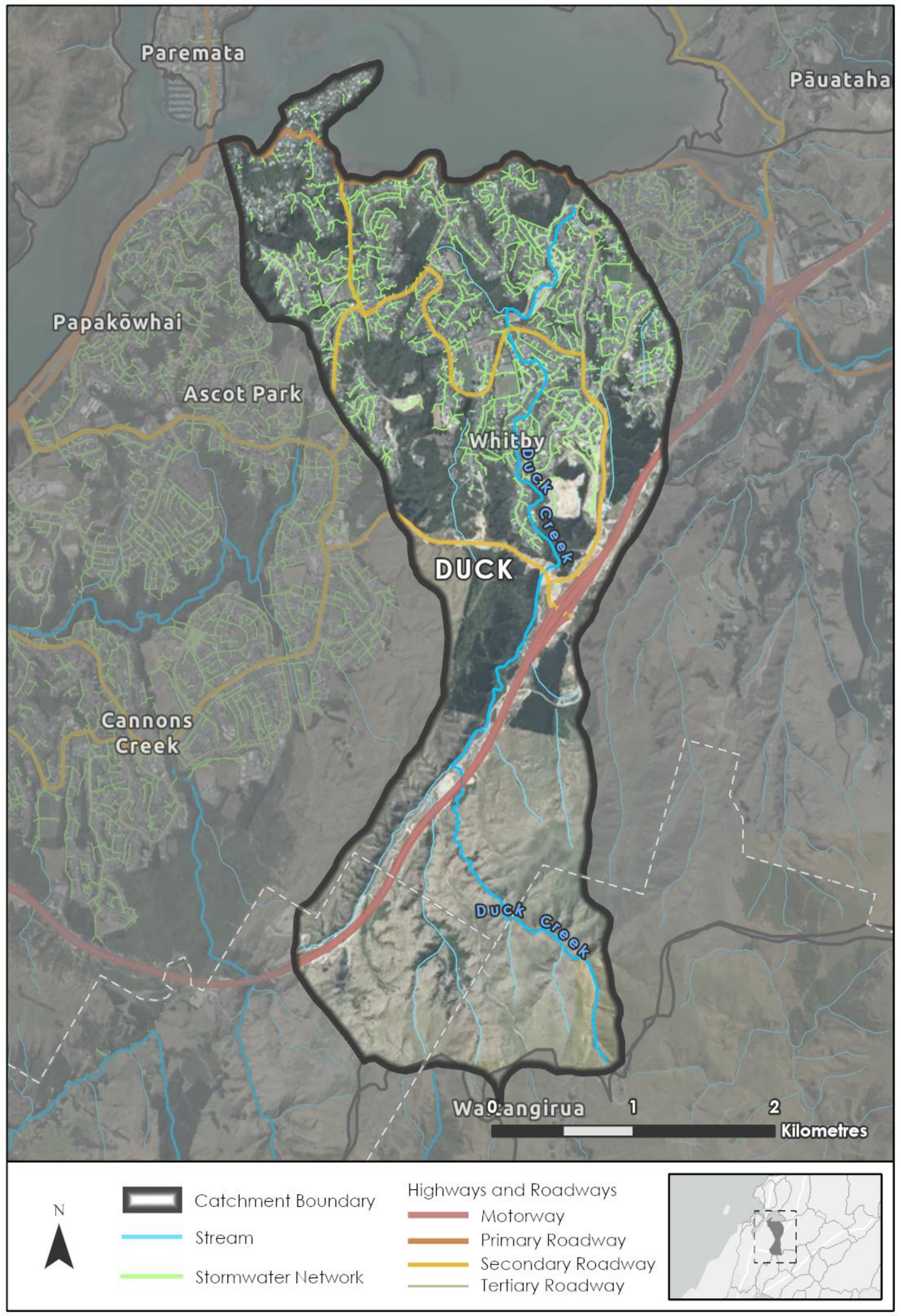
Preferred Management Approach

The smaller nature of the Porirua Coast catchments means focus should be placed on maintain and improving the existing ecological and cultural values with management approaches suitable for smaller scales. The preferred management approaches include:

