



# Southwest WWTP REMP Summary Environmental Care Report

Final - September 2025

Watercare 


## QUALITY INFORMATION

<b>Document</b>	Annual Report
<b>Date</b>	30 September 2025
<b>Name and position of originator</b>	Diana Villa Ortega; Environmental Scientist
<b>Report directory</b>	L:\WATER VALUE\1_Environmental care\Projects\Southwest\REMP\Reports\1019588.1.2.2-RPT-EC-SW REMP Reef Monitoring Report 2024_FINAL DRAFT v1.docx

## REVISION HISTORY

Rev	Revision Date	Name	Position	Signature
1	29/09/2025	Michiel Jonker	Environmental Care Manager	

## APPROVED

Date	Name	Position	Signature
29/09/2025	Michiel Jonker	Environmental Care Manager	

## CONSENT CHANGE AND MONITORING HISTORY

Change type	Description	Effective date	Reference / condition	Reporting / monitoring implications
Programme initiation	Commencement of Year 1 baseline monitoring under the Southwest Receiving Environment Monitoring Programme (SW REMP), covering water quality, benthic ecology, shellfish, reef ecology, and vegetation mapping.	June 2024	Condition 27, CST60082600 and CST60082302; Certified REMP (2024)	Annual reporting to Auckland Council required; results form the first year of the two-year baseline dataset.

## EXECUTIVE SUMMARY

Watercare Services Limited is required, under Condition 27 of the Clarks Beach wastewater treatment consents (CST60082600 and CST60082302), to establish a Receiving Environment Monitoring Programme (REMP) for the Waiuku Estuary and southern Manukau Harbour. The REMP is designed to provide a robust two-year baseline prior to the commencement of discharges from the new Clarks Beach outfall in 2026. This document presents the first Annual REMP Report, covering the period June 2024 to June 2025, and integrates results from four technical workstreams: water quality and benthic ecology, shellfish monitoring, reef ecology, and vegetation mapping.

### Key findings

Coastal water quality and benthic ecology: Water quality was generally moderate across the ten sites, with seasonal cycles in nutrients and phytoplankton reflecting natural estuarine processes. Whatapaka (WQ8) consistently showed higher nutrients, turbidity, and microbial counts, reflecting upstream catchment influences. Benthic surveys recorded diverse communities dominated by juvenile cockles, with health scores rated fair at most sites and good at Clarks Beach.

- Shellfish monitoring: Contaminant concentrations in oysters remained below food safety guidelines, though elevated copper, zinc, and arsenic were detected at Gordon's Landing. Faecal coliform exceedances occurred at Matakawau and Te Toro, likely due to diffuse sources. Wild oyster populations were stable, while cockles were abundant but largely juvenile.
- Reef ecology: Baseline surveys at Tokaroa Point confirmed diverse and structured intertidal communities dominated by barnacles, oysters, mussels, and common intertidal gastropods. Community composition was consistent with regional baselines, with no unusual disturbance or loss of sensitive species recorded.
- Vegetation mapping: Aerial and ground-truthed surveys mapped 460–933 ha of seagrass and extensive mangroves. No persistent large-scale nuisance algal blooms were observed, though small, transient patches of *Ulva* and *Gracilaria* were confirmed through ground surveys.

### Overall conclusion

The first year of baseline monitoring demonstrates that the Waiuku Estuary and southern Manukau Harbour currently support moderately healthy ecological communities with some localised stressors, including elevated metals at upstream sites, episodic bacterial exceedances, and the transient nature of nuisance algae. These results establish the baseline against which future change will be assessed once the new outfall is operational.

### Next steps

Year 2 monitoring will continue to build the baseline dataset, confirm patterns observed in Year 1, and provide Watercare and Auckland Council with a strong reference for detecting and managing any environmental changes following the commissioning of the Clarks Beach outfall in 2026.

## TABLE OF CONTENTS

1	Introduction .....	1
1.1	Background.....	1
1.2	Scope .....	1
2	REMP summary.....	2
2.1	Monitoring design .....	2
2.2	Water quality.....	2
2.3	Shellfish monitoring.....	3
2.4	Benthic ecology and sediment quality .....	4
2.5	Reef ecology .....	5
2.6	Vegetation mapping .....	6
3	Results.....	8
3.1	Water quality.....	8
3.1.1	General water quality .....	8
3.1.2	Microbial indicators .....	8
3.1.3	Dissolved oxygen (24-hour profile).....	8
3.1.4	Phytoplankton.....	8
3.1.5	Key observations .....	8
3.2	Shellfish monitoring.....	9
3.3	Benthic ecology and sediment quality .....	9
3.3.1	Sediment quality .....	9
3.3.2	Macrofuana.....	9
3.3.3	Benthic health indices.....	9
3.3.4	Subtidal habitat and biogenic features.....	9
3.3.5	Key observations .....	10
3.4	Reef ecology .....	10
3.4.1	Sessile species .....	10
3.4.2	Mobile species .....	10
3.4.3	Community composition.....	10
3.4.4	Key observations .....	10
3.5	Vegetation mapping .....	11
3.5.1	Habitat mapping .....	11
3.5.2	Ground truthing .....	11
3.5.3	Key observations.....	11

