

TECHNICAL STANDARD

Soft Sediment Video Surveys for Marine
Finfish Farming



ENVIRONMENT PROTECTION AUTHORITY

Overview

- How this technical standard align with the Marine Environmental Standards
- Outline what this technical standard covers
- Describe how this technical standard align with contemporary scientific knowledge
- Highlight changes to existing monitoring requirements
- Overview of the guidance material
- Conclusions/process moving forward



How does this technical standard align with the Environmental Standards?

- Outlines methodological requirements to address :
 - Section 42: Monitoring and Assessment Methods
 - Section 43: Farm Zone Monitoring
 - Section 44: Farm Zone Ecological Standards
 - Section 46: Soft Sediment Monitoring
 - Section 47: Soft Sediment Ecological Standards
- They provide certainty, consistency, and transparency
- Subjective vs semi-quantitative: integration environmental response

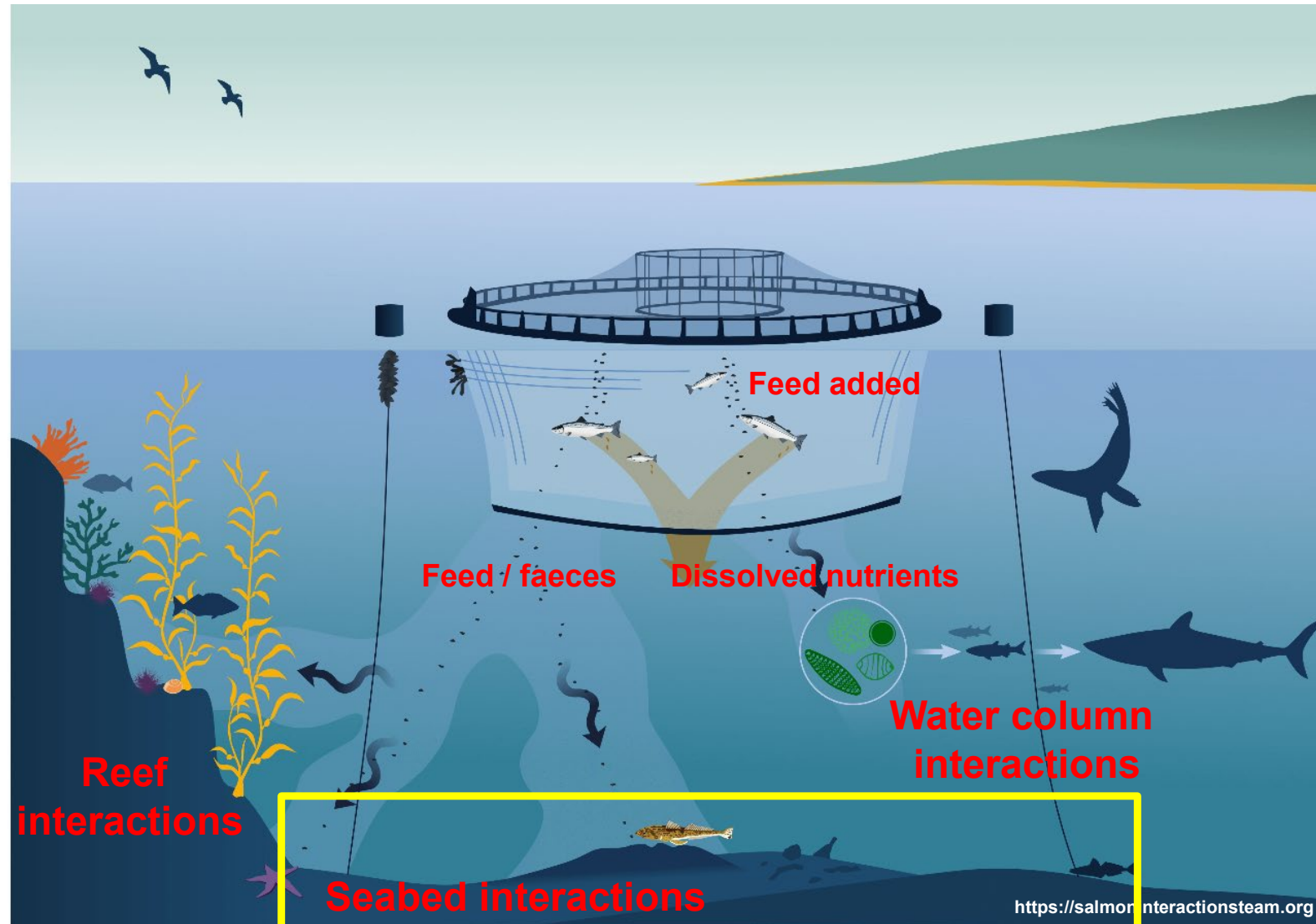


List of technical standards

1. Seabed Video Survey
2. Detailed Sediment Survey
3. Water Quality and Investigative Trigger Values
4. Reef Habitat Surveys
5. Establishment of Reference Conditions, Environmental Indicators and Reference Sites
6. Baseline Environmental Assessment Survey
7. Broadscale Environmental Monitoring Programs
8. Total Permissible Dissolved Nitrogen Output
9. Therapeutant Management
10. Seagrass Habitat Survey



Salmon farming interacts with the wider environment



What does this technical standard contain?

- Resource requirements
 - Document and record control
 - Equipment and image specifications
- Video survey techniques
 - How to do a video survey
 - Differentiates between Farm Zone and Depositional Zone video surveys
 - Minimum number of sampling sites
- How reference conditions are to be established
 - Baseline
 - Reference sites
 - Gradient approach



What does this technical standard contain?

- Video analysis
 - How to score a video survey
 - How to compare BCI to the ecological standards
 - Defines significant change
- Outlines video survey reporting requirements
- Documents how non-conformances are to be reported.