- Reducing the degree of imperviousness through controls on green and brownfield developments such as inclusion of permeable paving, vegetated swales (in gently sloping or low laying areas), retrofitting of filter strips and tree-pits and planter boxes.
- Improving infiltration through infiltration enabling devices in precinct sized developments
- Where space is permitted developing treatment, storage, and detention systems (such as constructed wetlands or ponds) to control peak flows and improve stormwater quality at the base of catchments
- Including proprietary treatment devices, like gross pollutant traps, other in catchpit devices and oil/water separators, as part of the treatment train to improve stormwater quality by removing larger litter items, particulates and separating out certain contaminants.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded. 3 Hongoeka is situated at the northern coastal end of Plimmerton and consists of a residential area, including the marae and wharenui, surrounded by six large land blocks. It is the largest area of Māori owned land in Porirua.

Stormwater Catchment	Priority Ranking
Duck	4



Key Issues for Stormwater Management

- State Highway 1 passes through this catchment
- The lower half of the catchment includes the urban area of Whitby, which also includes light commercial areas.
- This catchment drains to the Pauatahanui Inlet of which the tidal flats and saltmarsh are identified as an outstanding water bodies (wetlands) in Schedule A of the NRP
- Duck Creek (Wai-o-hata) is listed in Schedule C and Schedule F1 of the NRP.
- Te Awarua-o-Porirua is listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP

Predominant existing land use

Land use proportions (%)[1]		**Hazardous Activities and Industries within catchment** [2]	
General residential	43	**SLUR sites (%)**[2]	0.2
Open space	24	**Predominant HAIL activities**	• Explosives and ordinances production, storage, and use (located in the headwaters at the upper most part of the catchment reach)
Rural	11		

Existing Monitoring

4 monitoring locations (2 coastal sites, 2 freshwater sites)