4 Conclusion..... 1

Appendix A. Watercare Services Southwest Manukau. Water Quality and Benthic Ecology Baseline Monitoring 2024-2025

Appendix B. Clark’s wastewater treatment plant upgrade: Pre-construction shellfish monitoring 2024/2025

Appendix C. Southwest Receiving Environment Monitoring Programme. Reef Monitoring

Appendix D. Vegetation Mapping and Identification. Southwest Receiving Environment Monitoring Programme

**LIST OF FIGURES**

Figure 2-1 Location of water quality monitoring sites..... 3  
Figure 2-2 Benthic ecology and sediment sites including amendments to the originally proposed site locations and the perimeter shapes. .... 4  
Figure 2-3 Map showing approximate spatial area for stratified random, video transect start points for the biogenic habitat survey..... 5  
Figure 2-4 Location of transect lines at Tokaroa Point reef..... 6  
Figure 2-5 Spatial extent of focus area for estuarine vegetation mapping. .... 7

## ACRONYMS AND ABBREVIATIONS

Acronym	Definition
cfu	Colony forming units
CLG	Community Liaison Group
DO	Dissolved Oxygen
DRP	Dissolved Reactive Phosphorus
ESP	Environmental Services Panel (procurement contract reference)
GEL	Guideline Environmental Level
ha	Hectare
IANZ	International Accreditation New Zealand
mg/L	Milligrams per litre
mg/kg d.w.	Milligrams per kilogram dry weight
PAH	Polycyclic Aromatic Hydrocarbon
pH	Measure of acidity/alkalinity
REMP	Receiving Environment Monitoring Programme
RGB	Red–Green–Blue (colour imagery spectrum)
TAN	Total Ammoniacal Nitrogen
TIN	Total Inorganic Nitrogen
TN	Total Nitrogen
TON	Total Oxidised Nitrogen
TP	Total Phosphorus
TSS	Total Suspended Solids
WQ	Water Quality (site codes, e.g., WQ1–WQ10)
WWTP	Wastewater Treatment Plant

# 1 INTRODUCTION

## 1.1 Background

In 2018 Watercare Services Limited was granted resource consents (CST60082600 and CST60082302) for the construction of a new wastewater outfall at Clarks Beach and for the discharge of treated wastewater into the Waiuku Estuary. Condition 27 of these consents requires the development and implementation of a Receiving Environment Monitoring Programme (REMP). The purpose of the REMP is to establish a comprehensive environmental baseline and to detect and evaluate spatial and temporal trends in water quality, shellfish quality, marine benthic ecology, reef ecology, and marine vegetation of the southern Manukau Harbour. Monitoring is required for a minimum of two years prior to the commencement of discharge through the new outfall, which is scheduled to be operational in May 2026.

## 1.2 Scope

Under Condition 27 of the consents for the Southwest Subregional Wastewater Treatment Plant, Watercare is required to report annually on the findings of the baseline monitoring. This summary report represents the first Annual REMP Report, covering the period June 2024 to June 2025. Results from each year of baseline monitoring must be collated and submitted to Auckland Council in accordance with the certified REMP. These reports are required to include interpretation of results, assessment against relevant guidelines and standards, and recommendations for any adjustments to the monitoring programme. This integrated summary draws on the findings of four technical baseline reports that form part of the Year 1 REMP monitoring programme.

This summary report presents the findings from the first year of baseline monitoring (June 2024–June 2025) undertaken in accordance with the certified REMP. It integrates results from multiple technical workstreams:

- Coastal water quality and benthic ecology – monthly water quality sampling, diurnal dissolved oxygen, phytoplankton, and benthic macrofauna and sediment characterisation (Appendix A)
- Shellfish monitoring – contaminant analysis and microbial assessment of farmed oysters, plus population surveys of wild oysters and cockles (Appendix B).
- Reef ecology – rocky reef baseline surveys at Tokaroa Point (Appendix C).
- Vegetation mapping – aerial and ground-truthed surveys of seagrass and nuisance macroalgae (Appendix D).

