



Tauranga City

# Climate Change Physical Risk Assessment

Pilot assessment results  
– Property asset group

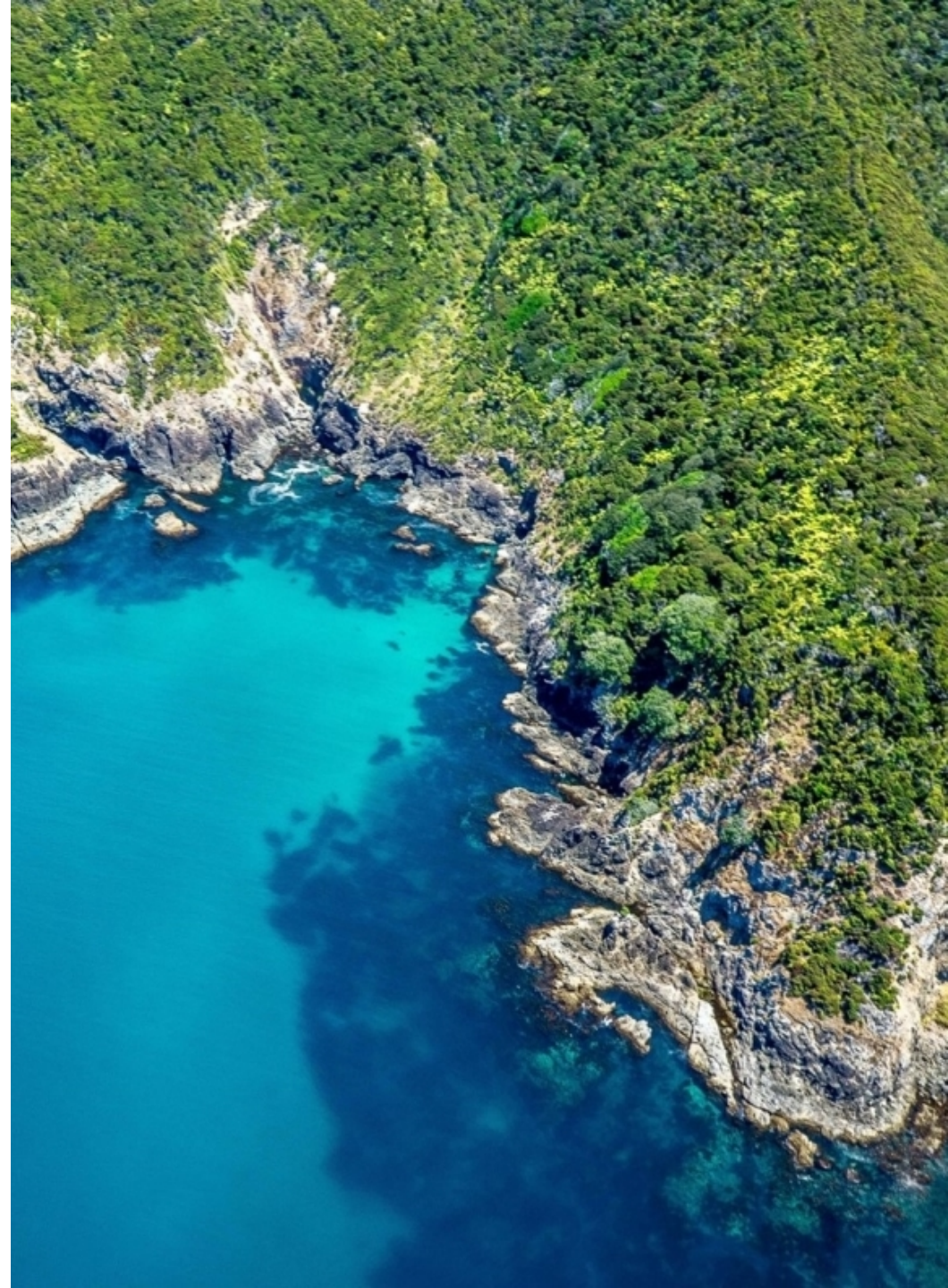
9 May 2023

 Tonkin+Taylor



# Agenda

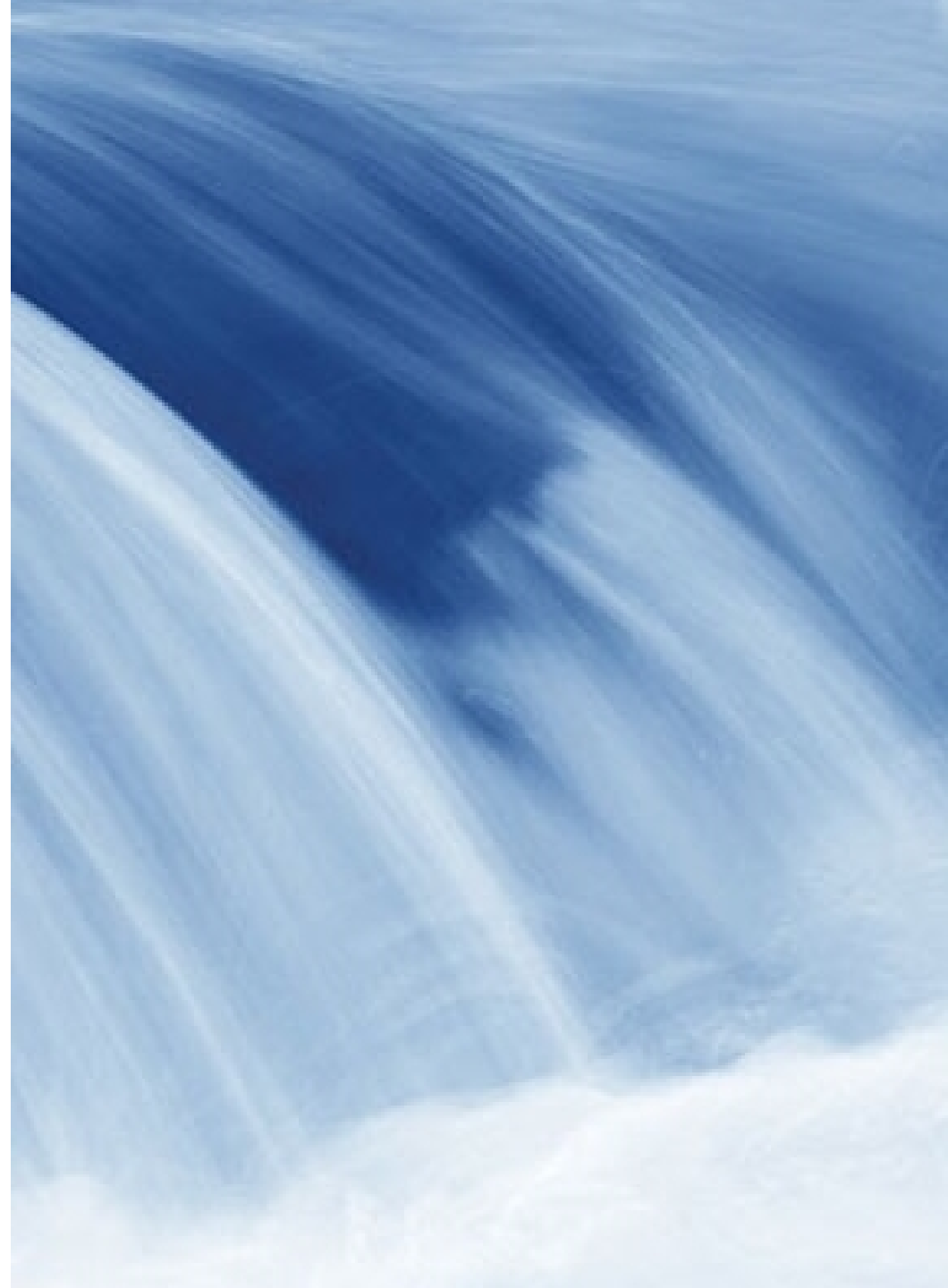
1. Project purpose
2. Review data and results
  - Non-spatial risk outputs
  - Pilot GIS exposure assessment
3. Summary
4. Next steps



# Purpose of the pilot

The pilot assessment aimed to:

- Establish and test a methodology for the Property asset group:
  - GIS exposure assessment to 6 hazards
  - Non-spatial risk assessment of physical risks over two climate change scenarios (RCP 4.5 and RCP 8.5) and three time horizons (present day, 2050 and 2100)
- Present the results back to key stakeholders within Council, and elicit feedback on the approach and outputs. This feedback is then intended to frame the next steps.