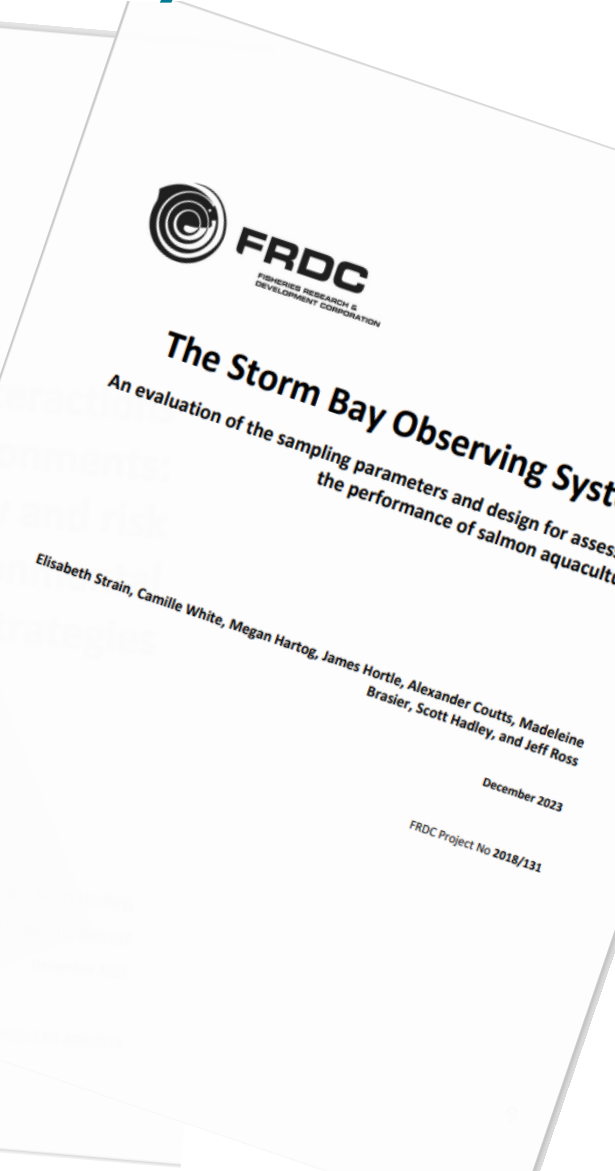
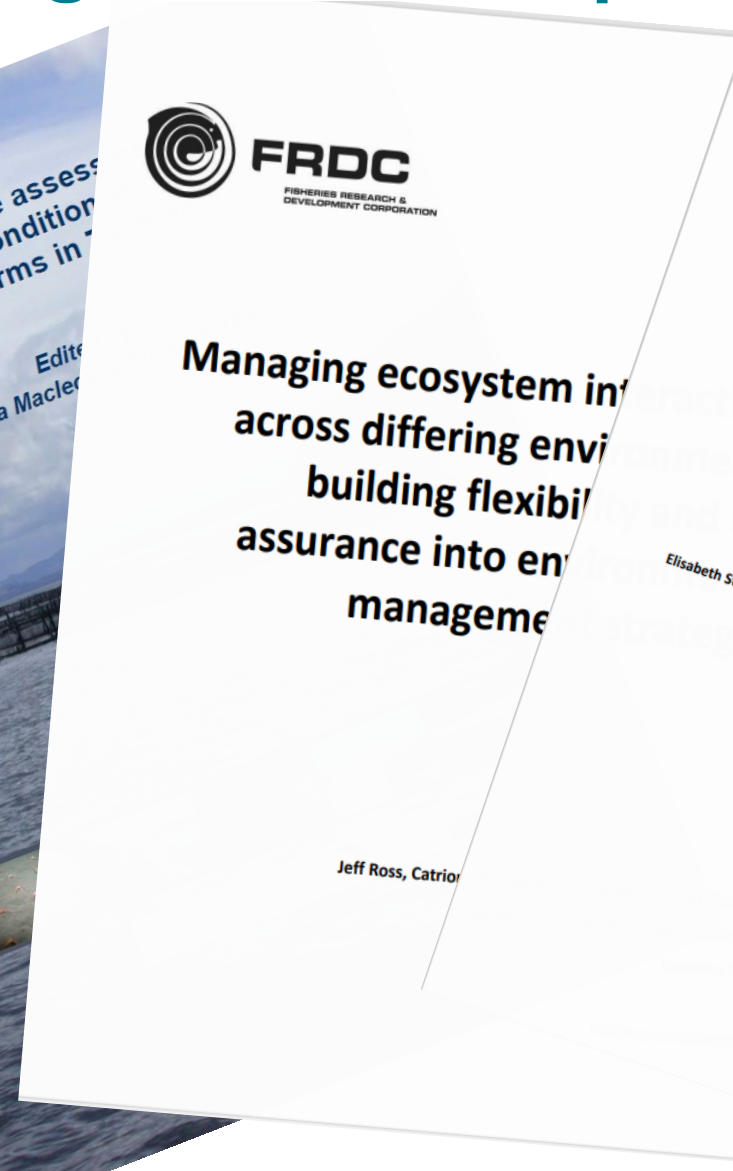
How does this technical standard align with contemporary knowledge?

- Expands on existing regulatory monitoring requirements in Environmental Licences
- Incorporated knowledge gained from international review
 - Implementing defined monitoring zones
 - Increasing the number of monitoring sites within the farm zone
 - Adopted a tiered monitoring approach
 - Risk-based

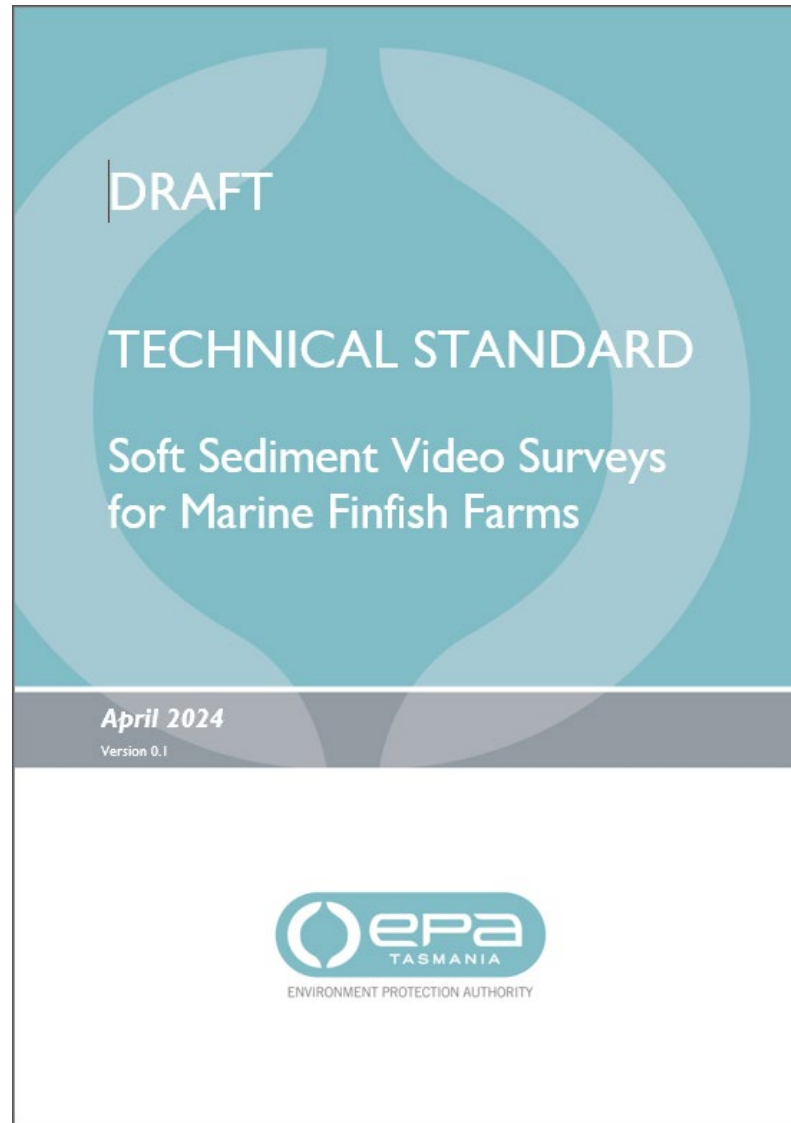


How does this technical standard align with contemporary knowledge?

