Harbour objective setting

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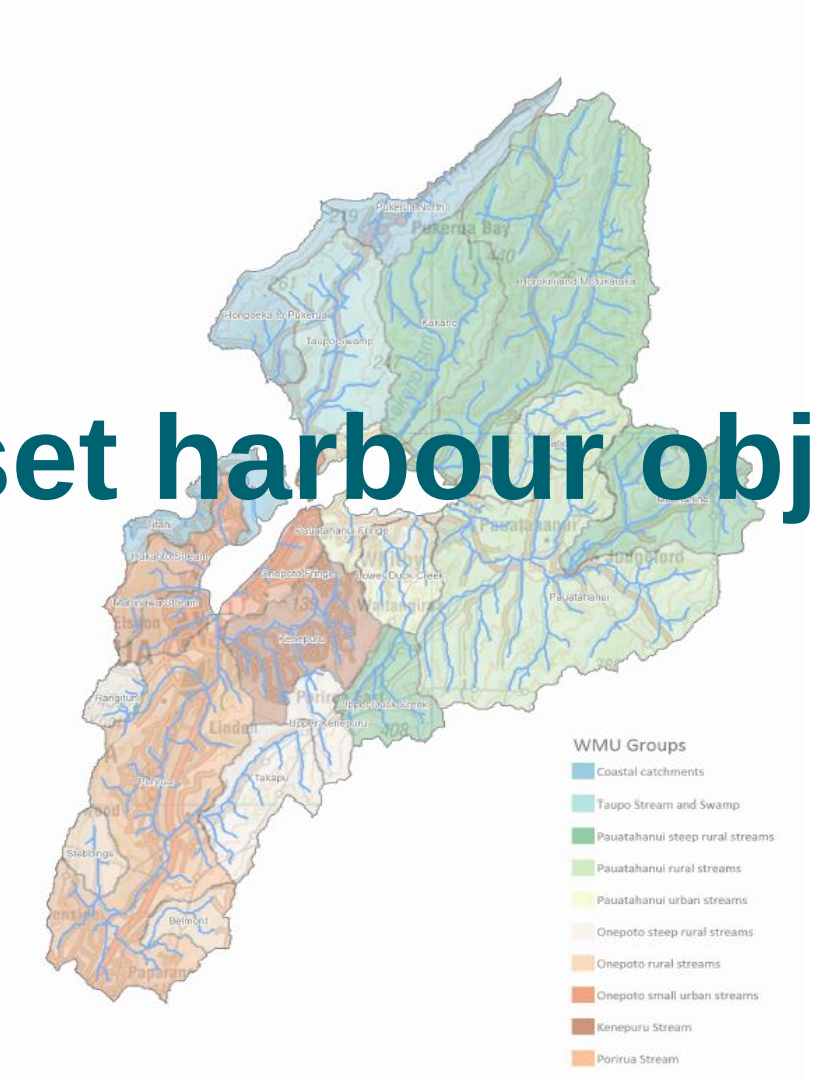
Why set harbour objectives?



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What you have already done

Draft objective setting based on qualitative analysis by Megan Oliver and Leigh Stevens, Committee workshop 31.05.2018

	Annual avg sedimentation rate			% area with soft mud			Copper			Zinc			Macroalgae (intertidal only			Invertebrates		
Grouping	Current state	Objective	Minimum scenario to achieve objective	Current state	Objective	Minimum scenario to achieve objective	Current state	Objective	Minimum scenario to achieve objective	Current state	Objective	Minimum scenario to achieve objective	Current state	Objective	Minimum scenario to achieve objective	Current state	Objective	Minimum scenario to achieve objective
Pauatahanui Intertidal	C	C↑	Imp	C	**B**	Imp	A	**A**	Imp	A/B	**A/B**	Imp	C	**C**	Imp	B	**B↑**	Imp
Pauatahanui subtidal				D	**D↑↑**	WS	A	**A**	Imp	B	**B↑**	WS	N/A			C	**C**	Imp
Onepoto intertidal	B	**A**	Imp	B	**B**	Imp	A	**A**	Imp	A/B	**A/B**	Imp	C	**C↑**	WS	B	**B↑**	Imp
Onepoto subtidal				D	**D↑↑**	WS	B	**B↑**	WS	C	**C↑**	WS	N/A			C	**C↑**	WS

Band	Description
A	Reflects relatively natural levels
B	Minor stress
C	Moderate stress and risk of losing sensitive species
D	Significant, persistent stress with likely loss of expected species
↑ or ↑↑	Relative improvement with band

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Sediment

- Affects ecological, mana whenua, recreational and amenity values
  - Alters and degrades habitat and community composition
  - Smothers invertebrates, shellfish and seagrass
  - Changes depth and flow
  - Feel of substrate under-foot
  - Reduces water clarity

Where does it come from?