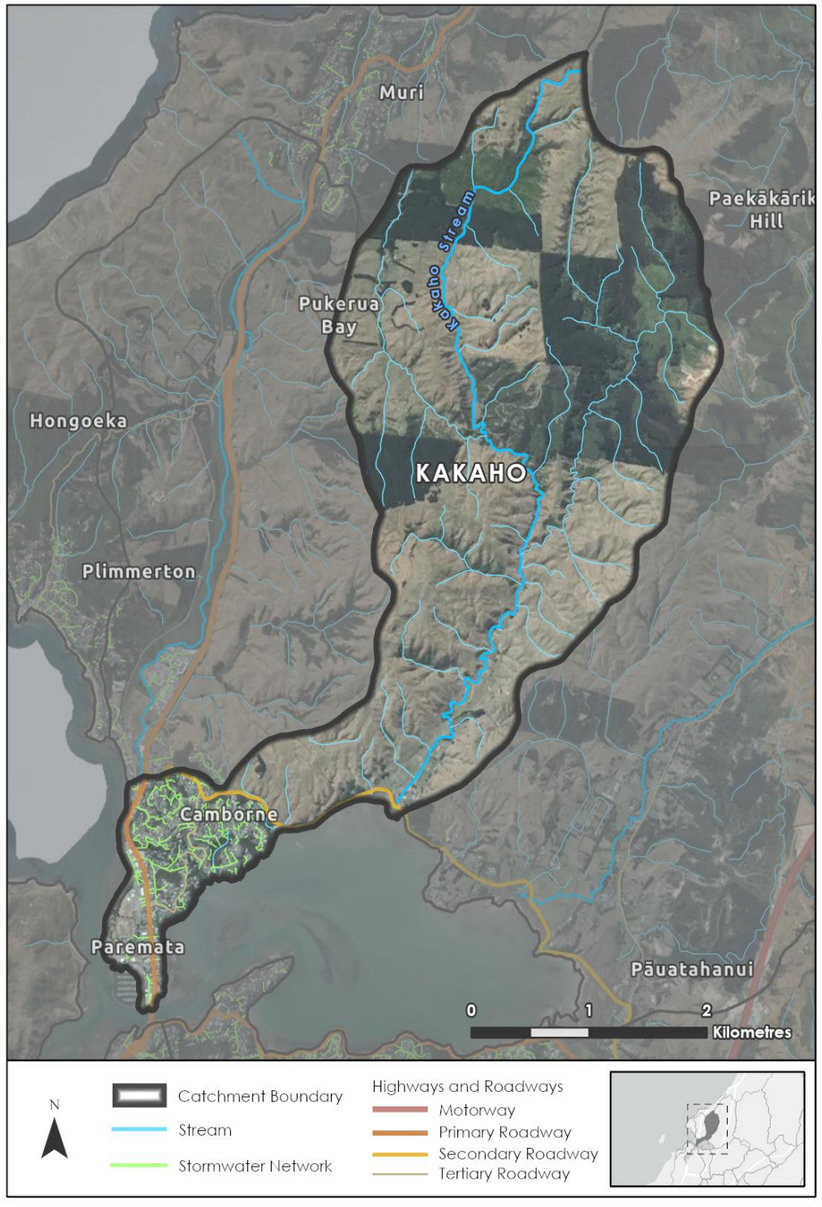
Preferred Management Approach

The Duck sub-catchment has residential and commercial development in the lower catchment and has also been identified as future growth area. This catchment will require management options that can be applied to both brownfield and greenfield developments. Management approaches that are preferred include:

- Development of community scale devices such as constructed wetlands and ponds at the base of catchments (including large catchments), or in shared areas, to treat, capture, attenuate, and release stormwater in controlled volumes to the receiving environment. Community scale devices also help add amenity and biodiversity value.
- Raingardens to improve stormwater quality, detention, and amenity. These can be installed in new developments or retrofitted and applied in urban and commercial areas.
- Tree-pits and planter boxes, as part of street-scale upgrades, to slow surface water flow and improve stormwater quality and general amenity
- Infiltration trenches /basins with adjoining filter strips to improve stormwater quality and reduced flow velocity. These options are suitable for precinct sizes areas and in both high- and low-density zones where space to implement management options is limited.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Kakaho	5



Key Issues for Stormwater Management

- State Highway 59 briefly passes through the lower end of the catchment
- Being predominantly rural land, the catchment is prone to runoff from pasture and shrubs
- The lower half of the catchment includes the urban area of Camborne, which also includes light commercial areas and the marina
- This catchment drains to the Pauatahanui Inlet of which the tidal flats and saltmarsh are identified as an outstanding water bodies (wetlands) in Schedule A of the NRP
- Te Awarua-o-Porirua is listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General rural	49	**SLUR sites (%)[2]**	2
Rural lifestyle	32	**Predominant HAIL activities**	• Vehicle refuelling, servicing, and repair (all located in the lower portion of the catchment
General residential	5		

Existing Monitoring

1 coastal monitoring site (at the Pauatahanui Inlet water ski club)