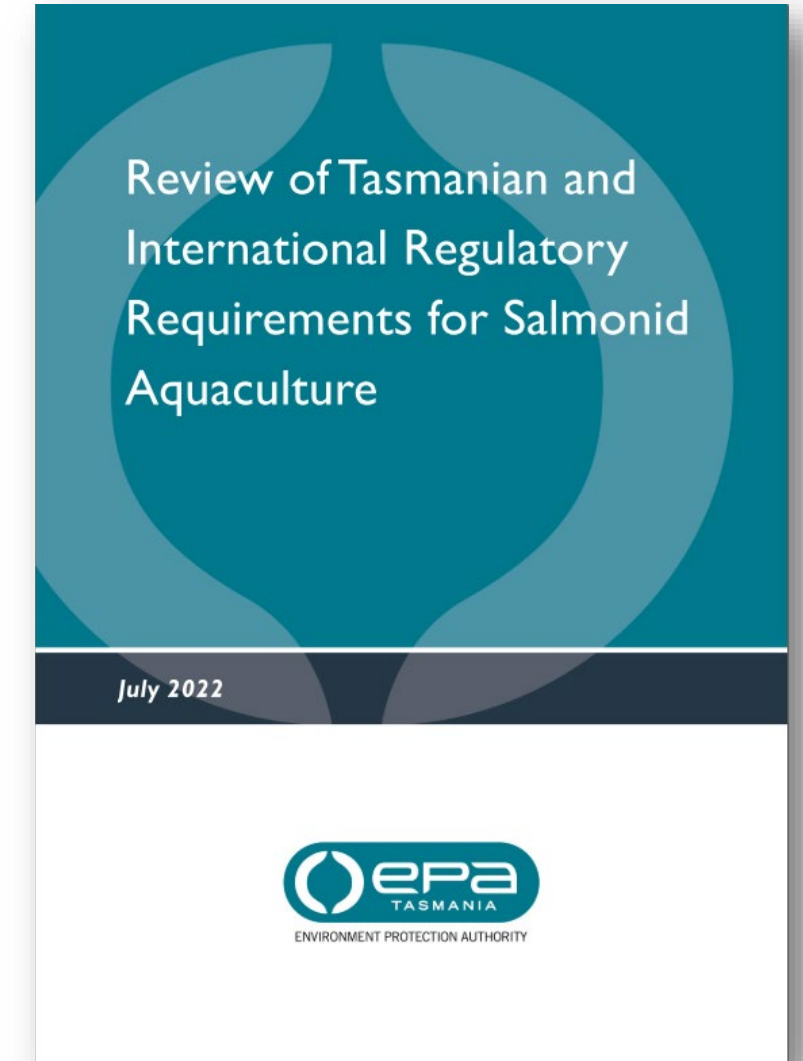
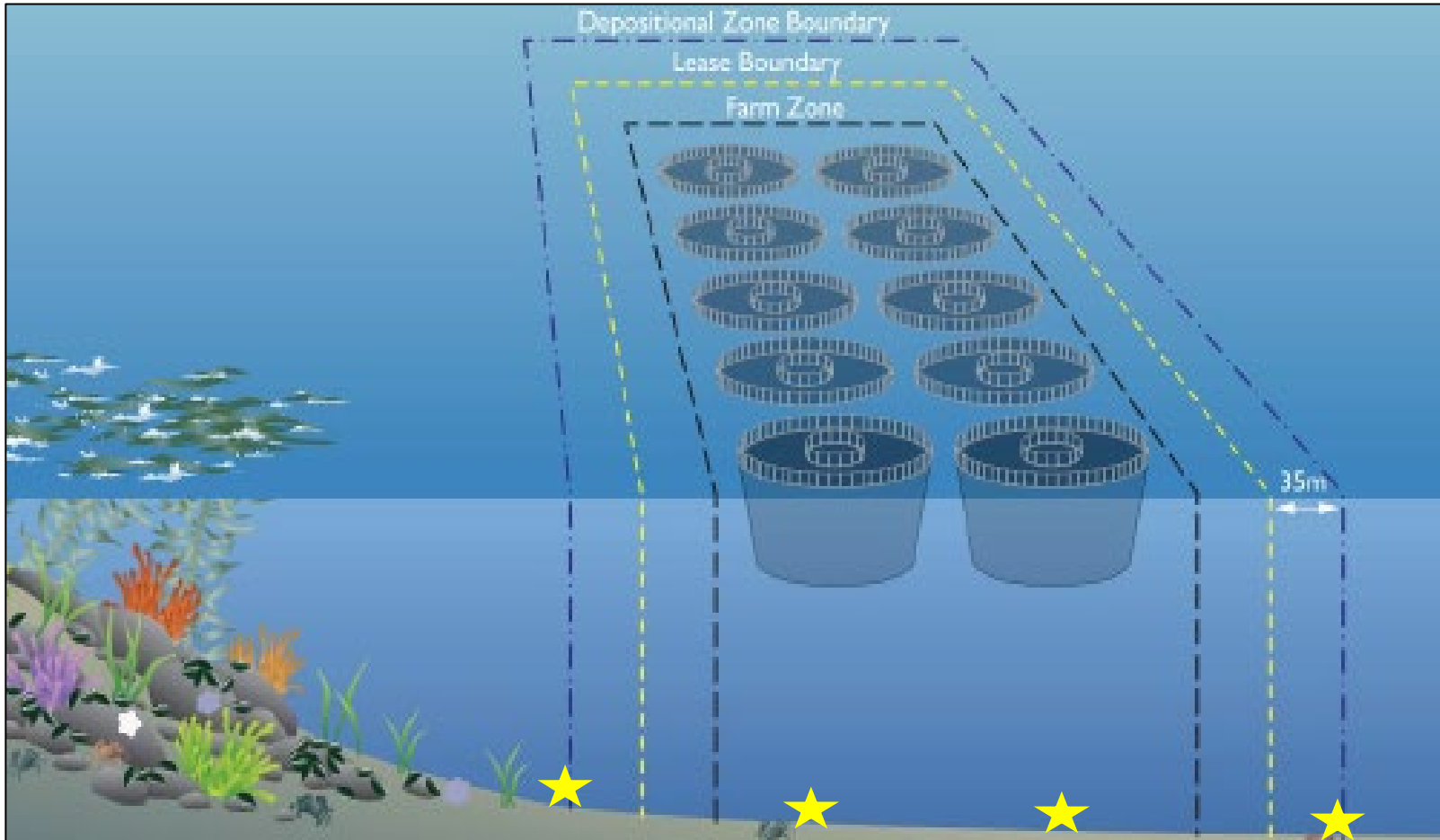
- Incorporates contemporary scientific knowledge (IMAS)
 - Macleod and Forbes (2004) – Guidelines to the assessment of sediment condition.....
 - FRDC projects
 - Managing ecosystem interactions (Ross et al. 2021)
 - Storm Bay Observing project (Strain et al. 2023)
- Addresses the requirements set out in the Environmental Standards



What changes are being made with this new Technical Standard?