## 2 REMP SUMMARY

### 2.1 Monitoring design

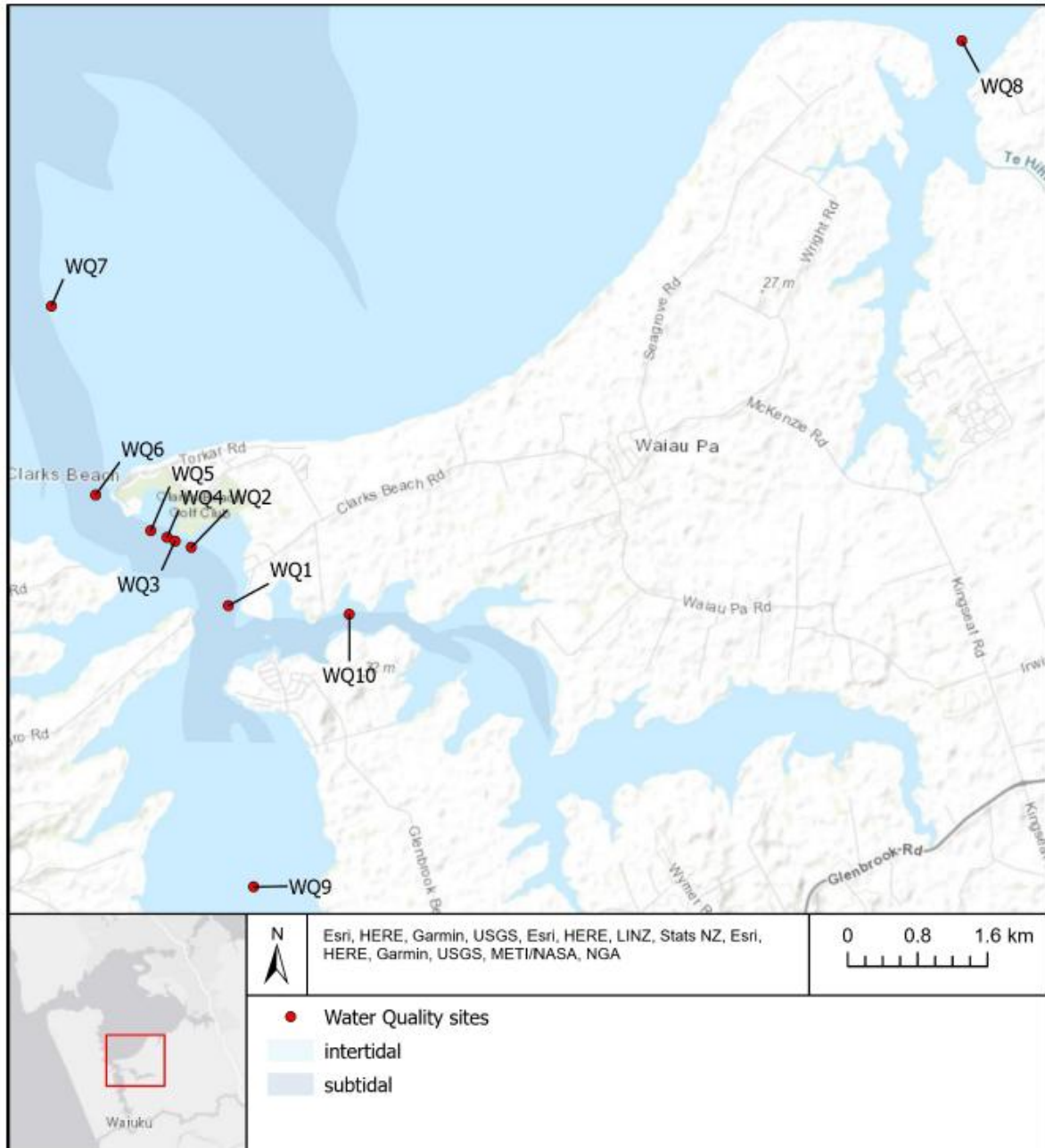
The REMP was designed to establish a robust baseline prior to commissioning of the new Clarks Beach wastewater outfall in 2026. Monitoring began in June 2024 and is scheduled to continue for two years before discharges commence. The programme integrates multiple components (water quality, shellfish, benthic ecology, reef ecology, and vegetation mapping) to capture spatial and temporal variability in the southern Manukau Harbour, particularly within the Waiuku Estuary.

### 2.2 Water quality

Ten sites were sampled monthly: 50 m south (WQ3) and north (WQ4), 250 m south (WQ2) and north (WQ5), 1 km south (WQ1) and north (WQ6), 3 km north (WQ7), Whatapaka (WQ8), Upper Waiuku (WQ9), and Taihiki Creek (WQ10) (Figure 2-1).

Field measurements (salinity, temperature, dissolved oxygen, pH, conductivity) were collected using YSI field meters. Water samples were analysed by Watercare Laboratories for nutrients (ammoniacal-N, total oxidised nitrogen, total inorganic nitrogen, total nitrogen), phosphorus (dissolved reactive phosphorus, total phosphorus), chlorophyll-a, total suspended solids, turbidity, *enterococci*, and faecal coliforms.