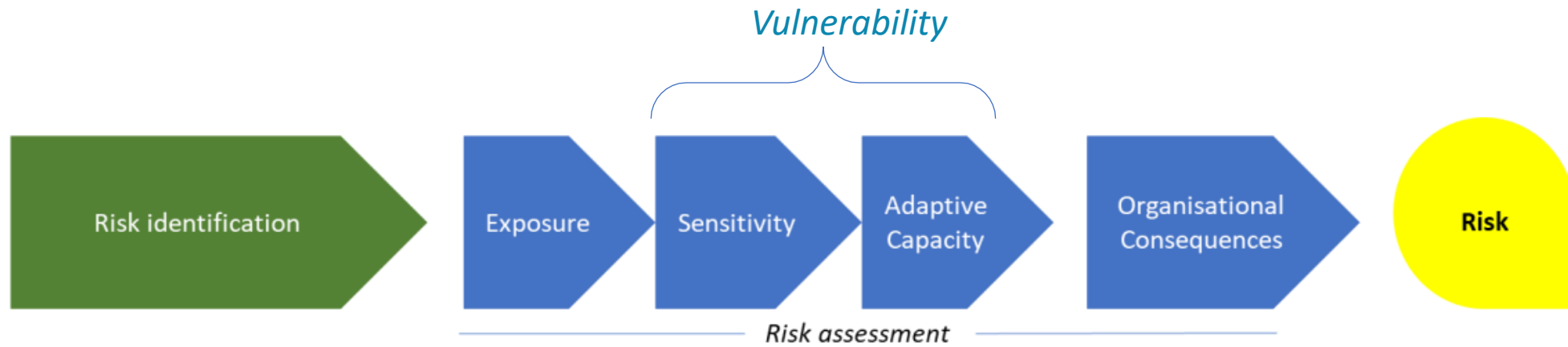


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# Non-spatial risk outputs

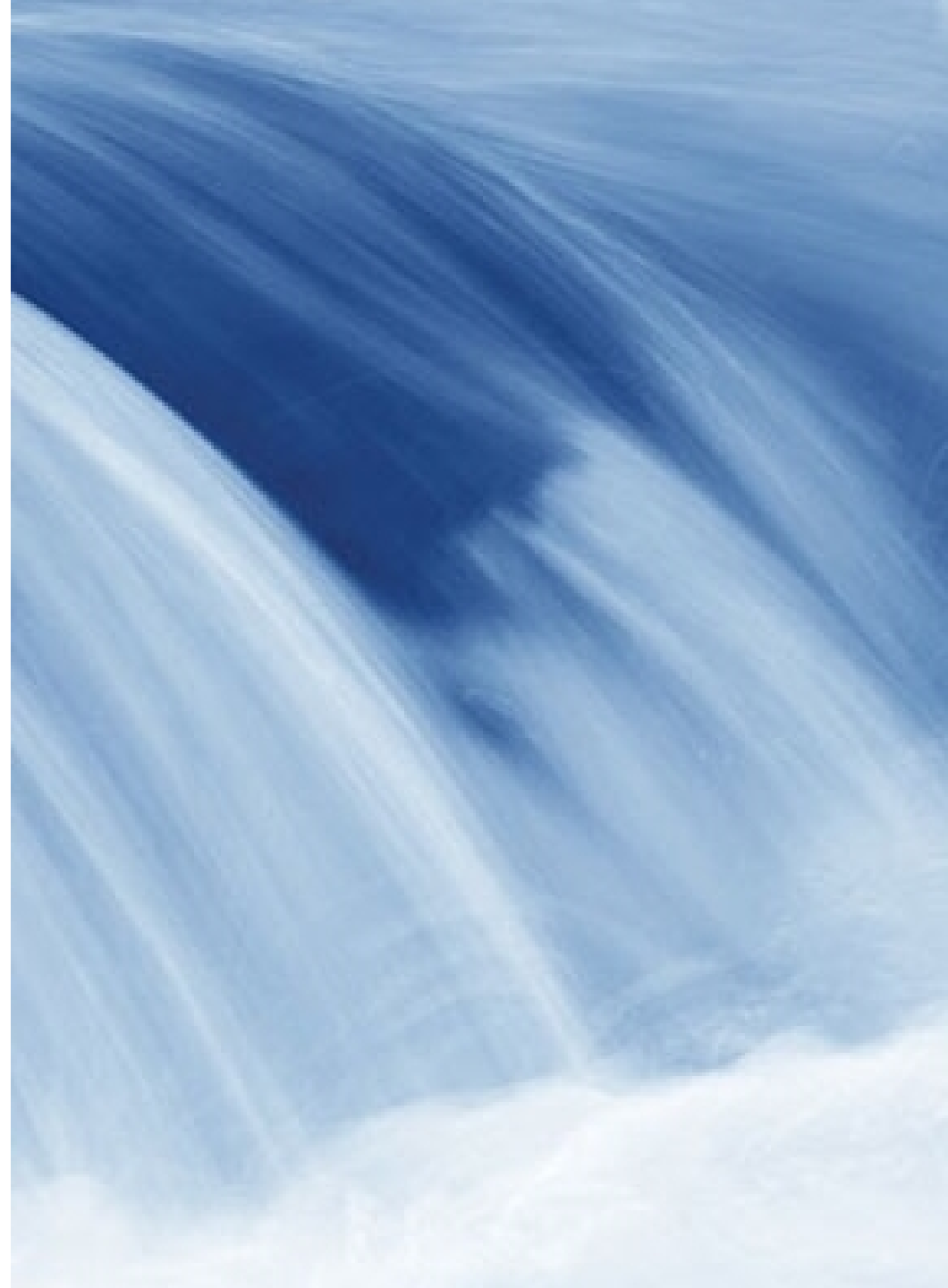
- Risk identification workshop
- Risk rating workshop x 2
- 1 asset group – Property



## Pilot non-spatial risk assessment

# Pilot non-spatial risk assessment - summary

- 23 direct risks rated
