



Tai Timu Tai Pari

# Sea change

Hauraki Gulf Marine Spatial Plan

## Aquaculture monitoring Hilke Giles September 2014



Hauraki Gulf  
Marine Park  
Ko te Pataka kai  
o Tikapa Moana  
Te Moananui a Toi



Hauraki Gulf Forum  
Tikapa Moana  
Te Moananui a Toi

Ministry for Primary Industries  
Manatū Ahu Matua



Department of  
Conservation  
Te Papa Atawhai

Waikato  
REGIONAL COUNCIL  
Te Kaitiaki o Rotorua o Waikato

Auckland  
Council  
Te Kaitiaki o Tāmaki Makaurau





# Content

1. Context of aquaculture monitoring
2. Current monitoring and its limitations  
(State of the Environment and consent)
3. Future monitoring – current projects and initiatives
  - a) Framework for regional environmental monitoring
  - b) New technologies



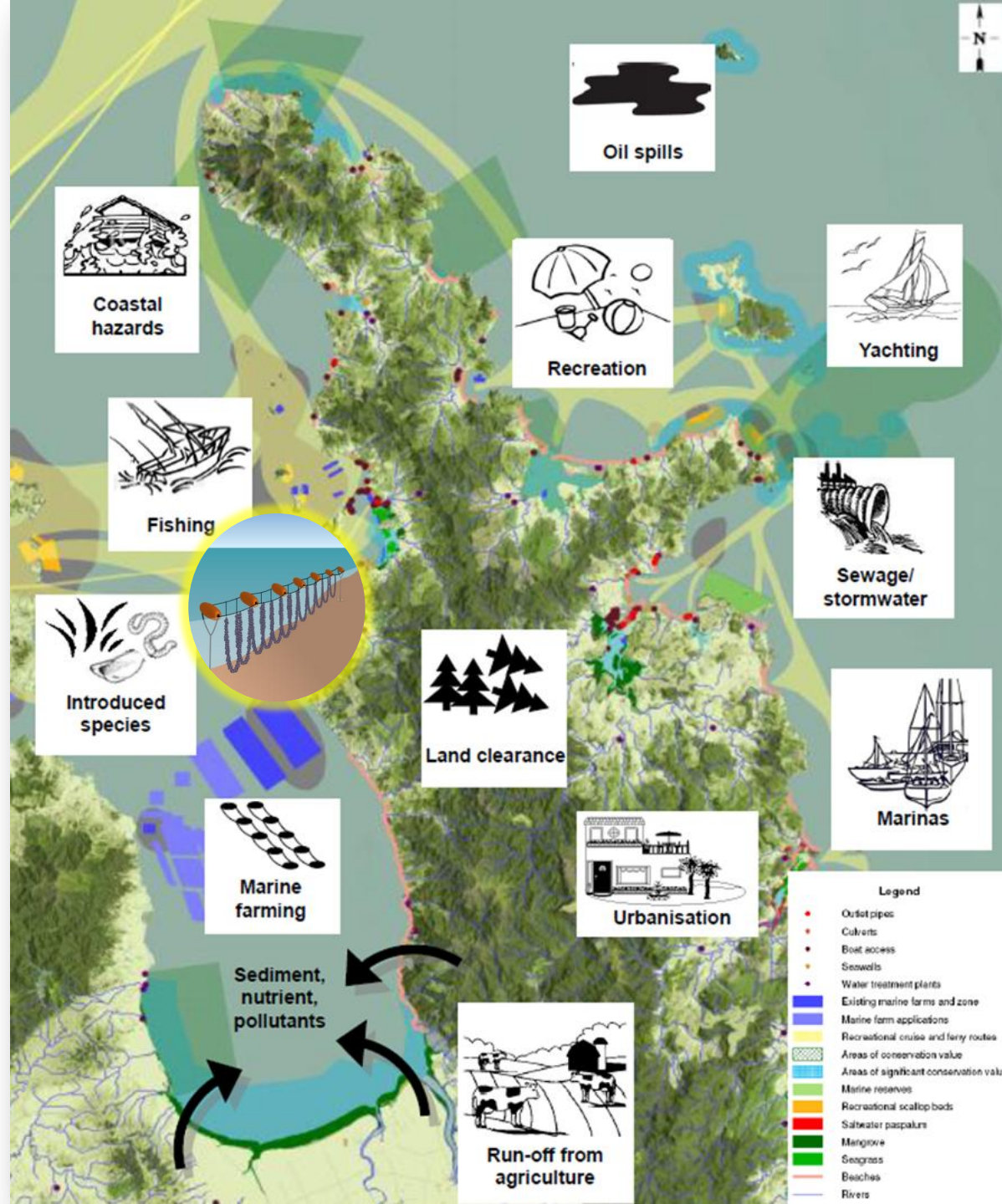
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# Regional council monitoring functions

