Save Langebaan Lagoon
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The Minister of Environmental Affairs
Private Bag X447
Pretoria 0001
For attention: The Director: Appeals and Legal Review Department
Email: appeals@environment.gov.za

Our Ref: SLL 2020/10 Appeal
Your ref: **14/12/16/3/3/1/1728/AM2**
9th October, 2020

Dear Minister

RE: APPEAL IN RESPECT OF AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION ISSUED ON 08 JANUARY 2018 DEA REF 14/12/16/3/3/1/1728/AM2 FOR THE SEA BASED AQUACULTURE DEVELOPMENT ZONE (ADZ) IN SALDANHA BAY WITHIN SALDANHA BAY LOCAL MUNICIPALITY IN THE WESTERN CAPE.

Introduction

1. Save Langebaan Lagoon hereby submit our appeal in terms of section 43 of the National Environmental Management Act 107 of 1998 (NEMA) and section 4(1)(c) of the Environmental Impact Assessment Regulations GN R. 982 of 2014 (EIA Regulations).

2. We confirm that we have simultaneously provided this appeal submission to the Applicants, and known Interested and Affected Parties (I&APs), and that we have done so in compliance with section 4(1) of the NEMA National Appeals Regulations, GN R. 993 of 2014.

3. Save Langebaan Lagoon (SLL) is a Voluntary Organisation, duly constituted under the Nonprofit Organisations Act, 71 of 1997, and has a current membership of 1478 registered I&APs. SLL was formed to educate the public regarding the impacts that the aquaculture development zone will have on the Langebaan Lagoon and the greater Saldanha Bay marine system, the quality of and access to its waters and the socio-economic prosperity of Langebaan. Further, SLL's role is to represent I&APs in interactions with the developers/proponents, their agents and the Competent Authority.

4. ***Our Statement on the Grounds of Appeal, as follows, must be read together with supportive documentation attached to this letter***

Annexure A: Appeal Questionnaire

Annexure B: Appeal Response Report

Appendix 1: Amendment of the Environmental Authorisation issued on 08 January 2018 for the sea-based Aquaculture Development Zone (ADZ) in Saldanha Bay within Saldanha bay Local Municipality in Western Cape Province

Appendix 2: Save Langebaan Lagoon (SLL) Mandate

Appendix 3: Save Langebaan Lagoon Appeal February 2018

Appendix 4: Saldanha Bay ADZ Environmental Authorisation 14/12/16/3/3/1/1728.

Appendix 5: Saldanha Bay ADZ Environmental Management Programme (Number 499020/6).

Appendix 6: Save Langebaan Lagoon Letter to DEFF – Fisheries 25 September 2020

Appendix 7: Saldanha Bay Aquaculture Development Zone – Final Basic Assessment Report (FIN BAR/ EIA)

Appendix 8: Saldanha Bay Sea Based Aquaculture Development Zone Baseline Benthic Survey Report – Final Draft.

Appendix 9: Saldanha Bay Sea Based Aquaculture Development Zone Baseline Benthic Survey – Final Presentation.

Appendix 10: Management Actions 2020 scientific findings – Final

Appendix 11: Sailing School Appeal Letter

Statement of Grounds of Appeal

5. ***Failure to conduct public participation process***

It is contended that the Applicants failed to conduct a public participation process prior to the application for amendment of the environmental authorisation. The Saldanha Bay ADZ Environmental Authorisation Ref. 14/12/16/3/3/1/1728 (Appendix 4), and the Saldanha Bay ADZ Environmental Management Programme (EMPr) Report number 499020/6 (Appendix 5), clearly requires the Aquaculture Monitoring Committee (AMC) and DEFF-Fisheries to provide updated information to the public (e.g. farm coordinates, water quality information, notification of new aquaculture operations).

Further, the overarching function of the Consultative Forum is to review environmental monitoring data, advise on ADZ management and recommend measures. In order for the CF to fulfil its mandate, members of the CF must be capacitated with prior information in order to *de facto* influence the decision-making process.

