19/RC/64

The Hearing Panel

9 October 2019

Addendum to Section 42A Officer's Report

Hearing of Application – APP 20181316 - Zane Smith & Jim Maass Barrett

Compiled by Andrew Maclennan, Senior Resource Management Consultant

Application: Zane Smith and Jim Maass Barrett have applied to:

- discharge shell, sediment and organic material on the seabed;
- discharge water associated with the harvesting of shellfish;
- establish permanent structures in the Coastal Marine Area;
- allow exclusive and preferential occupation for a marine farm within Big Glory Bay, Stewart Island.

Introduction

This addendum responds to Minute #2 of the Hearing Commissioner, dated 23 September 2019. The following addendum addresses the following matters:

- The procedural matters raised in the hearing
- An updated effects assessment
- An updated objective and policy assessment
- Other matters raised during the hearing.

Procedural matters

The legal submissions on behalf of Sandford Limited (Sandford) have raised a number of procedural matters relating to: the map associated with the application, notification, and the requirements of the Marine and Coastal Area (Takutai Moana) Act 2011 (MACA Act). I provide my opinion on these matters and one additional matter that was raised within the hearing.

Map of proposed marine farm locations

Ms Appleyard (Counsel for Sanford) has suggested that there has been confusion as to the intended location of the marine farm sites throughout the application process. She is correct that the original application showed all three proposed sites in a different location to what is currently being applied for. It was this version of the application that was sent to Mr Davidson at Davidson Environmental Limited as part of his first review. However, as part of the first response to the section 92 request dated 17 August 2018, the applicant submitted an amended plan showing the location of the of the application sites. This amended map was then sent to both Mr Davidson and Dr Newcombe as part of the package they have reviewed, and the conclusions reached in their reports have been based on the updated map. I have relied on these reviews when forming my conclusion within my officer's report, and as such the information and conclusions reached in my officer's report have been based on the updated version of the map.

The information associated with the application shown on the Environment Southland website clearly shows the progression of the application from the original application which is then updated by the further information response which shows the updated map. As such, I not consider that is was difficult for submitters to understand the location of the proposal.

I acknowledge that there was an error in my officer's report, as the image on page 9 of my officer's report shows the original (incorrect) map of the application site. While incorrect, I do not believe that this oversight has resulted in a procedural issue that would affect the submitters ability to understand the implications of the application.

Notification

Ms Appleyard has raised concerns with who was directly served notice of the application. The application was publicly notified, and the following parties were directly notified:

- Sanford Ltd
- Gorton's Fisheries Ltd
- EEC Ltd
- Maas Mussels and Oysters Ltd
- Southland District Council
- Te Ao Marama Inc
- Te Rūnanga o Ngāi Tahu
- Department of Conservation
- Fish and Game
- Minister for Conservation
- Minister of Fisheries
- Minister of Conservation
- Fish and Game Council

These parties include the statutory parties that are required to be notified pursuant to Regulation 10 of the Resource Management (Forms, Fees and Procedure) Regulations 2003, and the owners of the marine farms directly adjoining each of the three proposed marine farm sites.

Environment Southland have received legal advice from Mr Doesburg, a Senior Associate at Wynn Williams, attached in Appendix 1 to this Addendum, as to who is required to be directly notified. Mr Doesburg states that:

'On its face, the relationship between Reg 10 and sections 95A, 95B and 95E is flawed:

- *If requested by an applicant under s95A, an application must be publicly notified.*
- *S95B(1) directs that a limited notification assessment is only required if an application is not publicly notified under s95A.*
- *Reg 10(2)(a) only applies if an application is publicly notified and requires service on "every person who the consent authority decides is an affected person under section 95B of the Act".*
- *As a s95B assessment only occurs if an application is not publicly notified, no persons would ever be identified as affected persons in terms of Reg 10(2)(a). So Reg 10(2)(a) is redundant.*

However, in our opinion this was not Parliament's intention with the 2017 amendments. There is no suggestion in any of the documents that supported the 2017 amendments that the service requirements would change. Rather, the MfE technical guidance on the new notification tests state that "the requirement for decision-makers to serve public notices to particular people has not changed" (see page 10 of the guidance here).

Taking a risk-based, purposive approach, we think the best course of action is to err on the side of identifying and serving notice on "affected persons", rather than rely on a technical flaw in the RMA. Overall, we think this is the approach the Court would likely take. if the Council's approach to notification were challenged.'

Notwithstanding the legal opinion above, once the decision was made to publicly notified under section 95A of the Act, the Consent Authority followed requirements set out in Regulation 10 of the Resource Management (Forms, Fees and Procedure) Regulations 2003. Regulation 10(2)(a) requires the Consent Authority to serve notice on-

"(a) every person who the consent authority decides is an affected person under section 95B of the Act in relation to the activity that is the subject of the application or review;"

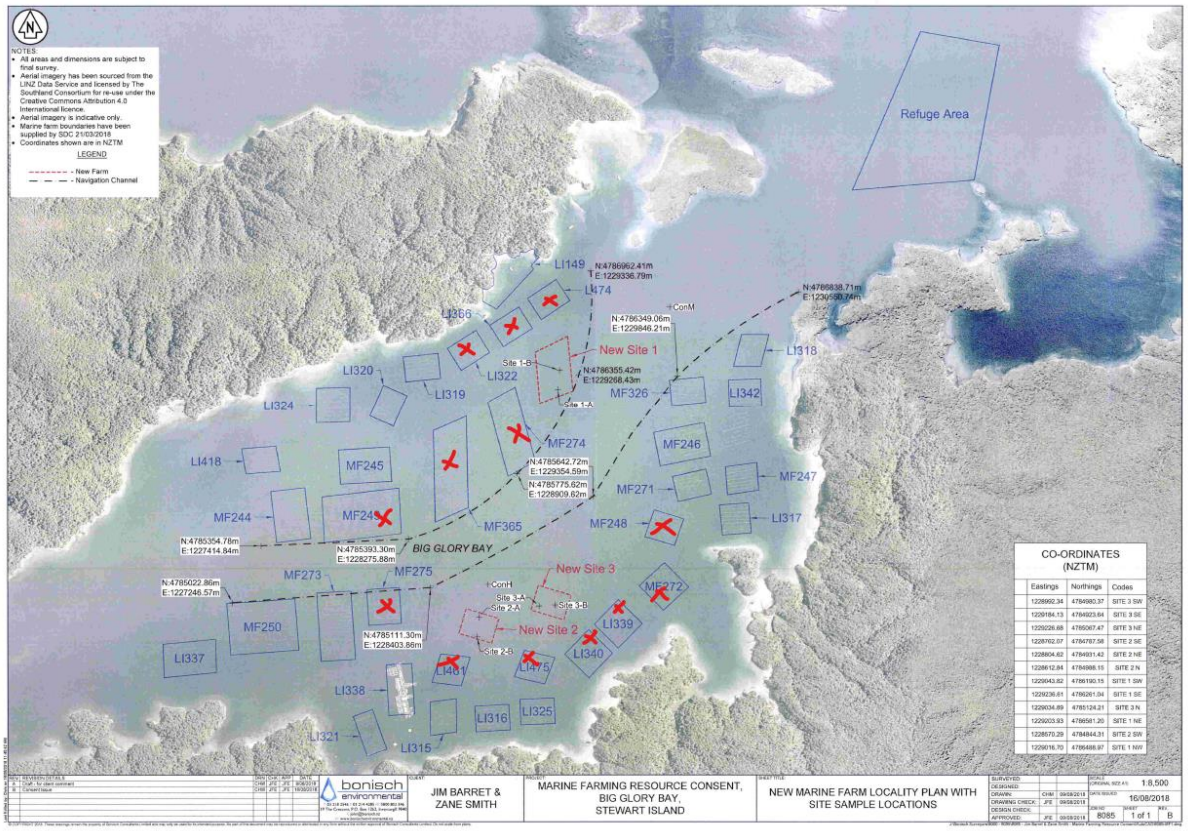
In accordance with section 95E(1), a person is an affected person if the consent authority decides that the activity's adverse effects on the person are minor or more than minor (but are not less than minor).

Sections 5 – 9 of the notification report relates to who is considered an 'affected party'. As noted in Section 6.3 is was considered that Te Rūnanga o Ngāi Tahu are an affected party. Section 8 states that:

'As noted in the effects assessment above, it is considered that the preferential occupation of 16 hectares of CMA sought by the application will have a more than minor impact on public access an enjoyment of the area. As such, it is recommended that the application be publicly notified.'

While not explicitly referred to in the notification report it was considered this effect on public access and navigation would be minor to those marine farming activities directly adjoining the application sites. Based on this assessment the consent holders of the marine farms identified with a red cross in the image below were considered directly affected:

Image 1: Showing the marine farms that were considered directly affected



I consider that it is reasonable to determine that the marine farms that are directly adjoining the application sites are directly affected, and no procedural issues arise.

Marine and Coastal Area (Takutai Moana) Act 2011

Ms Appleyard has raised concerns with the way the applicant has approached their obligations under the MACA Act. Environment Southland have received legal advice from Mr Doesburg as to how an application should be treated if the applicant has not notified any customary marine title applicant groups of the application and sought their views, this opinion is attached as Appendix 2 to this Addendum. In paragraph 3 of the attached opinion he notes that:

> *In our opinion, the fact the Applicant did not notify the Application to a group that has applied for recognition of coastal marine title under the TMA does not render the Application incomplete for the purposes of section 88 of the RMA. Additionally, we consider there is no procedural mechanism in the RMA to take into account the Applicant's lack of compliance with section 62(3) of the TMA into account when making an assessment of whether to grant a resource consent for the Application. Therefore, the Commissioner is required to continue to process the Application, despite the Applicant not complying with section 62(3) of the TMA.'*

I have relied on Mr Doesburg's opinion when coming to the view that way the applicant has approached their obligations under the MACA Act does not result in a procedural issue.

Navigation rights under existing resource consent

A significant part of the hearing was dedicated to understanding the applications effects on Sandford's ability to navigate around Big Glory Bay and also to Sandford's ability to manoeuvre their salmon cages

around Big Glory Bay as part of their fallowing rotation that is set out within their existing coastal permits.

Environment Southland have received legal advice from Mr Doesburg in relation to whether the Resource Management Act 1991 (RMA) or any case law allows Sandford to have occupation rights over the potential navigation route of their salmon cages which would preclude the Commissioner from granting the Application, this legal opinion is attached as Appendix 2 to this Addendum. In paragraphs 4 – 6 of the legal opinion, Mr Doesburg notes that:

> *'In our opinion, Sanford does not have an implied occupation right to navigate freely between the sites, to the extent the Application is precluded from being granted. Instead, we consider Sanford's exclusive occupation rights are limited to the consented marine farm sites and any additional infrastructure.*
>
> *In addition, we do not consider that the issue of derogation from Sanford's resource consent is a relevant issue, given there is recent Court of Appeal authority1 stating that resource consents do not provide property rights.*
>
> *Therefore, we do not consider the potential impact on Sanford's ability to rotate its salmon farms precludes the Commissioner from granting the Application. However, it is clear an effect on navigation is a relevant effect which should be included in the Commissioner's assessment of effects and decision on the Application. The weight to place on any navigation effects on Sanford is a decision for the Commissioner, having regard to factors provided under the decision-making sections of Part 6 of the RMA.'*

I have relied on Mr Doesburg's opinion when considering the proposed applications effect on Sanford's ability to their salmon cages around Big Glory Bay, this will be discussed further within the effects section below.

Effects of the Activity

Existing Environment

Ms Appleyard has suggested that the applicant have failed to properly assess the environment in which the effects of this application will occur[2]. She notes that the 'environment' includes the future environment as it may be modified by the implementation of resource consents which have been granted at the time a particular application is considered, where is it appears likely those consents will be implemented[3].

Dr Mitchell has provided a description on the existing environment within paragraphs 21. to 25. I agree with Dr Mitchell assessment of the existing environment. I consider the assessment of effect within my Officer's Report has been based on the correct understanding of the existing environment with the exception on one comment made in Section 6.3 - Ecological carrying capacity on page 14 where I state:

[1] Hampton v Canterbury Regional Council [2015] NZCA 509.
[2] Paragraph 37 of Legal Submissions on behalf of Sandford Limited
[3] Paragraph 38 of Legal Submissions on behalf of Sandford Limited

'In the second RFI response, dated 12 December 2018, the applicants noted that historically within Big Glory Bay high levels of mussel farming would have occurred from the early 2000s until about 2011 when Sanford Limited shifted its salmon cages (the main grower farm) from Site 320 to Site 249 out into the middle of the bay. The applicants state that 24 hectares of marine farms previously used for mussels farming is now either holding salmon or is being fallowed. The application states that this alone should allow for the 16 hectares of current application sites for mussels to proceed, as the applicants note that there has been no indication that the historic levels of mussel production was too high i.e. causing phytoplankton depletion effects in the bay or affecting production on other sites.

Overall, given the above assessment from both Mr Davidson and also Ms Newcombe, and the further information provided by the applicants, it is considered that the proposed application will have a less than minor effect on the ecological carrying capacity of the receiving environment.'

Based on the evidence provided by Mr Swart for Sandford, in paragraph 52. he notes that:

'In the future, Sanford is likely to put mussels in while sites that have been used to farm salmon are in fallow. Sanford is fully entitled to do this under its consents.'

As such, I consider that the capacity mentioned within the applicant's further information cannot be relied on in the current application. The carrying capacity of Big Glory Bay will be discussed further in carrying capacity section below.

Navigation and safety

When considering the applications effect on navigation safety I consider there are two separate issues that have been raised by the submitters. The first relates to the general safety of vessels operating within Big Glory Bay as the proposed application will increase number of vessels operating within the area and reduce the space for navigation. The second effect relates to the location of the proposed farms, and whether they will affect Sanford's ability to move its salmon farming operation to fallow sites.