Additional monitoring including 24-hour dissolved oxygen profiles were undertaken in December 2024, March 2025, and May 2025 at the 250 m North site (WQ5). Monthly phytoplankton sampling was conducted at six sites (WQ2, WQ5, WQ6, WQ7, WQ9, WQ10), with cell counts and taxonomic identification to genus or species level.



**Figure 2-1 Location of water quality monitoring sites.**

### 2.3 Shellfish monitoring

Five sites in the Waiuku Estuary – Matakawau Headland (M), Karaka Point (K), Te Toro Boat Ramp (R), Te Toro Road Settlement (S), and Gordon’s Landing (G).

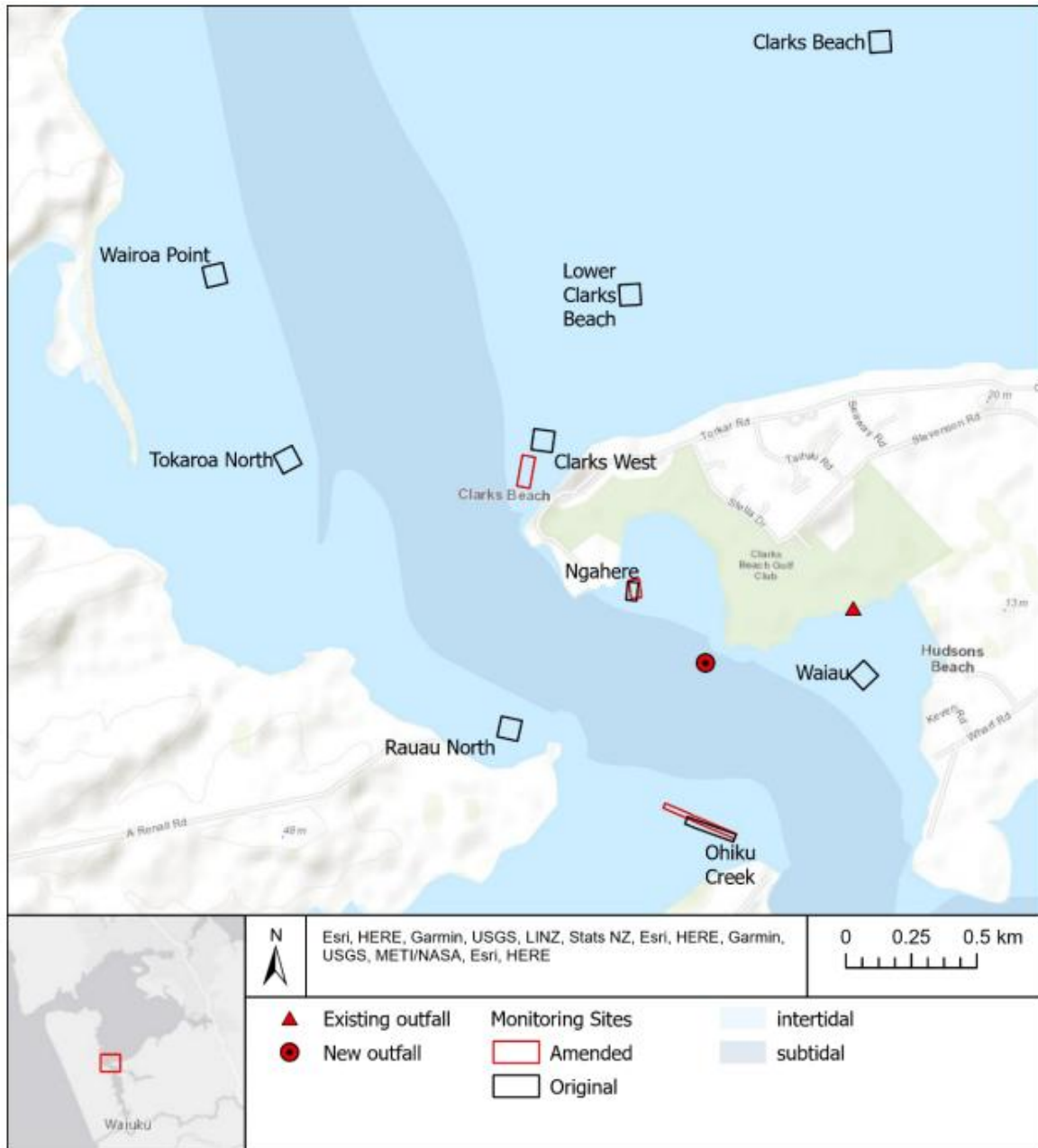
Farmed Pacific oysters were deployed in bags for acclimation prior to collection. Samples were analysed for microbial indicators (faecal coliforms, enterococci, enterovirus), metals (arsenic, copper, zinc, lead), and polycyclic aromatic hydrocarbons (PAHs).