- 7 indirect risks rated





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# Next steps

# Next steps

## Next steps

- Tailor risk rating workbook to TCC requirements
- Assess further asset groups (to be advised by TCC)?



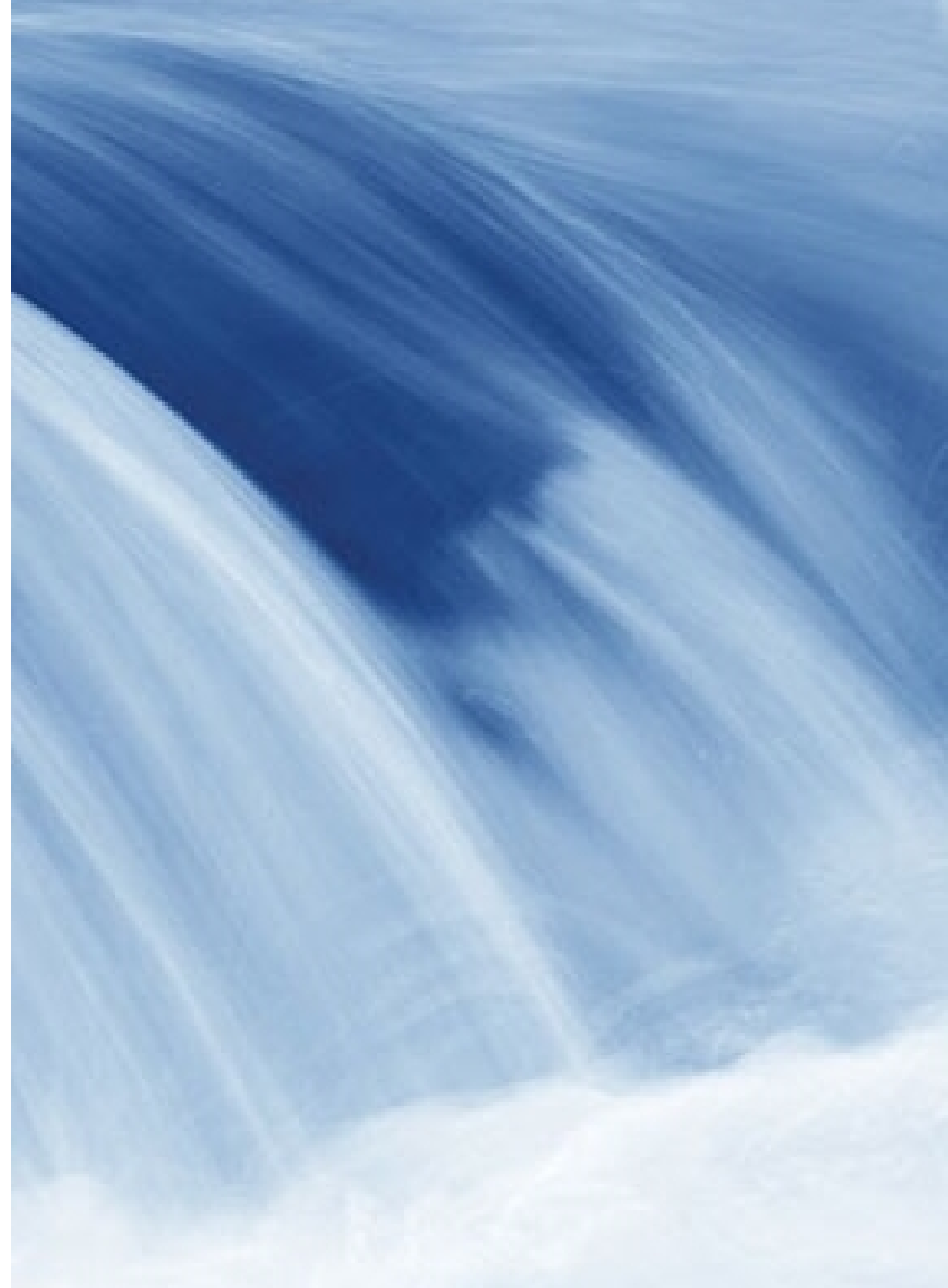
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# Pilot GIS exposure assessment