When considering the first effect, the general safety of vessels within Big Glory Bay, I have considered the evidence of Mr Eriksson who has usefully provided a description of the vessel movements undertaken by vessels in Big Glory Bay and also navigational challenges faced by vessels operating within Big Glory Bay.

I have also considered the Harbourmasters Technical Comment attached in Appendix 3 to this Addendum. Mr Cleaver (Environment Southland Harbourmaster) has reviewed the application and provided the following comment:

'On 20 Sept 2019 I conducted a site visit to Big Glory Bay to ascertain the navigation safety effects, if any, of the proposed new marine farm sites in this application. Factors such as vessel transit areas, vessel traffic, size of proposed marine farms, repositioning of existing consented marine farms and aids to navigation were taken into consideration.

I have also considered the additional vessel proposed for this application and I do not believe that it will have a detrimental effect on navigation safety as a whole in the Big Glory Bay area.'

Based on the evidence of Mr Eriksson, I acknowledge that the proposed application will represent a slight increase number of vessels operating within Big Glory Bay and will also reduce the space for

navigation. However, I also consider that it's a skipper's responsibility to maintain safe navigation of their vessel. Based on the evidence of Mr Eriksson and the advice from from Mr Cleaver, I consider that the proposed application will have a minor effect on the general navigation of Big Glory Bay.

When considering the second effect, the Sanford's ability to move its salmon farming operation to fallow sites, as noted above Mr Doesburg has provided a legal opinion stating that Sanford does not have an implied occupation right to navigate between its sites to the exclusion of all others. However, he also notes that an effect on navigation is a relevant effect which should be included in the Commissioner's assessment of effects and contribute to the decision made by the Commissioner. He states that the weight to place on any navigation effects on Sanford is a decision for the Commissioner, having regard to factors provided under the decision-making sections of Part 6 of the RMA (including the evidence provided by the parties). Finally, Mr Doesburg notes that Sanford's resource consents do not specify a method for which the salmon cages must be moved.

Using Mr Doesburg's opinion as a starting point for my effect's assessment, I note Mr Cleaver has review the application and provided the following comment:

> *'Marine farm site no.1 – the proposed position will create a navigation safety hazard for vessels relocating marine farms north of this site. Changing the shape of the farm will allow vessels to safely transit.*
>
> *Marine farm site no.2 – I have no navigation safety concerns with this proposed site.*
>
> *Marine farm site no.3 – Of the three proposed sites, this site creates the most risk to navigation safety for consented users relocating marine farms. The proposed position for this site is not supported.'*

Mr Cleaver's assessment has also noted that:

> *'Note: the navigation safety assessment of the proposed marine farm sites in Big Glory Bay is based on the assumptions that:*
>
> - *the salmon cages need to be moved together*
> - *that no other marine farms will be moved to allow an alternative navigation pathway.'*

The evidence from Sandford provided at the hearing appeared to be based on the understanding that their salmon cages have a right to be moved as one large group and that that no other marine farms will be moved to allow an alternative navigation pathway. During questioning Mr Swart suggested that to move the Salmon cages would require a gap between sites of between 180 metres and 200 metres to ensure safe transport of the salmon cages. Mr Doesburg's legal opinion states that this implied right to navigation freely between the sites to the exclusion of all others does not exist.

As no evidence has been provided by Sandford as to whether there are practicable alternative methods for fallowing their salmon farms sites, I consider that it is difficult to understand the potential effects of the application in respect of this navigation and safety issue. In the absence of this information I have reserved my opinion on the extent to which the application will affect Sanford's ability to move its salmon farming operation. However, given the number of marine farm consents held by Sanford within Big Glory Bay it would appear unlikely that a safe method of navigating between sites could not be achieved given this fallowing rotation only requires moving the farm *'every two years, and sometimes more often*'[4]. I note that as a submitter Sandford will have an opportunity to

[4] Paragraph 47. Mr Eriksson's evidence

provide written comments and further information on the matters covered by this addendum report. I will reconsider my position for my final recommendation on this navigation issue based on the information provided by Sandford.

Biosecurity management plan review (MPI)

Within Section 6.8 of my Officer Report I considered potential biosecurity effects from the applications. As part of this assessment I was noted that further information was requested of the applicants. The further information requested that a biosecurity management plan be created for the proposed activity. This biosecurity management plan was presented at the hearing by the applicants. I have sent this plan on to the Ministry for Primary Industries and also to Robert Win the Biosecurity Officer - Marine and Biodiversity at the Southland Regional Council they have provided the following comments of the applicant's biosecurity management plan:

> *'The Plan is very high level. Biosecurity plans need to be developed by an aquatic health professional who has visited the site, identified the hazards and critical control points and thoroughly documented procedures on how to address these.*
>
> *There needs to be at least another layer added that describes how each of the tasks for implementation are to be achieved (i.e. SOPs) and how their achievement is recorded and how these records are managed – these need to be written into a form that can be audited, verified and updated as necessary.*
>
> *Schematics of the facility would also be useful to assist the review of the document as a biosecurity plan should be a site specific. However, the sufficiency of a plan is difficult to assess without investigating the site and the procedures undertaken.*
>
> *Further, if the location of the farm is within the (Biosecurity Act) Controlled Area Notice for Bonamia, the tasks required to address the associated risks would need to be included in the Biosecurity Plan.'*

Based on the comments above, I consider more work is required to ensure that the biosecurity risks of the application are adequately mitigated. While the proposed biosecurity management plan in its current form is not acceptable, I consider that a robust set of consent conditions can be developed to ensure that the above comments can be incorporated into the final biosecurity management plan. With appropriate conditions of consent, I consider that the biosecurity effects of the application will be less than minor.

Cumulative effects on carrying capacity

When considering the applications cumulative effect on the carrying capacity of Big Glory Bay, Environment Southland have engaged Jeanie Stenton-Dozey, a marine ecosystems and aquaculture scientist and Dr David Plew, Hydrodynamics Scientist at National Institute of Water & Atmospheric Research Ltd (NIWA) to review: the application, further information, evidence from the submitters and further information from the applicant and provide advice on the applications effect on hydrodynamics and phytoplankton carrying capacity within Big Glory Bay. This report is attached to this addendum as Appendix 4 and referred to in this addendum as the 'NIWA Report'. Page 5 of the NIWA Report provides a summary of the applications effect on phytoplankton carrying capacity within Big Glory Bay, it notes:

'Simple tools (mussel filtration rates and application of the Pelagic Effect Assessment Criterion) used in this report to ascertain the cumulative impact of adding three new mussel farms to carrying capacity of BGB have indicated that the effects are minor.

The mussels on the new farms will increase the amount of BGB water volume processed by cultured mussel daily by 1.48%, raising the present 11.56% to 13.05%.

Since the daily bay water exchange rate with the water outside the bay (7–10%) is less than the daily mussel filtration rate (11–13%), it's likely that mussel production has always depended to some extent on in-bay phytoplankton primary production.

The Pelagic Effect Assessment Criterion based on the ratio of clearance time over retention time did not exceed 1 and thus the criterion was met. Based on this indicator the cumulative effect of adding the three new farms does not adversely impact the ecological carrying capacity of BGB.

Mussel production in BGB could benefit to some extent from enhanced chlorophyll-a production that is predicted to arise from the increase in salmon farming over the next 5–6 years.'

Given the information provided within the NIWA Report, I consider that the applications cumulative effects on carrying capacity will be minor.

<u>Water Quality (hydrodynamic effects)</u>

When considering the applications effect on the hydrodynamics of Big Glory Bay, the NIWA Report has also provided comment on the hydrodynamics effect of the application. Page 5 of the NIWA Report provides a summary of the application's hydrodynamic effects, it notes:

'The area's mussel and salmon aquaculture in Big Glory Bay cover a significant portion and their structures likely affects currents (tidal and wind driven) and circulation patterns within the bay.

There is some evidence of this effect in that the two previous conducted modelling studies (neither of which included the drag from marine farms) showed poor agreement with observations collected within the bay from a current meter deployed between two mussel farms.

The three proposed mussel farms increase the total consented farm area by 16 ha from ~160 ha currently for both salmon and mussels (although not all consented area is currently occupied). This increases the area consented for aquaculture from ~13% to ~15% of the bay area. The three new farms will cause further changes in currents and circulation patterns within the bay.

However, considering the locations of the proposed farms and the increase in farmed area relative to existing farms, I expect that these changes will be minor compared to the impact that the present aquaculture activities likely already have on the bay.'

Given the information provided within the NIWA Report, I consider that the applications cumulative effects on the hydrodynamics within Big Glory Bay will be minor.

Effects Conclusion

Within my Officer Report I have suggested that the actual and potential effects of the application include effects on:

- Occupation and navigation
- Landscape and visual amenity and natural character
- Ecological carrying capacity
- Wildlife
- Water Quality (Hydrodynamics)
- Benthic environment and indigenous biodiversity
- Cultural values
- Biosecurity
- Benthic survey and monitoring.

Based on the information provided within the application and at the hearing, I consider that the effects of the application on: landscape, wildlife, benthic environment, cultural values, biosecurity and benthic survey and monitoring will be less than minor.

As noted above, based information provided within the application, the hearing, and the further reviews undertaken by Mr Cleaver, Mr Win, Dr Plew and Dr Stenton-Dozey I consider the effects of the application on: occupation and general navigation, ecological carrying capacity, and water quality (hydrodynamics) will be minor. As noted above, I have reserved my position on the effects of Sanford's ability to operation to fallow sites.

Objective and policy assessment

The New Zealand Coastal Policy Statement

Dr Mitchell in paragraphs 44. – 48. of his evidence has provided an assessment of Objective 6 and Policies 3, 6 and 8 of the NZCPS.

In relation to Objective 6 and Policies 6 and 8 of the NZCPS, Dr Mitchell in paragraph 43. of his evidence states that:

> *'I do not consider that the applicants have provided sufficient evidence to demonstrate that the proposed marine farms will be located in an appropriate place within Big Glory Bay or that an additional 16 hectares of mussel farms will be within appropriate limits, in particular with regard to the potential cumulative effects that could result.'*

Based on a further review of the application documents following the hearing I agree with Dr Mitchell that the applicants have not provided evidence to demonstrate cumulative effects the proposed marine farms will have on the hydrodynamics and phytoplankton depletion within Big Glory Bay. However, based on the review of the further information provided by NIWA, I consider that the potential effects of the application on hydrodynamics and phytoplankton depletion have been considered to be minor. As such, I consider that the application will be consistent with Objective 6 and Policies 6 and 8 of the NZCPS.

In relation to Policy 3 of the NZCPS, within paragraph 46. of Dr Mitchell's evidence he states that:

'Based on the information provided by the applicant, the Cawthron review, the Davidson Environmental review, and evidence that will be presented by Sanford's other witnesses, my assessment is that the cumulative effects of this proposal on coastal processes and carrying capacity are both "uncertain" and "potentially significantly adverse". Thus, a precautionary approach is required.'

I disagree with this statement. Based on the review of the further information provided by NIWA, I consider that the potential effects of the application on hydrodynamics and phytoplankton depletion are known and are considered to be minor. Accordingly, I maintain the view that, in relation to this application, a precautionary approach is not required by Policy 3 of the NZCPS.

I acknowledge that Dr Mitchell comments were based on the information provided by the applicant at the time and he will have the opportunity to update his assessment taking into account the review provided by NIWA.

<u>The Regional Policy Statement</u>

Dr Mitchell in paragraphs 49. – 53. Of his evidence has provided an assessment of objectives and policies within the Coastal Chapter of the RPS. He concludes in paragraph 53. that:

'I do not consider that the proposal avoids, remedies or mitigates its adverse effects on navigation, and the applicant has provided no factual basis to confirm that the cumulative effects on hydrodynamic processes and carrying capacity will be avoided, remedied or mitigated.'

I disagree with this assessment. Notwithstanding the uncertainty associated with the navigation effects discussed above, I consider that cumulative effects of this proposal on carrying capacity (depletion of phytoplankton communities) and hydrodynamics has been adequately addressed by the NIWA review. Again, I acknowledge that Dr Mitchell will have the opportunity to update his assessment taking into account the review provided by NIWA.

I maintain the view that the proposed application is consistent with the direction set out within the RPS.

<u>The Coastal Plan for Southland</u>

Within paragraphs 55 and 56 of his evidence, Dr Mitchell has identified a number of objectives and policies within the Coastal Plan relating to navigation and safety issues. He concludes that:

'Given the evidence that will be presented by Mr Swart and Mr Eriksson, I consider that the proposal offends all these provisions.'

As noted in the effect's assessment above, when considering the applications effect on navigation safety I consider there are two separate issues that have been raised by the submitters, the general safety of vessels operating within Big Glory Bay and whether the application will affect Sanford's ability to move its salmon farming operation to fallow sites.

In relation to the first effect, based on the information provided by Mr Cleaver I consider the applications effect on general navigation within Big Glory Bay will be minor, and therefore will be consistent with the objectives and policies of the Coastal Plan that require safe navigation. In relation

to the application effect on Sanford's ability to fallow its salmon sites, I have reserved my opinion on this effect.

Within paragraphs 57 and 58 of his evidence, Dr Mitchell has identified a number of objectives and policies within the Coastal Plan relating to avoiding, remedying or mitigating any adverse effects. He states that:

> *'Because the proposal does not avoid, remedy or mitigate adverse effects on navigation, and the applicant has provided no information to confirm that it will avoid, remedy or mitigate the cumulative effects on hydrodynamic processes and carrying capacity, in my opinion, the proposal is clearly contrary to these provisions*.'