Seabed video monitoring must be undertaken within defined monitoring zones

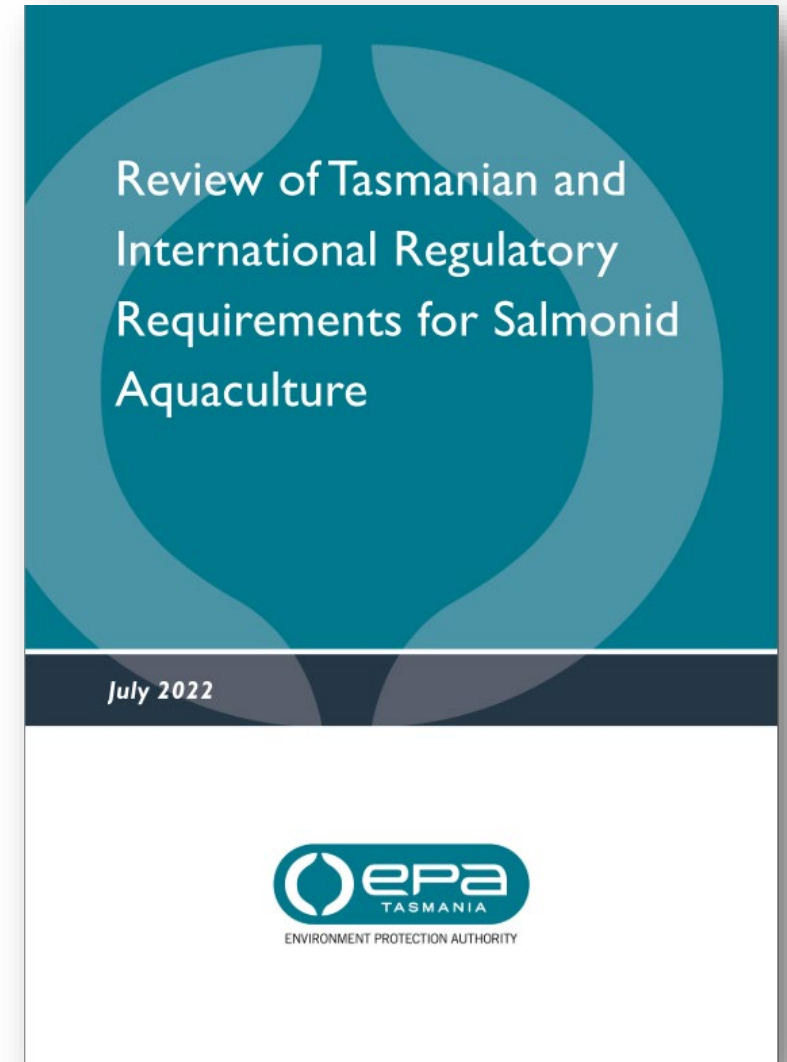


Number of video surveys within the Farm Zone

Table 4: Minimum number of pen bay sites required for Farm Zone soft sediment video surveys

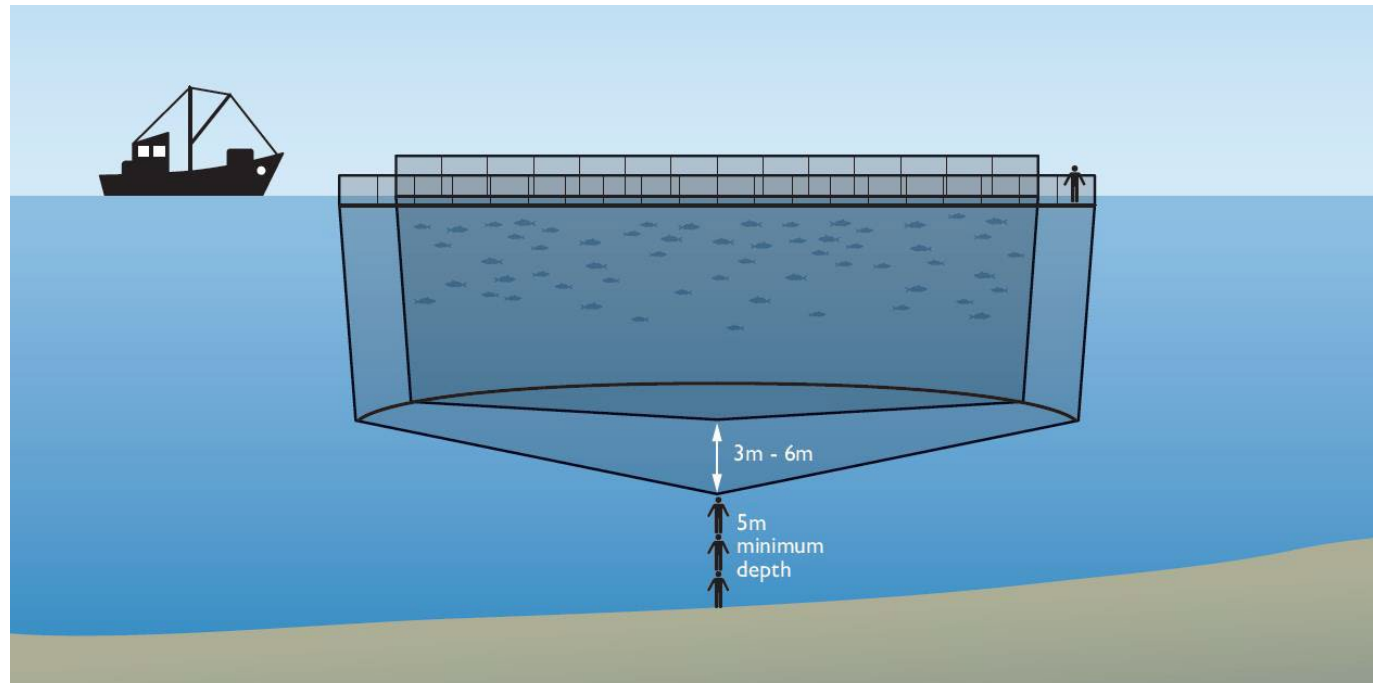
Total amount of feed used within the Farm Zone during the current production cycle (Tonnes)	Minimum number of pen bay sites
≤500	7
500 – 1500	8
1501 – 2500	9
2501 – 3500	10
3501 – 4500	11
4501 – 5500	12
5501 – 6500	13
6501 – 7500	14
7501 – 8500	15
8501 – 9500	16
>9500	16 pen bay sites + 1 additional pen bay site for every 1000 tonne increment in total feed used above 9500 tonnes

- Risk based approach
 - Increased feed results in an increase in the # of cages to be surveyed
 - More than a doubling of finfish production in Tasmania over the last 20 years
 - Change in farm husbandry practices



Number of video surveys within the Farm Zone

- Across SE Tasmania
 - ~ doubling of cages to be surveyed
- Farms where there is less than 5m between nets and the seabed will require additional pen bays to be surveyed



Number of video surveys at and beyond the Depositional Zone

- Number and location of soft sediment compliance sites to be determined by the EPA Director