Catchment	Catchment contribution to harbour deposition (%)		Current State			
	Pauatahanui Inlet	Onepoto Arm	Annual average sediment load (T/yr)	% load from different erosion processes		
				Hill slope	Land slide	Stream bank
Pauatahanui Stream	56	1	3,214	41	6	53
Horokiri Stream	21	-	955	31	36	33
Duck Creek	11	-	526	69	26	6
Kakaho Stream	6	-	245	43	41	16
Ration Creek	4	-	196	91	0	9
Porirua Stream	1	93	2,655	59	32	9
Kenepuru catchment	-		818	48	50	2
Porirua Stream catchment			1,705	66	26	7

- Most sediment comes from 4 catchments
- Mix of erosion processes

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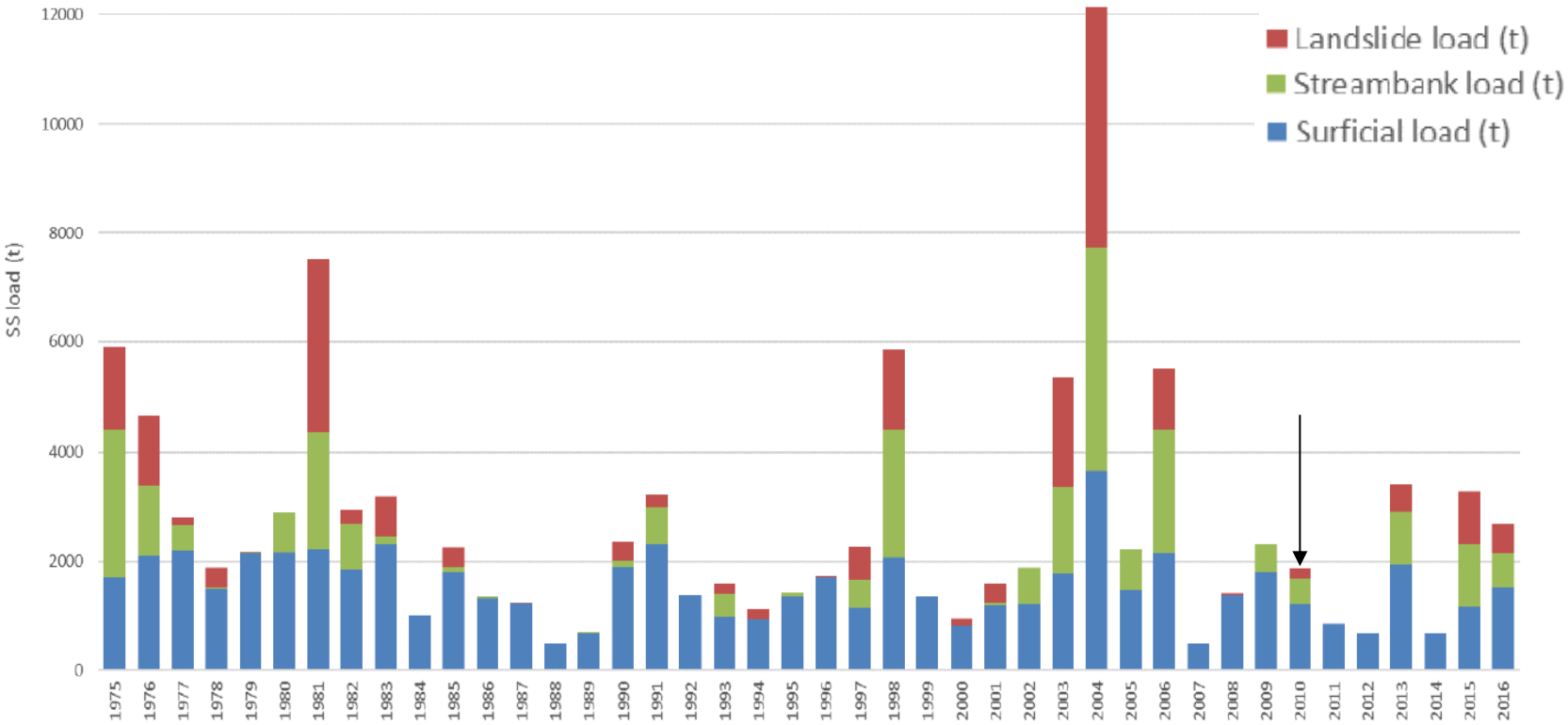
Where does it come from?



