

**Karehana and Taupo/James St Stormwater Catchment  
Recommendations**

**Porirua City Council Meeting - 25 May 2023**



## Background

1. The provision of a stormwater service aims to efficiently manage and control flows to support the Council's goals of protecting the public and property from the effects of frequent flooding.
2. The Plimmerton area in Porirua has experienced major flooding events over the past five years (2015, 2016 and 2020) with numerous residential properties requiring extensive renovations to make them fit for habitable purposes.
3. At a community meeting held in January 2021 Porirua City Council and Wellington Water committed to undertake catchment level investigations to develop options to mitigate the flooding impacts for the Karehana, Taupo/James St and Hongoeka Catchments.
4. While we are only seeking a decision for the Karehana and Taupo/James St catchment in this paper as the catchment studies are well progressed in these two areas and where funding commitments have been made, substantial areas of Porirua are at risk of flooding during extreme rain events and work is still required to develop the other stormwater catchment studies to address broader flood risk. Additional Opex budget is required to develop the catchment studies in these areas and establish what works may be required.
5. *Figure 1: Porirua Flooding Risks*



North
Hongoeka Flooding
Karehana Park Flooding
Taupo- Plimmerton Flooding
School Road Flooding
Pope St/SH59 Flooding
Acheron Flooding
SH59/New world Paremata Flooding
Paremata Flooding

West
Te Pene Avenue OLFP obstruction
Main Road/Waihora Park Flooding
John St flooding
Whitehouse Road Flooding
Takapuwahia Flooding
Porirua CBD Flooding

South
Kenepuru Drive SW Improvements
Wall Place Flooding
Eskdale/Conclusion Flooding

East
Duck Creek Flooding
Paremata School Flooding
Papakowhai Flooding
Warspite/Conclusion St/Omapere St Flooding
Niagara St/Loongana St Flooding
Kalingo St Flooding
Waihora Crescent Flooding
Matahourua Crescent and Maraeroa School Flooding
Champion St Flooding
Mungavin Avenue Flooding
Martin St Flooding
Princess St Flooding

## Karehana Catchment



### Background

6. The Karehana Stormwater Management and Improvements Study was initiated in February 2021 to identify possible long-term stormwater management options to reduce flooding in the Karehana Park catchment.
7. The primary goals of the long-term solution were:
  - to minimise the impact of flooding on people's lives and proactively plan for the impacts of climate change (to reduce the number of habitable floors effected by frequent flooding)
  - to minimise public health risks associated with wastewater and stormwater (to reduce the number of uncontrolled wet weather overflows onto land.)
8. The catchment study and options assessment for the Karehana catchment was completed in August 2021.
9. The following challenges with the network and catchment were identified during this study:
  - low network capacity with frequent debris blockages
  - small steep catchment
  - very developed and low-lying properties
10. Due to these challenges it was determined that protection from a full 100-year flood event would not be achievable
11. In November 2021, the recommended package of works and budget for the Karehana catchment to provide flood protection to habitable floors to a target 30-year flood event was approved by Porirua City Council.
12. Noting that a 30-year flood event represents a 1 in 30 chance of the event occurring each year.
13. The estimated cost of the approved works was \$16.9M.

## Options

14. The concept design phase for the Karehana Stormwater Improvements project is now complete.
15. During the concept design phase, the scope of works required in each “package” has been defined using more detailed site-specific information including detail survey and a beach morphology study.
16. A revised cost estimate for the scope of these works has also been prepared.
17. The hydraulic modeling has been updated with all the “new” site specific information gathered during concept design and this has been used to:
  - confirm the expected benefits of the original recommended scope
  - determine what optimisation to the original recommended scope could provide similar benefit
18. Approximately 25 habitable floors were affected during the November 2020 flood event, which was estimated to be similar to a 30-year flood event. This is expected to increase to 30 – 40 habitable floors affected with climate change.

### Option 1: Original Recommendation

19. In 2021, during the optioneering, Option 1 was found to protect the most habitable floors in a 30-year event.
20. This option focuses on all three areas of the catchment and provides improvements around Karehana Park, upstream of Firth Road, and to the eastern side of the valley (Cluny Road and Reserve Road).
21. *Figure 2: Option 1 Original Recommendation*



22. This was the original scope of works approved by Porirua City Council in 2021 for a budget of \$16.9M, with multiple packages of work up the catchment.