State of the  
Environment (SOE)  
monitoring

Improvements

Consent monitoring

Improvements

**Integration**

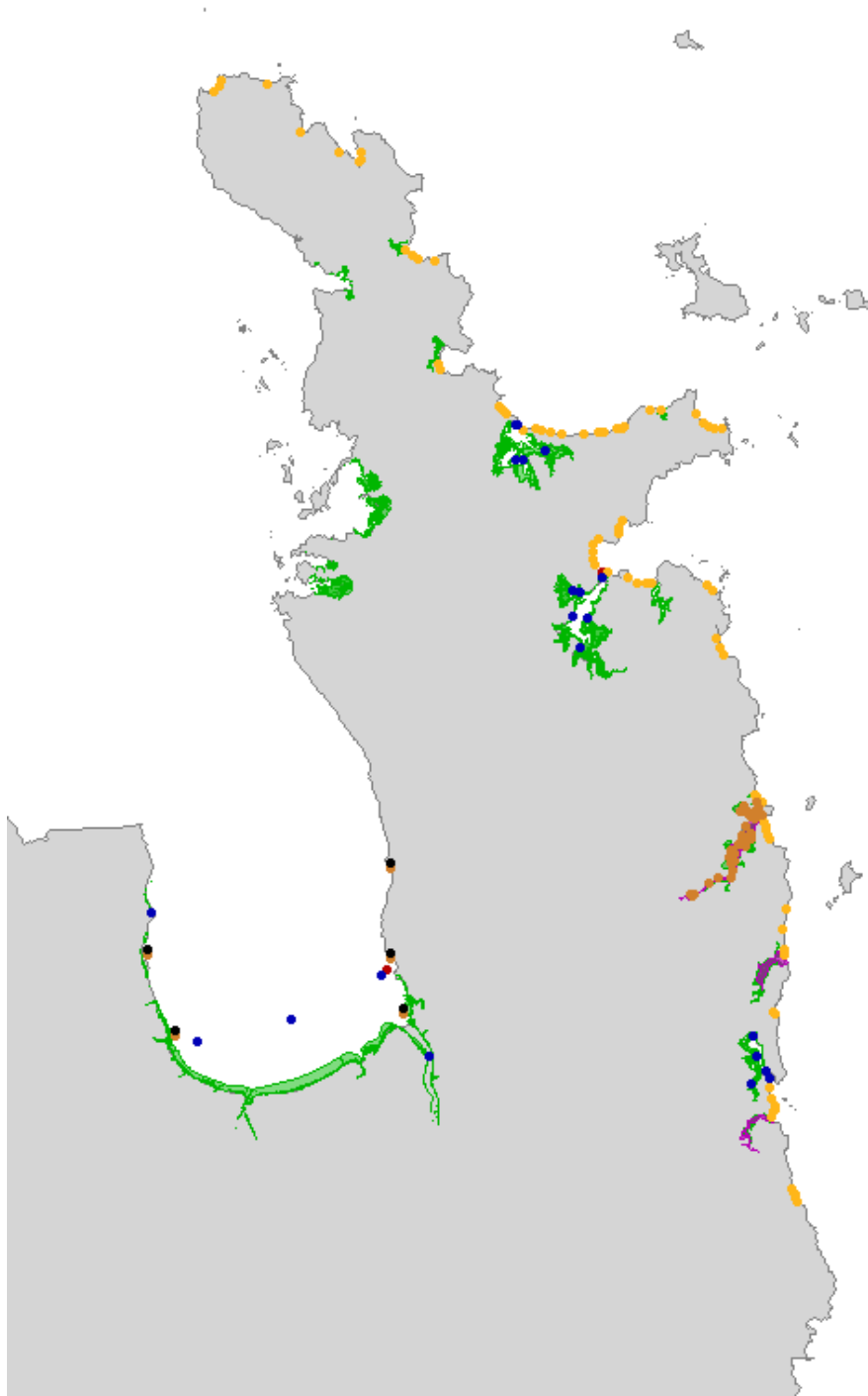




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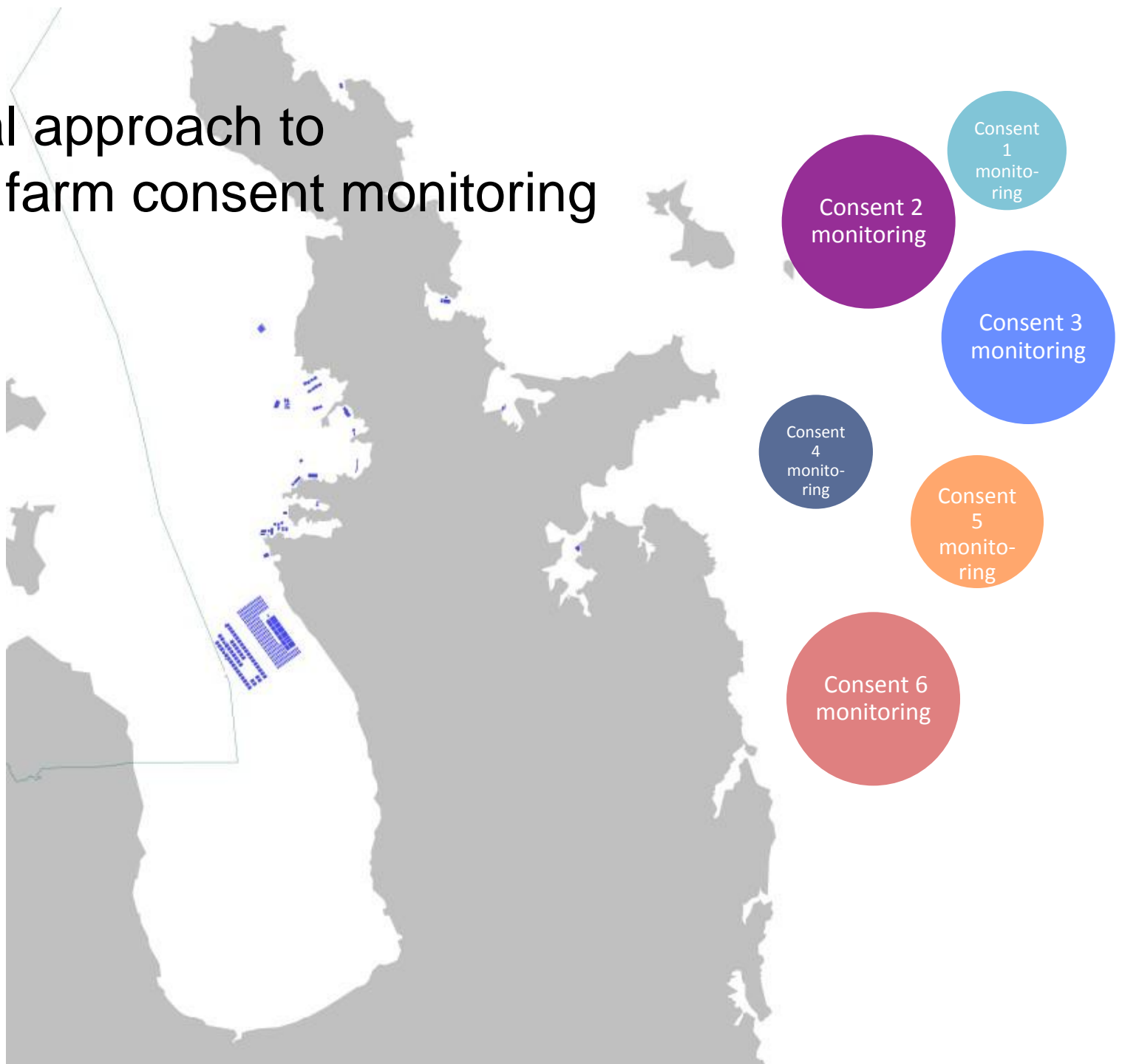
SOE  
monitoring



- Regional Estuary Monitoring Programme
- Estuary shellfish and habitat mapping
- Estuary vegetation mapping
- Sediment pollutants
- Estuarine water quality
- Shoreline change



# General approach to marine farm consent monitoring



# Current mussel farm monitoring

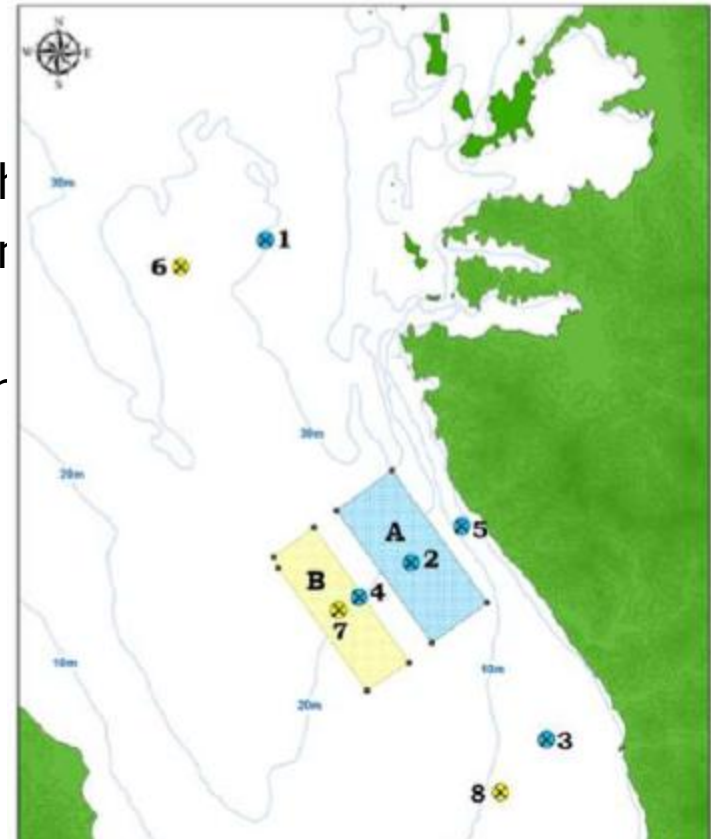
## Wilson Bay Area A

Water quality

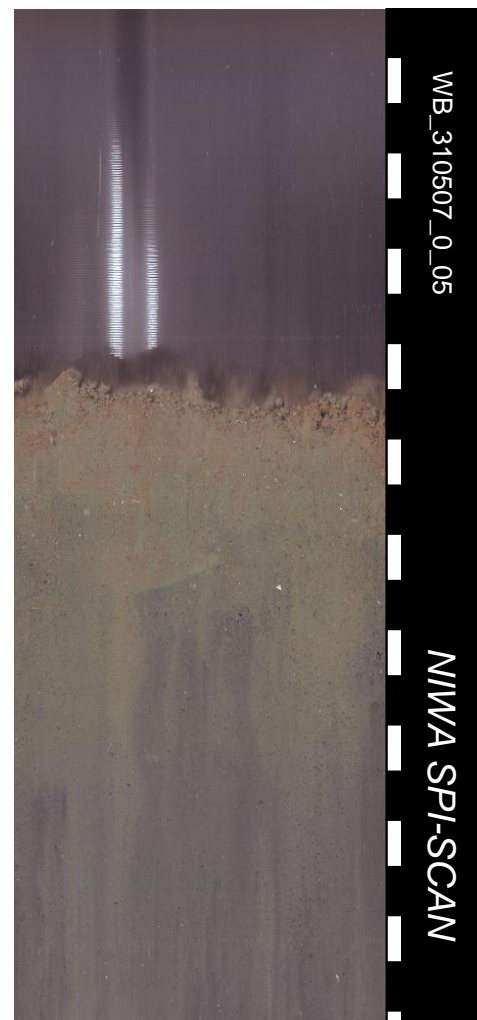
- Temperature, water transparency, chl
- Monthly sampling at 3 sites, reporting