In addition wild oyster and cockle populations were surveyed at sites C1–C5 (October 2024 and February 2025), with density and size frequency measured using quadrats and counts per m<sup>2</sup>

## 2.4 Benthic ecology and sediment quality

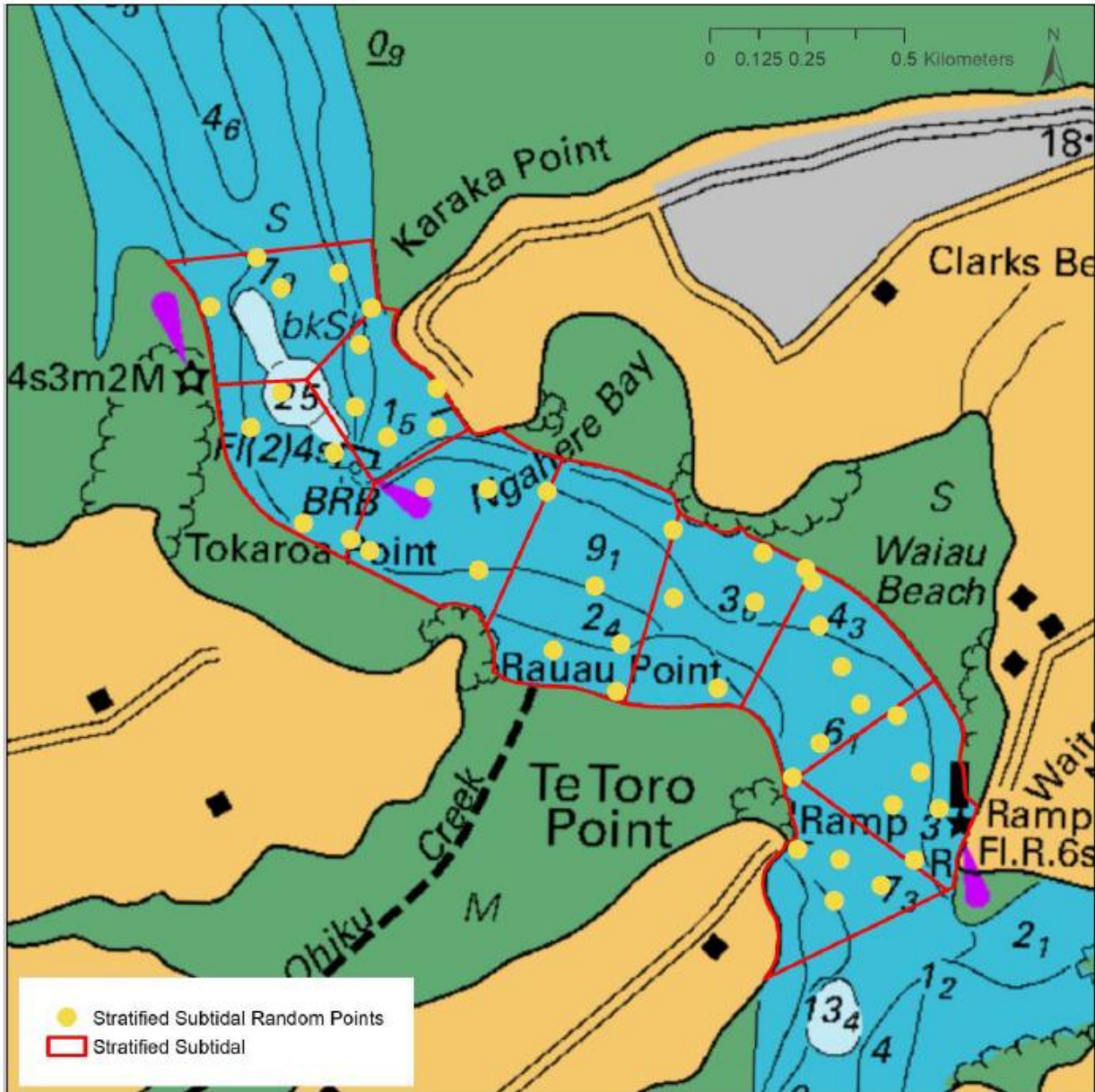
Nine intertidal sites along the Waiuku Channel, on both the western and eastern sides (Figure 2-2).

Sediment samples were analysed for grain size, mud content, organic carbon, nitrogen, and phosphorus. Macrofauna communities were assessed by collecting and identifying individuals to species level, with community metrics (diversity, evenness, abundance) and benthic health indices calculated. Additional sampling of bivalves (cockles, wedge shells, pipi) was undertaken.