- Some years can have inputs more than double our modelled year
- Large variation in size of landslide and streambank sources
- In some years, sediment comes during high rainfall and river flow events that can trigger landslides and streambank erosion

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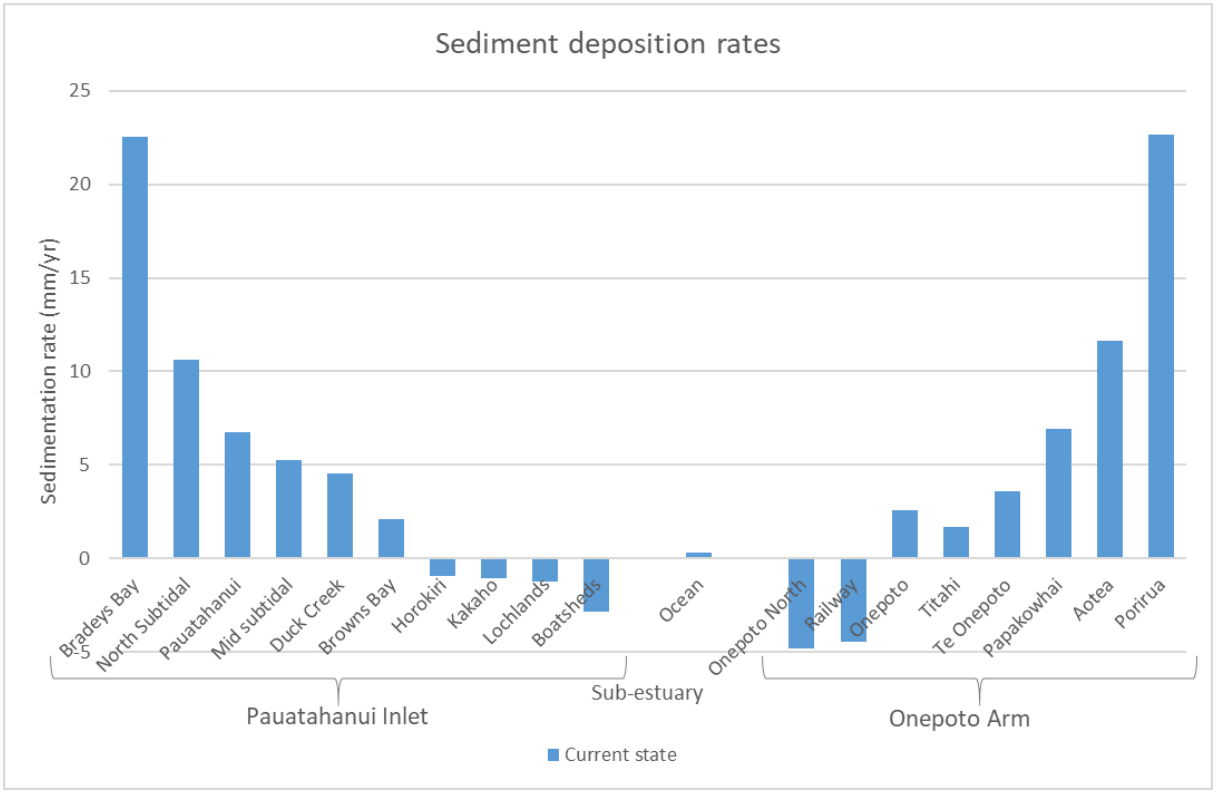
Where does it go?