The Consultative Forum was not informed of any proposed amendments to the Saldanha Bay ADZ EA, which violates the requirements set out in the EA and EMPr.

6. ***Exclusion of Consultative Forum with regard to future changes to EMPr.***

Amendment 4 of Appendix I, namely, *"Approval of the revised Environmental Management Programme (EMPr) and the inclusion of a condition to confirm that future amendments to the impact management actions of the EMPr may be approved by the ADZ Management Committee (AMC)"*, refers:
The approved amendment permits the AMC to affect actions regarding impact management of the ADZ without consultation with the members of the Consultative Forum, thereby excluding the opportunity for independent over-sight of such actions and in violation of the entrenched right of I&APs to contribute to decision-making regarding environmental governance. Consultation is clearly contemplated in the NEMA and in the EIA Regulations.

The guidelines for interpretation of the wording of the NEMA require that interpretation "is consistent with the purpose of this Act" (section 1 (3)). In this context, approval of this condition of the amendment creates an unlawful barrier to meaningful involvement of I&APs, thereby denying the benefit of scrutiny and input by I&APs to the ADZ project.

Further, the amendment states that the applicant does not require approval from DEA&DP prior to effecting changes. This additional exclusion of critical independent review of the AMC's actions, materially heightens the myriad risks to the receiving environment, as identified by the proponents in the Final Basic Assessment Report, as well as those acknowledged in the conditions attached to the EAs.

The widening of the authority of the AMC to make unilateral decisions suggests an intentional withdrawal of transparency by DEFF-Fisheries, which will fatally damage the tenuous trust between the parties that has been hard won through the stakeholder engagement process of the Consultative Forum.

7. ***Open-ended timeframe for construction phase of final Environmental Audit is prejudicial.***

Amendment , of Appendix 1, namely, *"Amendment of condition 33 of the EA to specify final audit report submission requirements more appropriate to type of development"* refers:

The approved amendment permits the submission of audited reports for the construction phase only when the last aquaculture farm has been established in the ADZ. This amended condition fails to set a deadline for the final facility construction. Foreseeably, this could take several years, during which time the construction of facilities will go unaudited and therefore, impacts associated therewith, will not be independently assessed and addressed, thereby placing the receiving environment at untenable risk of harm.

In support of this argument: The ADZ is an 884 ha development, with several zones, which are to be developed by numerous independent aquaculture farmers. A phased-in approach spanning 5 to 10 years has been approved. This time-scale is likely to result in the first audited report submission a decade post the first construction period. It is therefore of critical importance that an audited report on the impact of construction work be submitted every six months for scrutiny by members of the Consultative Forum.

8. ***Failure to clarify factually correct coordinates of authorised ADZ site.***

The lack of clarification of the actual coordinates of the authorised ADZ site presents a navigational hazard. The absence of correctly delineated coordinates that unambiguously reflect the positioning of the various farms (those planned and currently operational), continue to frustrate the updating of critical navigational charts for the area.

Recreational water users (sailing vessels, power boats, anglers, paddlers) as well as commercial vessels entering and leaving the Saldanha Bay waters require accurate and up-to-date maritime charts to ensure safety. (Attached is a Letter from a Sailing School – Appendix 11).

The errors on the charts appear to be due to a failure by DEFF, the ADZ AMC and Transnet Port Authorities to provide the Navy Hydrographer (hydrosan@iafrica.com) with consistently accurate information.

Alternatively, the various aquaculture operators/concession holders have failed to moor their farms in accordance with the requisite co-ordinates.

Consequently, a number of sailing vessels have incurred damage in collisions with equipment associated with aquaculture activities, such as buoys, lines, rafts, which are incorrectly marked on current charts, or moored in areas outside their designated locations. These incidents have occurred both north of the current aquaculture activity in Small Bay, as well as in Outer Bay, suggesting that aquaculture farmers are operating outside of their designated boundaries.

Furthermore, the area south of Mykonos is no longer designated as part of the ADZ, yet the latest navigation charts still show this to be an area reserved for aquaculture.