23. Table 1: Option1 Original Recommendation Benefits & Cost

<b>Capital Estimate</b>	\$39M to \$49M
<b>Estimate/Floor</b> (30yr rainfall event with climate change)	\$1.95M to \$2.45M
<b>Habitable Floors Benefit</b> (30yr rainfall event with climate change)	~ 20
<b>Habitable Floors Benefit</b> (100yr rainfall event - current)	~ 11

24. Noting: the cost estimate increase from the optioneering stage has been driven by more clarity in the extent of scope required for each package following the concept design and further investigation works, as well as increased uncertainty in the market.

**Option 2: Current Recommendation**

- 25. Option 2 represents an optimisation of the original recommended scope.
- 26. During the concept design more detailed survey and investigation work was undertaken and was determined that similar benefits may be achieved without the need to upgrade the stream works.
- 27. The removal of the streamworks upstream of the park removes substantial risk to the project and is more cost effective with similar benefits to the original recommended option.

28. Figure 3: Option 2 Current Recommendation



29. Table 2: Option 2 Current Recommendation Benefits & Cost

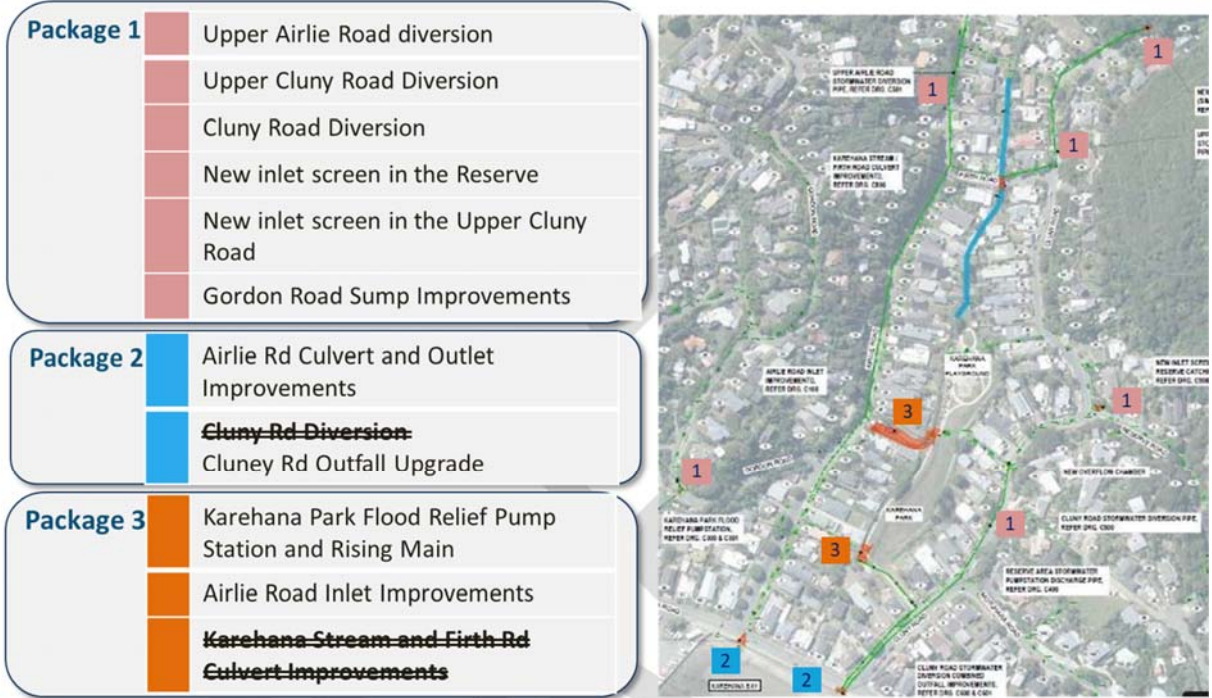
<b>Capital Estimate</b>	\$24M to \$31M
<b>Estimate/Floor</b> (30yr rainfall event with climate change)	\$1.2M to \$1.55M
<b>Habitable Floors Benefit</b> (30yr rainfall event with climate change)	~ 20
<b>Habitable Floors Benefit</b> (100yr rainfall event - current)	~ 8

**Option 3 Less Cost Alternative**

30. Option 3 represents a reduction in scope from the original recommended scope with the upper Cluney Rd and streamworks removed.