	Catchment inputs (t/yr)	Export (t/yr)	Deposition (t/yr)	Sedimentation rate (mm/yr)
Pauatahanui Inlet	5,500	1,500	4,000	4.7
Onepoto Arm	3,300	750	2,550	4.1



- Current rate may already be impacting on the values of the harbour
- Intertidal areas tend to have more erosion and less mud
- Subtidal areas tend to have more deposition and mud
- These reflect mid-range year – would expect higher deposition after very wet years
- Lots of wind and wave resuspension and movement

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What do our scenarios do on the land and streams?

Catchment	Current State	BAU	Improved	Water sensitive
	Annual average sediment load (T/yr)	% change in annual average sediment load		
Pauatahanui Stream	3,214	3	-35	-43
Horokiri Stream	955	-1	-49	-51
Duck Creek	526	-28	-56	-57
Kakaho Stream	245	-3	-64	-65
Ration Creek	196	3	-12	-13
Porirua Stream	2,655	-12	-47	-50
Kenepuru catchment	818	-55	-70	-71
Porirua Stream catchment	1,705	6	-40	-42

- Modelled scenario reductions are different in each catchment, BUT…strongly influenced by scenario setup
- Most reduction with improved scenario, little additional reduction with water sensitive
- Large reductions in landslide sources from stabilising the higher risk slopes
- Reducing streambank erosion from stabilising stream banks through stock exclusion and riparian planting. Further reductions are likely associated with reductions in peak flows.

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What do our scenarios do in the harbour?

	Catchment inputs		Export		Deposition		Sedimentation rate	
	t/yr	% change	t/yr	% change	t/yr	% change	mm/yr	% change
Pauatahanui Inlet								
Current state	5,500		1,500		4,000		4.7	
BAU	5,400	-2	1,500	0	3,900	-3	4.4	-6
Water Sensitive	3,000	-45	1,450	-3	1,550	-61	2.0	-57
Onepoto Arm								
Current state	3,300		750		2,550		4.1	
BAU	2,800	-15	750	0	2,050	-20	2.5	-39
Water Sensitive	1,400	-58	650	-8	710	-72	0.3	-93

- Reductions in catchment inputs, deposition and sedimentation rates
- Modelled scenario rates reach levels likely to be less than 2 mm/yr over background
- Still likely to have higher deposition in wetter years
- High resuspension means catchment reductions had no change on water column sediment