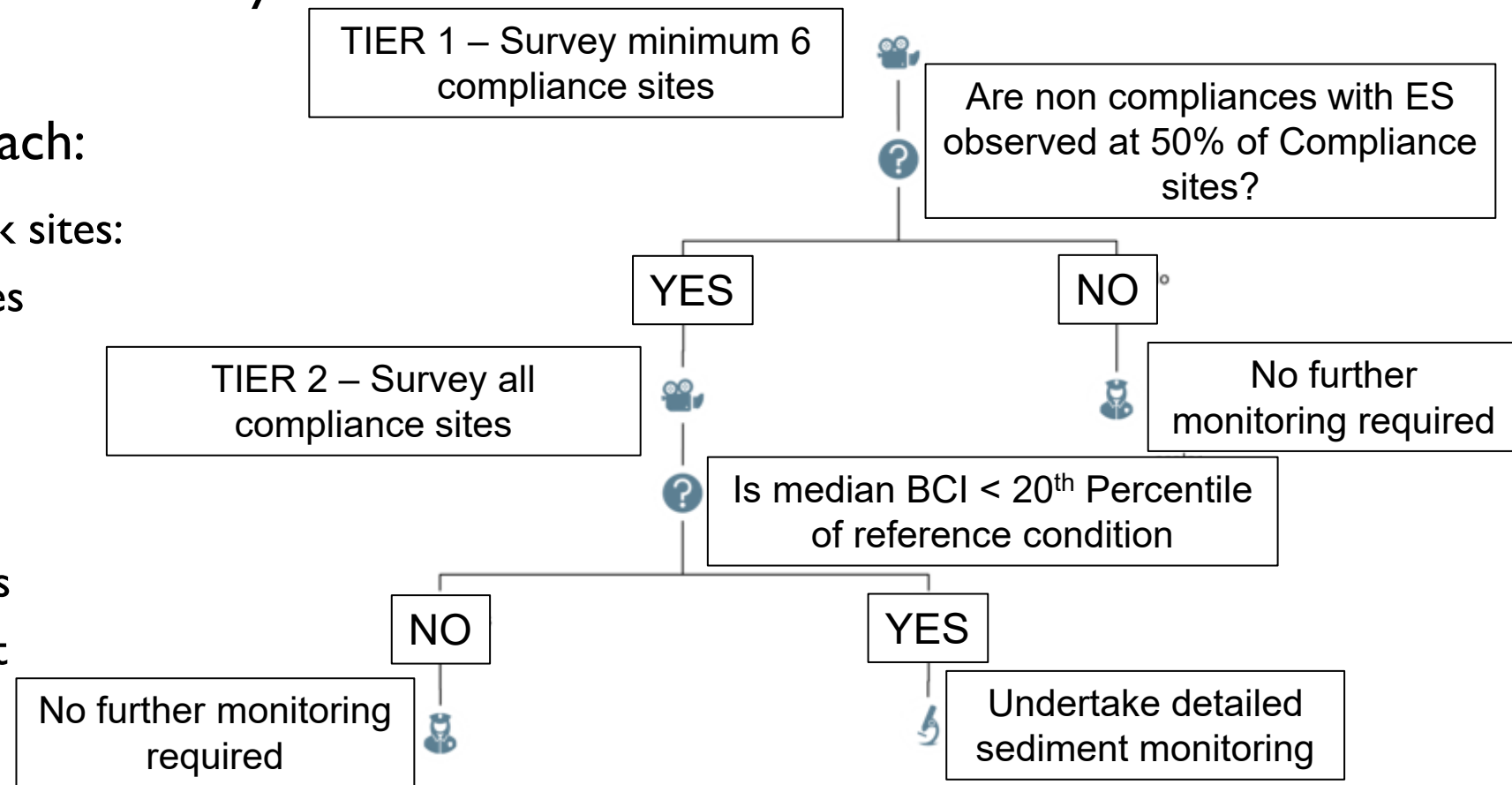
- 2-tiered risk-based approach:

- Tier 1 - minimum 6 high risk sites:

- Farm husbandry practices
- Historical performance
- Site hydrodynamics
- Any other information