Preferred Management Approach

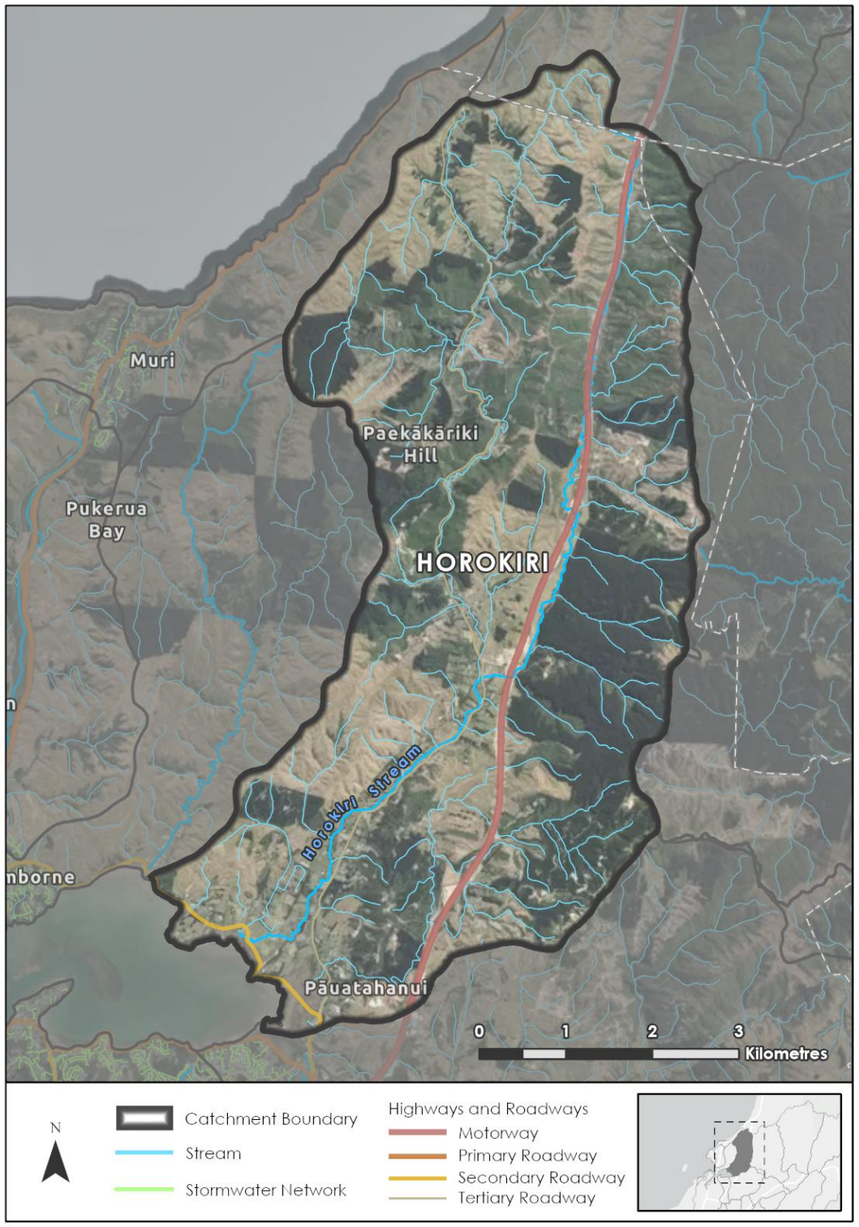
The Kakaho sub-catchment is like the Duck sub-catchment and has residential and commercial development in the lower catchment and will require management options that can be applied to both brownfield and greenfield developments. Management approaches that are preferred include:

- Development of community scale devices such as constructed wetlands and ponds at the base of catchments (including large catchments), or in shared areas, to capture, attenuate, and release stormwater in controlled volumes to the receiving environment. Community scale devices also help add amenity and biodiversity value.
- Raingardens to improve stormwater quality, detention, and amenity. These can be installed in new developments or retrofitted and applied in urban and commercial areas.
- Tree-pits and planter boxes, as part of street-scale upgrades, to slow surface water flow and improve stormwater quality and general amenity
- Infiltration trenches /basins with adjoining filter strips to improve stormwater quality and reduced flow velocity. These options are suitable for precinct sizes areas and in both high- and low-density zones where space to implement management options is limited.
- Riparian planting programmes to help maintain the natural environment and provide protection for streams and rivers by creating a 'buffer' zone.
- Inclusion of water harvest and reuse practices (storage tanks) in urban, commercial, and industrial development areas to add water harvesting and re-use and provide for a detention and slow-release function.

Given this catchment has been identified as a location of likely future growth WSD should be implemented early on and should include basic principles such as sighting of land that is appropriate for development and working with the natural environment (not against) to maintain natural hydrology and ecological values.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Horokiri	6



Key Issues for Stormwater Management

- The catchment is bisected by State Highway 1
- Being predominantly rural land, the catchment is prone to runoff from pasture and shrubs
- This catchment drains to the Pauatahanui Inlet of which the tidal flats and saltmarsh are identified as an outstanding water bodies (wetlands) in Schedule A of the NRP
- Horokiri (Horokiwi) Stream is listed in Schedule F1 and Schedule C (site of significance to mana whenua) of the NRP.
- Te Awarua-o-Porirua is listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General rural	63	**SLUR sites (%)[2]**	5
Rural lifestyle	28	**Predominant HAIL activities**	• Explosives and ordinances production, storage, and use (associated with the ex Pauatahanui Military Camp) • Chemical manufacture application and bulk storage
Open space	6		

