

Salt Ecology Short Report 014. Prepared by Leigh Stevens for Greater Wellington Regional Council, June 2022.

OVERVIEW

Since 2010, Greater Wellington Regional Council has undertaken annual State of the Environment (SOE) monitoring in Hutt Estuary to assess trends in the deposition rate, mud content, and oxygenation of intertidal sediments. Monitoring is conducted at a single site in the only remaining intertidal flat in the lower estuary (Fig. 1) with the most recent results collected on 21 January 2022 summarised here.

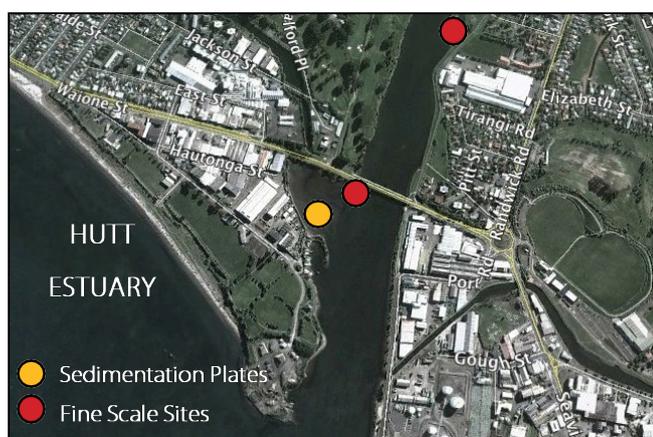
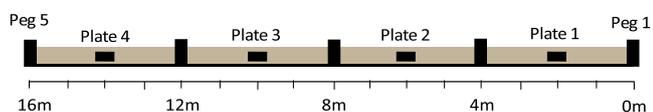


Fig. 1. Location of Hutt Estuary monitoring sites.

METHODS

Estuary sedimentation was measured using the 'sediment plate' method, as described in Robertson and Stevens (2010). The approach involves measuring the sediment depth from the surface to the top of each of four buried concrete plates, configured as follows:



Measurements are averaged across each plate (n=3) and used to calculate a mean annual sedimentation rate for the site. As year-to-year sedimentation changes can be highly

variable, a 5-year rolling mean sedimentation rate is reported where sufficient data are available.

A composite sample of the surface 20mm of sediment is simultaneously collected, and analysed for particle grain size (wet sieve, RJ Hill laboratories). This approach allows changes in sediment muddiness to be determined even where there are no changes in sediment depth.

Sediment oxygenation is an ancillary biological health variable that is visually assessed in the field by measuring the depth at which sediments show a change in colour to grey/black, commonly referred to as the apparent Redox Potential Discontinuity (aRPD). Results are compared to condition ratings of ecological state shown in Table 1.

RESULTS

Sedimentation rate

The overall mean sedimentation rate for the past 10 years (2013-2022) was 2.6 mm/y, reflecting an initial period of erosion, followed by steady sediment accrual from 2016 to 2019, but becoming more variable over the past 3 years (Fig. 2). The overall rate of increase corresponds to a condition rating of 'poor' (Table 2). Due to more recent accrual (particularly from 2017-2019), the mean sedimentation rate over the last 5 years (2018-2022) has increased to 3.5 mm/y, also rated as 'poor'.

Table 2. Indicator values and condition ratings from the Jan-2022 survey.

Indicator	Site A
Sedimentation rate (last 5 years) ¹	3.5
Sedimentation rate (last 10 years) ¹	2.6
Mud content (%)	17.4
aRPD (mm)	16.0

¹5yr and 10yr refers to trend period.

Table 1. Summary of condition ratings for sediment plate monitoring.