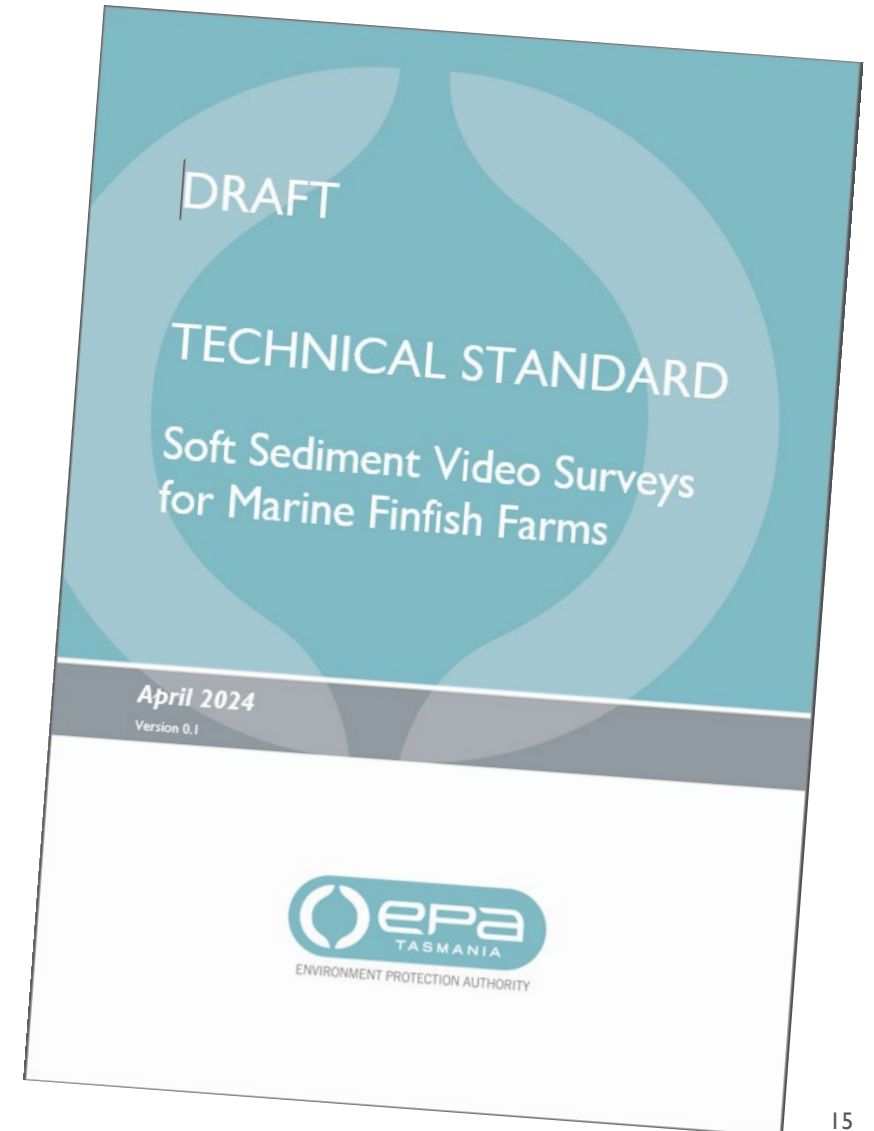
- Tier 2 – all compliance sites

- Significant change against ecological standards



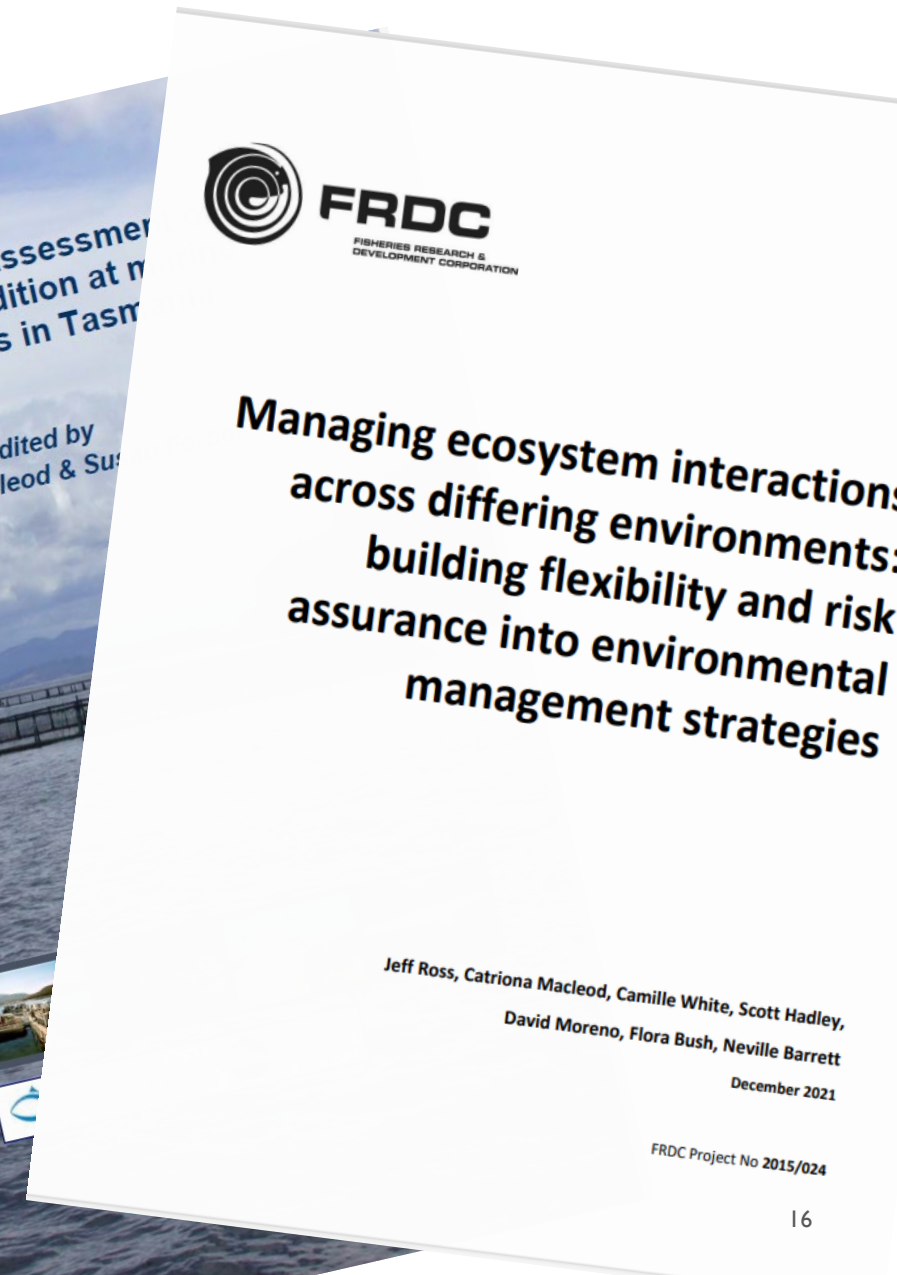
Determining significant change and reference condition

- Significant change is defined as the median BCI exceeding the 20th or 80th percentile of the reference condition BCI
- Reference condition will be determined by the Director:
 - Baseline surveys;
 - Reference sites; or
 - Gradient surveys approach
- Minimum of 17 representative survey sites are needed to establish reference condition
 - Shared among farms with similar environmental conditions
 - Minimum of 6 sites to be resurveyed each peak feed input to determine if reference conditions have changed



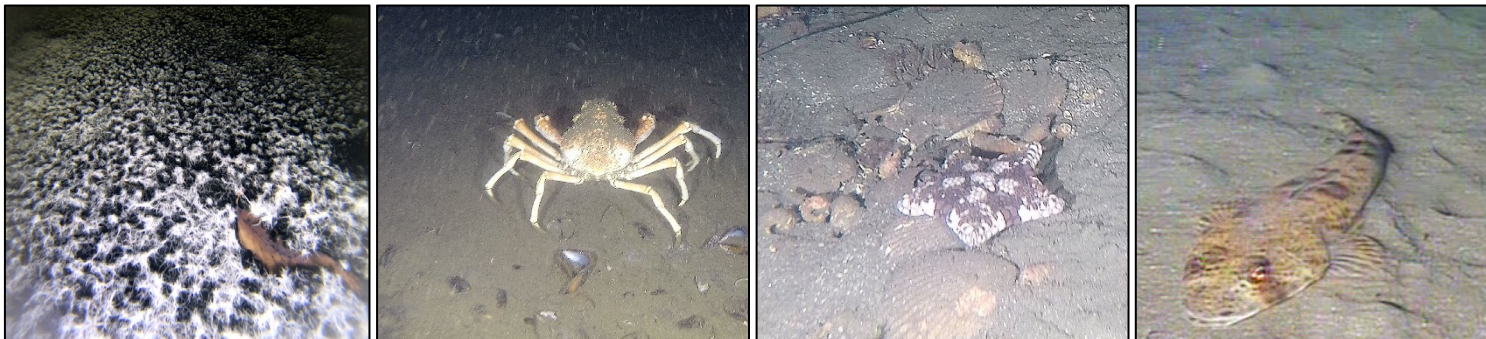
Introducing a Benthic Condition Index

- Farm Zone
 - Moving away from regulation focused only on extreme end points of organic enrichment
 - Gas bubbling
 - Bacterial mats
 - Integrated biological health score
- At and beyond the depositional Zone
 - Greater emphasis on the integrated biological health score
 - Less emphasis on a small isolated bacterial patches
 - Tiered approach
 - Focus on comparing to reference conditions



Introducing a Benthic Condition Index


- Integrated biological health score (developed and updated by IMAS).
 - 27 different criteria (video features) are used to calculate the BCI
 - Each video feature is score is weighted
 - It is based on the video scoring method originally developed by IMAS and more recently adapted by IMAS across a broad range for habitats in Tasmania