Seabed

- Sediment redox conditions (sedimer



# Sediment Profile Imaging





# Current mussel farm monitoring

## Wilson Bay Area A

### Water quality

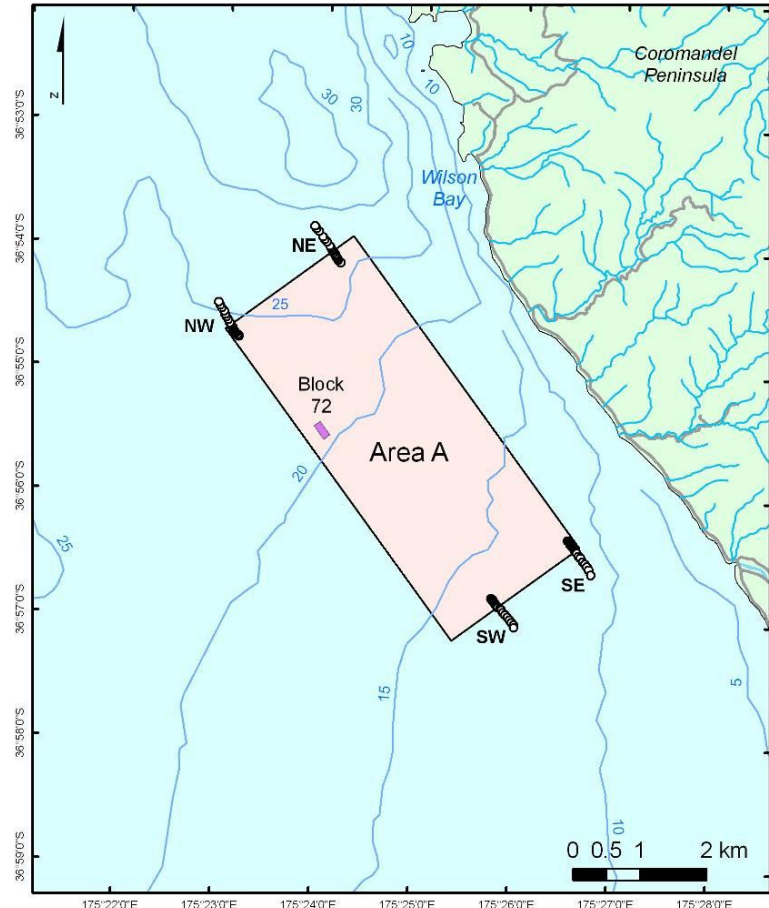
- Temperature, water transparency
- Monthly sampling at 3 sites, repeated

### Seabed

- Sediment redox conditions (sediment)
- Sediment grain size, organic matter
- As agreed (every 3-5 years)

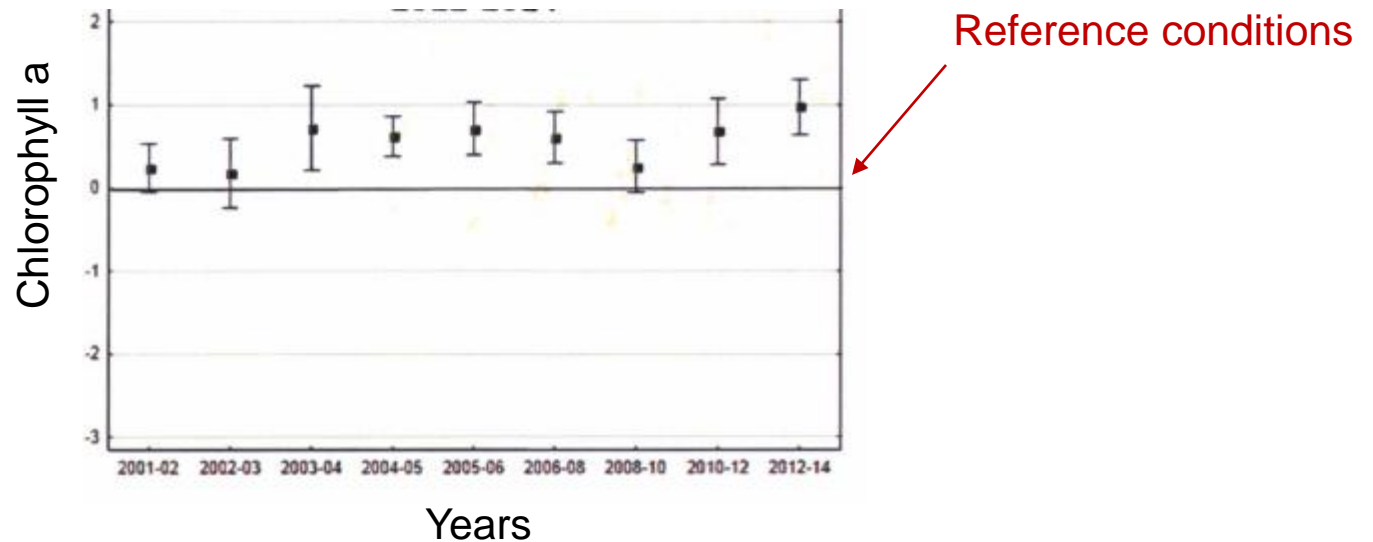
### Synoptic surveys

- Phytoplankton abundance, wave conditions in the vicinity of the farm
- At the end of each stage of development, 90% of lines in the water and seabed



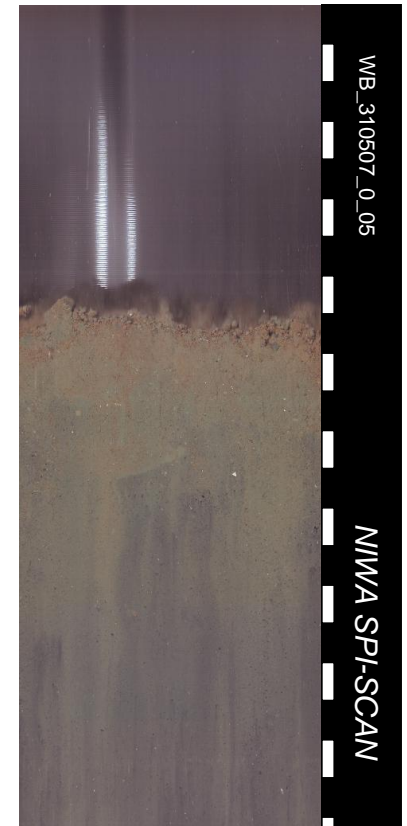
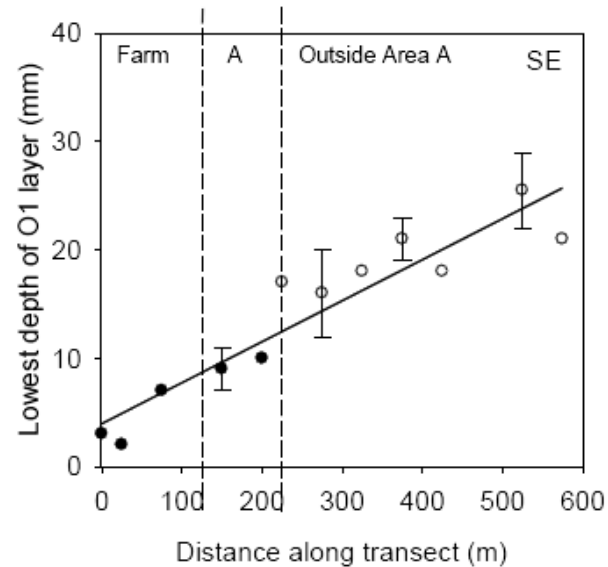
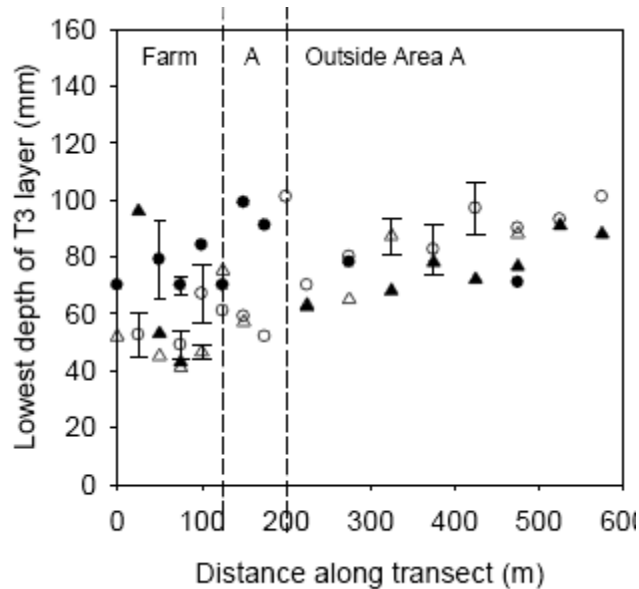
# Current mussel farm monitoring