As noted above, based on the information within the NIWA report, I comfortable with the level of information provided by the application is sufficient to conclude that with appropriate conditions of consent the application will avoid, remedy or mitigate the adverse effects associated with the application.

Section 104 of the RMA

Within paragraphs 57 and 58 of his evidence, Dr Mitchell has concluded that the proposal does not satisfy the requirements of section 104D.

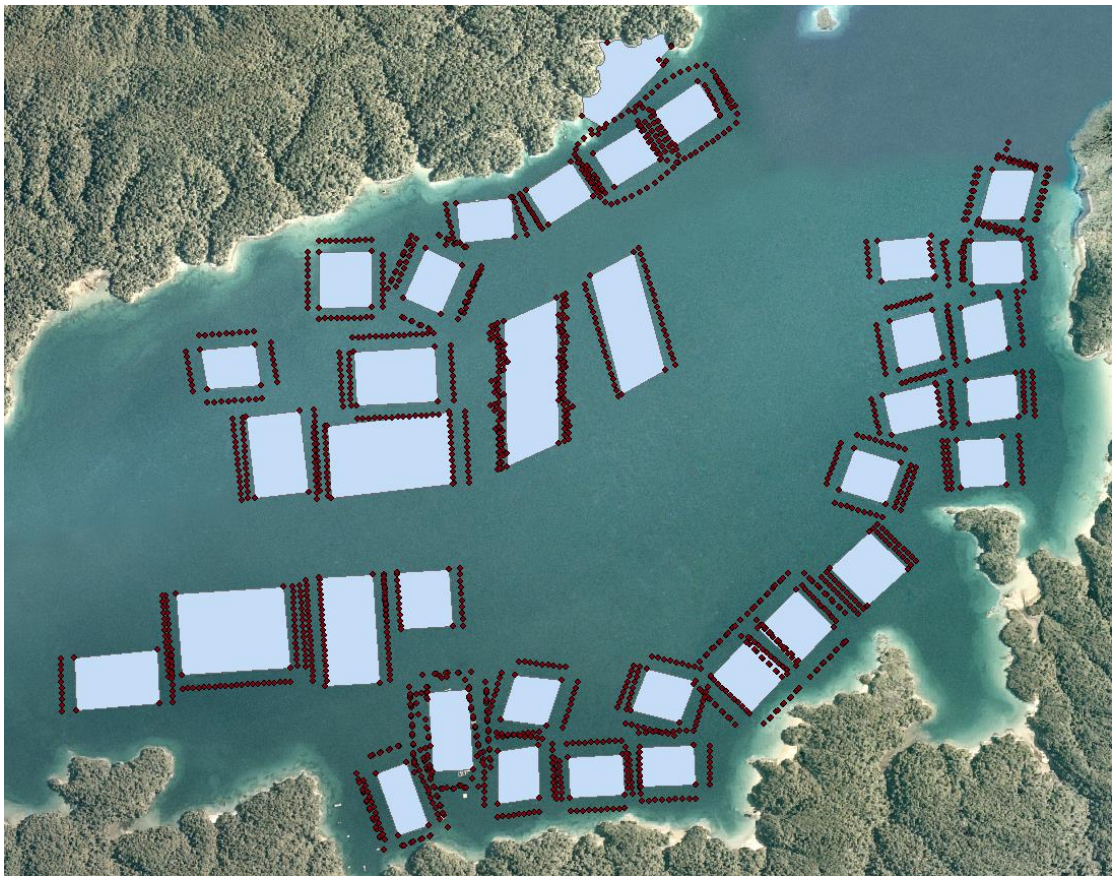
I maintain the view as set out within Section 11.2 of my s42A report that the application satisfies both of the gateway tests within Section 104D, and the Hearing Panel is not precluded from granting the resource consent.

Other matters

Location of Mooring Blocks

During the hearing the applicant noted that historically the anchor points associated with all of the consented marine farms have been located beyond the consented marine farm area. Image 2 below provided by the Environment Southland GIS Team, shows the location of the existing coastal permits and the existing anchor locations. I understand this has been agreed to by Environment Southland as a pragmatic solution to a historic problem.

Image 2: Showing the location of the existing coastal permits and the existing anchor locations.



Source: Environment Southland GIS Team

While this may have been accepted by Environment Southland to resolve a historic problem, I note that these consents are all due to expire in 2025 and as part of applying for new consents it is expected that the re-consenting of these site will ensure that all parts of the marine farm structure will be required to be contained within the consented occupation envelope.

As such, I consider that, in order to easily identify the extent of the marine farm structures all parts of the physical marine farm structure (including: mussel lines, floats, anchor blocks, anchor lines, etc.) should be enclosed within the proposed marine farm site as shown on the updated location map.

Signed:

Name: Andrew Maclennan
Reporting Officer

Date: 9 October 2019

Appendix 1 - Legal advice from Wynn Williams on notification

Michael Durand

From: Mike Doesburg <Mike.Doesburg@wynnwilliams.co.nz>
Sent: Thursday, 20 December 2018 4:35 PM
To: Michael Durand; Aurora Grant
Cc: Philip Maw
Subject: RE: Sanford application - Big Glory Bay - way forwards

Hi Mike and Aurora

We have considered the below and looked closely at the legislation, including the 2017 amendments. It would be good to discuss this with you, once you have had a chance to consider the below.

On its face, the relationship between Reg 10 and sections 95A, 95B and 95E is flawed:

- If requested by an applicant under s95A, an application must be publicly notified.
- S95B(1) directs that a limited notification assessment is only required if an application is not publicly notified under s95A.
- Reg 10(2)(a) only applies if an application is publicly notified and requires service on "every person who the consent authority decides is an affected person under section 95B of the Act".
- As a s95B assessment only occurs if an application is not publicly notified, no persons would ever be identified as affected persons in terms of Reg 10(2)(a). So Reg 10(2)(a) is redundant.

However, in our opinion this was not Parliament's intention with the 2017 amendments. There is no suggestion in any of the documents that supported the 2017 amendments that the service requirements would change. Rather, the MfE technical guidance on the new notification tests state that "the requirement for decision-makers to serve public notices to particular people has not changed" (see page 10 of the guidance **here**).

Taking a risk-based, purposive approach, we think the best course of action is to err on the side of identifying and serving notice on "affected persons", rather than rely on a technical flaw in the RMA. Overall, we think this is the approach the Court would likely take, if the Council's approach to notification were challenged.

Apologies that this is with you so late in the day – please let us know when would suit you to discuss this. We are generally free tomorrow before 12pm so could find a time that suits you best.

Kind regards
Mike

Mike Doesburg | Senior Associate | Wynn Williams

P +64 9 300 5755 M +64 21 030 0307 F +64 9 300 2609

www.wynnwilliams.co.nz

From: Michael Durand <Michael.Durand@es.govt.nz>
Sent: Thursday, 20 December 2018 9:29 a.m.
To: Mike Doesburg <Mike.Doesburg@wynnwilliams.co.nz>; Aurora Grant <Aurora.Grant@es.govt.nz>
Cc: Philip Maw <philip.maw@wynnwilliams.co.nz>
Subject: RE: Sanford application - Big Glory Bay - way forwards

Hi Mike

Sanford requested public notification. Looking at s95A and s95B, we don't think there is scope for us to decide who is an affected person:

- S95A says to publicly notify if the applicant has requested that;

- S95B only applies "if the application **is not publicly notified** under section 95A."
- S95E is used to decide who is an affected person, but this is only applies if s95B applies ("For the purpose of giving limited notification of an application for a resource consent for an activity to a person under section 95B(4) and (9) (as applicable), a person is an affected person if ...")
- But s95B does not apply if the applicant requests public notification.
- Reg 10 says we must serve notice on "every person who the consent authority decides is an affected person under section 95B"

From what I can see we do not get the opportunity to decide who is affected if the applicant requests public notification. Are we right?

I think as a result our error in serving notice only extends as far as the various specified Ministers and other authorities, band does not include any other parties in the Bay.

Keen to chat l;ater.

MD

From: Mike Doesburg [mailto:Mike.Doesburg@wynnwilliams.co.nz]
Sent: Wednesday, 19 December 2018 4:02 PM
To: Aurora Grant <Aurora.Grant@es.govt.nz>
Cc: Michael Durand <Michael.Durand@es.govt.nz>; Philip Maw <philip.maw@wynnwilliams.co.nz>
Subject: RE: Sanford application - Big Glory Bay - way forwards

Hi Aurora

Please see **attached** the final letter for your records and Jo Appleyard's response below.

I will give you a call to discuss what we can provide to respond to Jo's question below.

Kind regards
Mike

Mike Doesburg | Senior Associate | Wynn Williams

P +64 9 300 5755 M +64 21 030 0307 F +64 9 300 2609

www.wynnwilliams.co.nz

From: Jo Appleyard <Jo.Appleyard@chapmantripp.com>
Sent: Wednesday, 19 December 2018 3:33 p.m.
To: Philip Maw <philip.maw@wynnwilliams.co.nz>
Cc: Mike Doesburg <Mike.Doesburg@wynnwilliams.co.nz>
Subject: RE: Sanford application - Big Glory Bay - way forwards

Thanks Philip

Just talking to Sanford.

How has the Council arrived at the view that the other consent holders are " affected persons"?

From: Philip Maw <philip.maw@wynnwilliams.co.nz>
Sent: Wednesday, 19 December 2018 3:31 PM
To: Jo Appleyard <Jo.Appleyard@chapmantripp.com>

Appendix 2 - Legal advice from Wynn Williams on MACA Act and navigation

WYNNWILLIAMS

MEMORANDUM

Date: 9 October 2019

To: Andrew Maclennan, Reporting Consultant

From: Mike Doesburg

SMITH AND MAASS-BARRETT AQUACULTURE APPLICATION – LEGAL ADVICE FOR SECTION 42A REPLY REPORT ADDENDUM

Introduction

1. An Independent Hearing Commissioner has been appointed by Southland Regional Council to hear and determine resource consent application APP20181316 by Zane Smith and James Maass-Barrett (**Applicant**) for the establishment and operation of three new marine farm sites in Big Glory Bay, Stewart Island (**Application**). On 23 September 2019, the Commissioner issued a minute requesting further information, including information from the section 42A Reporting Consultant.

2. As a result of the Minute, you have asked us to provide legal advice on issues relevant to your addendum. In particular, you have asked for our advice on:

    a. how an application should be treated if the applicant has not notified any customary marine title applicant groups about the application and sought their views, pursuant to section 62(3) of the Marine and Coastal Area (Takutai Moana) Act 2011 (**TMA**); and

    b. whether the Resource Management Act 1991 (**RMA**) or any case law allows Sandford Limited (**Sanford**) to have occupation rights over the potential navigation route of their salmon cages which would preclude the Commissioner from granting the Application.

Executive summary

3. In our opinion, the fact the Applicant did not notify the Application to a group that has applied for recognition of coastal marine title under the TMA does not render the Application incomplete for the purposes of section 88 of the RMA. Additionally, we consider there is no procedural mechanism in the RMA to take into account the Applicant's lack of compliance with section 62(3) of the TMA into account when making an assessment of whether to grant a resource consent for the Application. Therefore, the Commissioner is required to continue to process the Application, despite the Applicant not complying with section 62(3) of the TMA.

4. In our opinion, Sanford does not have an implied occupation right to navigate freely between the sites, to the extent the Application is precluded from being granted. Instead, we consider Sanford's exclusive occupation rights are limited to the consented marine farm sites and any additional infrastructure.

5. In addition, we do not consider that the issue of derogation from Sanford's resource consent is a relevant issue, given there is recent Court of Appeal authority[1] stating that resource consents do not provide property rights.

6. Therefore, we do not consider the potential impact on Sanford's ability to rotate its salmon farms precludes the Commissioner from granting the Application. However, it is clear an effect on navigation is a relevant effect which should be included in the

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1 *Hampton v Canterbury Regional Council* [2015] NZCA 509.

Commissioner's assessment of effects and decision on the Application. The weight to place on any navigation effects on Sanford is a decision for the Commissioner, having regard to factors provided under the decision-making sections of Part 6 of the RMA.

7. Our detailed analysis follows.

Marine and Customary Area (Takutai Moana) Act 2011

8. Sanford has raised a procedural issue as a result of the Applicant's failure to notify customary marine title any applicant groups of the application and seek their views, as required by section 62(3) of the TMA. We have considered this issue in two parts:

   a. whether an applicant's failure to comply with section 62(3) of the TMA renders the application incomplete for the purposes of section 88 of the RMA; and

   b. whether the RMA requires that failure to be resolved before the Commissioner can determine the Application.

Section 88 of the RMA

9. The requirement for the Applicant to notify their resource consent application to a group that has applied for recognition of coastal marine title under the TMA is provided for in section 62(3) of the TMA. Section 62 of the TMA provides:

> (1) …
>
> (2) Subsection (3) applies if a person applies for a resource consent, a permit, or an approval in relation to a part of the common marine and coastal area in respect of which—
>
> (a) no customary marine title order or agreement applies; but
>
> (b) either—
>
> (i) an applicant group has applied to the Court under section 100 for recognition of customary marine title and notice has been given in accordance with section 103; or
>
> (ii) an applicant group has applied to enter negotiations under section 95.
>
> (3) Before a person may lodge an application that relates to a right conferred by a customary marine title order or agreement, that person must—
>
> (a) notify the applicant group about the application; and
>
> (b) seek the views of the group on the application.

10. Section 88 of the RMA specifies the information which must be filed in support of a resource consent application. It requires provision of:

    a. A completed application form, which should be made on, or correlate with the information contained in, Form 9 of the Resource Management (Forms, Fees and Procedure) Regulations 2003 (**Form 9**).

    b. The information required by Schedule 4 of the RMA.