# Pilot GIS based assessment

- **Phase 1 – Pilot GIS exposure analysis**
- 6 hazards: flooding, coastal inundation, coastal erosion, liquefaction, groundwater and landslides
- 1 asset group – Property and some additional properties e.g. Baycourt and BayVenues (53 properties)



# Flooding

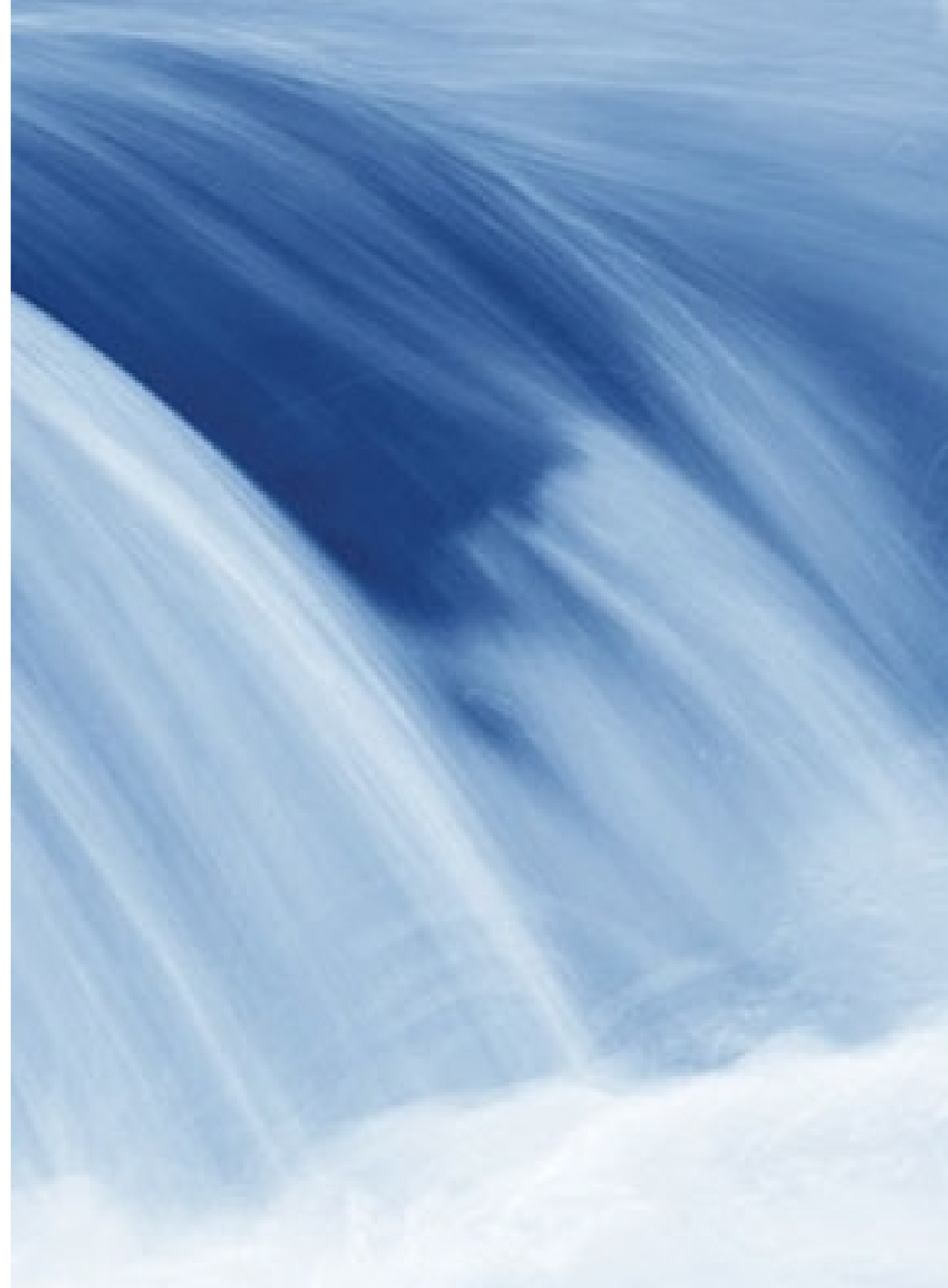
Scenarios used:

- 1 in 10 year ARI\* (existing)
- 1 in 50 year ARI^ (2130 ED)
- 1 in 100 Year ARI (2130 ED)
- 1 in 500 year ARI (2130 ED)