**Figure 2-2 Benthic ecology and sediment sites including amendments to the originally proposed site locations and the perimeter shapes.**

Biogenic habitats: Underwater video transects (50 × 200 m) recorded substrate type and the presence of features such as sponges, bryozoans, and macroalgae (Figure 2-3).



**Figure 2-3** Map showing approximate spatial area for stratified random, video transect start points for the biogenic habitat survey.

## 2.5 Reef ecology

Quadrat and transect surveys were undertaken on 31 October 2024 at Tokaroa Point, Waiuku Estuary, following Auckland Council’s rocky reef monitoring protocols. Four 20 m transects were established across high, mid (two), and low intertidal zones, each permanently marked and geo-referenced. Along each transect, six 1 m<sup>2</sup> quadrats were sampled at ~2–4 m intervals on alternating sides of the tape. Within each quadrat, non-biological variables (e.g., sediment cover, bare space, relief, surface water) and biological variables (sessile percent cover and mobile species counts) were

recorded. Species data were analysed in R using multivariate methods (nMDS, PERMANOVA, SIMPER) to assess community composition across tidal heights.

During site establishment, it was noted that the mid-intertidal transects were heavily covered in fine sediment, with characteristics more typical of intertidal mudflats than rocky reef. In light of this, Tonkin & Taylor recommended considering alternative monitoring locations, which are proposed for subsequent surveys.



**Figure 2-4 Location of transect lines at Tokaroa Point reef.**

## 2.6 Vegetation mapping

Two aerial surveys were completed (December 2024 and May 2025) using fixed-wing aircraft equipped with RGB and multispectral cameras. Image classification was performed in ArcGIS Pro to map seagrass, mangroves, and macroalgal beds. Aerial imagery covered ~150 km<sup>2</sup> from Waiuku township north to Big Bay, and from Clarks Beach east to Kingseat (Figure 2-5).

Drone surveys and field observations validated aerial classifications. Seagrass, *Ulva* (sea lettuce), and *Gracilaria* spp. were specifically targeted. Surveys were timed with optimal tides to maximise detectability.

Following discussions with Auckland Council, and in recognition of the significant logistical constraints associated with capturing high-quality imagery at the full 150 km<sup>2</sup> scale, the vegetation mapping scope has been refined (for year two baseline monitoring). Future surveys will adopt targeted aerial survey over a reduced area of approximately 50 km<sup>2</sup> directly relevant to the outfall.

Council reviewed and endorsed<sup>1</sup> the proposed change in REMP methodology. This refined approach is expected to increase the likelihood of obtaining imagery of sufficient quality to detect nutrient-sensitive algae (*Ulva* and *Gracilaria*) while still providing robust mapping of seagrass. The scope change has been formally noted in REMP reporting, with a full review of methods to occur at the scheduled two-year REMP review.



**Figure 2-5 Spatial extent of focus area for estuarine vegetation mapping.**

---

<sup>1</sup> Email correspondence between M Jonker and L Blackburn. Title: Southwest REMP: vegetation mapping provisions – constraints and proposed options. Date: 17 September 2025.

## 3 RESULTS

### 3.1 Water quality

#### 3.1.1 General water quality

Across the ten monitoring sites, water quality was generally consistent and within expected ranges for an estuarine system. Nutrient concentrations showed clear spatial patterns:

- Ammoniacal-N was typically low at most Waiuku Channel and Taihiki Creek sites
- Total oxidised nitrogen (TON) was highest at the uppermost sites – Taihiki (WQ10) and Upper Waiuku (WQ9) – and declined towards the main harbour
- Total nitrogen (TN) was relatively uniform across all sites
- Phosphorus (DRP and TP) displayed seasonal trends: declining from June to November, rising through April, then dropping again by May. Patterns were consistent across all sites
- Suspended solids, turbidity, pH, salinity, and dissolved oxygen (spot samples) showed little spatial or temporal variation.

#### 3.1.2 Microbial indicators

- *Enterococci* concentrations were consistently low, mostly below detection limits across all sites
- Faecal coliforms varied between non-detect and 64 cfu/100 mL. Around 14% of samples were >10 cfu/100 mL, with 5 samples ≥20 cfu/100 mL. Elevated counts were mostly associated with Whatapaka (WQ8), a site influenced by upstream land use.

#### 3.1.3 Dissolved oxygen (24-hour profile)

- Strong diurnal variation was observed, with lowest concentrations at dawn, peaking mid-afternoon, and declining overnight
- Seasonal patterns were evident: highest in early summer (December), intermediate in March, and lowest in May
- Depth variation was less pronounced than diurnal variation.