We therefore urgently request that all aquaculture activity is suspended until there is clarification of the ADZ's coordinates and reliable confirmation that the individual farms are operating strictly within their allocated siting.

9. ***Waste Management act not assessed in EIA***

The National Environmental Management: Waste act,2008(ActNo.59 of 2008) serves to regulate waste management in order to protect the health environment by providing reasonable measures for the prevention of pollution and ecological degradation. In the Saldanha bay ADZ Final Basic Assessment Report (FIN BAR), it was stated that the ADZ is a Sea-based project and the developer will need to apply separately for land based processing activities with regards to waste management. The effects of aquaculture activity in terms of waste on the Sea- bed must be addressed. Fin Fish farming produces organic waste in the form of faecal matter and surplus fish feed which sinks to the sea-bed and is suspended in the water column below the Fin Fish cages. The build up of organic waste on the reef habitat below causes ecological degradation. We submit that the Waste Act,2008(Act No. 59 of 2008) should apply to the ocean and lagoon as well. A waste management program must be implemented to provide a structure to mitigate the organic waste sediment and to address the plastic waste that breaks free from the aquaculture infrastructures. This pollutes the water and beaches, the mitigations steps set in place to date, are inadequate, resulting in floating debris in the form of plastic barrels, buoys and plastic baskets.

10. ***New scientific evidence of Reef Habitat in ADZ :***

The applicant has failed to include critical scientific evidence in their application.

Please note point 10 is a copy of a letter sent to the DEFF on 25 September 2020 requesting the suspension of all aquaculture activity in part of the authorised Saldanha Bay Aquaculture Development zone (ADZ), due to critical new scientific findings regarding the receiving environment. Annex 6.

Re: New scientific information concerning current operations of aquaculture facilities in the Saldanha Bay Aquaculture Development Zone

Background

The Baseline Benthic Survey was commissioned in 2020 by the Department of Environment, Forestry and Fisheries (DEFF), Branch Fisheries, the holder of an Environmental Authorisation for the Saldanha Bay Aquaculture Development Zone (ADZ) and conducted by Anchor Research and Monitoring.

The new findings of the above survey indicate that the Saldanha Bay Aquaculture Development Zone (ADZ) presents an untenable risk to the receiving environment of the Big Bay precinct of Saldanha Bay, for which no mitigations were submitted in the Basic Assessment Report, in application for environmental authorisation.

This research was conducted post the granting of the environmental authorization, Annex 4, no impact mitigations to avoid/reduce harm to the sensitive reef ecosystems were investigated, nor has a programme to contain/reduce such impact been set out in the approved Environmental Management Programme (Number 499020/6) for the ADZ, Annex 5.

Below, please find relevant extracts from the Saldanha Bay ADZ Baseline Benthic Survey Presentation (Annex 9), in support of our contention that these new findings show conclusively that the ADZ presents an immitigable risk to this marine eco-system.

Statement of Concerns

1. ***Results and Discussion: Presence of hard substrata/reef in Big Bay*** [1]

   i. The marine specialist report for the Saldanha ADZ EIA considered subtidal reef habitat to be scarce in Saldanha Bay (Pulfrich 2018).[2]

   ii. Only identified Lynch blinder and North Bay blinder as important reef areas.[3]

   iii. Reports from divers during this assessment revealed the presence of calcrete rock at several sampling sites during the baseline survey (Capfish 2019).[4]

   iv. Difficulties in obtaining grab samples at several stations in Big Bay during 2020 (AR&M) sediment surveys also suggests that rock which may form reef is more widespread in Big Bay than originally suspected.[5]

   v. Observations by ARM divers deploying water quality monitoring instruments during April 2020, also indicated reef in several areas of the Big Bay ADZ precinct.[6]

   vi. Subsequent literature review revealed the existence of an extensive abrasion platform (areas of exposed calcrete rock) throughout much of Big Bay (Flemming 2015).[7]

   vii. The distribution of the abrasion platform is overlaid on a map of Big Bay and the ADZ boundaries as well as the sampling sites on the following slide.[8]