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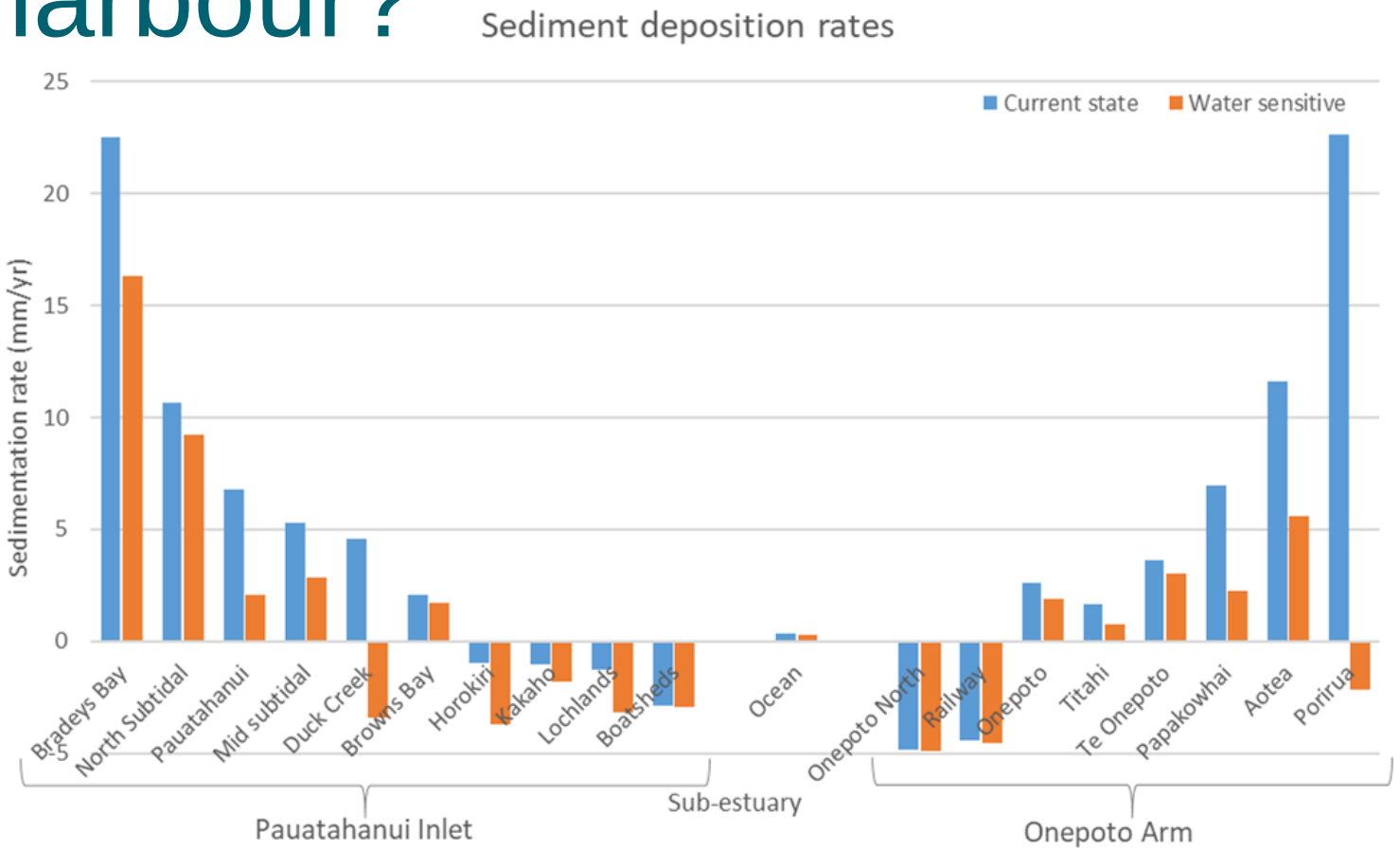
What do our scenarios do in the harbour?



- Patterns of erosion and less mud likely to continue on intertidal areas
- Some areas that are depositing may become erosional
- Depositional and muddy subtidal areas may continue to have high sedimentation and mud levels

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Advice on sediment objectives

- Reduce sedimentation rate over both arms of the harbour
- Protect valuable and vulnerable intertidal areas
- Recognise that deeper subtidal areas are inherently muddier and have legacy
- Recognise and provide for variability in sediment deposition through time and in places around the harbour
- Water column sediment cannot be managed through catchment management at this stage
- Will require significant reductions in catchment sediment inputs

Sediment objectives

- The annual average sedimentation rate is less than 2 mm per year [and no more than double the natural sedimentation rate] in the Pauatahanui Arm.
- The annual average sedimentation rate is less than [1 mm or 2 mm] per year [and no more than double the natural sedimentation rate] in the Onepoto Arm.
- Sediment mud content does not exceed 20% in the intertidal sediments and should not increase from current state.
- Spatial extent of soft mud shall not exceed 15% of the available intertidal area and no increase in soft mud area from current state.

Pathogens

- Affects on mana whenua and recreational values
- Strong community expectations to be safer to swim more of the time