Properties located within 14 catchments

*\*all catchments except Greerton*

*^data for 9 catchments unavailable*



# Flooding - summary

	Property	2130_500	2130_100	2130_50
0	Cargo Shed – 23 Dive Crescent	Intersection	Intersection	No intersection
2	Property Tenancies – 72A Keith Allen Drive (4 tenancies) building 1	Intersection	Intersection	No intersection
4	Links Ave Clubrooms - 130 Links Ave	Intersection	No intersection	No intersection
5	Pemberton Clubrooms – 527 Fraser Street	Intersection	Intersection	Intersection
12	Mt Holiday Park Harbour amenities – 10 Adams Ave	Intersection	Intersection	No intersection
13	Mt Holiday Park Pilot amenities – 10 Adams Ave	Intersection	Intersection	No intersection
14	Arataki Community Centre – Zambuk Way	Intersection	Intersection	Intersection
19	Residential Property – 43a, 43b, 43c Third Ave building 1	Intersection	Intersection	No intersection
20	Residential Property – 43a, 43b, 43c Third Ave building 2	Intersection	Intersection	No intersection
21	Residential Property – 35a Third Ave building 1	Intersection	Intersection	No intersection
22	Residential Property – 35b Third Ave building 2	Intersection	Intersection	No intersection
25	Art Gallery	Intersection	No intersection	No intersection
27	Baypark Stadium building 1	Intersection	Intersection	No intersection
28	Baypark Stadium building 2	Intersection	Intersection	Intersection
32	Mount Hot Pools building 1	Intersection	Intersection	No intersection
33	Mount Hot Pools building 2	Intersection	Intersection	No intersection
34	Greerton Aquatic & Leisure Centre building 1	Intersection	Intersection	Intersection
38	Queen Elizabeth Youth Centre (including Memorial Hall)	Intersection	Intersection	No intersection
43	Welcome Bay Hall	Intersection	Intersection	Intersection
46	University of Waikato Adams Centre for High Performance (Adams Centre)	Intersection	No intersection	No intersection

# Coastal inundation

- 17 scenarios mapped, represent different levels of sea level rise and different return period storm events
- 8 properties potentially affected



# Coastal inundation

Scenarios used:

<b>Name in table</b>	<b>Mapping</b>
Sc1	2020 - sea level rise 0
Sc2	2080 - sea level rise 0.2m
Sc3	2080 - sea level rise 0.4m
Sc4	2130 - sea level rise 0.6m
Sc5	2130 - sea level rise 1.05m
Sc6	2130 - sea level rise 1.4m
Sc7	2020 - sea level rise 0 - AEP 2
Sc8	2130 - sea level rise 1.05m - AEP 2
Sc9	2020 - sea level rise 0 - AEP 1
Sc10	2080 - sea level rise 0.2m - AEP 1
Sc11	2080 - sea level rise 0.4m - AEP 1
Sc12	2130 - sea level rise 0.6m - AEP 1
Sc13	2130 - sea level rise 1.05m - AEP 1
Sc14	2130 - sea level rise 1.4m - AEP 1
Sc15	2020 - sea level rise 0 - AEP 0.2
Sc16	2130 - sea level rise 1.05m - AEP 0.2
Sc17	2130 - sea level rise 1.4m - AEP 0.2



# Coastal inundation - summary

Property	Sc1	Sc7	Sc9	Sc15	Sc2	Sc3	Sc10	Sc11	Sc4	Sc5	Sc6	Sc8	Sc12	Sc13	Sc14
	2020 - sea level rise 0	2020 - sea level rise 0 - AEP 2	2020 - sea level rise 0 - AEP 1	2020 - sea level rise 0 - AEP 0.2	2080 - sea level rise 0.2m	2080 - sea level rise 0.4m	2080 - sea level rise 0.2m - AEP 1	2080 - sea level rise 0.4m - AEP 1	2130 - sea level rise 0.6m	2130 - sea level rise 1.05m	2130 - sea level rise 1.4m	2130 - sea level rise 1.05m - AEP 2	2130 - sea level rise 0.6m - AEP 1	2130 - sea level rise 1.05m - AEP 1	2130 - sea level rise 1.4m - AEP 1
Art Gallery	No intersection	No intersection	No intersection	Intersection	No intersection	No intersection	No intersection	Intersection	No intersection	No intersection	No intersection	Intersection	Intersection	Intersection	Intersection
Baypark Arena	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	Intersection
Baypark Stadium building 2	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection
Cargo Shed – 23 Dive Crescent	Intersection	Intersection	Intersection	Intersection	Intersection	Intersection	Intersection	Intersection	Intersection	Intersection	Intersection	Intersection	Intersection	Intersection	Intersection
Memorial pool	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	Intersection
Mount Hot Pools building 1	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	Intersection
Mount Hot Pools building 2	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	Intersection
Property Tenancies – 72A Keith Allen Drive (4 tenancies) building 1	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	Intersection	No intersection	Intersection	Intersection
Property Tenancies – 72A Keith Allen Drive (4 tenancies) building 2	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	No intersection	Intersection	No intersection	Intersection	Intersection
Queen Elizabeth Youth Centre (including Memorial Hall)	No intersection	No intersection	No intersection	Intersection	No intersection	No intersection	No intersection	Intersection	No intersection	No intersection	No intersection	Intersection	Intersection	Intersection	Intersection

# Coastal erosion

- 9 scenarios mapped
- 2 properties potentially affected

Scenario	Meaning
TGAErosion_2080_P5_60	2080 (probability 5%, sea level rise 60 cm)
TGAErosion_2080_P66_40	2080 (probability 66%, sea level rise 40 cm)
TGAErosion_2080_P66_60	2080 (probability 66%, sea level rise 60 cm)
TGAErosion_2130_P5_125	2130 (probability 5%, sea level rise 1.25 m)
TGAErosion_2130_P5_160	2130 (probability 5%, sea level rise 1.6 m)
TGAErosion_2130_P66_80	2130 (probability 66%, sea level rise 80 cm)
TGAErosion_2130_P66_125	2130 (probability 66%, sea level rise 1.25 m)