## Wilson Bay Area A results: water quality



# Current mussel farm monitoring

## Wilson Bay Area A results: seafloor





# Current mussel farm monitoring

## Wilson Bay Area B

### Water quality

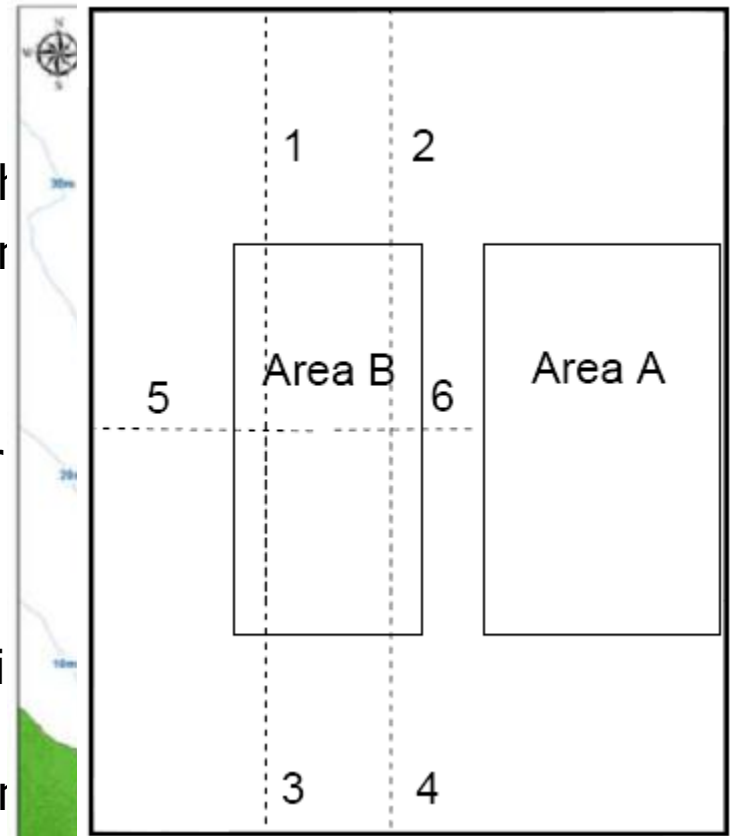
- Temperature, water transparency, chl
- Monthly sampling at 3 sites, reporting

### Seabed

- Sediment macrofauna
- Sediment grain size, organic matter
- Every 3 years

### Synoptic surveys

- Phytoplankton abundance, wave height in the vicinity of the farm
- At the end of each stage of development (at 25 and 50% of lines in the water)



# Current mussel farm monitoring

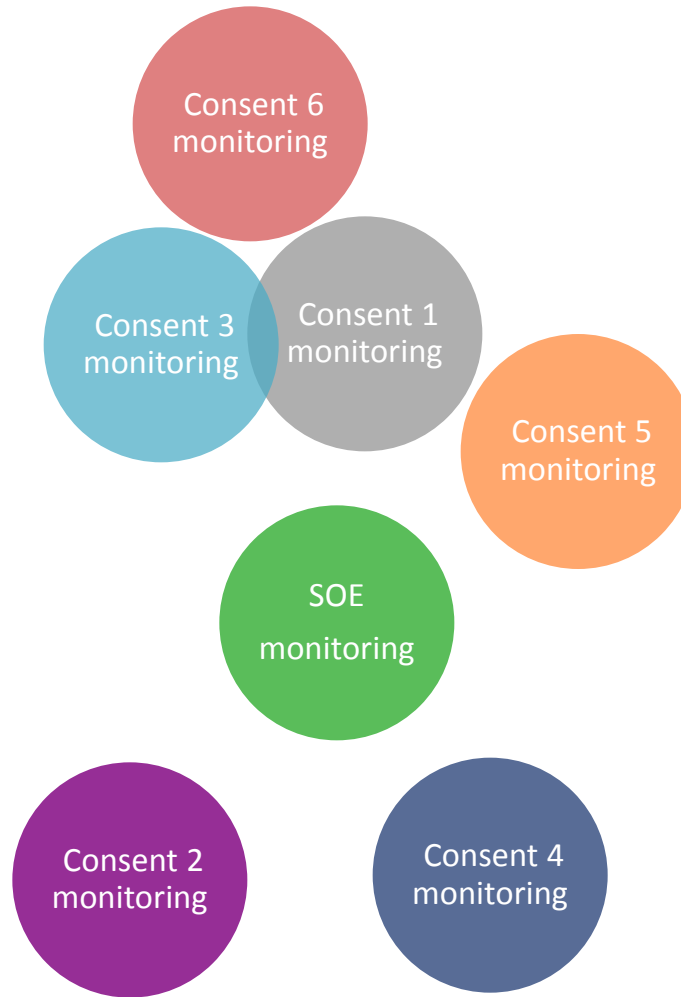
## Coromandel region mussel farm extensions

### Seabed

- Grain size, total organic carbon, total nitrogen, ash-free dry weight, redox potential
- Video sled transects to describe substratum and dominant epibiota and extent of mussel shell drop-off
- Camera images to support description of epibiota and shell drop-off
- 6-7 year intervals
- At eight representative 'reference' farms and six 'control' sites in unfarmed environments (baseline survey included all farms)

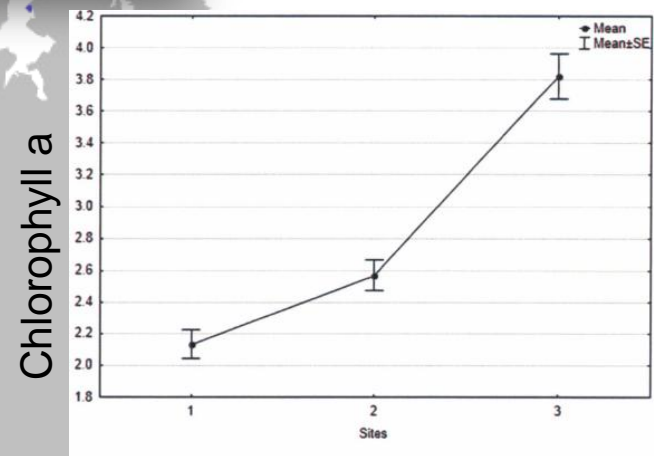
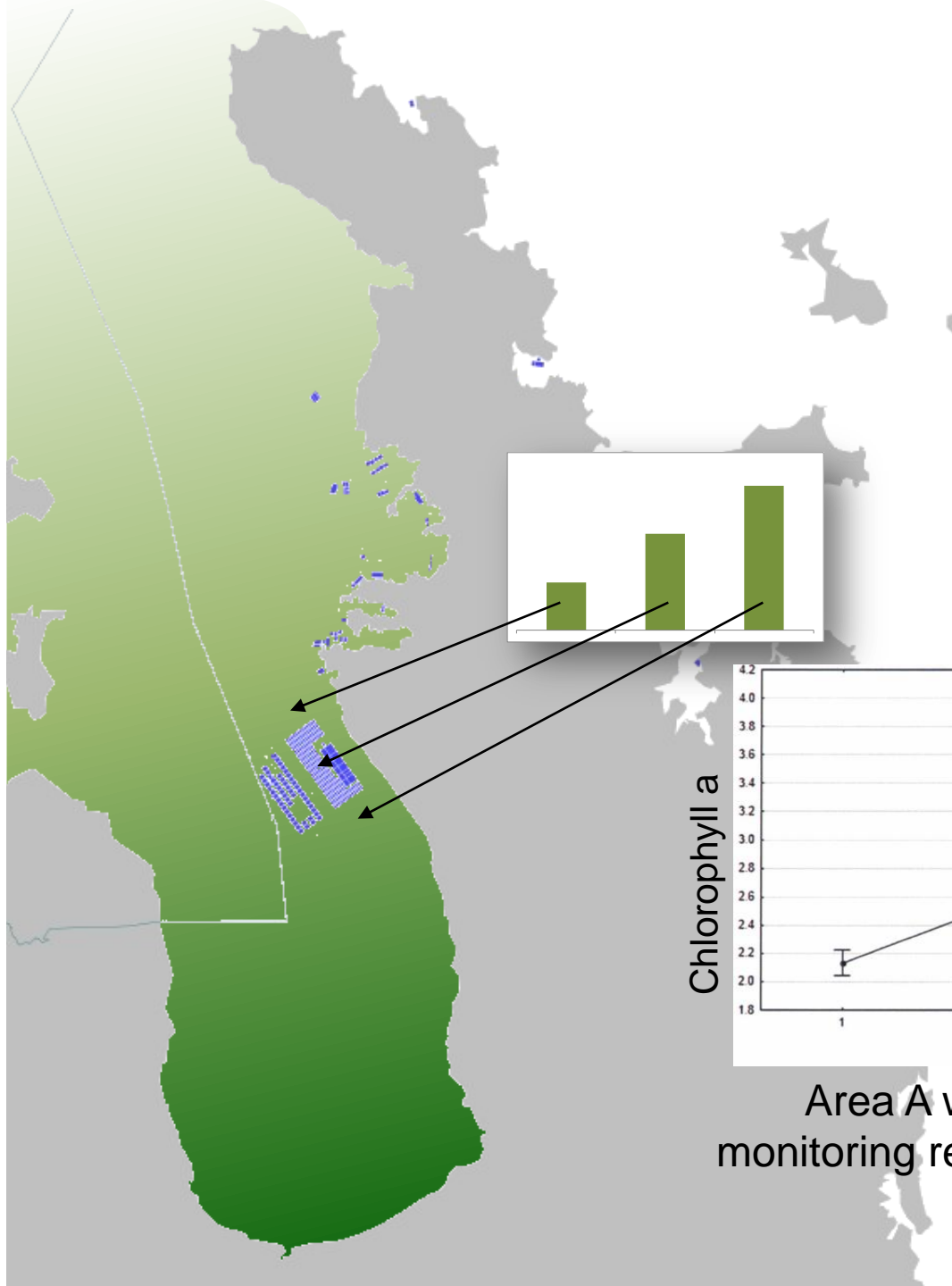