#### 3.1.4 Phytoplankton

- 152 taxa were recorded across 11 phyla. Dominant groups were unicellular flagellates and small flagellates, both showing strong seasonal cycles – increasing in spring, peaking in summer, and declining in autumn
- Potentially toxic taxa were detected in low numbers, including *Alexandrium spp.*, *Gymnodinium catenatum*, *Azadinium sp.*, *Karenia sp.*, and low levels of *Pseudo-nitzschia*
- Filamentous cyanobacteria occurred in trace amounts at two sites (WQ2 and WQ7) in July 2024.

#### 3.1.5 Key observations

Overall, coastal water quality in the Waiuku Channel and Taihiki Creek was generally moderate, with nutrient and microbial concentrations reflecting natural estuarine variability. The Whatapaka (WQ8) site consistently stood out as having poorer water quality, showing elevated nutrients, suspended solids, turbidity, and occasional microbial spikes compared to other sites. In contrast, sites near the existing and proposed outfall (WQ2–WQ6) displayed stable nutrient levels and low bacterial counts, indicating no evidence of unusual baseline degradation. Seasonal cycles were evident in phosphorus,

phytoplankton communities, and dissolved oxygen, which tracked natural estuarine processes and now provide a reliable baseline against which future outfall effects can be assessed.

### 3.2 Shellfish monitoring

Shellfish monitoring showed mixed results across the five sites. Elevated concentrations of copper, zinc, and arsenic were detected in farmed oysters, particularly at Gordon's Landing, though values remained below guideline thresholds for food safety. Lead and PAHs were consistently low.

Microbial indicators revealed exceedances of faecal coliform thresholds at Matakawau and Te Toro during several dry-weather sampling events, suggesting diffuse non-point sources rather than direct outfall influence.

Enterovirus was below detection in all samples. Population surveys indicated stable wild oyster densities and condition, while cockles were abundant but generally small, with the majority under the edible size threshold.

### 3.3 Benthic ecology and sediment quality

#### 3.3.1 Sediment quality

- Sediments were predominantly sandy (51–99%), with mud content varying strongly between sites
- Highest mud levels (48%) occurred at Ngahere, while Tokaroa North had the lowest
- Mud, total organic carbon, nitrogen, and phosphorus concentrations were highly correlated, showing localised enrichment patterns

#### 3.3.2 Macrofauna

- 18,735 individuals representing 90 taxa were collected across the nine intertidal sites.
- Cockles (*Austrovenus stutchburyi*) were the most abundant species by a wide margin, followed by nut shells (*Linucula hartvigiana*) and polychaetes (*Anoides trifida*).
- Cockle and nut shell abundances were markedly lower at western sites north of Tokaroa and Karaka Points, while eastern sites showed more variable but generally higher diversity.
- The majority of cockles were juveniles (<5 mm), with no harvestable-sized individuals (>30 mm) recorded

#### 3.3.3 Benthic health indices

- Diversity and evenness indices were strongly influenced by dominant cockle and nut shell numbers
- Multivariate analyses showed communities in the main harbour were more variable than those in Waiuku River, with Ngahere distinct from other sites
- Benthic health scores were rated 'fair' at all sites except Clarks Beach, which achieved a 'good' rating.

#### 3.3.4 Subtidal habitat and biogenic features

- Video transects confirmed widespread hard substrates (reef, boulders, rubble), present in 88% of transects
- Biological features included sponges (78% of transects), bryozoans (64%), ascidians (38%), and macroalgae (18%)

- Ecological complexity was generally higher downstream of the outfall, except around Tokaroa Point where it was low.

### 3.3.5 Key observations

Benthic and sediment monitoring indicated moderate overall ecological health, with clear spatial variability. Sediments ranged from sandy to muddy, with enrichment patterns linked to organic carbon and nutrients. Macrofaunal communities were diverse but dominated by juvenile cockles and nut shells, resulting in skewed diversity metrics. Health scores were generally fair, with Clarks Beach performing better than other sites. Subtidal habitats supported sponges, bryozoans, and ascidians, with greater complexity recorded downstream of the outfall.

## 3.4 Reef ecology

### 3.4.1 Sessile species

The reef supported a typical assemblage of barnacles, bivalves, and algae, distributed according to tidal height.

- Barnacles (*Austrominius modestus*, *Chamaesipho spp.*) and limpets dominated the high shore
- Pacific oysters (*Crassostrea gigas*) and green-lipped mussels (*Perna canaliculus*) were more common in the low shore zone
- Algal cover was primarily red seaweeds (*Gelidium spp.*, *Apophlaea sinclairii*), with occasional *Ulva spp.* patches in lower areas.

### 3.4.2 Mobile species

Mobile invertebrates were abundant, reflecting the diversity of available habitats across the reef.

- Periwinkles (*Nodilittorina antipoda*), limpets (*Cellana radians*, *Notoacmea spp.*), chitons (*Sypharochiton pelleris*), and topshells (*Melagraphia aethiops*) were frequently observed.
- Small crabs and other motile species were also present, with higher abundances recorded in mid to low tidal zones where moisture was retained longer.