[1] Annex 9 – page 17
[2] Annex 9 – page 17
[3] Annex 9 – page 17
[4] Annex 9 – page 17
[5] Annex 9 – page 17
[6] Annex 9 – page 17
[7] Annex 9 – page 17
[8] Annex 9 – page 17

viii. Pictures of the rock/reef type habitat found in the finfish area were taken during instrument servicing in the finfish area on the 29th of June 2020. These images were taken in extremely poor visibility but indicate the presence of basket stars (Phylum Echinodermata), sponges (Phylum Porifera) and possibly Bryozoans. Before conclusions can be drawn about the nature of the communities, specimens would need to be collected and identified.[9]

2. ***Presence of hard substrata/reef in Big Bay /Recommendations*** [10]

i. Given the presence of low-lying reef detected during the baseline surveys and instrument deployments in the finfish area in Big Bay, it is recommended that a side scan sonar survey be undertaken across the whole of Big Bay to establish the actual extent of this reef and that reef biota be surveyed.[11]

ii. Once the extent and nature of the reef and associated benthic communities have been assessed and quantified, the management measures, mitigation measures and monitoring measures should be reassessed.[12]

iii. West Coast Rock Lobster (Jasus Lalandi) are evident in the video footage recorded from the Molapong dives was and were noted by AR&M divers deploying instruments.[13]

iv. White Rock Lobster would benefit from increased organic matter originating from the aquaculture as a food source, their habitat may ultimately become smothered by fall off biofouling and culture animals.[14]

3. Conclusions/ Presence of hard substrata and reef in the big bay precinct [15]

i. The presence of hard substrata and low lying reef (besides that identified at Lynch Blinder) within the Big Bay ADZ precinct has been highlighted for the first time. [16]

ii. The reef appears to be low-profile that is mostly < 1m in height, although some outcrops greater than 1 m in height are present.[17]

iii. The extent and nature of the reef needs to be quantified throughout Big Bay which is frequently impacted by scouring and sand deposition.[18]

iv. The nature of the macro-faunal/epifaunal assemblages associated with the reef needs to be quantified.[19]

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[9] Annex 9 - page 21
[10] Annex 9 – page 24
[11] Annex 9 – page 24
[12] Annex 9- page 24
[13] Annex 9 – page 22
[14] Annex 9 – page 22
[15] Annex 9 – page 27
[16] Annex 9 – page 27
[17] Annex 9 – page 27
[18] Annex 9 – page 27
[19] Annex 9 – page 27

v. Once the above aspects are completed, the impacts of aquaculture in the Big Bay precinct in light of there being reef present should be re-assessed. [20]

4. ***Extract from the "Saldanha Bay ADZ Baseline Benthic Survey Report – Final Draft, (Annex 2), in support of the contention that the ADZ poses an immitigable threat to this marine eco-system.***

"The impact assessment for bivalve aquaculture did not assess the impact of placing the culture structures over hard substrata (SRK BAR 2017, appendix D2), and while the impact assessment for finfish culture does consider the presence of reef, it assumed limited distribution which was confined to Lynch Blinder (SRK BAR 2017, appendix D2). The effects of aquaculture on patches of low-lying reef with some substantial outcrops exceeding 1m in height and their associated epifaunal communities has thus not been considered in the Big Bay precinct beyond Lynch Blinder. Given the identification of reef in this precinct further studies should be conducted to address this omission. It is important to note that this is **ONLY** applicable to areas of the Big Bay precinct (not the ADZ as a whole) where reef occurs (the present day extent of reef in Big Bay is yet to be determined and a detailed bathymetry/side scan sonar survey should be undertaken)." [21]

5. ***Annex 10 refers: "Preliminary way forward with regards to scientific findings to be undertaken forward by the DEFF: Fisheries Management", published in Management Actions 2020 scientific findings, as communicated to the members of the ADZ Consultative Forum.***

In consideration of the findings identified in the Benthic Survey Presentation and Report, Save Langebaan Lagoon Action Group therefore avers that the recommendations by DEFF in Annex 3 are inadequate and/or inappropriate, in addition to lacking the necessary sense of urgency to meaningfully address these additional ecological risks to the receiving environment. [22]

6. ***In addition to the above, please clarify:***

i. Why the Flemming report/side scan sonar report as mentioned in the Benthic Survey was not included in the environmental impact assessment studies conducted as part of the Final Basic Assessment Report?

ii. Why no investigation was conducted by DEFF regarding the presence of a reef as identified by Pulfrich (2018)?