# Monitoring now

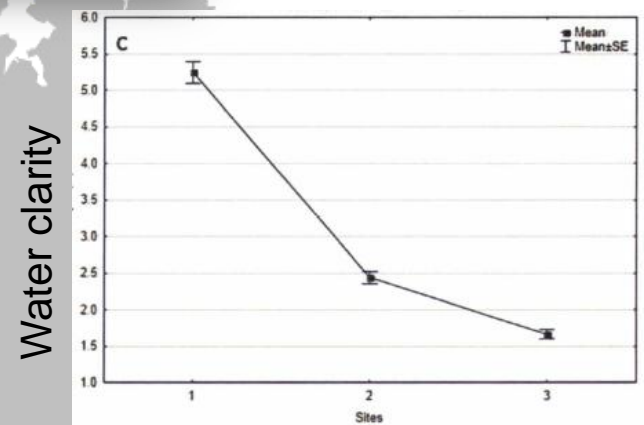
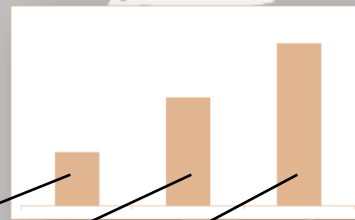
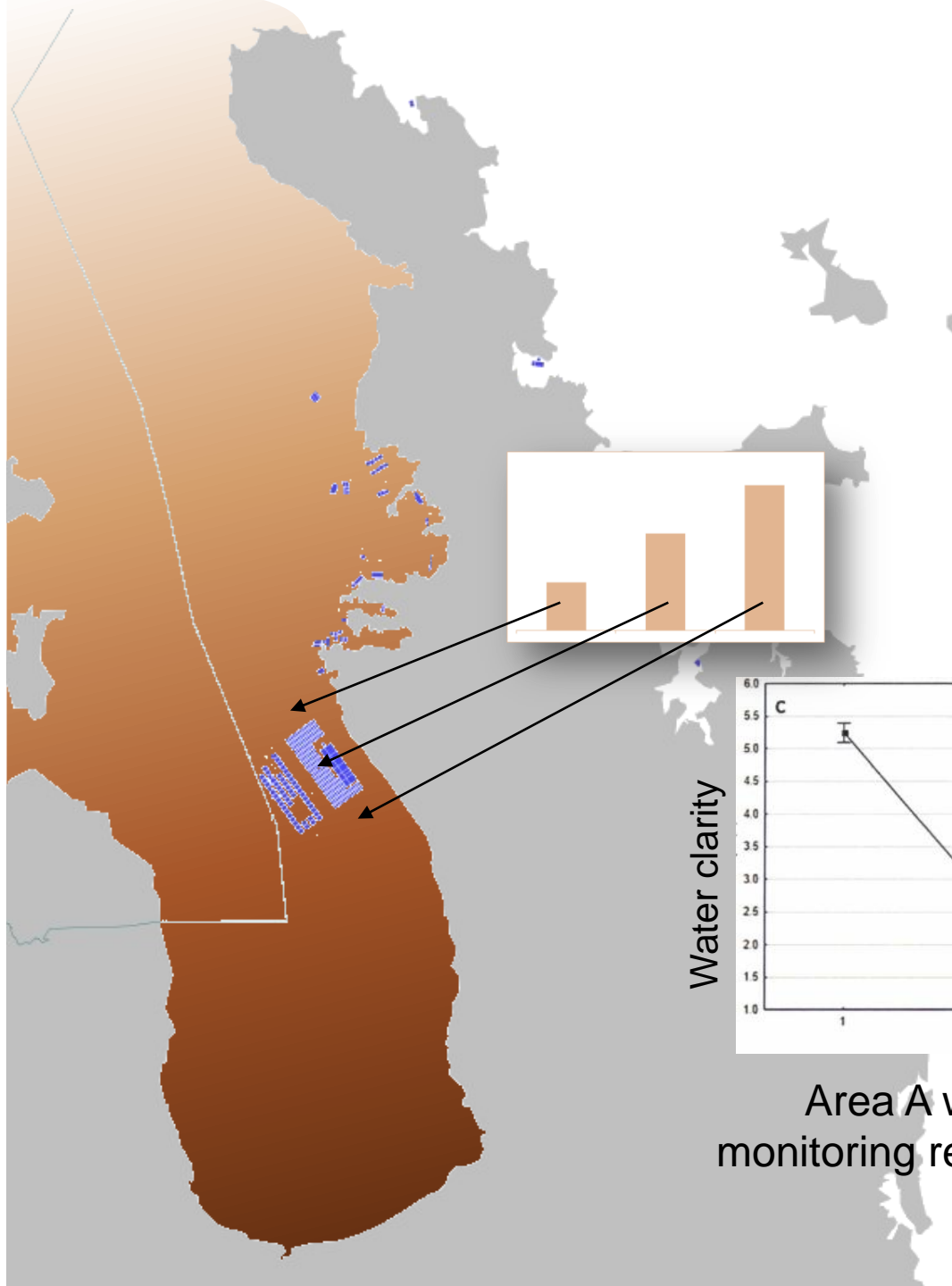


Why is this a problem?