*P5 – 5% probability over the timeframe*

*P50 – 50% probability over the timeframe*

*P66 – 66% probability over the timeframe*

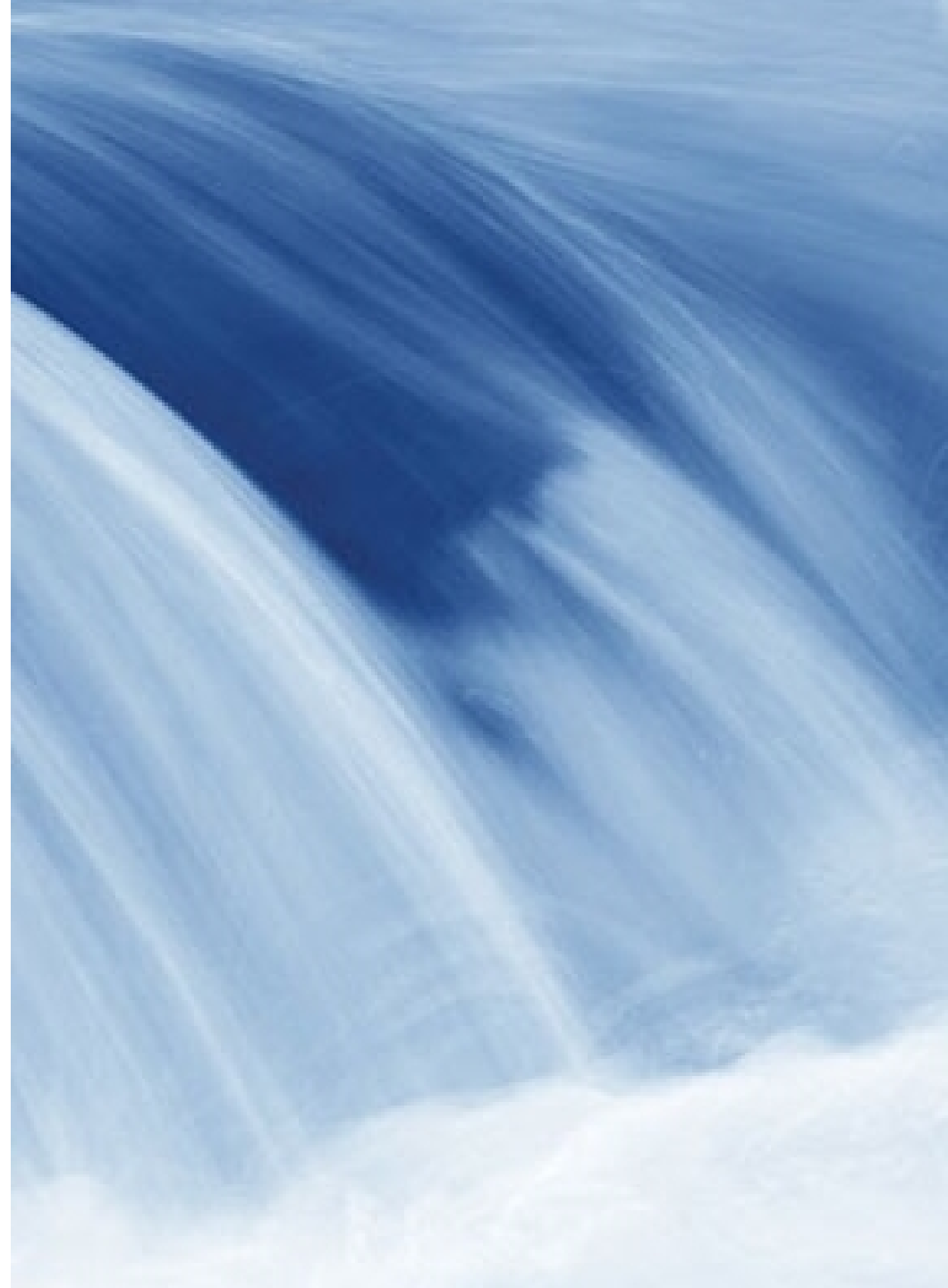


# Coastal erosion - summary

Property	2030_P5	2030_P66	2080_P5_60	2080_P66_40	2080_P66_60	2130_P5_125	2130_P5_160	2130_P66_80	2130_P66_125
Papamoa Surf Club	No intersection	No intersection	No intersection	No intersection	No intersection	Intersection	Intersection	No intersection	No intersection
Mt Surf Club	No intersection	No intersection	Intersection	No intersection	No intersection	Intersection	Intersection	No intersection	Intersection

# Liquefaction

- Liquefaction vulnerability rating:
  - Unmapped - out of TCC zone
  - Possible - requires further site investigation
  - Unlikely - liquefaction unlikely to occur



# Liquefaction - summary

	Property	Liquefaction Vulnerability	Rationalised vulnerability
2	Property Tenancies – 72A Keith Allen Drive (4 tenancies) building 1	High	Possible
3	Property Tenancies – 72A Keith Allen Drive (4 tenancies) building 2	High	Possible
4	Links Ave Clubrooms - 130 Links Ave	Possible	Possible
10	Mt Holiday Park Info Centre/office - 10 Adams Ave	Possible	Possible
11	Mt Holiday Park Ocean Amenities – 10 Adams Ave	Possible	Possible
12	Mt Holiday Park Harbour amenities – 10 Adams Ave	Possible	Possible
14	Arataki Community Centre – Zambuk Way	Possible	Possible
16	Mt Library building 1	Possible	Possible
17	Mt Library building 2	Possible	Possible
18	Papamoa Library & Community Centre	Possible	Possible
24	Mt Surf Club	Possible	Possible
25	Art Gallery	High	Possible
27	Baypark Stadium building 1	Possible	Possible
28	Baypark Stadium building 2	Possible	Possible
29	Baypark Stadium building 3	Possible	Possible
30	Baypark Arena	Possible	Possible
31	Baywave TECT Aquatic & Leisure Centre	Possible	Possible
32	Mount Hot Pools building 1	Possible	Possible
33	Mount Hot Pools building 2	Possible	Possible
37	Memorial pool	High	Possible
38	Queen Elizabeth Youth Centre (including Memorial Hall)	High	Possible
39	Mount Sports Centre	Possible	Possible
45	Papamoa Sport and Recreation Centre	Possible	Possible
46	University of Waikato Adams Centre for High Performance (Adams Centre)	Possible	Possible