[20] Annex 9 – page 27
[21] Annex 8 – page 40
[22] Annex 10

We therefore request that the concerns raised and the gaps in knowledge identified by Anchor Research and Monitoring in the Benthic Survey Presentation and Report be addressed immediately by DEFF.

Further, we request independent oversight of the steps to be taken to ameliorate such risk and that all interested and affected parties are comprehensively apprised of such action.

The Benthic Survey Presentation and Report raise numerous critically important questions regarding the impact of aquaculture on the habitats of these rocky outcrops, including the health of the rock lobster population, and the dispersion of pollutants, issues germane to assessment of the risk of ecological harm posed by the ADZ and the type and efficacy of mitigation measures.

In conclusion:

We submit that the omission of a comprehensive assessment of the sea-bed in the area of the sited ADZ in the final basic assessment report must render the Environmental Authorisation granted fatally and technically flawed. Mitigations submitted in the final BAR are incomplete or lacking and therefore should not have been relied upon by the Minister of Environmental Affairs to inform a positive authorisation.

We therefore call on DEFF to immediately suspend the current Saldanha Bay ADZ operations until these critical deficiencies of the approved Environmental Management Programme for the ADZ have been comprehensively addressed.

Yours Sincerely

Clifford Wright

Chairman – Save Langebaan Lagoon

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APPENDIX 3	Save Langebaan Appeal 09 February 2018
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APPENDIX 10	**Management Actions 2020 scientific findings – Final.**
APPENDIX 11	**Sailing School Appeal Letter**

APPEAL QUESTIONNAIRE

Appellant's contact information:

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Western Cape

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Cell: +27 82 854 6078

Email: clifford@savelangebaanlagoon.co.za

Project information:

Project name : Sea Based Aquaculture Development Zone (ADZ) in Saldanha Bay within Saldanha Bay Local Municipality in the Western Cape Province,West Coast District Municipality

Authorisation register number as on environmental authorisation:

Project 1: 14/12/16/3/3/1/1728/ AM2

Authorisation date as on environmental authorisation:

Project : 8th January 2018

APPEAL IN RESPECT OF AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION ISSUED ON 08 JANUARY 2018 DEA REF 14/12/16/3/3/1/1728/AM2

FOR THE SEA BASED AQUACULTURE DEVELOPMENT ZONE (ADZ) IN SALDANHA BAY WITHIN SALDANHA BAY LOCAL MUNICIPALITY IN THE WESTERN CAPE,

1. Are you lodging this appeal as an individual or on behalf of a community/organisation?

	Community/ organisation

If on behalf of a community or organisation, please provide proof of mandate to do so.

See proof attached: APPENDIX 1: MANDATE

2. Is your appeal based on factors associated with the process that was followed by the applicant in obtaining authorisation?

Yes	

Please provide reasons:

1. Failure to conduct public participation process

It is contended that the Applicants failed to conduct a public participation process prior to the application for amendment of the environmental authorisation. The Consultative Forum was not informed of any proposed amendments to the Saldanha Bay ADZ EA, which violates the requirements set out in the EA and EMPr.

3. Is your appeal based on factors associated with environmental impacts not taken into account by the department in refusing or authorising the application?

YES	

Please provide reasons:

1. Reef habitat below designated Saldanha Bay ADZ, Big Bay Precinct
   This point is referred to in greater detail in question 7.