11. In particular, we note:

    a. Form 9 does not refer to the TMA, nor require provision of any information relating to the process in section 62(3) of the TMA.

    b. While Schedule 4 of the RMA does refer to the TMA, it does not require information under section 62(3) of the TMA.

12. Clause 3(c) of Schedule 4 of the RMA provides that an application for resource consent must include an assessment of the activity against any resource management matters set out in a planning document prepared by a customary

marine title group under section 85 of the TMA. This obligation only applies once customary marine title has been recognised; not in the intervening period while applications are considered. The fact that the RMA expressly provides that such an assessment must be included in an application suggests that Parliament expressly turned its mind to the relationship between the TMA and the RMA.

13. In our opinion, the absence of any reference to the obligation in section 62(3) of the TMA from Schedule 4 of the RMA indicates that the section 62(3) obligation is a relevant matter to the decision to accept an application as complete under section 88 of the RMA. Accordingly, in our opinion, the failure to comply with section 62(3) of the TMA does not render the application incomplete under section 88 of the RMA.

Making a decision on the Application

14. We have considered whether the RMA or case law requires the failure to comply with section 62(3) of the TMA to be remedied before a decision can be made. In our opinion, there is no legal constraint on the Commissioner considering the Application despite the Applicant failing to comply with section 62(3) of the TMA.

15. We have considered section 104(3)(d), which provides that resource consent must not be granted if an application should have been "notified" but was not. However, we consider that the reference to notification in section 104(3)(d) of the RMA is a reference to the RMA's regime for public or limited notification of resource consents,[2] rather than any notification required under the TMA or any other statute.

16. Having regard to the Commissioner's powers under the RMA, we consider that there is no procedural mechanism that requires or authorises the Commissioner to require the failure to be remedied before making a decision on the Application.

17. On 2 October 2019, the Applicant's consultant planner provided evidence[3] that Mr Paul and the New Zealand Māori Council, two claimants who have applied for recognition of customary marine title under the TMA, were notified of the Application. Therefore, the requirements of the TMA have been carried out, albeit post-application. In our opinion, this effectively remedies any procedural defect contained in the Application.

18. As a final point, we note that the Application was publicly notified, so any person (including Mr Paul and the New Zealand Māori Council) could have made a submission and be heard on the Application. We therefore consider that it would be unlikely that any party would be prejudiced by the Applicant's failure to comply with section 62(3) of the TMA.

Navigation

19. A further issue raised by Sanford relates to its rights of navigation and occupation in the context of its salmon farms in Big Glory Bay.

20. We have considered this issue in three parts:

    a. Whether an effect on navigation is a relevant effect under the RMA which can be included in the Commissioner's assessment of effects of the Application.

    b. Whether Sanford has an implied coastal occupation right to navigate to the exclusion of other activities.

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2 See the definition of 'notification', 'public notification' and 'limited notification' in section 2AA of the RMA. Both 'public notification' and 'limited notification' are defined to only include notification made under sections 95, 169 or 190 of the RMA.

3 Evidence of John Frances Engel dated 2 October 2019, paragraphs [5]-[10].

c. Whether granting a resource consent for the Application would amount to a derogation from Sanford's resource consent.

Are navigation safety effects relevant under the RMA?

21. Section 104(1)(a) requires decision-makers to have regard to any actual and potential effects on the environment of allowing the activity. The RMA's definitions of "effect" and "environment" are broad.

22. In our opinion, navigation safety effects are relevant effects that can be included in the Commissioner's assessment of effects. We base our opinion on the following factors:

a. The maintenance and enhancement of public access to and along the coastal marine area is a matter of national importance which all persons exercising functions and powers under the RMA must recognise and provide for.[4]

b. The issue of navigation safety is addressed under the Regional Coastal Plan for Southland (**Coastal Plan**).[5] The relevant provisions of the Coastal Plan indicate that the effects of an application on navigation safety is an issue that should be taken into account by the Commissioner.

c. Previous applications for aquaculture activities in the coastal marine area have considered effects of the activity on navigation, where it has been relevant in the factual and planning context.[6]

Does Sanford have an implied occupation right to navigate freely, to the exclusion of all other activities

23. Section 12(2) of the RMA sets out the presumption that no person may occupy the coastal marine area unless expressly allowed by a resource consent (or rule in a regional coastal plan or National Environmental Standard, neither of which apply). Therefore, the extent of Sanford's occupation rights in the coastal marine area are specified by its resource consents. While the Commissioner is not precluded from granting another resource consent over the area which is occupied by Sanford, in practice it would not be appropriate to do so as the application could only be given effect to in the event Sanford's resource consent expired and was not renewed.[7]

Sanford's resource consents

24. It is our understanding that Sanford currently has resource consents to occupy the coastal marine area in Big Glory Bay for the purpose of undertaking marine farming activities at seven different sites. In each of these consents, conditions 1 to 3 outline the nature of Sanford's occupation rights. These conditions provide:[8]

> (1)(a) This consent authorises the placement of structures in, on and over the seabed, to occupy the coastal marine area, and to discharge contaminants as described in the application for resource consent dated 10 February 2014 and further information dated 28 November 2014, at the locations shown in Appendix 2, for the purpose of marine farming the following species…

---

4 RMA, s 6(d).

5 Regional Coastal Plan for Southland, chapter 11.8.

6 See, for example, *Golden Bay Marine Farmers v Tasman District Council* W19/2003 [2003] NZEnvC 101 at Chapter 8.

7 See *Golden Bay Marine Farmers v Tasman District Council* W19/2003 [2003] NZEnvC 101 at [144].

8 The wording and numbering is from resource consent MF246. The resource consents for the other marine farms are materially the same.

…

(2) The occupation of the coastal marine area for marine farming activities pursuant to the consent, shall only occur within the application co-ordinates as detailed and shown on the attached survey map attached as [x], comprising approximately [x] hectares.

All used and unused [mussel/salmon] anchors outside the above co-ordinates that are detailed on the survey map attached as [x] are to be considered part of the marine farm site.

(3) Except to the extent that it is necessary to achieve the purpose of this consent and for public safety, members of the public shall not be excluded from the marine farm site at any time.

Note: This consent does not authorise exclusive occupation within the authorised area even though the marine farming structures and operations will result in some exclusion over part of that area. The extent that the physical exclusion over part of the authorised area is necessary for the normal operation of the marine farm is provided for in this consent (refer to section 122(5) of the Resource Management Act 1991).

25. Conditions 19 and 20 of the resource consent deal with fallowing and rotation. Condition 19 relevantly provides:

> The consent holder shall at all times undertake rotation and fallowing of their salmon farming operations in accordance with the Fallowing Plan in Appendix 3…

26. The Fallowing Plan does not specify what path is to be taken when moving the salmon farming operations between the multiple sites.

Interpreting Sanford's resource consent

27. The nature of resource consents is governed under section 122 of the RMA. Of relevance to coastal permits are subsections 122(1) and (5), which provide:

> **122 Consents not real or personal property**
>
> (1) A resource consent is neither real nor personal property.
>
> …
>
> (5) Except to the extent—
>
> (a) that the coastal permit expressly provides otherwise; and
>
> (b) that is reasonably necessary to achieve the purpose of the coastal permit,—
>
> no coastal permit shall be regarded as—
>
> (c) an authority for the holder to occupy a coastal marine area to the exclusion of all or any class of persons; or
>
> (d) conferring on the holder the same rights in relation to use and occupation of the area against those persons as if he or she were a tenant or licensee of the land.

28. Section 122(5) provides two[9] ways that coastal permit may give rights of exclusion of others from use and occupancy. The first is where the resource consent expressly provides for such rights of exclusion, in which event any exclusion will take effect in accordance with the way it is expressed in the resource consent. The second is when exclusion of others or a degree of exclusion is reasonably necessary to achieve the purpose of the permit.[10]

29. Concerning subsection 122(5)(a), conditions 1 and 2 are clear that Sanford's occupation rights in the coastal marine area are limited to the areas contained in the site maps attached to each resource consent. Condition 3 and the attached advice note further define Sanford's occupation rights within each site, providing the resource consents do not authorise exclusive occupation, albeit noting the marine farming structures and operations will result in some exclusion over part of the site.

30. Additionally, the advice note to condition 3 refers to section 122(5) of the RMA and states that the resource consent provides for the extent that the physical exclusion over part of the authorised area is necessary. In our opinion, the purpose of the advice note is to eliminate any debate over whether the exclusion of others is reasonably necessary to achieve the purpose of the resource consent, as provided for in section 122(5)(b). The effect of the advice note is to clarify that no further occupation rights are to be implied into the resource consents, beyond those contained on the face of the consent.

31. In our opinion, the effect of conditions 1 to 3 is to limit Sanford's occupation rights to the marine farm sites. We do not consider that section 122(5) is applicable to areas of the coastal marine area outside Sanford's marine farm sites. Therefore, we are of the opinion that Sanford does not have an implied occupation right to navigate between sites to the exclusion of others.

Derogation

32. We have considered whether the navigation effects of the Application on Sanford's marine farming operation could amount to a derogation from Sanford's resource consent, if the Application were to be granted. The principle of non-derogation recognises that a consent authority cannot derogate from the grant of a resource consent through the consent process itself.

33. The Court of Appeal's 2015 decision in *Hampton v Canterbury Regional Council*[11] (***Hampton***) has cast some doubt over the application of the derogation principle to resource consents under the RMA. In particular, the Court did not consider that resource consents provide a property right capable of being derogated from.[12] Given that resource consents do not provide property rights to consent holders, in our opinion the principle of derogation is unlikely to be a relevant issue in this case.

34. We have considered how the position in *Hampton* on derogation applies in this case. We are of the opinion that the Commissioner is not precluded from granting the Application due to any potential effect on Sanford's ability to rotate its salmon farms. However, as stated above at [21]-[22], we consider that the effects of the Application on Sanford's resource consent, including effects on navigation, are relevant effects which can be taken into account by the Commissioner under section 104 of the RMA. The weight to be placed on those navigation effects is a decision for the

---

9 See *Hume v Auckland Regional Council* [2002] 3 NZLR 363; (2002) 8 ELRNZ 211; [2002] NZRMA 422 (CA) at [17]-[22].

10 *Hume v Auckland Regional Council* [2002] 3 NZLR 363; (2002) 8 ELRNZ 211; [2002] NZRMA 422 (CA).

11 *Hampton v Canterbury Regional Council* [2015] NZCA 509.

12 *Hampton v Canterbury Regional Council* [2015] NZCA 509 at [99]-[105].

Commissioner, having regard to factors provided under the decision-making sections of Part 6 of the RMA.

35. In the event our opinion that the principle of derogation is not applicable is incorrect, it is not clear from the evidence we have read in this case that granting the Application would result in a derogation from Sanford's resource consent. The previous threshold to establish a derogation of a resource consent is high. It required any incursion on the "property right" of a resource consent to be significant to the extent of frustrating the previous grant, or at least a substantial interference.[13]

36. In our opinion, unless granting the Application would have the effect of frustrating Sanford's ability to comply with conditions 19 and 20 of its resource consent, we do not consider that the effects of the Application on Sanford's resource consents will amount to a derogation in this case. On this point, we note that Sanford's resource consents do not specify a method for which the salmon cages must be moved. Whether in fact the Application frustrates Sanford's ability to rotate its salmon farms is a decision for the Commissioner, based on the evidence of the effects on navigation provided.

Wynn Williams

[13] *Southern Alps Air Ltd v Queenstown Lakes District Council* (2007) 13 ELRNZ 221; [2008] NZRMA 47 (HC) at [50]; *Mt Cook National Park Board v Mt Cook Motels Limited* [1972] NZLR 481 (CA).

Appendix 3 – Harbourmaster Technical Comment

Coastal Permit Technical Comment

For all consent applications that may affect navigational safety

environment SOUTHLAND REGIONAL COUNCIL Te Taiao Tonga

Activities in coastal waters or on rivers and lakes may affect navigational safety or other areas of interest to the Harbourmaster. The Harbourmaster also assists the Consents Division by providing expert input into assessments of consent applications, where necessary.

Comments from the Harbourmaster assist with prompt decision making on consent applications.

This form should be completed and included with any consent application for an activity in a navigable water body that affects, or may affect, navigational safety. This includes applications for the installation, extension or removal of a structure in a navigable water body, any reclamation, and any commercial surface water activity in any navigable water body.

Section 1: Applicant to complete

Name: Zane Smith & Jim Maass-Barrett

Address: P O Box 129, Oban, Stewart Island 9849

Proposed activity: To establish and carry out new marine farming activities at three sites

Location: NZTM 2000: 1229724E 4786551N, 1228697E 4785069N, and 1229089E 4785211N

Use NZTM2000 or otherwise identify the location accurately

Type of consent sought: Coastal Permit for placement of structures; disturbance of the seabed; occupation of space; temporarily mooring a vessel within the sites; deposition of material on the seabed; and discharge of water associated with shellfish harvesting.

e.g. Land use consent for works in a river bed; coastal permit for occupation of coastal space

Consent sought:

- ☒ A new consent for a new activity, or
- ☐ A new consent for an existing activity
- ☐ A change to a condition of an existing consent

Section 2: Harbourmaster or the Deputy Harbourmaster to complete

In my assessment, the following has been taken into account by the applicant when assessing adverse effects of their proposed activity (tick all that apply):

	Yes	No	N/A
Effects of the activity on navigational safety/bylaws	☒	☐	☐
Oil transfer sites and oil transfers	☐	☐	☒
Oil / fuel spill risk	☐	☐	☒

Other (*Comment)*:

In my assessment the following variables have been taken into account when assessing the adverse effects of the proposed activity (tick all that apply):

	Yes	No	N/A
Suitability of depth of water	☒	☐	☐
Vessel size suitability for the proposed area	☐	☐	☒
Integrity of holding ground for the anchor/mooring	☒	☐	☐
Sufficiency of the swing room for the vessel to rotate around the anchor/mooring without collision	☐	☐	☒
Other vessels are able to safely navigate in the area	☒	☐	☐
The structure, if existing, is well maintained, is safe and poses no hazard in itself	☐	☐	☒
Effect on other users of the area(s)	☒	☐	☐
Adequacy of anchorage size	☐	☐	☒

Other (*Comment)*: _____

Further comments:

On 20 Sept 2019 I conducted a site visit to Big Glory Bay to ascertain the navigation safety effects, if any, of the proposed new marine farm sites in this application. Factors such as vessel transit areas, vessel traffic, size of proposed marine farms, repositioning of existing consented marine farms and aids to navigation were taken into consideration.