Indicator	Unit	Very Good	Good	Fair	Poor
Sedimentation rate ¹	mm/yr	< 0.5	≥0.5 to < 1	≥1 to < 2	≥ 2
Mud content ²	%	< 5	5 to < 10	10 to < 25	≥ 25
aRPD ³	mm	≥ 50	20 to < 50	10 to < 20	< 10

Condition ratings derived or modified from: ¹Townsend and Lohrer (2015), ²Robertson et al. (2016), ³FGDC (2012).

The reasons for the temporal variance in erosion and accretion patterns are unclear, but may relate to altered catchment sediment inputs, or variability due to river flow conditions. In the Hutt Estuary, high river flows can cause scouring of the tidal flats, which has been observed, on occasion, during monitoring. The Te Mome Stream channel, which discharges across the tidal flats near the site, also has a localised influence on sediment movement and partially explains the relatively high variance between plates within years.

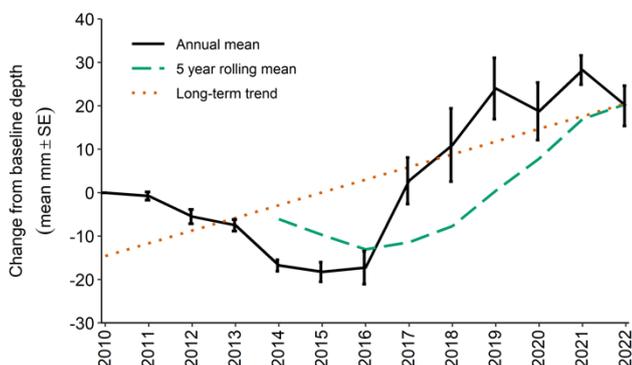


Fig. 2. Change in mean sediment depth over buried plates (\pm SE) relative to baseline year (Jan 2010), Hutt Estuary.

Sediment mud content and oxygenation

Mean sediment mud content in Jan-2022 was 17.4%. This value is within the range of previous measurements and corresponds to a condition rating of 'fair'. Unlike in previous surveys (2015, 2016 and 2020) where periods of sediment erosion have correlated with low mud contents, the mud content increased since 2021 despite sediments eroding.

The average aRPD depth (based on replicate measurements adjacent to each plate) was 16mm in January 2022, a condition rating of 'fair' (Table 3). This level of oxygenation is partially maintained by the presence of crabs and burrowing organisms, which turn over surface sediments and create voids that allow air and water to transfer oxygen to underlying sediments.



Moderately well-oxygenated muddy sand sediment at Site A.

Table 3. Sedimentation rate, grain size (%) and aRPD (mm) results compared to Table 1 condition ratings.

Year	Sed rate mm/yr	Gravel %	Sand %	Mud %	aRPD mm
2011	-1.0	-	-	-	-
2012	-4.3	-	-	-	-
2013	-2.2	-	-	-	-
2014	-9.1	3.6	74.5	21.9	15
2015	-1.5	10.1	77.6	12.3	15
2016	1.0	8.8	74.8	16.4	8
2017	19.7	5.5	71.3	23.2	13
2018	8.4	7.8	68.4	23.8	15
2019	13.0	9.5	66.7	23.8	20
2020	-5.3	9.1	73.7	17.2	25
2021	10.6	9.8	77.9	12.3	30
2022	-7.4	12.0	70.6	17.4	16

Note: Grain size results are based on a single composite sample.

CONCLUSIONS

The sedimentation rate over the past 10 years shows an overall trend of deposition, with a moderately elevated sediment mud content, and moderately shallow and variable aRPD depth. These results indicate the intertidal estuary flats remain under pressure from sediment deposition. They reinforce previous recommendations to assess and manage fine sediment inputs to the estuary, noting that most fine sediment is likely to deposit in subtidal basin areas which are not monitored.

RECOMMENDED MONITORING

Continue annual monitoring of sediment rate, aRPD and grain size to measure intertidal sediment deposition and temporal change. Report results annually via a summary card report, with detailed reporting undertaken ~5 yearly in conjunction with fine scale monitoring.

REFERENCES

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