Video features		Scoring levels				Weighting
		0	1	2	3	
Seabed observations	Gas bubbling	Absent	On disturbance	Spontaneous outgassing	-	-10
	Sediment colour	Normal ²	Not normal ²	-	-	-1
	Feed pellets/ faeces	Absent	Few	Many	Feed spill	-1
	Biofouling debris	Absent	Sparse	Moderate to dense	-	-1.5
	Bacterial coverage (<i>Beggiatoa</i> spp.)	Absent	Thin patchy	Thick patchy or thin extensive	Thick extensive or streaming	-1.5
	Algal cover	Absent	Sparse	Moderate	Dense	1.5
Worms	Worm tubes/ casts	Absent	Present	-	-	1
	Capitellid polychaete worms (<i>Capitella</i> sp.)	Absent	Few (<10)	Many (≥10)	-	-1.5
	Dorvilleid polychaete worm (<i>Schistomeringos lovei</i>) ²	Absent	Few (<30)	Many (≥30)	-	-1.5
	Dorvilleid polychaete worm (<i>Ophryotrocha shieldsi</i>) ²	Absent	Few (<30)	Many (≥30)	-	-1.5
	Sabellid polychaete worms	Absent	Few (<10)	Many (≥10)	-	1
	Other worms (Annelids) including spoon worms (Echiurans)	Absent	Few (<3)	Many (≥3)	-	1.5
Echinoderms	Northern Pacific sea-star (<i>Asterias novaezelandiae</i>)	Absent	Few (<3)	Many (≥3)	-	-1
	Other sea-stars	Absent	Few (<3)	Many (≥3)	-	1
	Brittle stars (Ophiuroids)	Absent	Present	-	-	1.5
	Heart urchins (<i>Echinocardium cordatum</i>)	Absent	Few (<3)	Many (≥3)	-	1
Molluscs	Dog whelks (<i>Nassarius</i> spp.)	Absent	Few (<10)	Many (≥10)	-	-1
	New Zealand screw shell (<i>Macarocolpus roseus</i>)	Absent	Few (<10)	Many (≥10)	-	1
	Side-gilled slugs (<i>Pleurobranchidae</i>)	Absent	Few (<3)	Many (≥3)	-	-1
Crustaceans	Squat lobsters (<i>Galatheidae</i>)	Absent	Few (<3)	Many (≥3)	-	-1
	Pie crust crab (<i>Metacarcinus novaezelandiae</i>)	Absent	Few (<3)	Many (≥3)	-	-1
	Swarming epibenthic crustaceans	Absent	Few (<3)	Many (≥3)	-	1
	Other crustaceans	Absent	Few (<3)	Many (≥3)	-	1
Other	Fish	Absent	Few (<3)	Many (≥3)	-	1
	Other fauna	Absent	Few (<3)	Many (≥3)	-	1
	Burrows/ mounds	Absent	Few	Many	Dense	1.5
	Faunal tracks	Absent	Present	-	-	1

Farm Zone Ecological Standards – BCI approach

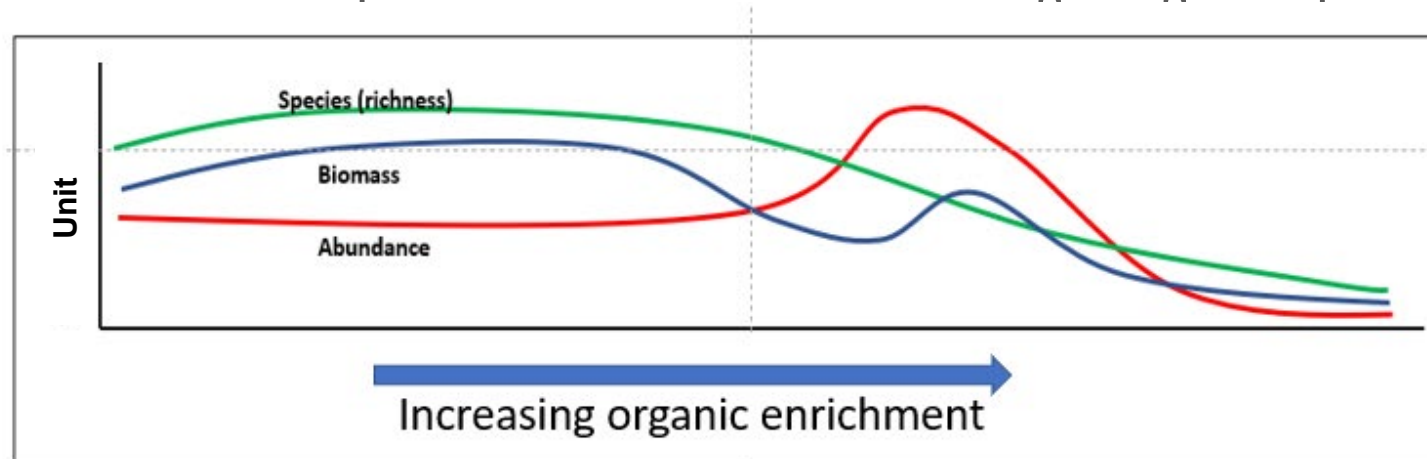
	Stage 1: No evidence of impact	Stage 2: Minor effects (Degrading)	Stage 3: Moderate effects (Degrading)	Stage 4: Major effects 1 (Degrading)	Stage 5: Major effects 2 (Degrading)	Stage 6: Grossly polluted	Stage 7: Major effects (Recovering)	Stage 8: Moderate effects (Recovering)	Stage 9: Minor effects (Recovering)
Description	No evident change	Zone of enhancement: slight community change observed	Significant community change: rapid change in community mix	Major community change and visible change in sediment characteristics	Major community change and visible change in sediment with bacterial coverage	Devoid of acrobenthic community with significant sediment change	Major community change (return to monospecific dominance) and visible change in sediment characteristic	Fauna re-establishing: zone of enhancement	Community largely recovered
Functional categories	Unimpacted indicator species present	Absence of larger, long-lived species & pristine indicator species	Deposit feeding polychaete worms/ opportunistic species dominate; absence of filter/suspension feeders	Opportunist species (esp. capitellids/ dorvilleids) characterise community	Opportunist species (esp. capitellids/ dorvilleids) dominate; bacterial coverage	Devoid of macrobenthic community	Opportunist species dominate but numbers dropping and other species colonising	Presence of transitional species with notable increase in epibenthic opportunist species	Diversification of community but absence of long-lived species and pristine indicator species
BCI	> 5	2.5 – 5	< 2.5	< 0	< 0	< -10	< 0	< 2.5	2.5 – 5 (stabilisation of cumulative scores within this range)
Exposed/ Sandy sites	Algae, echinurans/ sipunculans	Prevalence of burrow/faunal track/tubes; echinurans/ sipunculans	Side gilled slugs; Pacific seastars; pellets; farmed fish faeces; biofouling debris	Side gilled slugs; Pacific seastars; any evidence of bacterial coverage; gas bubbles; black sediment; pellets; farmed fish faeces; excessive biofouling debris	Side gilled slugs; Pacific seastars; any evidence of bacterial coverage; gas bubbles; black sediment; excessive biofouling debris	Conditions not observed	Side gilled slugs; Pacific seastars; any evidence of bacterial coverage; gas bubbles; black sediment; pellets; farmed fish faeces; excessive biofouling debris	Side gilled slugs; Pacific seastars; any evidence of bacterial coverage; gas bubbles; black sediment; excessive biofouling debris	Prevalence of burrow/faunal track/tubes; point at which sea slugs are displaced (temporal)
BCI	> 5	2.5 – 5	< 2.5	< 0	< 0	< -10	< 0	< 2.5	2.5 – 5 (stabilisation of cumulative scores within this range)
Sheltered/ Muddy sites (inc. Macquarie Harbour)	Brittlestars	Prevalence of burrow/faunal track/tubes; squat lobsters, dog whelks	Squat lobsters, dog whelks, pellets, farmed fish faeces	Continuous patches/mats of bacterial cover, gas bubbles, black sediments, pellets, farmed fish faeces	Continuous patches/ mats of bacterial coverage, gas bubbles, black sediments	Conditions not observed	Continuous patches/mats of bacterial cover, gas bubbles, black sediments	Squat lobsters, dog whelks	Prevalence of burrow/faunal track/tubes; brittlestars, squat lobsters, dog whelk