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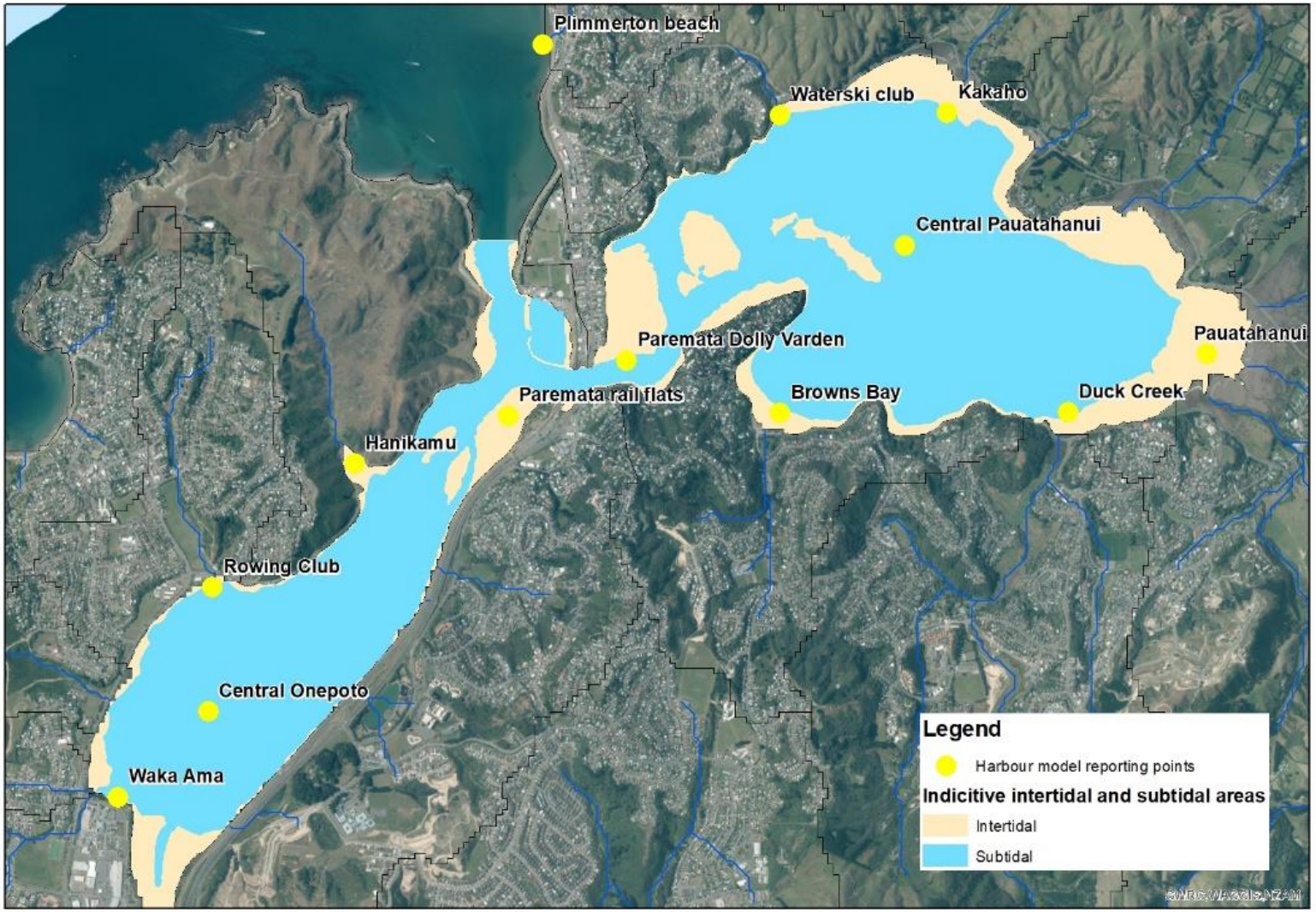
Where are we looking at?