31. This option was considered as this is scope of work provides some benefit, at a lower cost.

32. Figure 4: Option 3 Less Cost Alternative



33. Table 3: Option 3 Less Cost Alternative Benefits & Cost

<b>Capital Estimate</b>	\$18M to \$23M
<b>Estimate/Floor</b> (30yr rainfall event with climate change)	\$1.2M to \$1.53M
<b>Habitable Floors Benefit</b> (30yr rainfall event with climate change)	~ 15

### Option 4 Minimum Alternative

- 34. Option 4 represents a significant reduction in scope with focus on the lower end of the catchment.
- 35. This option was considered as this is work that can be done within an estimate close to the original budget, while still providing some benefit.
- 36. *Figure 5: Option 4 Minimum Alternative*



37. *Table 4: Option 4 Minimum Alternative Benefits & Cost*

<b>Capital Estimate</b>	\$16M to \$21M
<b>Estimate/Floor (30yr rainfall event with climate change)</b>	\$1.6M to \$2.1M
<b>Habitable Floors Benefit (30yr rainfall event with climate change)</b>	~ 10

### Option 5: “Do Nothing”

- 38. We had reports of approximately 25 properties impacted by flooding in 2020 (approximately a 30-year flood event). The modeling has indicated that this is expected to grow to between 30-40 properties impacted in a 30yr event with climate change applied, without intervention.
- 39. The service level of maintenance required at Karehana Bay continues to be operationally more challenging and more frequent than in other hotspots in the network. Currently, operational resources are allocated specifically to Karehana Bay/Plimmerton in preparation, during and after rainfall events, resulting in resources not attending other hotspots and callouts across the network.
- 40. High tides and blocking of the main stormwater outlet continues to be the main operational challenge with the sand being dug out and or checked at least 3 times weekly. And in the event of high tide coinciding with rainfall the temporary pump currently located at the outlet is operated.
- 41. It should be noted that the pump was only ever intended to be a short-term operational response to be used in emergencies, but this has been operated for 268 hours between May 2022 and April 2023.

- 42. Currently operational costs in this area are \$70,000- 100,000/yr (excluding any post flood cleanup or damage costs).
- 43. From an operational point of view a long-term solution is required at Karehana Bay as the current setup and operational response required in the area is not sustainable beyond another 1 -2 years.
- 44. This option is not recommended.

## Recommendation

- 45. Approximately 25 habitable floors were impacted by flooding in 2020 (approximately a 1 in 30 year flooding event). The modeling has indicated that this is expected to grow to between 30-40 properties impacted in a 30yr event with climate change applied, without intervention.
- 46. In November 2021, a recommended package of works and budget for the Karehana catchment to provide flood protection to habitable floors to a target 30-year flood event was approved by Porirua City Council.
- 47. The estimated cost of the approved works was \$16.9M.
- 48. During the concept design a revised cost estimate for the scope was prepared. This identified a revised cost estimate above the original budget.
- 49. More detailed modeling was also undertaken and confirmed the streamworks above the park would not be required to achieve similar benefits in a 30 year flood event.
- 50. We are currently seeking approval to proceed with the Current Recommended Option at an estimate of \$24M - \$31M.
- 51. This work will benefit approximately 20 Habitable floors for a 30yr rainfall event (with climate change).
- 52. *Table 5: Options Summary Benefits & Cost*

	Option 1: Original Recommendation	Option 2: Current Recommendation	Option 3: Less Cost Alternative	Option 4: Min Alternative
<b>Capital Estimate</b>	\$39M to \$49M	\$24M to \$31M	\$18M to \$23M	\$16M to \$21M
<b>Estimate/Floor</b> (30yr rainfall event with climate change)	\$1.95M to \$2.45M	\$1.2M to \$1.55M	\$1.2M to \$1.53M	\$1.6M to \$2.1M
<b>Habitable Floors Benefit</b> (30yr rainfall event with climate change)	~ 20	~ 20	~ 15	~ 10
<b>Habitable Floors Benefit</b> (100yr rainfall event - current)	~ 11	~ 8	-	-

- 53. Noting: the cost estimate is currently at concept design level and is the best information we have at this stage.
- 54. Operationally (for a similar run time as the temporary pump station) we expect the operational and maintenance costs of the new pumps to be between \$25k – \$40k. With Inlet and channel clearance costs in the order of \$40k - \$50k. However, this will vary depending on the size and number of storm water events.