 New Environmental Standard
 and Technical Standard

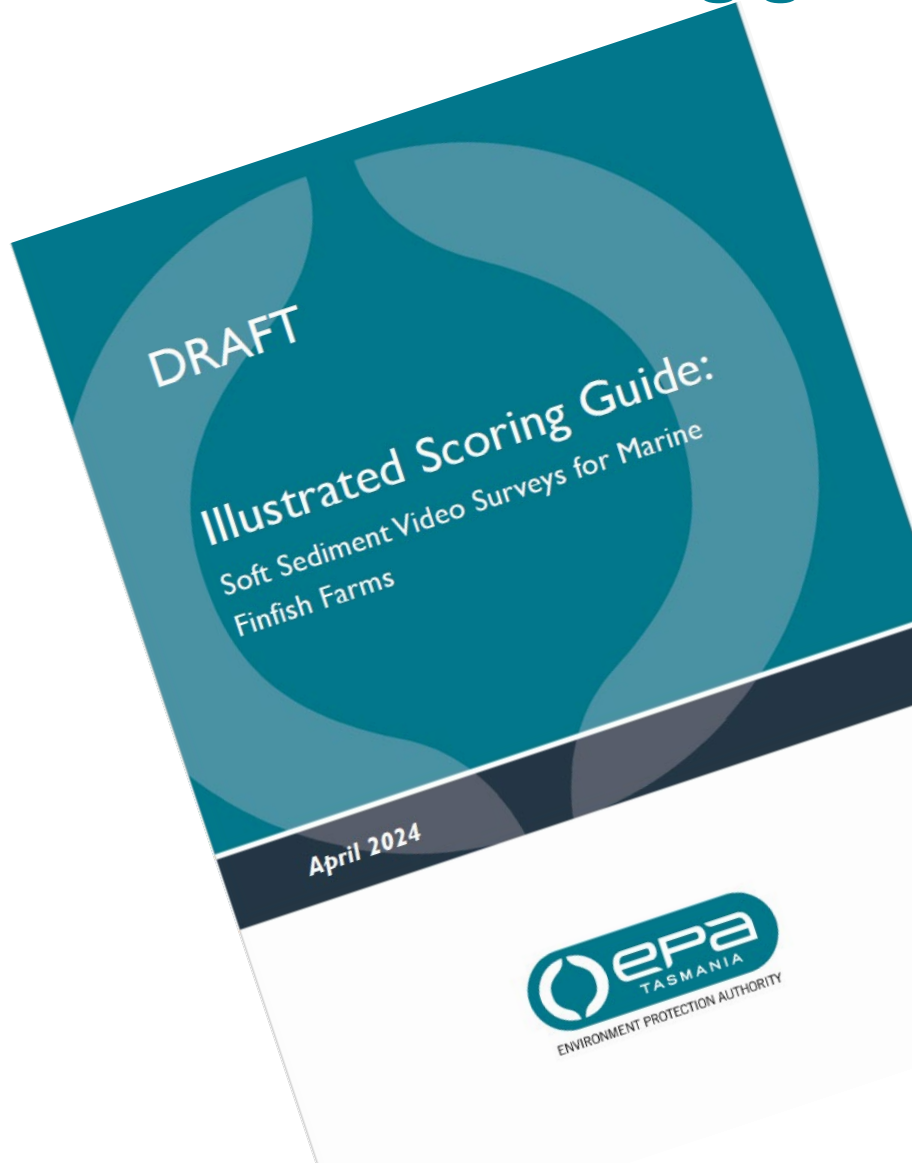

 Existing Environmental
 Licence Conditions

Farm Zone Ecological Standards – BCI approach

- Seabed interactions
 - Biological processes breakdown particulate wastes
 - Changes in seabed communities
 - Modified bacterial processes
 - Excessive accumulation of wastes (under cages)
 - Bacterial mats on the seabed
 - Outgassing of sulphide/methane



Illustrative scoring guide



26. Burrows/mounds

Burrows and mounds are created by sediment infauna. A high density of burrows and mounds on the seabed is not usually associated with highly enriched sediments (Macleod & Forbes, 2004).

Table 28 provides a summary of scoring criteria for burrows and mounds.

Table 28: Scoring criteria for burrows and mounds

	Absent	Few	Many	Dense	Weighting
Criteria	None observed throughout the video	Occasional mound or burrow present, but they do not affect the overall topography of the sediment	Sediment surface shows some topographic alteration due to mounds and burrows.	Sediment surface dominated by mounds and burrows creating a highly irregular and pitted surface.	1.5
Score	0	1	2	3	



Scoring level 1: Few (occasional mound or burrow present, but does not affect the overall topography of the sediment)

Also present: biofouling debris, feed pellets/faeces, Northern Pacific seastar, worm tubes/casts



Scoring level 2: Many (sediment surface shows some topographic alteration due to mounds and burrows)

Also present: ribbon worm, worm tubes/casts, faunal tracks.

Conclusions - what benefit does this technical standard have?

- **Environment** – Increased protection of the environment through a stronger regulatory framework to maintain and enhance environmental values of marine waterways and coastal areas

Sustainable environment – seabed is sufficiently biologically active to have the capacity to breakdown and assimilate organic wastes in the receiving environment

- **The Regulator** – improved efficiencies in the carrying out of the assessment and regulatory responsibilities with clear standards against which to audit and verify compliance
- **The Community** – Stronger protection for the environment and increased transparency regarding environmental performance
- **The Industry** – certainty, consistency, and clarity about the environmental monitoring requirements that operators must meet and comply with

Consultation process

Timing

- 6 weeks comment period
 - Asking for constructive feedback on the technical content
 - Keep in mind that that this technical standard has been developed based on the requirements contained within the Environmental Standard

Workshops

- 2 Separate workshops
 - Industry and consultants
 - Other stakeholders
- Emphasis will be on changes made due to written submissions

Publishing

More information

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