I have also considered the additional vessel proposed for this application and I do not believe that it will have a detrimental effect on navigation safety as a whole in the Big Glory Bay area.

Marine farm site no.1 – the proposed position will create a navigation safety hazard for vessels relocating marine farms north of this site. Changing the shape of the farm will allow vessels to safely transit.

Marine farm site no.2 – I have no navigation safety concerns with this proposed site.

Marine farm site no.3 – Of the three proposed sites, this site creates the most risk to navigation safety for consented users relocating marine farms. The proposed position for this site is not supported.

Aids to navigation on existing marine farms are positioned adequately, however maintenance is required on the defective lights reported on; these need to be repaired as soon as possible and the Harbourmaster notified when this is completed.

Note: the navigation safety assessment of the proposed marine farm sites in Big Glory Bay is based on the assumptions that:

- the salmon cages need to be moved together
- that no other marine farms will be moved to allow an alternative navigation pathway

Section 3 Harbourmaster or the Deputy Harbourmaster to complete

I do believe some of the activities proposed will cause adverse effects on navigational safety.

Signed: _____ Date: 07/10/2019

Harbourmaster

(Disclaimer: The completion of this technical comment does not declare support for, or guarantee the granting of a resource consent application.)

Appendix 4 – Technical advice from NIWA on hydrodynamics and phytoplankton depletion

Comments on cumulative effects of proposed mussel farms in Big Glory Bay

Hydrodynamics and phytoplankton carrying capacity

Prepared for Environment Southland

October 2019

Prepared by:
Jeanie Stenton-Dozey
David Plew

For any information regarding this report please contact:
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NIWA Project: ENS20502 ENS20502

Quality Assurance Statement		
	Reviewed by:	Jeffrey Ren
	Formatting checked by:	Rachel Wright
	Approved for release by:	Helen Rouse

Contents

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Executive summary

The hearing for the application APP20181316 by Zane Smith and James Maass-Barrett ('the Applicant') for resource consents associated with the establishment and operation of three new mussel farm sites totally 16 hectares in Big Glory Bay (BGB), Stewart Island was held in September 2019. The Commissioner asked for further information relating to the phytoplankton carrying capacity of and hydrodynamic effects of the application in Big Glory Bay. Environment Southland (ES) requested that NIWA provide comments on:

1. Hydrodynamic effects based on the information provided within the application and further information provided with respect to the size and location of the proposed farm sites.
2. The response submitted by the Applicant on phytoplankton carrying capacity and past mussel harvest volumes having been higher in the past.

Hydrodynamics:

- The area's mussel and salmon aquaculture in Big Glory Bay cover a significant portion and their structures likely affects currents (tidal and wind driven) and circulation patterns within the bay.
- There is some evidence of this effect in that the two previous conducted modelling studies (neither of which included the drag from marine farms) showed poor agreement with observations collected within the bay from a current meter deployed between two mussel farms.
- The three proposed mussel farms increase the total consented farm area by 16 ha from ~160 ha currently for both salmon and mussels (although not all consented area is currently occupied). This increases the area consented for aquaculture from ~13% to ~15% of the bay area. The three new farms will cause further changes in currents and circulation patterns within the bay.
- However, considering the locations of the proposed farms and the increase in farmed area relative to existing farms, I expect that these changes will be minor compared to the impact that the present aquaculture activities likely already have on the bay.

Carrying capacity:

- Simple tools (mussel filtration rates and application of the Pelagic Effect Assessment Criterion) used in this report to ascertain the cumulative impact of adding three new mussel farms to carrying capacity of BGB have indicated that the effects are minor.
- The mussels on the new farms will increase the amount of BGB water volume processed by cultured mussel daily by 1.48%, raising the present 11.56% to 13.05%.
- Since the daily bay water exchange rate with the water outside the bay (7–10%) is less than the daily mussel filtration rate (11–13%), it's likely that mussel production has always depended to some extent on in-bay phytoplankton primary production.
- The Pelagic Effect Assessment Criterion based on the ratio of clearance time over retention time did not exceed 1 and thus the criterion was met. Based on this indicator the cumulative effect of adding the three new farms does not adversely impact the ecological carrying capacity of BGB.
- Mussel production in BGB could benefit to some extent from enhanced chlorophyll-*a* production that is predicted to arise from the increase in salmon farming over the next 5–6 years.

1 Background

The hearing for the application APP20181316 by Zane Smith and James Maass-Barrett ('the Applicant') for resource consents associated with the establishment and operation of three new mussel farm sites totally 16 hectares in Big Glory Bay (BGB), Stewart Island was held on 16 September 2019 (Figure 1-1). The hearing was adjourned following the presentation of submitter evidence to allow for the Reporting Officer to consider all of the evidence presented and to provide an addendum to the s42A Report[1] addressing the potential effects on hydrodynamics and phytoplankton carrying capacity.

The Commissioner asked the Applicant to provide further information relating to the phytoplankton carrying capacity of Big Glory Bay with evidence to support the Applicant's assertion that mussel volumes produced had peaked at higher levels in the past, without any measured adverse effects on phytoplankton carrying capacity. The Commissioner also raised the need for the Applicant to consider the 'Pelagic Effect Assessment Criterion' from the Aquaculture Stewardship Council (ASC 2019) or similar scientific method to demonstrate the proposed additional mussel farming is within the carrying capacity of Big Glory Bay. In accordance the Applicant submitted a Response to a Request for Further Information (RFI)[2] on 2 October 2019. In addition, the Commissioner asked the Reporting Officer for Environment Southland to address the hydrodynamic effects of the application in his reply including an assessment as to whether the effects are less than minor, minor, more than minor. In this regard the Regional Officer requires the provision of some general comments on hydrodynamic effects based on the information provided within the application and further information provided with respect to the size and location of the proposed farm sites.

Environment Southland (ES) requested that NIWA provide comments on:

1. Hydrodynamic effects based on the information provided within the application and further information provided with respect to the size and location of the proposed farm sites.

2. The response to the RFI submitted by the Applicant on phytoplankton carrying capacity and past mussel harvest volumes having been higher in the past.

In both instances NIWA studied the relevant information regarding the application provided by the Reporting Officer and on the ES website[3].

Our discussion is presented in two sections: Hydrodynamics by Dr David Plew and Carrying Capacity by Dr Jeanie Stenton-Dozey.

[1] 42A Officer's Report Hearing of Application – APP 20181316- Zane Smith & Jim Maass Barrett. Compiled by Andrew Maclennan, Resource Management Consultant

[2] John Engel "Response to additional request for information dated 2 October 2019 for an application for coastal permit for marine farming".

[3] https://www.es.govt.nz/environment/consents/notified-consents/2019/zane-smith-and-jim-maass-barrett

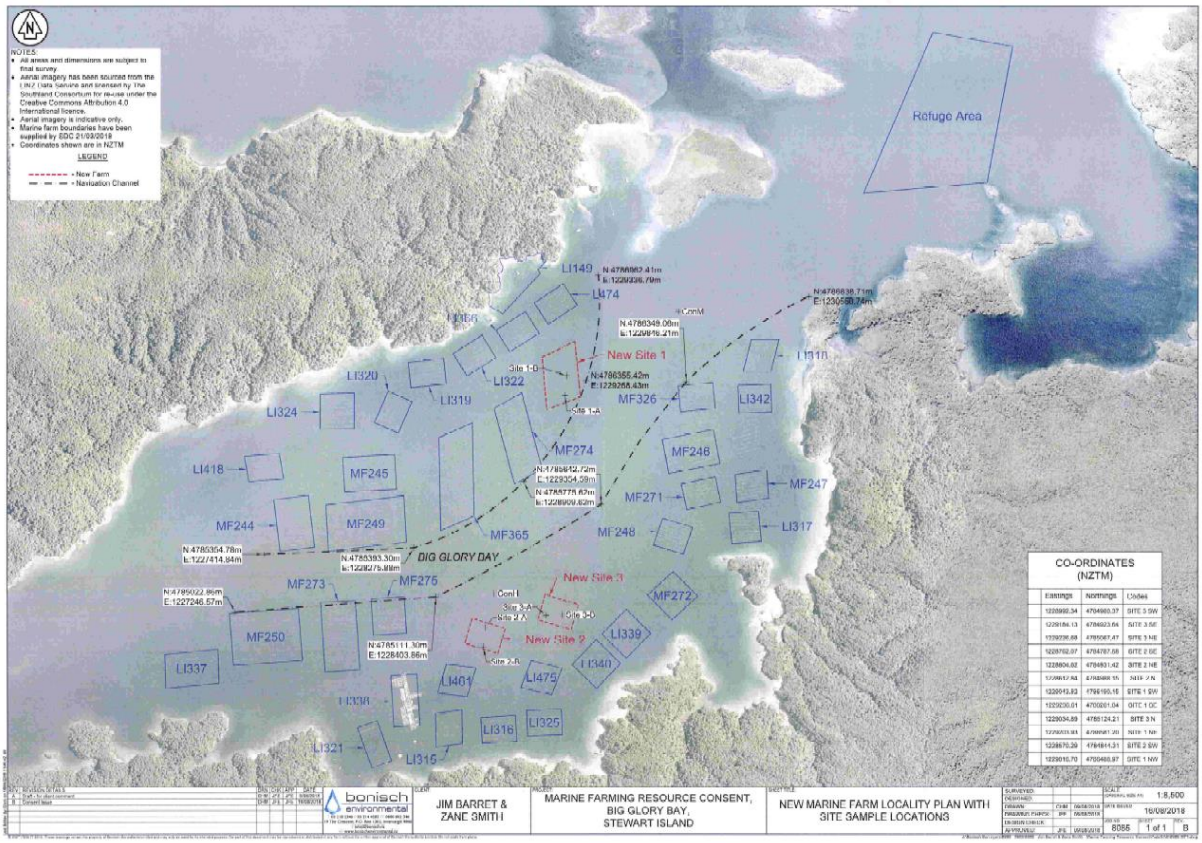

Figure 1-1: New marine farm locality plan in Big Glory Bay. The three new proposed sites are marked in red.

2 Hydrodynamics

2.1 General aspects of currents

Currents within coastal embayments such as BGB are largely driven by tides, which flow in and out of the bay every ~12 hours. Tidal currents can transport material to a considerable distance, but because they generally reverse direction every 6 hours, often material may end up close to its starting point some 12 hours later. However, tidal currents don't completely reverse, and eddies that form behind headlands, constriction and expansion of flow through narrow passages and steering by coastlines and bathymetry result in net flow patterns, or residual currents, that can be discerned by averaging currents over several tidal cycles.

On top of this, wind also drives currents in the bay, and indirectly affects currents in the bay by modifying coastal currents. Atmospheric pressure changes affect sea level, causing flows into and out of the bay similar to (but generally smaller than) tides. The other factor that can cause currents are differences in water density. In an embayment, fresh water inputs from streams or runoff form a less dense (lighter) surface layer that flows seaward. As it does, it mixes with and entrains sea water, so that a volume of water significantly greater than the freshwater input to the bay flows out of the bay near the surface. To balance this, there is a deeper inflow of denser sea water. This vertical circulation pattern (outward at the surface, inward at the bottom) is commonly referred to as an estuarine circulation. A flow resembling estuarine circulation can also be caused by heating of surface waters in the bay (by solar radiation). Wind can also drive surface currents one direction, while deeper water moves in different directions.

2.2 Hydrodynamics of Big Glory Bay

The hydrodynamics (the movement of water) in BGB have been investigated through observations and hydrodynamic modelling. Reports and evidence submitted by other parties refer to the use of drogues and current meters by Pridmore and Rutherford in July 1988. While I have been unable to access the original publications in time to prepare this report, a summary of the findings of Pridmore and Rutherford (1990) regarding the internal circulation patterns in BGB was provided in an appendix to the RFI by Engel[4]. A summary diagram is reproduced in Figure 2-1. The net circulation pattern according to Pridmore and Rutherford (1990) is of a general flow towards the mouth of the bay along the northern and southern coastlines. Pridmore and Rutherford (1990) also describe an estuarine-type circulation pattern of net outflow at the surface and inflow near the bed.

I am aware of two hydrodynamic modelling studies of BGB. In 2012, DHI produced a model for Sanford Ltd to consider the impact of increased salmon farming. This model was reviewed by NIWA (Broekhuizen, Hadfield and Stenton-Dozey 2012) who considered that the hydrodynamic model was generally 'sound and fit for purpose'. This model was validated against current meter data collected by the Cawthron Institute at two locations – in the entrance to BGB, and in the inner bay between two mussel farms approximately 300 m apart (6 Sep–6 Oct 2010). DHI used the MIKE3 FM HD hydrodynamic model with variable horizontal resolution and 13 vertical layers, forced by tides and wind with steady (non-varying) freshwater inputs included.