## Taupo/James St Catchment



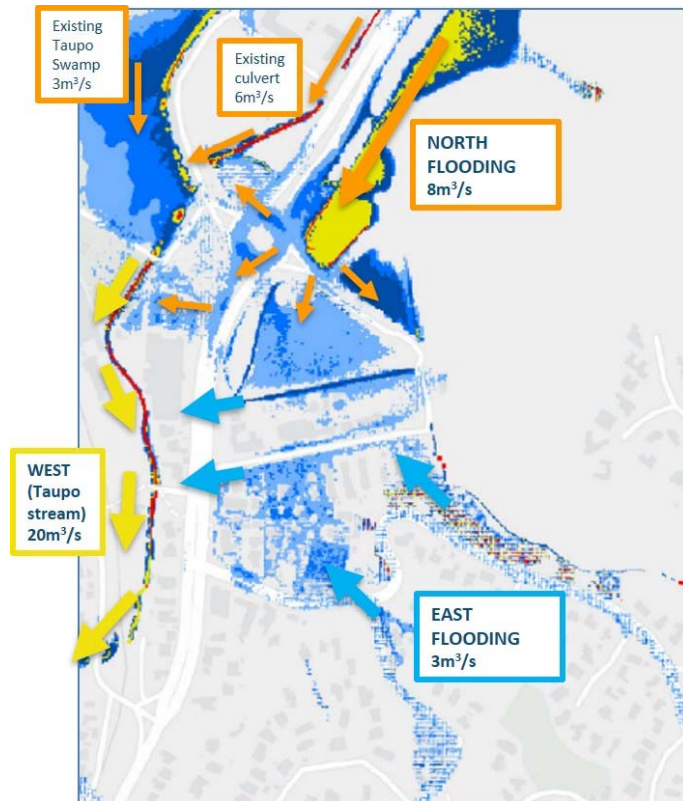
### Background

55. After the community meeting in January 2021, catchment level investigations and modelling were carried out and high-level options were developed for discussion.
56. In June 2022, a workshop was held with Porirua City Council, Ngati Toa and Waka Kotahi to review the initial results of modelling and collectively review the options (long list to short list) and agreed the work scope to be investigated and costed:
  - Camborne Hill (overland flow) diversions;
  - James St Triangle (inlet & outlet) improvements;
  - Improve + additional SH59 cross drainage.

### Investigation Results

57. Following the June 2022 workshop, further investigation, modelling, high level cost estimate and staging for the agreed work scope has been carried out.
58. Modelling has shown that Taupo stream also needs to be widened to convey the increased flow to the sea.
59. Modelling has shown that all the works are required to alleviate SH59 flooding and benefit 20 – 25 James St + Greys Rd habitable floors that could be flooded in a 30-year ARI weather event.

60. Figure 6: Taupo /James St SW flows in a 30-year flood event



## Costs & Staging

61. The cost of the works required to mitigate flooding is estimated to be circa \$40m - \$63m.
62. The cost estimate is based on high level scope developed from flow modelling outputs. The scope and cost estimate will be refined as design and consenting progresses.
63. The works are proposed to be implemented in three stages:
  - **Stage 1: East**  
An initial stage of work is recommended (circa \$10m - \$16m) to reduce overland flow from Camborne around James St + Greys Rd buildings by upsizing the existing Greys Rd pipes and James St intakes/outlets.
  - **Stage 2: West**  
The second stage (circa \$14m - \$22m) is to 'open up' the choke points in the Taupo stream (primarily two vehicle bridges and the overgrown stream banks) so it is ready for the increased flow from the northeast.
  - **Stage 3: North**  
The third stage (circa \$14m - \$22m) is to allow increased flow from the northeast to the Taupo Stream by constructing additional box culverts under SH59 and Ulric St and to attenuate the northwest flow from the Taupo Swamp by constructing a retention bund at the south end of the Plimmerton Domain fields.

64. Figure 7: Taupo Stages and high-level costs



65. Table 6: Taupo Stages and estimates

	Stage	Cost
	<b>Design &amp; Consenting</b>	\$2-\$3m
<b>1</b>	<b>East – reduce overland flow from Camborne</b> <ul style="list-style-type: none"> <li>Greys Rd pipework upsizing</li> <li>James St intakes + outlets upsizing</li> </ul>	\$10-\$16m
<b>2</b>	<b>West - widen Taupo stream for increased north flow</b> <ul style="list-style-type: none"> <li>Stream bank widening</li> <li>Two vehicle bridges</li> <li>Three pedestrian bridges</li> </ul>	\$14-\$22m
<b>3</b>	<b>North - direct north east flow under SH59 to Taupo stream</b> <ul style="list-style-type: none"> <li>Two new box culverts under SH59 + Ulric St</li> <li>Domain retention bund</li> </ul>	\$14-\$22m
	<b>Total</b>	<b>\$40-\$63m</b>