# Groundwater

- Assessed against the 50 percentile and 95 percentile of depth readings overtime
- 44 properties potentially affected

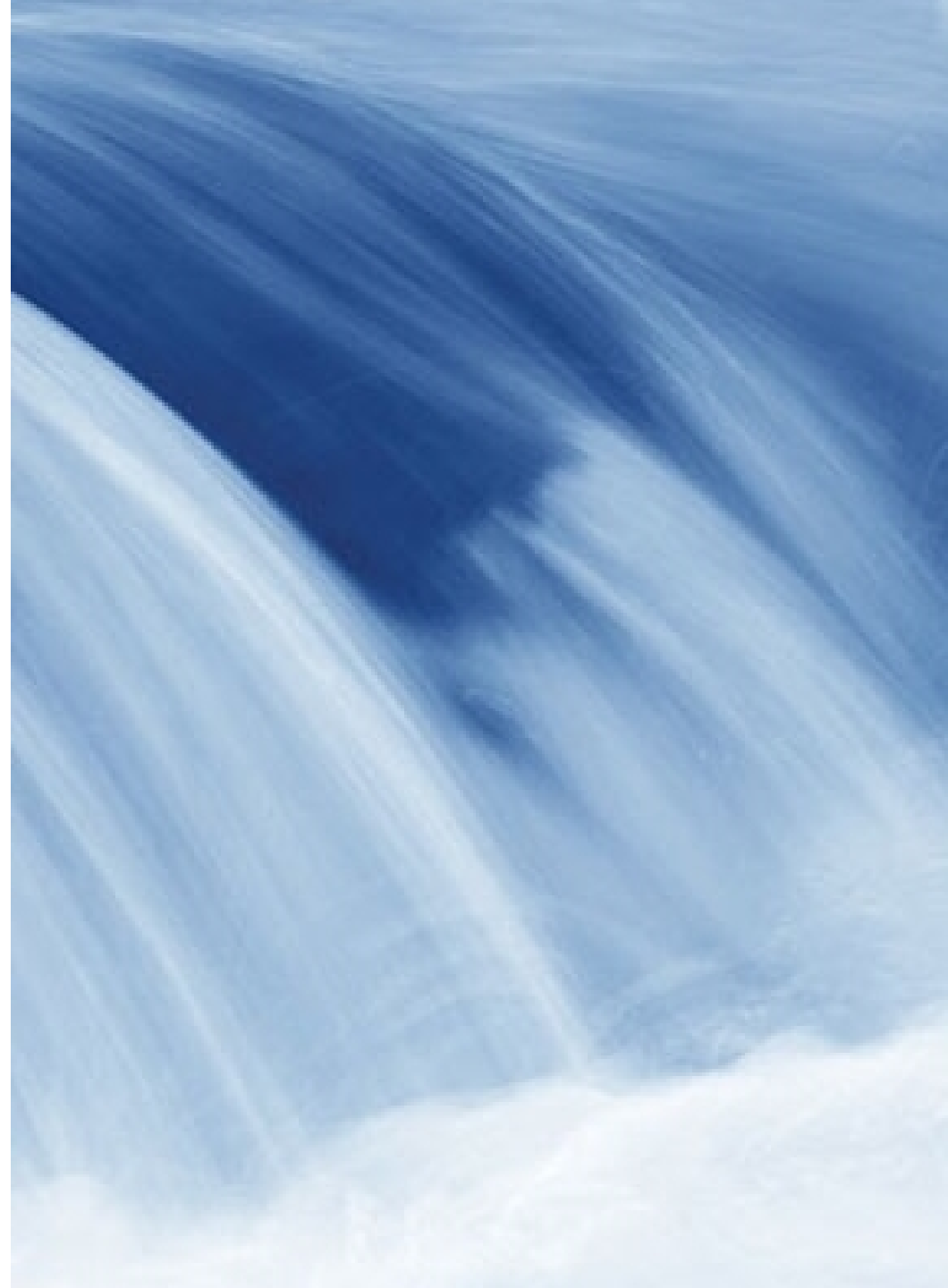


# Groundwater - summary

Property		99 Percentile					95 Percentile				
		0 to 1m	1 to 3m	3 to 5m	5 to 10m	> 10m	0 to 1m	1 to 3m	3 to 5m	5 to 10m	> 10m
0	Cargo Shed – 23 Dive Crescent	Yes	No	No	No	No	Yes	No	No	No	No
1	Property Tenancies -171 Chadwick Road (4 tenancies)	No	No	No	No	Yes	No	No	No	No	Yes
2	Property Tenancies – 72A Keith Allen Drive (4 tenancies) building 1	No	Yes	No	No	No	No	No	Yes	No	No
3	Property Tenancies – 72A Keith Allen Drive (4 tenancies) building 2	No	Yes	No	No	No	No	No	Yes	No	No
4	Links Ave Clubrooms - 130 Links Ave	No	Yes	No	No	No	No	Yes	No	No	No
5	Pemberton Clubrooms – 527 Fraser Street	No	No	No	No	Yes	No	No	No	No	Yes
6	Moreland Fox Club buildings – 21 Devon St	No	No	No	No	Yes	No	No	No	No	Yes
10	Mt Holiday Park Info Centre/office - 10 Adams Ave	No	No	No	Yes	No	No	No	Yes	No	No
11	Mt Holiday Park Ocean Amenities – 10 Adams Ave	No	No	No	No	No	No	No	No	Yes	No
12	Mt Holiday Park Harbour amenities – 10 Adams Ave	No	No	No	Yes	No	No	No	Yes	No	No
13	Mt Holiday Park Pilot amenities – 10 Adams Ave	No	No	No	No	Yes	No	No	No	No	Yes
14	Arataki Community Centre – Zambuk Way	No	Yes	No	No	No	No	Yes	No	No	No
15	Greerton Library	No	No	No	No	Yes	No	No	No	No	Yes
16	Mt Library building 1	No	No	Yes	No	No	No	No	Yes	No	No
17	Mt Library building 2	No	No	Yes	No	No	No	No	Yes	No	No
18	Papamoa Library & Community Centre	No	Yes	No	No	No	No	Yes	No	No	No
19	Residential Property – 43a, 43b, 43c Third Ave building 1	No	No	No	Yes	No	No	No	No	Yes	No
20	Residential Property – 43a, 43b, 43c Third Ave building 2	No	No	No	Yes	No	No	No	No	Yes	No
21	Residential Property – 35a Third Ave building 1	No	No	No	Yes	No	No	No	No	Yes	No
22	Residential Property – 35b Third Ave building 2	No	No	No	Yes	No	No	No	No	Yes	No
23	Papamoa Surf Club	No	No	No	Yes	No	No	No	No	Yes	No
24	Mt Surf Club	No	No	No	No	No	No	No	Yes	No	No
25	Art Gallery	No	Yes	No	No	No	No	Yes	No	No	No
26	Baycourt	No	No	No	Yes	No	No	No	No	Yes	No
27	Baypark Stadium building 1	Yes	No	No	No	No	No	No	No	No	No
28	Baypark Stadium building 2	No	Yes	No	No	No	Yes	No	No	No	No
29	Baypark Stadium building 3	No	Yes	No	No	No	No	Yes	No	No	No
30	Baypark Arena	No	Yes	No	No	No	Yes	No	No	No	No