### 3.4.3 Community composition

Community analysis showed clear ecological zonation and alignment with expected Manukau Harbour reef communities.

- Distinct assemblages were evident between tidal levels, with barnacle-dominated upper zones contrasting with oyster and mussel communities lower down
- Overall species composition and relative abundances were consistent with regional baselines, and no unusual shifts or losses were recorded.

### 3.4.4 Key observations

The Tokaroa Point reef survey provided the first-year baseline of intertidal reef ecology. Results showed diverse sessile and mobile species consistent with natural zonation patterns, dominated by barnacles, oysters, mussels, and common intertidal gastropods.

## 3.5 Vegetation mapping

### 3.5.1 Habitat mapping

The aerial surveys provided the first year of mapped extents for key intertidal habitats.

- Seagrass extent was estimated at 460 ha in December 2024 (from 8,891 ha processed imagery) and 933 ha in May 2025 (from 9,663 ha imagery)
- Mangroves and sandflats were also mapped, though minor differences between the two surveys likely reflected differences in coverage and image quality rather than ecological change
- Large-scale blooms of nuisance macroalgae were not detected during aerial surveys.

### 3.5.2 Ground truthing

Field validation was used to confirm and refine aerial classifications.

- Drone surveys and in-situ checks confirmed the presence of small patches of *Ulva* spp. (sea lettuce) and isolated *Gracilaria* spp. within seagrass beds and on flats.
- No extensive *Gracilaria* or *Ulva* blooms were captured in aerial imagery, though Coast and Catchment benthic surveys detected short-term blooms at Tokaroa North in early 2025, highlighting the transient nature of these species

### 3.5.3 Key observations

The first year of vegetation mapping successfully established baseline extents of seagrass and mangrove habitats while confirming that large nuisance algal blooms were not persistent during the monitoring period. Small, localised patches of *Ulva* and *Gracilaria* were present but difficult to detect consistently with aerial imagery alone, underscoring the importance of combining aerial methods with ground truthing.

## 4 CONCLUSION

The first year of baseline monitoring under the REMP has provided a comprehensive and integrated dataset describing the condition of the Waiuku Estuary and southern Manukau Harbour prior to the commissioning of the new Clarks Beach outfall in 2026.

Water quality monitoring showed generally moderate conditions, with nutrients and suspended solids within expected estuarine ranges, although Whatapaka consistently exhibited elevated nutrient and turbidity levels reflecting upstream catchment inputs. Microbial indicators were typically low across most sites, providing confidence in the baseline condition of the receiving waters.

Shellfish monitoring confirmed that contaminant concentrations in oysters were below food safety thresholds, though elevated copper, zinc, and arsenic were recorded at Gordon's Landing. Faecal coliform exceedances at some sites point to diffuse catchment sources rather than point-source discharges. Wild oyster populations were stable, while cockles were abundant but mainly juvenile.

Benthic and sediment surveys highlighted diverse intertidal communities dominated by cockles and nut shells, with sediment quality strongly linked to mud content and organic enrichment. Health scores were mostly rated fair, with Clarks Beach scoring higher than other sites. Subtidal video transects revealed widespread hard substrates and associated biological features, with greater ecological complexity downstream of the proposed outfall.

Reef monitoring at Tokaroa Point documented a structured and diverse intertidal community consistent with Manukau Harbour baselines, with no evidence of disturbance or atypical assemblages. Vegetation mapping successfully established the extent of seagrass and mangroves, with no persistent nuisance algal blooms observed; however, ground truthing confirmed that short-lived *Ulva* and *Gracilaria* patches can occur. The vegetation mapping methodology has been adjusted to improve the likelihood of better mapping *Ulva* and *Gracilaria* variability.

Taken together, these findings provide a robust and multi-faceted baseline against which future changes can be assessed. They also highlight key areas of variability and potential sensitivity, such as elevated metals at upstream sites, periodic bacterial exceedances, and the transient dynamics of nuisance algae. As the programme enters its second year, continued monitoring will be essential to confirm these patterns, strengthen baseline datasets, and ensure Watercare and Auckland Council are well positioned to detect and respond to any future changes once discharges commence.

**Appendix A. Watercare Services Southwest Manukau.  
Water Quality and Benthic Ecology Baseline Monitoring  
2024-2025**

**Appendix B. Clark's wastewater treatment plant upgrade:  
Pre-construction shellfish monitoring 2024/2025**

## **Appendix C. Southwest Receiving Environment Monitoring Programme. Reef Monitoring**

**Appendix D. Vegetation Mapping and Identification.  
Southwest Receiving Environment Monitoring Programme**