[4] s92 Response Tidal flushing – Pridmore 1991 APP-20181316.pdf dated 17 August 2018

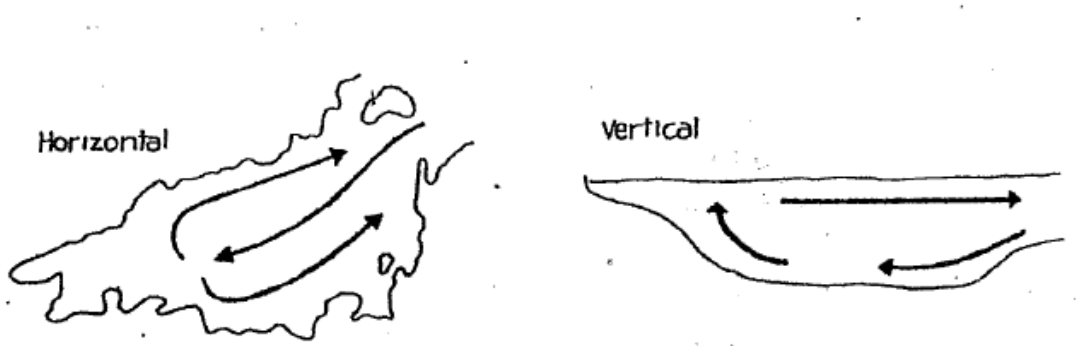

Figure 2-1: Diagram of the internal circulation patterns in Big Glory Bay according to R. Pridmore 1991. Taken from s92 Response Tidal Flushing – Pridmore 1991 APP029181316.pdf.

A second modelling study by Aquatic Environmental Sciences and Aquadynamic Solutions (ADS 2017) used the DELFT3D hydrodynamic model with 40 m horizontal resolution and 10 vertical layers, driven by wind, offshore currents and tides. This model was calibrated and validated using the same current meter described above.

The two models give similar results. The models show large scale eddies and recirculation in the bay. The models show that average currents in the bay are low (< 5 cm/s in the inner bay), and stronger (5–15 cm/s) towards the mouth. They show a general flow towards the mouth of the bay along the northern and southern coastlines (underlying the oscillating tidal flows), and an estuarine-type circulation pattern of net outflow at the surface and inflow near the bed, consistent with the description by Pridmore and Rutherford (1990).

Both models compared well with the current meter that was deployed in the entrance to the bay. However, neither model reproduced the speed or direction of currents at the location of the inner current meter with much accuracy. Both studies attribute this to the presence of the numerous mussel farm and fish farm structures in the bay. Neither model included the effect of mussel or salmon farms, so it is likely that much of the discrepancy between models and data is due to the farms.

2.3 Effects of marine farms on currents

Several peer-reviewed scientific publications show that longline farms (of the type or like those used for culture of Greenshell mussels in New Zealand) impede flow, and cause changes in currents. The greatest change generally occurs within the farmed area itself. Observational studies have detected a wide range of reductions in current speed from 13% (Boyd and Heasman 1998) up to 90% (Lin et al. 2016). This wide range is due to a number of factors including the design of the farm, density of the farming (the spacing between the mussel crop ropes along a longline, and the spacing between longlines), depth of the crop lines relative to the water depth, size of the crop, orientation of the longlines, size of the farm, and the proximity of the farm to other obstructions such as the shore or other farms (which restricts the ability for flow to be diverted around the farm rather than through). For mussel farms in New Zealand, a more typical reduction in flow speed is 20-60% (Plew et al. 2005; Plew 2011b).

The effects of mussel farms on currents extend beyond the boundaries of the farms. At downstream of the farm there is a wake zone with reduced velocities (the size of this is determined by farm size and tidal excursion), and there can be increased velocities around the sides of the farm as flow is

diverted around the farm. As an illustration, Figure 2-2 (from Plew 2005) shows transects of water velocities measured through a large mussel farm in Golden Bay, with the arrows indicating the direction and speed of the current. Velocities within and downstream (south-east) of the farmed area are lower than elsewhere, and the direction of the arrows show how flow is diverted around the farm.

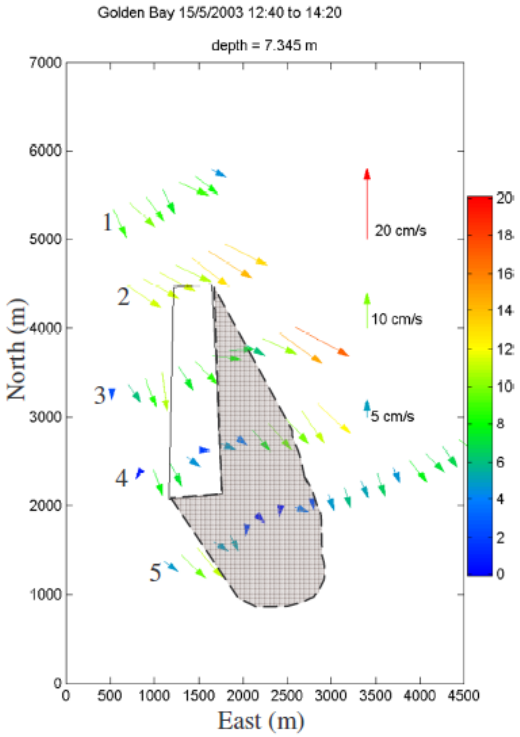

Figure 2-2: Measured water currents through a large mussel farm in Golden Bay. The arrows indicate the speed and direction of currents, which were measured from a current meter mounted on a boat. At this stage of the tide, the predominant current was from north-west to south-east. From Plew (2005).

Multiple marine farms within an embayment have cumulative effects on currents, which can alter circulation patterns with the bay (Grant and Bacher 2001; Plew 2011b; Shi et al. 2011; O'Donncha et al. 2013; Lin et al. 2016; Wang et al. 2018). Fish cages also affect currents in similar manner (Merceron et al. 2002; Helsley and Kim 2005; Johansson et al. 2007; Winthereig-Rasmussen et al. 2016), and depending on their structure and because of the solidity of the structures compared to mussel farms, may have higher drag. There can be changes in flow direction, some local increases in velocity, but in general the presence of farms causes reductions in the average water velocity within bays. An illustration of this is given in Figure 2-3, which shows results from a modelling study of two bays in the Pelorus Sound (Plew 2011b). The figure on the left shows the residual (time-averaged) currents with no farms, and on the right the change in residual currents caused by mussel farms.

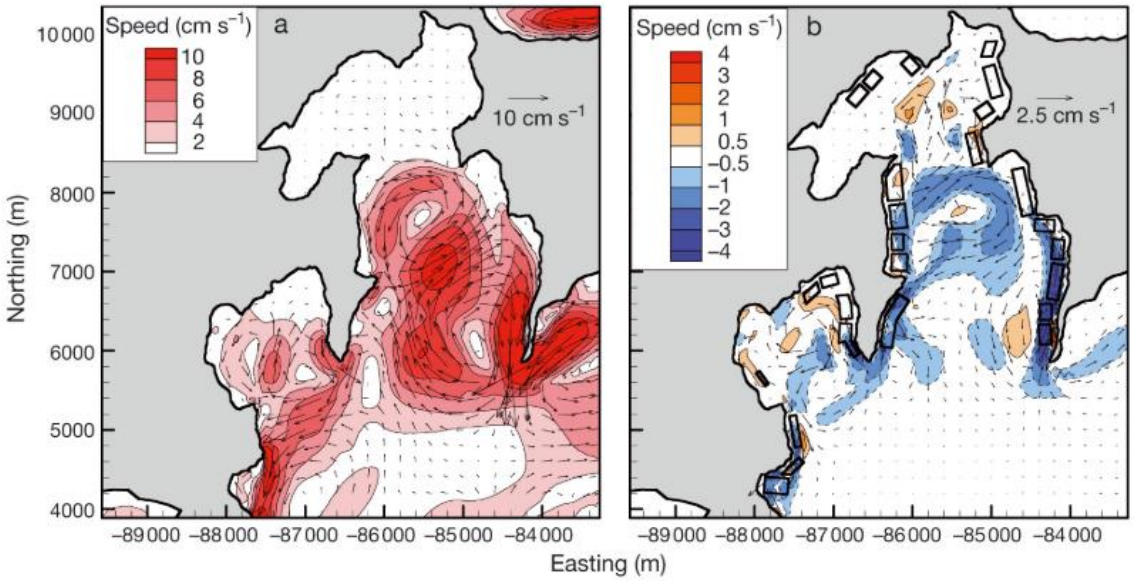

Fig. 5. (a) Residual current speeds with no farms, and (b) difference in residual speeds. Decreases in water speed are indicated with dashed contour lines. Boxes: farm positions

Figure 2-3: (a) residual currents in Port Ligar and Waihinau Bay (Pelorus Sound) in the absence of marine farms, (b) difference in residual currents caused by marine farms (outlined in black). From Plew (2011b).

The location of the farms is also important. Farms located in areas with high current speeds have a large effect on flow within the bay, as do those in areas where flows are constricted, such as through narrow entrances. This is illustrated both in the previous figure as well as in Figure 2-4 below, taken from the same study (Plew 2011b). The figure shows the percentage change in mean water speed caused by different farm layouts. Figure 2-4a shows the changes in current speeds caused by the present farm layout, while Figure 2-4 b-d show changes in current speeds caused by the same amount of farming (occupying the same total surface area) located in different parts of the bay. Under those scenarios, placing the farm in the middle portion of the bay (Figure 2-4c) caused the greatest reduction in current speeds (-19% averaged over the bay) as it blocked a significant fraction of the width of the bay.

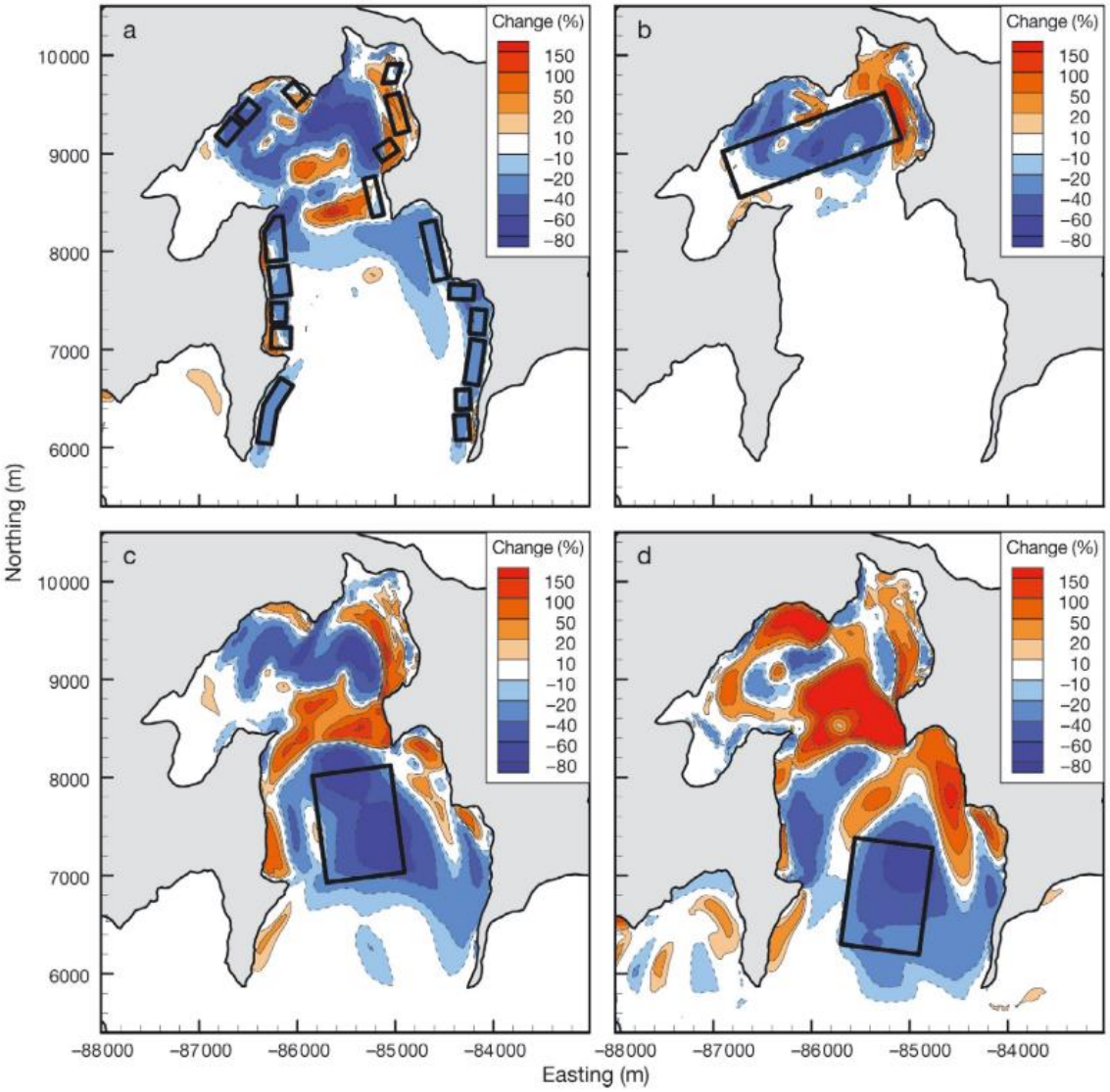

Fig. 7. Comparison of % change in mean water speed for existing farms in Port Ligar (a), and a single large farm covering the same total area located in the (b) inner bay, (c) mid bay, and (d) outer bay. Positive values (solid contours) indicate an increase in mean water speeds compared to simulations with no farms, negative values (dashed contours) indicate a reduction in speed

Figure 2-4: Effect of different layouts of marine farms with the same total farmed area on mean currents speeds in Port Ligar. From Plew (2011b).