## Options

### Option 1: Do all (circa \$40m - \$63m) = Recommended

66. Progress with all works required to alleviate flooding, primarily from the North East, of SH59 and James St + Greys Rd buildings including church & school.
67. Recommended staging = Design & Consents for all works (\$2-3m) then 1 East (\$10-\$16m) then 2 West (\$14-\$22m) then 3 North (\$14-\$22m).
68. Noting that the timing of Stage 2 West (\$14-\$22m) and Stage 3 North (\$14-\$22m) physical works may be subject to funding availability.
69. Cost share is to be discussed with Waka Kotahi of the North work (\$14-22m) on the basis that the new culverts under SH59 would reduce flooding of SH59.

### Option 2: Do less (circa \$10-\$16m)

70. Only do stage 1 East = \$10-16m
71. Reduce overland flow from the east around the James St + Greys Rd buildings by upsizing the existing Greys Rd pipes and James St intakes/outlets.
72. Not recommended as this will not relieve the primary flooding from the north east.

### Option 3: Do nothing

73. Not recommended as this will not relieve any flooding of SH59 or James St + Greys Rd buildings.

## Taupo / James St Recommendation

74. The recommended option is Option 1 Do all (\$40m-\$63m) as all works are required to alleviate flooding of SH59 and James St + Grey St buildings.
75. Recommended staging = Design & Consents for all works (\$2m-3m) then Stage 1 East (\$10m-\$16m) then 2 West (\$14m-\$22m) then 3 North (\$14m-\$22m).
76. Noting that the timing of Stage 2 West (\$14m-\$22m) and Stage 3 North (\$14m-\$22m) physical works will be subject to Porirua City Council Annual Plan and Long-Term Plan funding processes.
77. Noting that cost share is to be discussed with Waka Kotahi of the North work (\$14m-\$22m) on the basis that the new culverts under SH59 would reduce flooding of SH59.

## Financial Implications

78. The 2021 Long-term Plan included a total of \$20M for major stormwater projects across the city

Area	22/23	23/24	24/25	25/26
Plimmerton	\$10M	\$10M		

79. Note \$1M allocated for use by PCC for catch nets. Resulting in \$19M available for work by Wellington Water.

## Recommended Cashflow

80. The recommended cashflow forecast for Karehana and Taupo/James St projects is:

81. *Table 7: Current Indicative Cashflow*

CAPEX	LOS	Benefits	Total	22/23	23/24	24/25	25/26	26/27
Plimmerton Flooding		LTP funding	\$20,000,000	\$10,000,000	\$10,000,000			
Karehana	30yr	20+ floors	\$31,000,000	\$ 700,000	\$ 5,000,000	\$11,000,000	\$ 8,000,000	\$ 6,300,000
Taupo /James St	30yr	20+ floors School risk SH59 risk	\$63,000,000	\$ 250,000	\$ 2,750,000	\$16,000,000	\$22,000,000	\$22,000,000
<b>Total</b>			<b>\$94,000,000</b>	<b>\$ 950,000</b>	<b>\$ 7,750,000</b>	<b>\$27,000,000</b>	<b>\$30,000,000</b>	<b>\$28,300,000</b>

82. Noting that the recommended Karehana and Taupo/James cashflows are subject to Porirua City Council Annual Plan and Long-Term Plan funding processes.

## Conclusion

83. In conclusion we are seeking the following decisions from Council.

A. Karehana:

- We are seeking approval to proceed with the current Recommended Option at an estimate of \$24M - \$31M.
- This work will benefit approximately 20 Habitable floors for a 30yr rainfall event (with climate change).

B. Taupo/James St:

- We are seeking approval to proceed with the Recommended Option 1 (Do All), at an estimate of \$40M - \$63M.
- This works will benefit approximately 20 Habitable floors and the SH59 roadway for a 30yr ARI rainfall event.
- We are seeking approval to commit to \$2M - \$3M for design and consenting of all stages.
- We are seeking approval to commit to \$10M - \$16M for Stage 1 East physical works (overland flow from Camborne).
- We note that the timing of Stage 2 West (\$14M - \$22M) and Stage 3 North (\$14M - \$22M) physical works will be subject to Porirua City Council Annual Plan and Long-Term Plan funding processes.