Existing Monitoring

No established monitoring locations

Preferred Management Approach

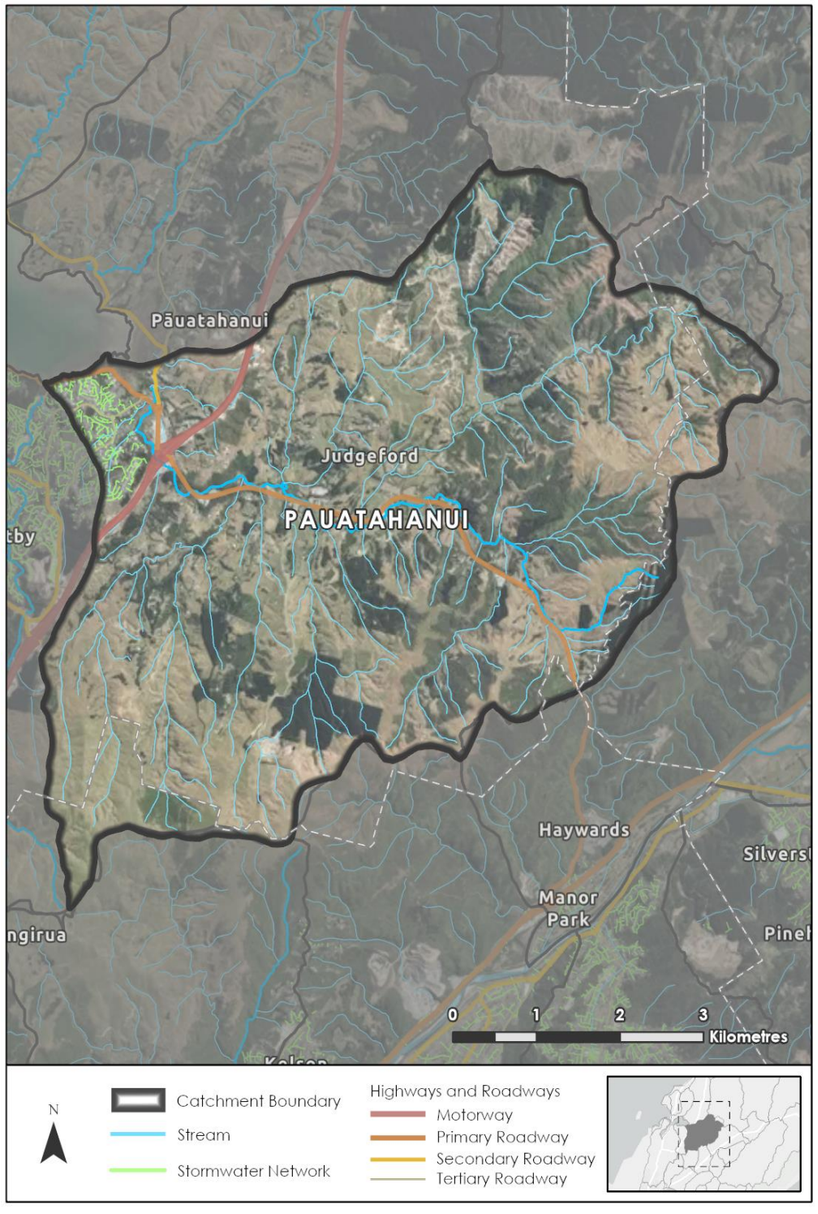
The Horokiri catchment provides a great opportunity for the inclusions of WSD management options as it has little development (no stormwater network) and has a decent proportion of open space. The preferred management approaches include:

- Options for a 'pipeless' network, which favour open conveyance development over a piped network
- Development of community scale devices such as constructed wetlands and ponds at the base of catchments (including large catchments), or in shared areas, to capture, attenuate, and release stormwater in controlled volumes to the receiving environment. Community scale devices also help add amenity and biodiversity value.
- Raingardens to improve stormwater quality, detention, and amenity. These can be installed in new developments or retrofitted and applied in urban and commercial areas.
- Reducing the degree of imperviousness through infiltration soakage controls in green and brownfield developments such as inclusion of infiltration basins, permeable paving, vegetated swales (in gently sloping or low laying areas), inclusion of filter strips, tree-pits, and planter boxes. Infiltration soakage controls help improve water quality.
- Riparian planting programmes to help maintain the natural environment and provide protection for streams and rivers by creating a 'buffer' zone.
- Inclusion of water harvest and reuse practices (storage tanks) in urban, commercial, and industrial development areas to add water harvesting and re-use and provide for a detention and slow-release function.

Given this catchment has no existing stormwater network but is identified as a potential area for future growth, it provides a rare opportunity to implement alternative network approaches. Considering the little existing infrastructure WSD should be implemented early on and should include basic principles such as sighting of land that is appropriate for development and working with the natural environment (not against) to maintain natural hydrology and ecological values.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.

Stormwater Catchment	Priority Ranking
Pauatahanui	7 (Lowest)



Key Issues for Stormwater Management

- This catchment is bisected by State Highway 58 and 1.
- Being predominantly rural land, the catchment is prone to runoff from pasture and shrubs.
- There is a small portion of the Whitby urban area within the catchments, and this catchment has been noted for future urban development.
- This catchment drains to the Pauatahanui Inlet of which the tidal flats and saltmarsh are identified as an outstanding water bodies (wetlands) in Schedule A of the NRP
- Pauatahanui Stream is listed in Schedule C and Schedule F1 of the NRP.
- Te Awarua-o-Porirua is listed as Ngā Taonga Nui a Kiwa in Schedule B of the NRP
-

Predominant existing land use

Land use proportions (%)[1]		Hazardous Activities and Industries within catchment [2]	
General rural	70	SLUR sites (%)[2]	9
Rural lifestyle	10	Predominant HAIL activities	• Cemeteries and waste recycling, treatment, and disposal (a portion of which was landfill – Brittons, Haywards Hill). • Chemical manufacture, application and bulk storage, and mineral extraction, refining and reprocessing, storage and use
Future urban	5		

Existing Monitoring

No established monitoring locations

Preferred Management Approach

Like the Horokiri and the Taupō catchments the Pauatahanui sub-catchment provides an opportunity for the inclusions of many WSD management options in greenfield developments, with future growth predicted in the sub-catchment and little existing development. The preferred management approaches for this catchment include:

- Development of community scale devices such as constructed wetlands and ponds at the base of catchments (including large catchments), or in shared areas, to capture, attenuate, and release stormwater in controlled volumes to the receiving environment. Community scale devices also help add amenity and biodiversity value.
- Raingardens to improve stormwater quality, detention, and amenity. These can be installed in new developments or retrofitted and applied in urban and commercial areas.
- Reducing the degree of imperviousness through infiltration soakage controls in green and brownfield developments such as inclusion of infiltration basins, permeable paving, vegetated swales (in gently sloping or low laying areas), inclusion of filter strips, tree-pits, and planter boxes. Infiltration soakage controls help improve water quality.
- Riparian planting programmes to help maintain the natural environment and provide protection for streams and rivers by creating a 'buffer' zone.
- Inclusion of water harvest and reuse practices (storage tanks) in urban, commercial, and industrial development areas to add water harvesting and re-use and provide for a detention and slow-release function.

Again, given this catchment has been identified as a location of likely future growth WSD should be implemented early on and should include basic principles such as sighting of land that is appropriate for development and working with the natural environment (not against) to maintain natural hydrology and ecological values.

1 Three highest land use proportions displayed as % of total area; 2 Only selected SLUR sites with verified history of HAIL, or confirmed contamination are included in the assessment. Unverified/ remediated sites have been excluded.