2.4 Implications of existing farms for the hydrodynamics of Big Glory Bay

Because neither of the two models of BGB included the effects of the farms, neither give a true representation of the present currents and circulation patterns in the bay. Big Glory Bay already contains several mussel farms, as well as three salmon farms. Of the approximately 1200 hectares of the bay, at least 160[5] hectares (13.3% of the bay) are already allocated for marine farming. Not all these areas are currently in use. A response from J. Engel (12 Dec 2018)[6] states that in the past, mussel farming would have filled a maximum of 148 hectares of BGB and is currently at 125 hectares (10.1% of the bay). I estimate that the salmon farms cover an additional area of approximately 3.5 ha based on structure visible in satellite images from 22 Nov 2018. Based on my own work elsewhere

[5] Evidence from Ted Cully states that Sanford Ltd exercise 24 of the 35 consented mussel farm areas, comprising a total area of 161.5 hectares. Evidence from Peter Schofield says the bay already has ~162 ha allocated to marine farming. It is not clear to me it 161.5 ha is the total area allocated, or only the area of the 24 areas exercised by Sanford Ltd.

[6] file: Response to further information 11-12-18 APP-20181316.pdf

and studies by others, I expect that the presence of the existing farms will have resulted in reductions of mean current speeds throughout the bay.

Various estimates of flushing time have been given, depending on the method used to calculate the flushing time. The tracer flushing simulations (Hartstein) likely give the most accurate indication of the time taken to replace the water in the bay. In the absence of farms, 85-90% of the water in Big Glory Bay was replaced in 28 days. With farms present, I expect that this would be greater. In particular, water at the head of the bay would take longer to be replaced due to a reduction in circulation caused by farm drag.

I cannot say with any certainty what the magnitude is of the effects existing farms have on current speeds or flushing times. To do so would require adding the drag of the existing farms into a hydrodynamic model. Commonly this has been done with 2-dimensional, depth-averaged models which do not account for differences in water currents vertically through the water column (Grant and Bacher 2001; Plew 2011a, 2011b; O'Donncha et al. 2013), although increasingly, 3 dimensional models have been used (Shi et al. 2011; O'Donncha et al. 2015; Wang et al. 2018). In general terms, I speculate that throughout the bay, current speeds are generally reduced, although there may be local accelerations around farm perimeters and between farms, such as through the central channel denoted by the dashed lines in Figure 1-1. Overall circulation patterns have likely been altered, and I expect that the strength of outward flowing currents along the north and south coasts reported by Pridmore and Rutherford (1990) and Hartstein (2019) would have been reduced. The overall flushing time has likely increased.

2.5 Effect of the proposed farms on currents

The three proposed mussel farms occupy a total of 16 hectares, and their proposed locations are shown in Figure 1-1. These three farms will induce further modification to currents and circulation in addition to that caused by existing farms. Considering the likely, but unquantified, impacts of the existing farms, the additional impact on currents and circulation from the proposed farms would be minor. On the incoming tide, the outmost site (site 1) may divert water towards the open 'navigation' channel. If site MF274 is occupied, then effects on the outgoing tide are likely small. The inner two sites (2 and 3) are in an area of the bay that both models indicate has low current speeds (albeit in the absence of other farms), so I expect would have relatively little effect on overall circulation and flushing times.

To provide any more certainty of the effect of the proposed farms would first require assessing the effects of the existing farms, which to my knowledge has not been done.

I note the comment in the Recommending Report[7] (Section *Water column* Response page 9):

The amount of water coming in and out of the bay does not change but the marine farm structures will deflect water around them and create eddies in the tidal current.

While this statement is correct in that the tidal prism (the difference in volume between high and low tide) will be essentially unaffected by the present or proposed farms, the volume of water flowing in and out of the bay at any instant, and the speed of currents within the bay, may be affected. Water can be flowing in and out of the bay at the same time – for example in on one side while out on the other, or inwards near the bed and outwards near the surface. This has implications for the flushing time of the bay. Furthermore, the drag from the farm removes kinetic energy, likely reducing (slowing) the tendency of water to circulate in gyres or large eddies. However, considering

[7] s92(1) Further information response 17 August 2018 (First) APP-20181316 17_08_2018.pdf

that the proposed farms increase the occupied area by from 10 to 12%, I expect that the additional effect on currents within the bay will be minor.

With regard to the impact on sites used by Sanford for salmon farming, the sites that could potentially affected by the proposed mussel farms are LI321, LI328, LI339 and LI340. LI339 and LI340 are inshore of site 3, which may divert currents towards these two sites, possibly causing small (likely undetectable) increases in current speeds. Conversely, sites LI321 and LI328 are located further into the bay, and could possibly experience a small (again, likely undetectable) reduction in current speeds, particularly on the incoming tide.

2.6 Waves

Mussel farms can attenuate wave energy (Plew et al. 2005), although being flexible and highly porous structures, the effects are not generally considered significant. The attenuation is greatest for short wavelength, short period waves; while longer ocean swell passes through the farm nearly unaffected because the structure moves with the wave. Big Glory Bay is sheltered from ocean swell, and most wave activity will be from locally generated wind waves. The longest fetch (straight line distance across the water surface) is for winds from the South-West (~ 5 km) or North-East (6 km). A sustained 40 knt wind from either direction would produce waves with significant heights of up to 1.1 m and with wave periods (time between wave crests) of 3–3.5 s. Under such conditions, mussel farms of the size proposed could potentially attenuate reduce wave heights by up to 10%, based on the model proposed by Plew et al. (2005). Again, considering the number of existing farms, I expect that the additional wave attenuation would likely only be detectable in the vicinity of, or a short distance down-wave of, the proposed farms.

2.7 Hydrodynamics – conclusions

Big Glory Bay is presently used for mussel and salmon aquaculture. A significant portion (~15%) of the bay is currently allocated for aquaculture. The presence of the structures used for mussel and salmon aquaculture likely affects currents (tidal and wind driven) and circulation patterns within the bay. There is some evidence of this in that the two previous conducted modelling studies (neither of which included the drag from marine farms) showed poor agreement with observations collected within the bay from a current meter deployed between two mussel farms. The three proposed mussel farms increase the total consented farm area by 16 ha from ~160 ha currently for both salmon and mussels (although not all consented area is currently occupied). This increases the area consented for aquaculture from ~13.3% to ~15.5% of the bay area. The three new farms will cause further changes in currents and circulation patterns within the bay. However, considering the locations of the proposed farms and the increase in farmed area relative to existing farms, I expect that these changes will be minor compared to the impact that the present aquaculture activities likely already have on the bay.

3 Carrying capacity

There is potential for bivalve farming operations to exceed the ecological carrying capacity of a body of water in which they are located. Ecological carrying capacity has been defined as the stocking or farm density above which unacceptable ecological impacts begin to manifest (Inglis et al. 2000 referenced in ASC 2019). This happens when the removal of phytoplankton by all bivalve farms in a water body, including the applicant site, outstrips the capacity of the ecosystem to replenish the supply, resulting in adverse conditions for wild and cultured populations (ASC 2019). In this context the inference is that if phytoplankton concentrations are reduced by farmed bivalves to a level that impacts the survival of all filter feeders, ecological carrying capacity has been adversely affected. Inter alia, sustainable bivalve culture and phytoplankton primary production will also be compromised leading to impacts on phytoplankton carrying capacity.

From the Applicant's original application for a resource consent in May 2018 to the latest responses by the Applicant to the RFI in October 2019, there has been a broad generic argument presented by the Applicant, Submitters and reviewers on whether the addition of three new mussel farms will lead to the exceedance of the ecological carrying capacity of BGB. To address this issue, it is recognised by all parties that the addition of the new farms must be assessed in terms of cumulative effects of multiple farms in the bay rather than in isolation. However, to date all arguments have been in general terms with no attempt to (even partially) quantify the interaction between aquaculture and phytoplankton in the bay.

I will first consider the Applicant's arguments on why the phytoplankton carrying capacity will not be adversely impacted by the addition of three new mussel farms. I will then address these arguments by assessing the contribution of these new farms to the overall mussel Filtration Rate (FR in L/h) in the bay, then discuss 'Pelagic Effect Assessment Criterion' from the Aquaculture Stewardship Council (ASC 2019) followed by a discussion on salmon and mussel farm interactions.

3.1 The Applicant's view on phytoplankton carrying capacity

The Applicant has presented their argument that the phytoplankton carrying capacity will not be adversely impacted on the grounds of:

1. Over 20 years of environmental monitoring has not shown any decline in chlorophyll-*a* concentrations (as a proxy for phytoplankton) with annual mussel harvest since 2008 ranging between sustained between 2191 and 4615 greenweight tonnes (Figure 3-1)[8].

2. The addition of 16 hectares of mussel farms offsets the removal of 12 hectares of mussel farms for conversion to salmon farms in 2011 reducing the maximum of 148 hectares. In the evidence of Phil Mitchell[9] it was stated that Sanford had removed some 24 hectares of mussels to develop its salmon farming sites. Mussel farming currently occupies 125 hectares[10].

3. The intensification of salmon farming in BGB would generate more N (dissolved inorganic nitrogen (ammonia and nitrates)) which in turn would be available for

[8] John Engel "Response to additional request for information dated 2 October 2019 for an application for coastal permit for marine farming". pt. 12 , page 4
[9] Submitter Expert Evidence of Phil Mitchell - Sanford - 9 Sept 2019.pdf pt. 36.
[10] Response to further information 11-12-18 APP-20181316.pdf

phytoplankton production, thus providing more phytoplankton to the bay ecology and more food for cultured mussels[11].

4. Since flushing time of BGB showed approximately 60% exchange by day 14 and 85-90% flushing after 28 days coupled with the fact that phytoplankton regeneration can be in the order of 1 to 5.5 days, and the fact that long-term monitoring has not detected a decrease in chlorophyll-*a*, this suggests that phytoplankton in the bay arise from in-bay production as well all as being entrained into the bay from coastal oceanic waters[12].

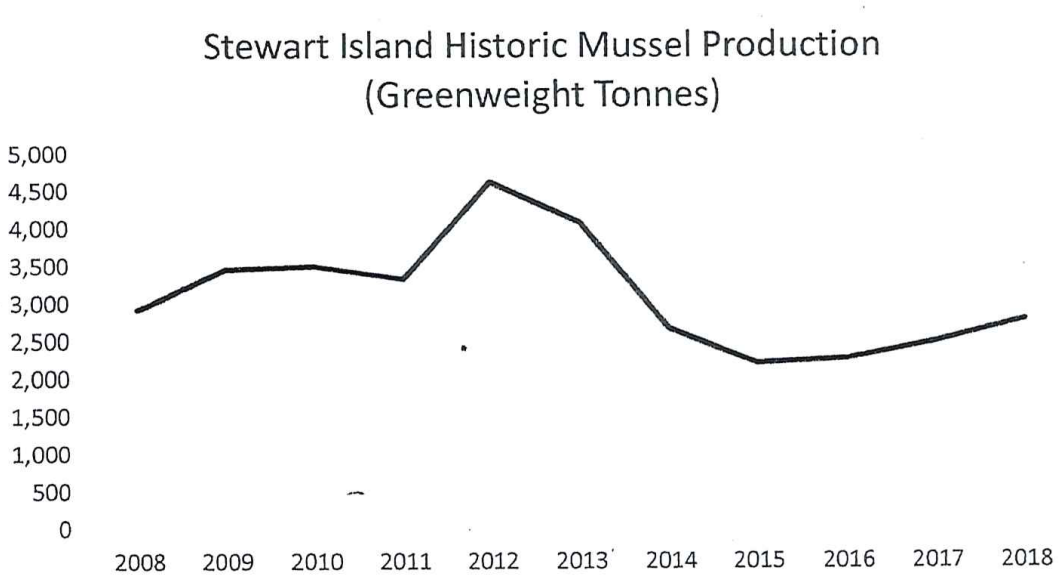

Figure 3-1: Annual Mussel production in Big Glory Bay. From: Attachment 2 in John Engel "Response to additional request for information dated 2 October 2019 for an application for coastal permit for marine farming".

3.2 Mussel filtration

It is possible to estimate filtration rate (FR in L/h/hectare) for cultured mussel in Big Glory Bay based on a similar exercise undertaken by NIWA for the Marine Farming Association in the Marlborough Sounds (Stenton-Dozey and Broekhuizen 2019, Table 3-1). In this exercise different size mussels are considered from spat to harvest size and an assumption is made on what proportion of dropper will be occupied by any one size at any one time (note: these estimates are based on extensive discussion with mussel farmers in the Marlborough Sounds and on information provided by the Applicant[13]). I have assumed that all mussel farms in BGB will have similar densities / hectare as calculated for the proposed new 6-hectare farm in Table 3-1.

The overall mussel FR is 7286240 L/h/ha = 7286.24 m^3/h/ha = 174869.8 m^3/day/ha. This FR is then multiped up by the number of hectares for the new farms, the existing farms and new plus existing farms in Table 3-2.

[11] John Engel "Response to additional request for information dated 2 October 2019 for an application for coastal permit for marine farming". pt. 13, page 4
[12] John Engel "Response to additional request for information dated 2 October 2019 for an application for coastal permit for marine farming". pts.6 to 10 to 9 page 3.
[13] s92(1) Further information response 17 August 2018 (First) APP-20181316.pdf, page 2.

Table 3-1: For each hectare farmed, the volume of water filtered by mussels. Based on data used in Stenton-Dozey and Broekhuizen 2019. We used 15 longlines (180 m each) per 6 ha farm (i.e., Site 1 in Figure 1-1) (2.6 longlines ha)[14] with a dropper length of 4000 m/longline except for spat lines where we used a dropper length of 6000 m. Mussel filtration rates (FR) per size class (NIWA unpubl. data). Approximately 10% of a dropper was assumed to be devoid of mussels.