2. Waste Management act not assessed in EIA
   The question of waste management was excluded in the process of the EIA , as it was stated that this is a Sea-based project and application for land based processing activities would have to apply separately for waste management. The effects of aquaculture activity in terms of waste on the Sea-bed needs to be addressed .

4. Would you agree to the activity proceeding if your concerns can be addressed by rectifying the process or mitigating or eliminating the impacts of the activity?

	No

Please provide reasons:

1. Exclusion of Consultative Forum with regard to future changes to EMPr.

The amendment states that the applicant does not require approval from DEA&DP prior to effecting changes. The widening of the authority of the AMC to make unilateral decisions suggests an intentional withdrawal of transparency by DEFF-Fisheries, which will fatally damage the tenuous trust between the parties that has been hard won through the stakeholder engagement process of the Consultative Forum.

5. Are you fundamentally opposed to any development activity on the site?

Yes	

Please provide reasons:

The Saldanha Bay ADZ boarders on a Marine Protected area as well as an Internationally recognised RAMSAR site. Globally scientific reasearch has shown that open water FIN FISH farming causes irrepreable damage to the marine ecology. This updated international data should be considered with regards toi the Saldanha bay ADZ.

6. Do you have an objection in principle against the development?

Yes

Please provide reasons:

1. Refer to Save Langebaan Lagoon first appeal submitted ,dated 05 February 2018 – Appendix 3

2. Reef habitat below designated Saldanha Bay ADZ, Big Bay Precinct
This point is referred to in greater detail in question 7.

3. Failure to clarify factually correct coordinates of authorised ADZ site.
Currently geographic coordinates of Saldanha bay ADZ and Molapong Aquaculture Pilot Phase site appear incorrect on maritime charts, and charts are not being updated, this is a threat to navigation.

7. Does your appeal contain any new information that was not submitted to the environmental consultant or department prior to the department's consideration of the application?

Yes	

If the answer above is yes, please explain why it should be considered by the Minister and why it was not made available to the environmental consultant or department during the application process.

1. New Scientific Evidence of Reef habitat below Saldanh Bay ADZ :

On 14 September SLL received an email from the ADZ CEO informing us that a new independent benthic study had been undertaken in Saldanha Bay. The DEFF: Branch Fisheries Management had appointed Anchor Research and Monitoring for a 6-month contract to conduct part of the monitoring requirements as per the Sampling Plan. This report was released to DEFF: Branch Fisheries in June 2020 and forwarded to the Consultative Forum members on 14 September 2020.

The report provides new scientific information that is critical in addressing the receiving environment and the impact that the ADZ will have on the Big Bay Precinct (one of the 4 precincts / aquaculture zones that are being developed).

The report highlights the discovery of a reef habitat below the area, that is being developed. The report states that no assesment was done in the Basic Assesment Report (BAR) /EIA with regard to this reef and no factors considered as to how the marine ecology of the reef will be affected by aquaculture activity and specifically the Fin Fish farms directly above the reef habitat.

SLL does not know why the existence of the reef was excluded in the EIA.

SLL does not know why the applicant failed to mention the new scientific information in their application for amendments of the EA submitted to DEFF on 30 July 2020 when the report is dated June 2020 and thus the applicant should have been aware of the new information.

8. **DECLARATION:**

I declare that the contents of this submission are to the best of my knowledge the truth and I regard this declaration as binding on my conscience.

APPELLANT: SAVE LANGEBAAN LAGOON

Per: Clifford Wright – Chairman Save Langebaan Lagoon

DATE: 06 October 2020

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X447, Pretoria, 0001, Environment House, 473 Steve Biko Road, Pretoria, 0002

Email: Appealsdirectorate@environment.gov.za

APPEAL RESPONSE REPORT

PROJECT NAME/TITLE:

THE SEA BASED AQUACULTURE DEVELOPMENT ZONE (ADZ) IN SALDANHA BAY WITHIN SALDANHA BAY LOCAL MUNICIPALITY IN THE WESTERN CAPE, WEST COAST DISTRICT MUNICIPALITY

PROJECT LOCATION:

IN SALDANHA BAY WITHIN SALDANHA BAY LOCAL MUNICIPALITY IN THE WESTERN CAPE, WEST COAST DISTRICT MUNICIPALITY

PROJECT REFERENCE NUMBER: 14/12/16/3/3/1/1728/AM2

DATE PROJECT/ACTIVITY AUTHORISED: 8th January 2018

DETAILS OF THE APPELLANT	DETAILS OF THE APPLICANT
Name of appellant: Save Langebaan Lagoon	Name of applicant:
Appellant's representative (if applicable): Clifford Wright Chairperson Save Langebaan Lagoon	Applicant's representative (if applicable):
Postal address: Postnet Suite 7 Private Bag X6 Langebaan 7357 / Western Cape	Postal Address:

Email Address: clifford@savelangebaanlagoon.co.za	Email Address:
Telephone number: +27 82 854 6078 +27 22 461 2797	Telephone number:
Fax Number: 0866 459 796	Fax number:

GROUNDS OF APPEAL	RESPONDING STATEMENT BY THE APPLICANT	COMMENTS BY THE DEPARTMENT
Amendment 4 : Approval of revised Envirnmental Management Program and inclusions of condition to confirm that future amendments to impact management actions of the EMPr may be approved by the ADZ <Management committee AMC. 1. ***Failure to conduct public participation process***		

It is contended that the Applicants failed to conduct a public participation process prior to the application for amendment of the environmental authorisation. The Saldanha Bay ADZ Environmental Authorisation Ref. 14/12/16/3/3/1/1728 (Appendix 4), and the Saldanha Bay ADZ Environmental Management Programme (EMPr) Report number 499020/6 (Appendix 5), clearly requires the Aquaculture Monitoring Committee (AMC) and DEFF-Fisheries to provide updated information to the public (e.g. farm coordinates, water quality information, notification of new aquaculture operations). Further, the overarching function of the Consultative Forum is to review environmental monitoring data, advise on ADZ management and recommend measures. In order for the CF to fulfil its mandate, members of the CF must be		

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3. 4. ***Failure to clarify factually correct coordinates of authorised ADZ site.*** The lack of clarification of the actual coordinates of the authorised ADZ site presents a navigational hazard. The		

absence of correctly delineated coordinates that unambiguously reflect the positioning of the various farms (those planned and currently operational), continue to frustrate the updating of critical navigational charts for the area. Recreational water users (sailing vessels, power boats, anglers, paddlers) as well as commercial vessels entering and leaving the Saldanha Bay waters require accurate and up-to-date maritime charts to ensure safety. (Attached is a Letter from a Sailing School – Appendix 11). The errors on the charts appear to be due to a failure by DEFF, the ADZ AMC and Transnet Port Authorities to provide the Navy Hydrographer (hydrosan@iafrica.com) with consistently accurate information. Alternatively, the various aquaculture operators/concession holders have failed to moor their farms in accordance with the requisite co-ordinates.		

Consequently, a number of sailing vessels have incurred damage in collisions with equipment associated with aquaculture activities, such as buoys, lines, rafts, which are incorrectly marked on current charts, or moored in areas outside their designated locations. These incidents have occurred both north of the current aquaculture activity in Small Bay, as well as in Outer Bay, suggesting that aquaculture farmers are operating outside of their designated boundaries. Furthermore, the area south of Mykonos is no longer designated as part of the ADZ, yet the latest navigation charts still show this to be an area reserved for aquaculture. We therefore urgently request that all aquaculture activity is suspended until there is clarification of the ADZ's coordinates and reliable confirmation that the individual farms are operating strictly within their allocated siting.		