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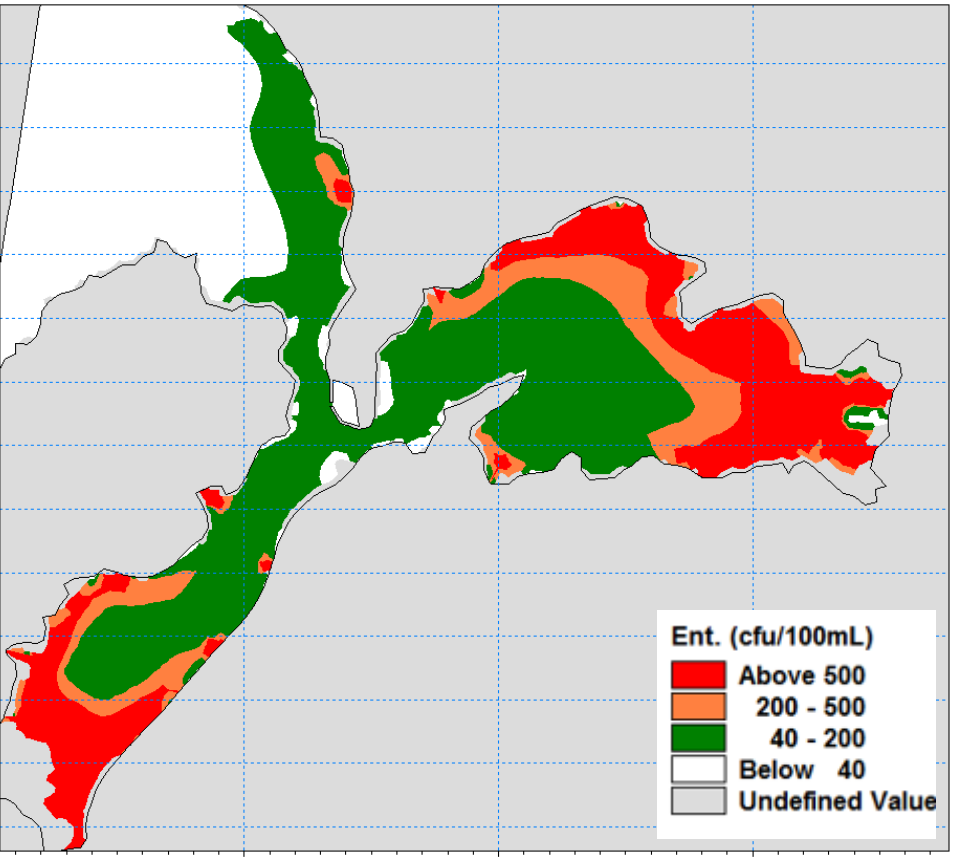
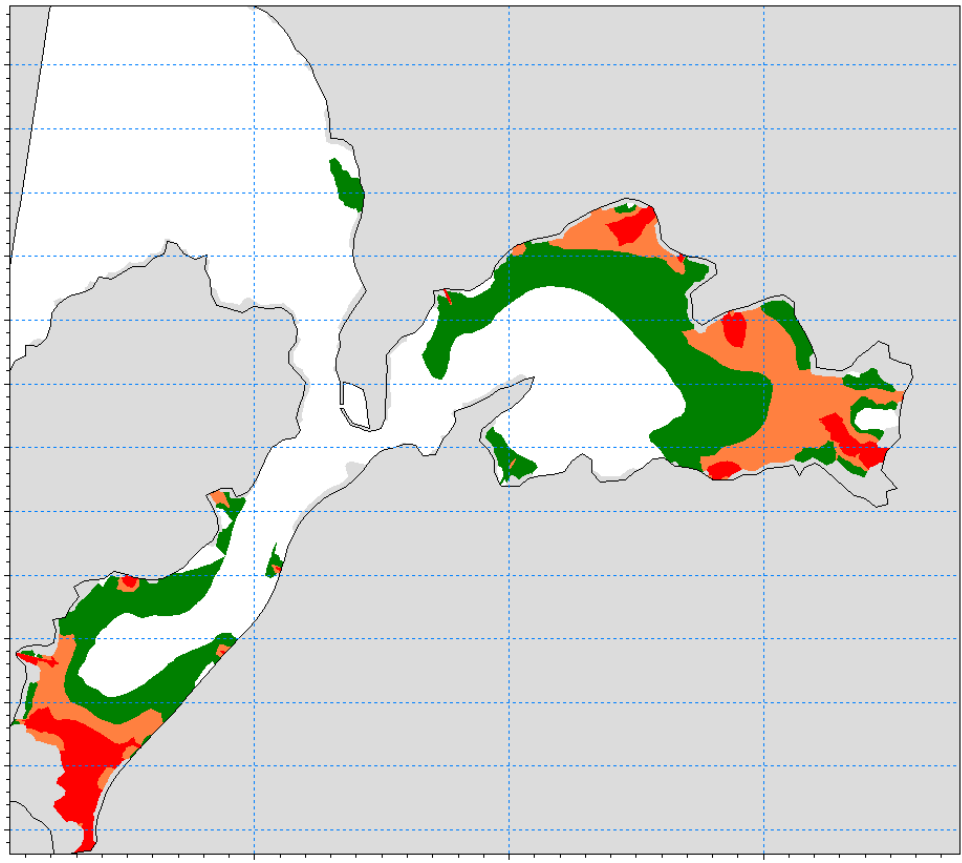
What do our scenarios get us on the land and streams?