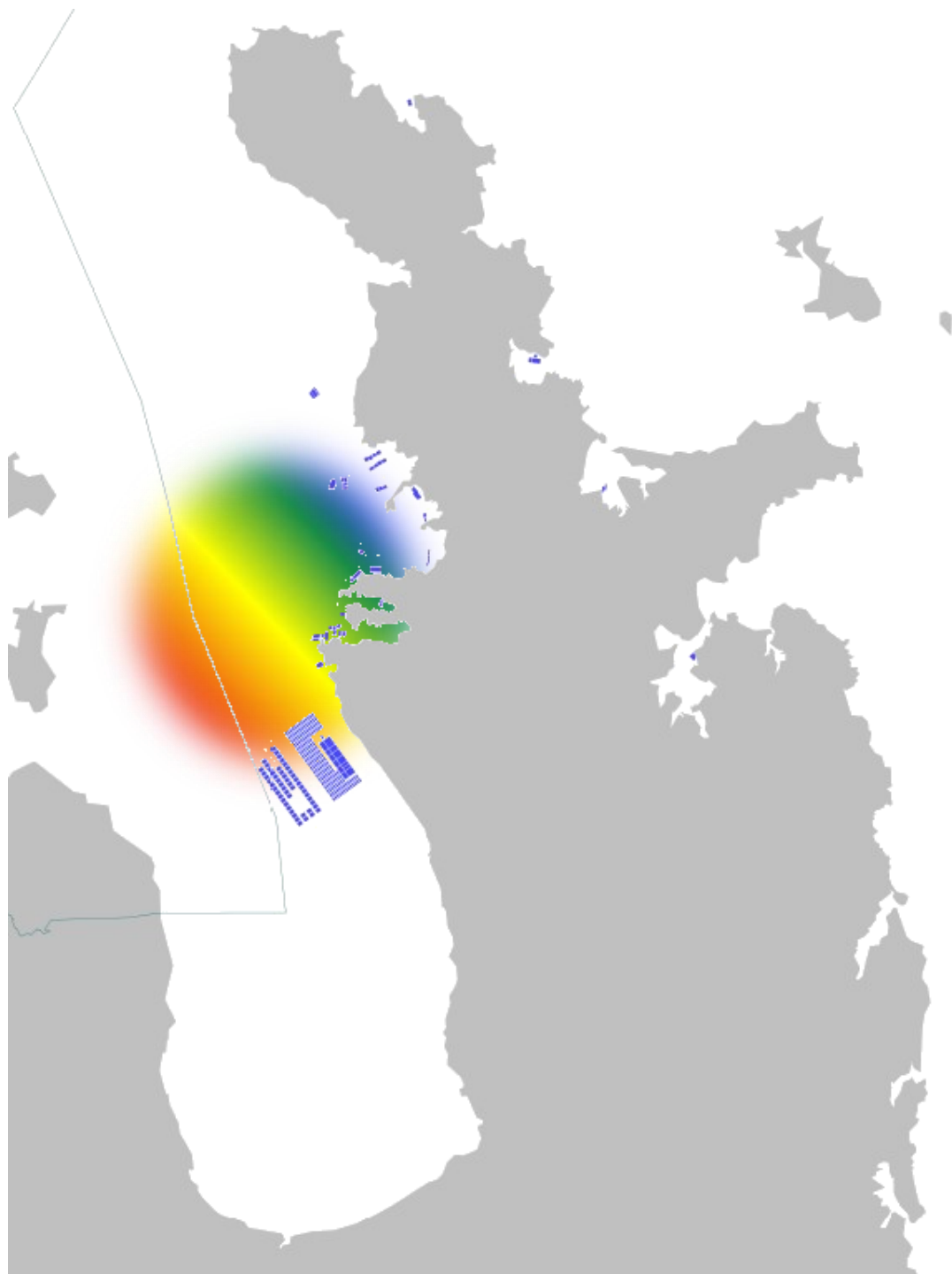




Area A water quality monitoring results 2012-2014



Area A water quality monitoring results 2012-2014

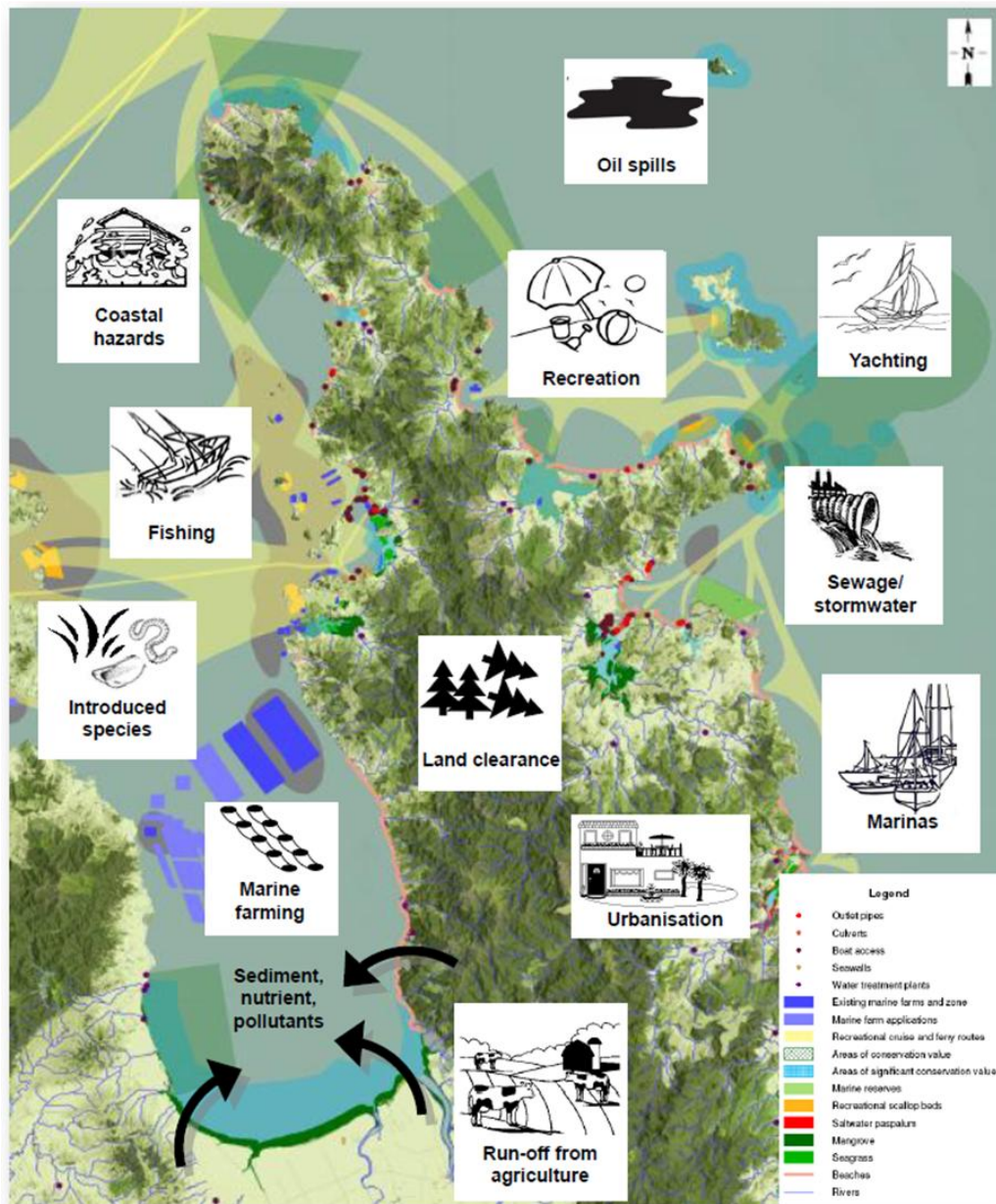




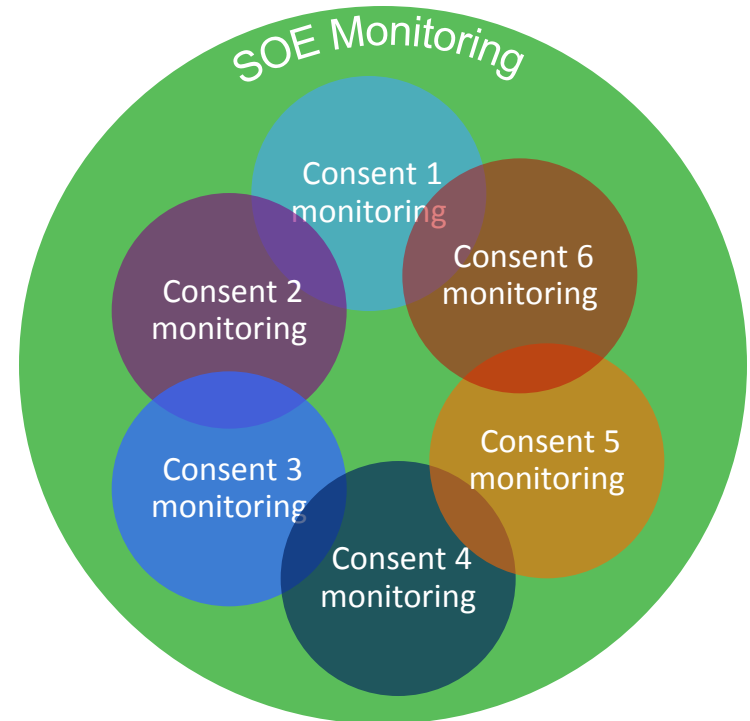


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# Monitoring in the future



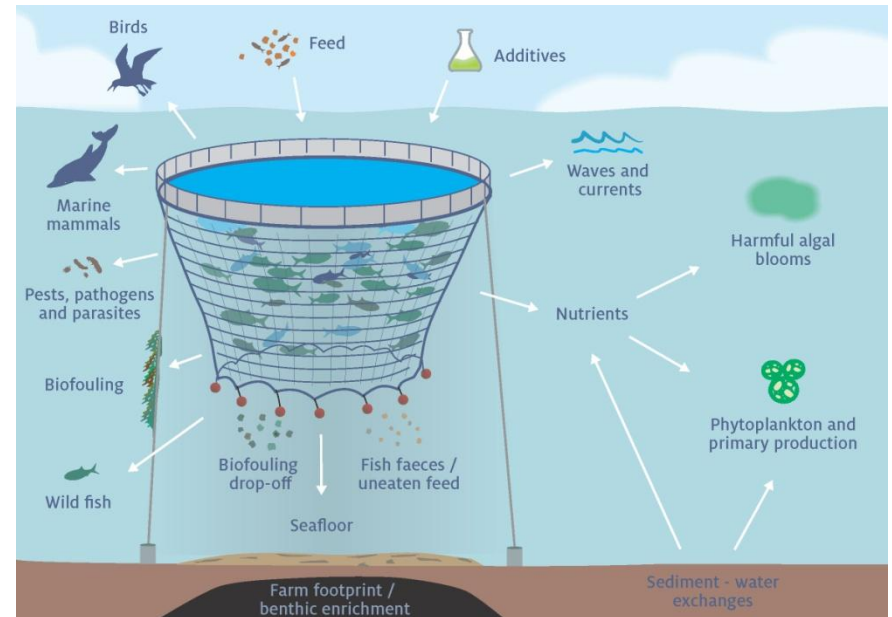
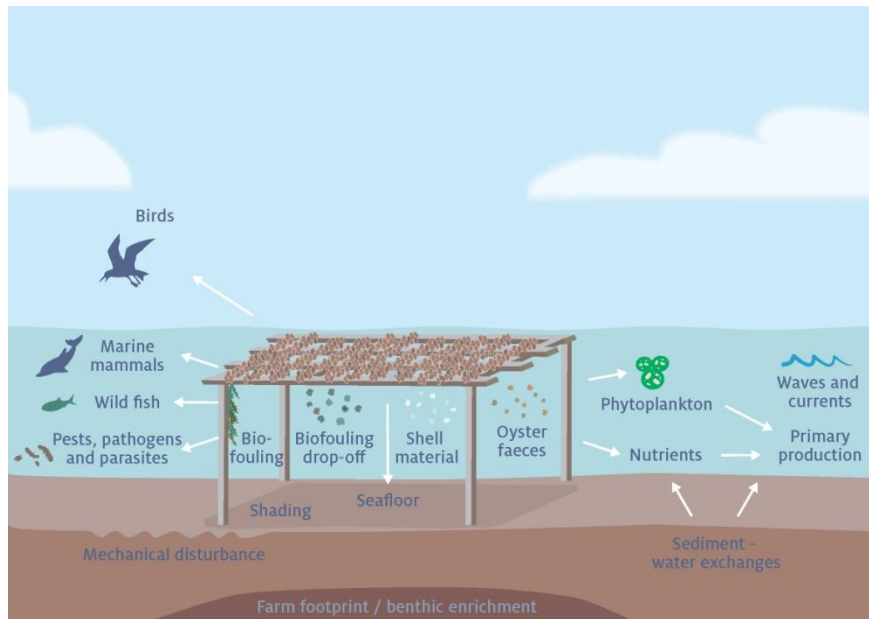
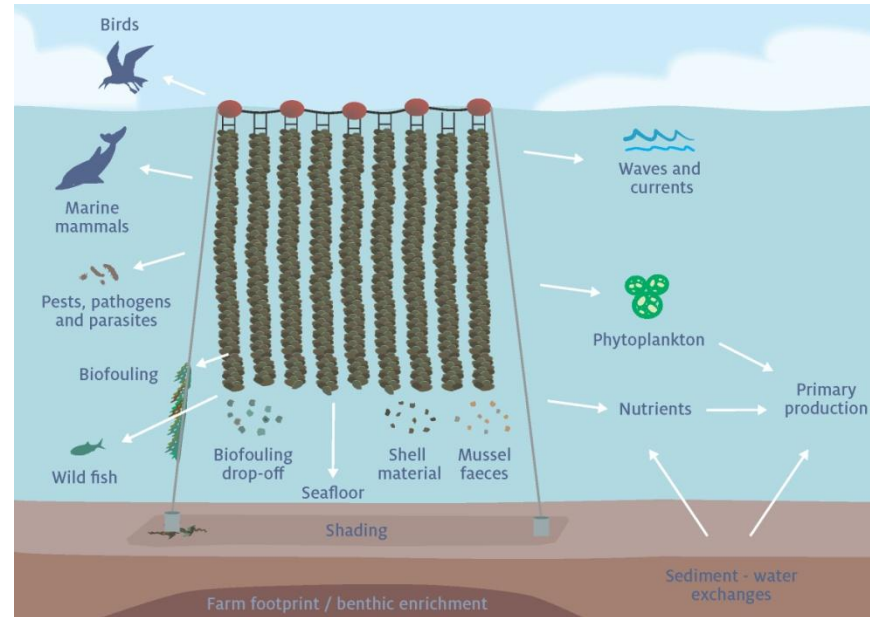
Project:  
Framework for regional  
environmental monitoring  
Case study 1: Aquaculture

# Project: Framework for regional environmental monitoring

- New framework objectives
  - Integration of SOE and consent monitoring