31	Baywave TECT Aquatic & Leisure Centre	No	Yes	No	No	No	No	Yes	No	No	No
32	Mount Hot Pools building 1	No	No	Yes	No	No	No	Yes	No	No	No
33	Mount Hot Pools building 2	No	No	Yes	No	No	No	Yes	No	No	No
34	Greerton Aquatic & Leisure Centre building 1	No	No	No	No	Yes	No	No	No	No	Yes
35	Greerton Aquatic & Leisure Centre building 2	No	No	No	No	Yes	No	No	No	No	Yes
36	Otumoetai pool	No	No	No	No	Yes	No	No	No	No	Yes
37	Memorial pool	No	Yes	No	No	No	No	Yes	No	No	No
38	Queen Elizabeth Youth Centre (including Memorial Hall)	Yes	No	No	No	No	Yes	No	No	No	No
39	Mount Sports Centre	No	No	No	Yes	No	No	No	Yes	No	No
40	Bethlehem Hall	No	No	No	No	Yes	No	No	No	No	Yes
41	Matua Hall	No	No	No	No	Yes	No	No	No	No	Yes
42	Greerton Hall	No	No	No	No	Yes	No	No	No	No	Yes
43	Welcome Bay Hall	No	No	Yes	No	No	No	No	Yes	No	No
44	Tauriko Hall	No	No	No	No	No	No	No	No	No	No
45	Papamoa Sport and Recreation Centre	No	Yes	No	No	No	No	Yes	No	No	No
46	University of Waikato Adams Centre for High Performance (Adams Cen	No	Yes	No	No	No	No	Yes	No	No	No

# Landslides

- 2 properties potentially affected
- Vulnerability rating:
  - Failure - Property is on/above the slope that may fail.
  - Regression - Property is upslope from the failure point (and close to the failure point)
  - Runout - Property is downslope, within the runout zone



# Landslides - summary

No	Property	Failure	Regression	Runout
36	Otumoetai pool	Intersection	Intersection	No intersection
37	Memorial pool	No intersection	No intersection	Intersection



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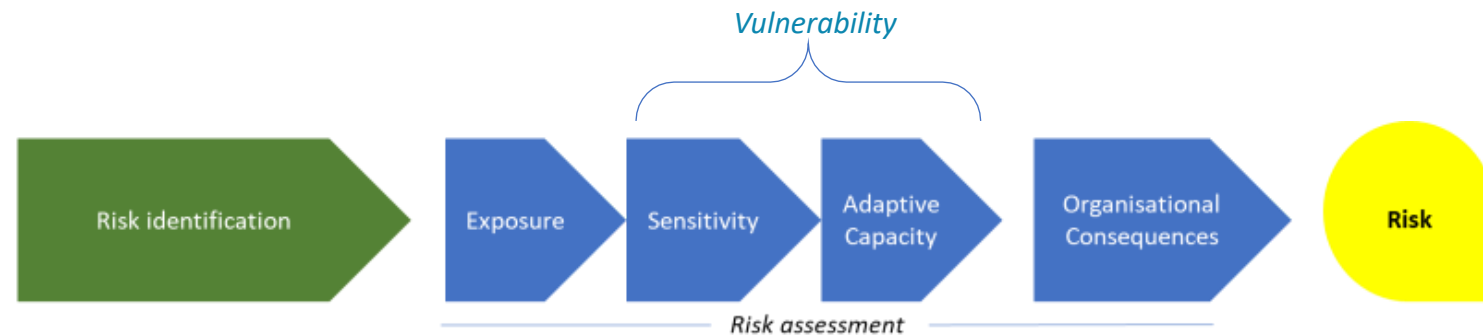


# Discussion / next steps

# Discussion

## 'Risk' assessment

- Risk can be estimated by considering:
  - Vulnerability / fragility data
  - Criticality (consequence) data



# Discussion

## Next steps:

- Phase 2 – Pilot GIS **risk** analysis of pilot Property asset group

- The asset data and geospatial data are not currently joined by a common ID.
- Seismic assessment data would be extremely useful to inform liquefaction assessment, but these are largely incomplete (i.e., <1% available).
- Construction Date (i.e., Age) and Condition are the only asset attributes that are complete enough to consider using. However, these are the least valuable data sets for informing asset vulnerability.
- There is no criticality data available.

## Data issues for 'risk' assessment