- Current state needs improvement in both arms of the harbour
- Modelled pathogen levels in some smaller streams might be modelled as worse than reality
- *E. coli* objectives in Pauatahanui Inlet streams likely require improvements between levels achieved in Improved and Water Sensitive scenarios
- *E. coli* objectives in Onepoto Arm streams likely require improvements greater than the levels achieved in Water Sensitive scenario

What do our scenarios get us in the harbour?



Current state



Water sensitive

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What do our scenarios get us in the harbour?

	Model reporting location	Current state	BAU	Water sensitive
Pauatahanui intertidal	Duck Creek	D	D ↑	C*
	Browns Bay	B	B	A
	Pauatahanui	D	D ↑	C
	Kakaho	D*	C	B
	Water Ski	C*	B	B
	Paremata Dolly Varden	B	B	A
Pauatahanui subtidal	Central Pauatahanui	B	B ↑	A
Onepoto intertidal	Waka Ama	D	D	D ↑↑
	Rowing Club	D	D	C
	Paremata Rail flats	B	B	A
	Hanikamu	C*	B	B*
Onepoto subtidal	Central Onepoto	B	B	A
Outer harbour	Plimmerton beach	B	B	A

- Higher levels at the upper parts of the harbour and major stream mouths, that pattern is likely to continue
- Most places are likely see a band change improvement
- Each reporting point is influenced by many catchment, but dominated by the nearest catchments
- *E. coli* objectives in Pauatahanui Inlet streams may not deliver as much change as scenario results
- *E. coli* objectives in Onepoto Arm streams may deliver more change than scenario results, but unknown if this would be enough to change a further band

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Advice on pathogen objectives

- Reduce pathogens in both arms of the harbour
- Make it safer to recreate in the harbour more of the time
- Recognise that shallower waters around the edges of the harbour are more risky and harder to reduce risks
- Recognise that deeper central waters with higher tidal flow and currents are lower risk
- Outer harbour and open coastal waters are generally lower risk with high mixing and dilution. Catchment management likely has limited influence on risk in these places.

Pathogen objectives

- Onepoto Arm intertidal – C band
- Onepoto Arm subtidal – A band
- Pauatahanui intertidal – B band
- Pauatahanui subtidal – B band
- Potential objectives for Open Coast – to be discussed?

Macroalgae

- Affects ecological and aesthetic values
- Indicative of nutrient and sediment conditions
- Excessive amounts can
  - Reduce light for desirable species
  - Smother shellfish beds and other desirable species
  - Reduce waves and currents causing mud to accumulate
  - Unpleasant to see and walk through, smell as breaks down

Macroalgae

- Current state: moderate macroalgae cover and low biomass, so no problematic nuisance conditions
- No new modelling information
- Reviewed monitoring data and earlier advice
- Macroalgae is flicking between the C and B band conditions.
- Likely to be maintained or improved to within B band condition

Advice on macroalgae objectives

- Maintain or reduce macroalgae coverage and entrainment
- Drivers of macroalgae are managed through other objectives:
  - Nutrient concentration criteria for periphyton objectives will limit or reduce nutrients entering harbour
  - Ammonia toxicity objectives and pathogen objectives will reduce nutrients entering the harbour from wastewater overflows
  - Sedimentation objectives will reduce sediments entering the harbour

Macroalgae objectives

- EQR is not less than 0.6 (B band) and does not worsen from current state in intertidal areas

Metals

- Affects ecological values through toxicity to animals
- Monitoring shows conditions close to toxic conditions in some hotspots, particularly subtidal areas
- Not much change in last 10 years

Advice on metals objectives

- Maintain or reduce metals
- Subtidal areas are muddier and have higher legacy contamination that will be harder to reduce than intertidal areas
- Hotspots tend to be in the sediment deposition areas and high sources
- Relative reductions in sediments and metals
- Setting harbour objectives will help direct management of stormwater discharges into the harbour

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Metal objectives

- Concentrations of metals in intertidal sediments should be no more than 0.5 times ANZECC guideline values (ISQG–Low), including reducing contamination in known intertidal hot spot areas (B band)
- Concentrations of metals in subtidal sediments are to reduce below ANZECC (ISQG-Low) guidelines (C band)

Invertebrates

- No new information from modelling
- Will develop a narrative objective reflecting your previous banded objective
- Drivers of invertebrate conditions are managed through other objectives?