Mussel size class (mm)	Shell length (mm)	mussels/m	dropper length (m) / longline used per mussel size class (m)	average dropper portion occupied at any one time	dropper length occupied at any one time (m)	number of mussels on dropper length occupied at any one time	FR (L/h) /mussel	FR (L/h) on dropper length occupied at any one time	FR (L/h) per ha (x2.6 longlines/ha)
No mussels	0	0	6000	0.1	600	0	0	0	0
spat nursery	<35	2000	6000	0.09	540	1080000	0.5	540000	1404000
intermediate seed	35 - 50	800	4000	0.15	600	480000	0.9	432000	1123200
young final seed	50 - 70	160	4000	0.22	880	140800	2	281600	732160
half adult	70 - 90	160	4000	0.22	880	140800	4	563200	1464320
harvest adult	90 - 110	160	4000	0.22	880	140800	7	985600	2562560
TOTAL									7286240

Table 3-2: Mussel filtration rate (L/day/ha of farm) and the percentage of BGB volume filtered by mussels. For the area of new farms (16 ha), the existing farms (125 ha) and new plus existing farms (141 ha).

	New farms 16 ha	Existing farms 125 ha	New+Existing farms 141 ha
FR m^3 / day / ha	2797916.2	21858720	24656636
BGB Volume m^3	189000000	189000000	189000000
Percentage of BGB volume filtered by mussels	1.480	11.565	13.046

The mussels on the new farms will increase the amount of BGB water volume processed by cultured mussel daily by 1.48%, raising the present 11.56% to 13.05%. This is a small percentage increase and thus minor with respect to the volume of water processed by existing mussels in BGB. However, it should be noted these FRs should be viewed against the daily exchange rate of the bay volume to ascertain the proportion of 'new' offshore oceanic water being processed by mussels compared to 'old' resident in-bay water (i.e., that portion not exchanged with water outside the bay).

Using the hydrodynamic model presented in ADS 2017 and in the evidence of Neil Harstein[15], the flushing time of the bay was calculated by filling the bay with a tracer then tracking how much of the tracer remained in the bay over time. The simulations showed 85-90% of the water within Big Glory Bay is flushed out in 28 days. In such studies, tracer concentrations tend to fall exponentially over time and not in a linear fashion (David Plew, pers. comm.) following a trend similar to that in Figure 3-2 (the actual concentration tends to fluctuate about the trend line due to tidal inflow and outflow, but overall follows this form of decay and the oscillations decrease in magnitude over time).

[14] Application Zane Smith and Jim Maass-Barrett May 2018.pdf
[15] Applicant Summary of evidence Neil Hartstein 11 March 2019

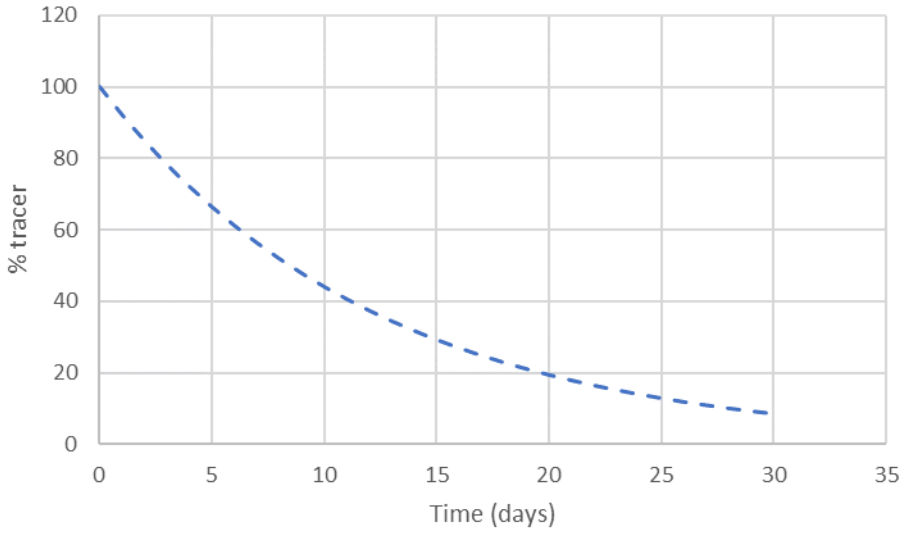

Figure 3-2: Modelled hydrodynamic tracer concentrations tend to fall exponentially over time.

The curve above can be described by the following equation:

$$M(t) = M_0 \exp(-Kt)$$

where $M(t)$ is the mass of tracer at time t, M_0 the mass of tracer at time 0, and K is the exchange rate. The value of K can be calculated from:

$$K = -\frac{1}{t} ln\left(\frac{M(t)}{M_0}\right)$$

If 10-15% of the tracer remains in the bay after 28 days, then K is in the range 0.068 – 0.082 day^{-1}. This implies that between 7-8% of the bay volume is exchanged each day, which is close to the 10% suggested by Pridmore. This means that the daily exchange rate (7–10%) is less than the daily mussel FR (11–13%). This implies that historically, mussels in BGB have been reliant on 'old' resident in-bay water, processing between 3–4% by volume daily. It's likely therefore that in-bay phytoplankton production is important source of food for the mussels.

3.3 Pelagic Effect Assessment Criterion

The ASC Bivalve Standard addresses ecological carry capacity using relatively simple calculations that compare how long it takes a population of bivalves to clear a body of water (clearance time orCT) with how long it takes for tides to flush that body of water (retention time orRT). When carrying capacity is exceeded, farmed areas should have or be part of a bay-scale management plan for addressing potential cumulative pelagic effects from multiple farms.

The Applicant considered that the 'Pelagic Effect Assessment Criterion' had limitations[16]:

- as there was no way to make allowances for the large daily input of N from salmon feed and the assumed consequential increase in phytoplankton growth and
- since the criteria apply to ecological carrying capacity it has limited use for BGB where the ecological carrying capacity has been historically compromised since marine farming began the 1980s.

I don't fully understand the Applicant's issues on the limitations of applying the 'Pelagic Effect Assessment Criterion'. Some aspects can be applied, and I do so in the following section. If the area of all of the farms within a water body, inclusive of the certification unit, is less than 10% of the total area of the water body, then requirements 2.2.1 and 2.2.2 (below) need not apply. With the new farms, mussel culture will cover 144 hectares of BGB which has a total area of 12000 hectares. This is 12% of the total area, greater the criterion of 10%.

3.3.1 Indicator 2.2.1

(ASC 2019, page 15 and 32) - The ratio of clearance time (CT)[17] over retention time (RT)[18]: requirement > 1. Both CT and RT can be estimated from available information. First CT, as used in indicator 2.2.1:

$$CT\ (days) = Vt / (N \times C)$$

Where:

- *Vt* is the total volume of the water body at high tide (L). I added 2 m to the average depth of 15.55 m at midtide to estimate the volume of the bay at high tide (based on information in ADS 2017) = 21.06×10^{10} L
- *N* is number of bivalves at harvest size. I used the average weight of a BGB mussel of 36 g (unpul. NIWA data) to convert used greenweight tonnes for the 2018 harvest (2767 tonnes) (Figure 3-1) to mussel numbers = 76861111 mussels. The new farms are expected to provide 400 tonnes annually = 11111111 mussels. So, the total number of mussels with existing and new farms is 87972222.
- *C* is average clearance rate (litres/individual species/day) at harvest size (i.e., adult mussels FR = 7 L/h/adult = 168 L/day, Table 3-1).

This means that:

- Calculated CT (existing farms) = 16.31 days
- Calculated CT (existing farms+new farms) = 14.25 days

Next, RT as used in indicator 2.2.1:

$$RT = -1 \times P / \ln (Vl / Vt)$$

[16] John Engel "Response to additional request for information dated 2 October 2019 for an application for coastal permit for marine farming". pts. 17 to 20, page 5.
[17] Clearance time is the number of days required for the dominant bivalve stock(s) (wild and cultured) to clear the volume of the bay. The dominant species census should be based on the peak standing stock during the year (i.e., harvest stock). The calculation is based on published clearance rate data for the bivalve group (mussels, scallops, clams and oysters).
[18] Retention time is the number of days for tides to flush a volume of water equal to the volume of the bay or water body

Where:

- P is the tidal periodicity, the length of the tidal cycle (e.g., ~0.5 days for semidiuranl tides)
- Vl is the total volume of the water body at low tide (litres) = 18.9 x 10^{10} L
- Vt is the total volume of the water body at high tide = 21.06 x 10^{10} L

- The resulting calculated RT = 4.62 days.

The indicator 2.2.1 ratios are therefore:

- Ratio of CT(existing farms) / RT = 16.31/4.62 = 3.53 days.
- Ratio of CT(existing farms+new farms) / RT = 14.25/4.62 = 3.06 days.

Both these ratios are > 1 (Pelagic Effect Assessment Criterion requirement).

Based on this indicator the cumulative effect of adding the three new farms does not adversely impact the ecological carrying capacity of BGB.

3.3.2 Indicator 2.2.2

(ASC 2019, page 15) Where clearance time is less than retention time, the ratio of clearance time over primary production time (PPT)[19]: requirement > 3.

It's likely a rough estimate of PPT can be estimated from available information but it is beyond the scope of this report. However, since CT/RT > 1, application of this indicator is not required.

3.4 Salmon and mussel farm interactions

Neil Hartstein's evidence (March 2019, page 11)[20] states that water quality modelling shows that TAN (Total Ammonia Nitrogen) levels would increase in Big Glory Bay by up to 30µg/L during the maximum feeding scenario for increased salmon production in BGB. This equated to the model predicting Total N levels to increase by approximately 10% when compared to Total N observations made during the ongoing Sanford's monthly water quality monitoring program. Based on model results this increase can lead to an increase in chlorophyll-*a* of between 2 and 4 µg/L for the maximum salmon feeding scenario. The mid-level scenario results show a chlorophyll-*a* increase of between 2-3.5 µg/L. The question is whether mussel production near salmon farms enhanced by these increases in chlorophyll-*a*?

By example, a study in the Gulf of Castellammare, Sicily considered whether the growth and reproduction of mussels was stimulated in an integrated multi-trophic aquaculture (IMTA) farm scenario with fish (Sarà et al. 2012). The authors modelled the effect of primary phytoplankton production enrichment at fish cages on shellfish growth and life history traits using 4 years of data. There was a mean increase in chlorophyll-*a* of approximately 45% close (within about 100 m) to fish

[19] PPT is the number of days required for the replacement of the standing stock of phytoplankton in the bay (i.e., time-scale of phytoplankton population growth). PPT is the ratio of yearly averages of phytoplankton biomass (B) to phytoplankton primary production (PPP) within the system. B can be estimated from chlorophyll a measurements, published data or satellite predictions assuming a carbon to chlorophyll ratio of 50. PPP can be obtained from published results or model predictions.
[20] Applicant Summary of evidence Neil Hartstein 11 March 2019

cages compared to sites away (about 1.5 km) from the cages. Model simulations showed that mussels close to cages could reach greater maximum length at the end of 4th year than those far from cages and in open-sea. This study does indicate that the BGB mussels close to salmon farms could benefit from increased chlorophyll-*a* concentrations.

3.5 Carrying capacity – conclusions

The simple tools used in this report to ascertain the cumulative impact of adding three new mussel farms to carrying capacity of BGB have indicated that the effects are minor. The mussels on the new farms will increase the amount of BGB water volume processed by cultured mussel daily by 1.48%, raising the present 11.56% to 13.05%.

Since the daily bay water exchange rate with the outside (7–10%) is less than the daily mussel FR (11–13%) it's likely that mussel production has always depended to some extent on in-bay phytoplankton primary production. It is feasible that in-bay primary production takes place since the bay-wide water mass has a long residency time of 14 to 28 days sufficient to allow for phytoplankton turnover rates of 2 to 5 days.

Application of the Pelagic Effect Assessment Criterion based on the ratio of clearance time (CT) over retention time (RT) not exceeding 1 was met. Based on this indicator the cumulative effect of adding the three new farms does not adversely impact the ecological carrying capacity of BGB. This criterion was applied because the area of mussel farming in BGB (12%) exceeded criterion of 10% of the total BGB surface area.

It is possible that mussel production in BGB could benefit to some extent from enhanced chlorophyll-*a* production that is predicted to arise from the increase in salmon farming over the next 5–6 years.

There are advanced modelling tools in use in New Zealand that could be applied to bring greater certainty to estimates impacts on ecological carrying capacity by mussel farming. For instance, in assessing impacts of a large mussel farm in Wilson Bay, Firth of Thames three distinct plankton models were applied (Stenton-Dozey, Broekhuizen and Morrisey 2008). One was used to consider the fate of ichthyoplankton. A second was used to quantify impacts upon phytoplankton and zooplankton. These were used to as an alternative means of assessing effects upon phytoplankton. Each model was applied under a variety of hydrodynamic conditions during both winter and summer. Collectively, the results represent an extensive analysis of sensitivity to parameterisation and structural assumptions embodied within the models.

In the Pelorus Sound multiple regression models were used to predict aquaculture production in (Zeldis, Hadfield and Brooker 2013). Overall, these results show that time series of physical drivers (climatic predictors, including Southern Oscillation Index (SOI), along-shelf winds, sea surface temperature (SST) and Pelorus River flow) were useful for explaining production variation of farmed bivalves.

However, these advanced tools are beyond the scope of the present application for three new mussel farms in Big Glory Bay. Their application is applicable to bay-wide and regional scale farming zones with multiple farms where spatial-explicit long-term monitoring data in which all famers participate underpins models that can more accurately assess the ecological carrying capacity of systems.

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