  - Fit-for-purpose
  - Consistency
  - Cost-effectiveness
  - Cooperation / alignment of interests
  - Transparency
  - Certainty
- Consider/manage cumulative effects



# All types of aquaculture





# Approach for consent monitoring

1. Identify key ecological issues (finfish, mussel, oyster)

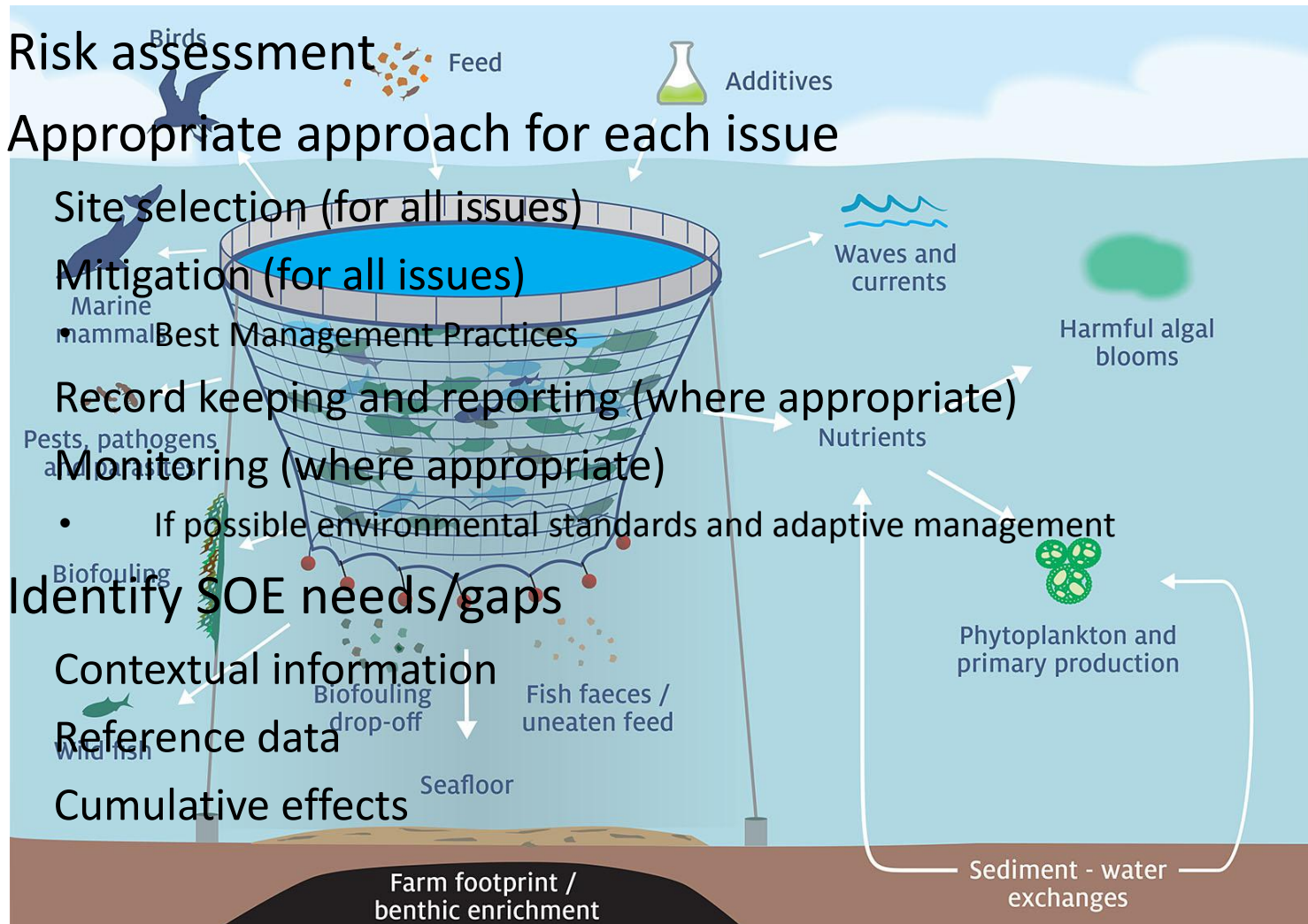
2. Risk assessment

3. Appropriate approach for each issue

- Site selection (for all issues)
- Mitigation (for all issues)
- Best Management Practices
- Record keeping and reporting (where appropriate)
- Monitoring (where appropriate)
  - If possible environmental standards and adaptive management

4. Identify SOE needs/gaps

- Contextual information
- Reference data
- Cumulative effects



# Benthic effects (example): Enrichment stage approach



# Benthic effects (example): Preliminary Enrichment Stage Calculations

CMFZ before  
development

ES = 2.5

⇒ Balanced  
macrofauna population  
("healthy")

Area B before  
development

ES = 4.1

⇒ Very impoverished  
macrofauna

Coromandel mussel  
farms (farms &  
controls)

ES = 1.8

⇒ Naturally diverse and  
abundant macrofauna  
("healthy")

Indicative of either:

- a) Highly stressed environment,  
or
- b) Core sampling was inadequate

Pristine/  
natural



Anoxic/  
azoic

# Benthic effects (example): BMPs

| Management goal         | BMP  | Monitoring and reporting   | Sector |
|-------------------------|--|--|--------|
| Minimise seabed impacts | <ul style="list-style-type: none"> <li>Maintain stocking densities at a level that can meet standards for seabed impacts stipulated by WRC.</li> </ul>   | <ul style="list-style-type: none"> <li>Maintain records of farm stocking densities and times of stock additions and harvesting, and report to WRC annually or as requested.</li> </ul> | F      |
|                         | <ul style="list-style-type: none"> <li>Implement practices to minimise feed wastage, which may include:                             <ul style="list-style-type: none"> <li>Developing feed management plans and on-going assessment of feed management</li> <li>Ensuring that feeds are formulated for the species, life-stage, environment and feeding system used.</li> <li>Monitoring of feed consumption.</li> <li>Securing feed storage and delivery systems to prevent catastrophic loss.</li> <li>Monitoring waste feed on seabed.</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>Maintain records of quantities of feed used, and waste feed on seabed, and report to WRC annually or as requested.</li> </ul>                   | F      |
|                         | <ul style="list-style-type: none"> <li>Maintain a minimum space of 5 m between nets and the seabed, to promote adequate flushing of farm wastes.</li> </ul>  | <ul style="list-style-type: none"> <li>None required.</li> </ul>   | F      |
|                         | <ul style="list-style-type: none"> <li>Appropriate storage, land-based disposal, of garbage and inorganic solid waste.</li> </ul>  | <ul style="list-style-type: none"> <li>None required.</li> </ul>   | All    |



# Project: Framework for regional environmental monitoring (contd.)

- Current status
  - Cawthron and WRC finalising draft reports
- Next steps
  - Work with industry to check/update BMPs
  - Seek feedback from industry
- In the meantime
  - Review existing SOE and consent monitoring (data & approaches)
  - Collate existing data (e.g. WRC-Dairy NZ co-funded NIWA project)
  - Develop/trial better approaches

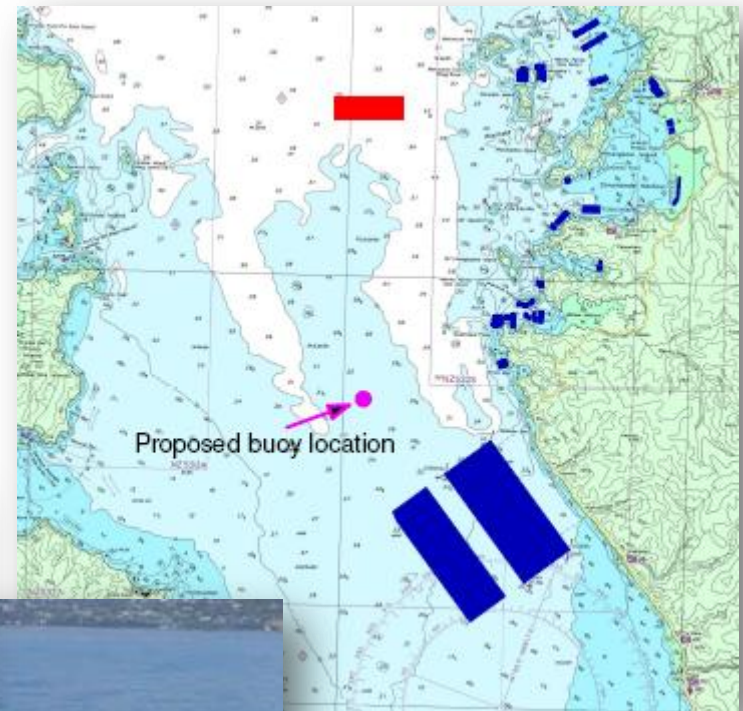
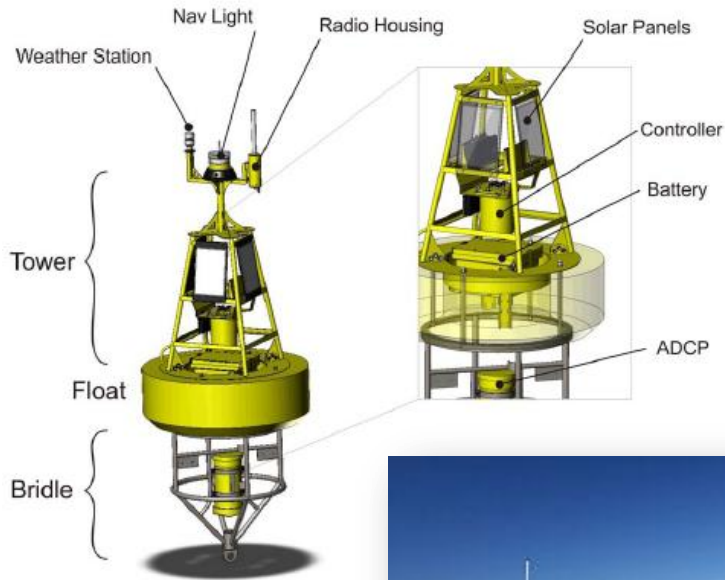




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# New technologies: Real-time monitoring devices



Weather station  
ADCP - currents  
Salinity, temperature, dissolved oxygen,  
chlorophyll-a, turbidity





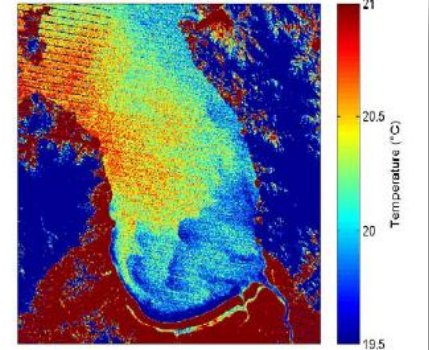
# New technologies



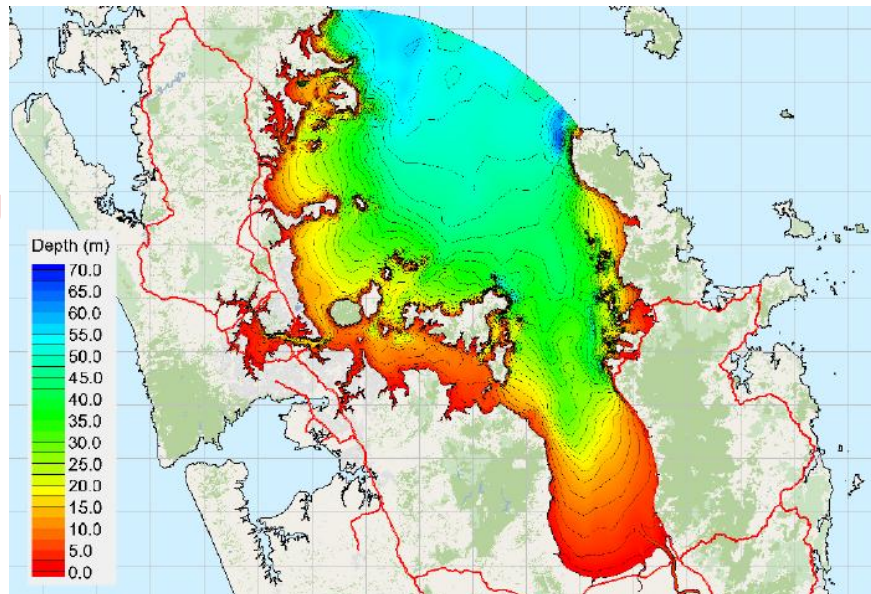
Real-time data



Satellite data



Modelling



... all to supplement,  
not replace,  
traditional methods





# End of Report

**Project Board** Roger Blakeley (AC & Chair)  
Tim Higham (HGF) Tracey May (WRC) Andrew Doube (MPI)  
Sean Cooper (DoC) Paul Majurey (MW)



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Department of  
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Te Papa Atawhai