4. 5. ***Waste Management act not assessed in EIA*** The National Environmental Management: Waste act,2008(ActNo.59 of 2008) serves to regulate waste management in order to protect the health environment by providing reasonable measures for the prevention of pollution and ecological degradation. In the Saldanha bay ADZ Final Basic Assessment Report (FIN BAR), it was stated that the ADZ is a Sea-based project and the developer will need to apply separately for land based processing activities with regards to waste management. The effects of aquaculture activity in terms of waste on the Sea- bed must be addressed. Fin Fish farming produces organic waste in the form of faecal matter and surplus fish feed which sinks to the sea-bed and is suspended in the water column below the Fin Fish cages. The build up of organic waste on the reef habitat below causes ecological degradation. We submit that the Waste Act,2008(Act No. 59 of 2008) should apply to the ocean and lagoon as well. A waste management program must be implemented to provide a structure to mitigate the organic waste		

sediment and to address the plastic waste that breaks free from the aquaculture infrastructures. This pollutes the water and beaches, the mitigations steps set in place to date, are inadequate, resulting in floating debris in the form of plastic barrels, buoys and plastic baskets. 5. 6. ***New scientific evidence of Reef Habitat in ADZ :*** **The applicant has failed to include critical scientific evidence in their application.** Please note point 10 is a copy of a letter sent to the DEFF on 25 September 2020 requesting the suspension of all aquaculture activity in part of the authorised Saldanha Bay Aquaculture Development zone (ADZ), due to critical new scientific findings regarding the receiving environment. Annex 6. **Re: New scientific information concerning current operations of aquaculture facilities in the Saldanha Bay Aquaculture Development Zone**		

Background The Baseline Benthic Survey was commissioned in 2020 by the Department of Environment, Forestry and Fisheries (DEFF), Branch Fisheries, the holder of an Environmental Authorisation for the Saldanha Bay Aquaculture Development Zone (ADZ) and conducted by Anchor Research and Monitoring. The new findings of the above survey indicate that the Saldanha Bay Aquaculture Development Zone (ADZ) presents an untenable risk to the receiving environment of the Big Bay precinct of Saldanha Bay, for which no mitigations were submitted in the Basic Assessment Report, in application for environmental authorisation. This research was conducted post the granting of the environmental authorization, Annex 4, no impact mitigations to avoid/reduce harm to the sensitive reef ecosystems were investigated, nor has a programme to contain/reduce such impact been set out in the approved Environmental Management Programme (Number 499020/6) for the ADZ, Annex 5. Below, please find relevant extracts from the Saldanha Bay ADZ Baseline Benthic Survey		

Presentation (Annex 9), in support of our contention that these new findings show conclusively that the ADZ presents an immitigable risk to this marine eco-system. ***Statement of Concerns*** 1. ***Results and Discussion: Presence of hard substrata/reef in Big Bay*** [1] i. The marine specialist report for the Saldanha ADZ EIA considered subtidal reef habitat to be scarce in Saldanha Bay (Pulfrich 2018).[2] ii. Only identified Lynch blinder and North Bay blinder as important reef areas. [3] iii. Reports from divers during this assessment revealed the presence of calcrete rock at several sampling sites during the baseline survey (Capfish 2019). [4] iv. Difficulties in obtaining grab samples		

[1] Annex 9 – page 17

[2] Annex 9– page 17

[3] Annex 9 – page 17

[4] Annex 9 – page 17

at several stations in Big Bay during 2020 (AR&M) sediment surveys also suggests that rock which may form reef is more widespread in Big Bay than originally suspected. [5] v. Observations by ARM divers deploying water quality monitoring instruments during April 2020, also indicated reef in several areas of the Big Bay ADZ precinct.[6] vi. Subsequent literature review revealed the existence of an extensive abrasion platform (areas of exposed calcrete rock) throughout much of Big Bay (Flemming 2015).[7] vii. The distribution of the abrasion platform is overlaid on a map of Big Bay and the ADZ boundaries as well as the sampling sites on the following slide.[8] viii. Pictures of the rock/reef type habitat found in the finfish area were taken during instrument servicing in the finfish area on the 29th of June 2020. These images were taken in extremely poor visibility but indicate the		

[5] Annex 9 – page 17

[6] Annex 9 – page 17

[7] Annex 9 – page 17

[8] Annex 9 – page 17

presence of basket stars (Phylum Echinodermata), sponges (Phylum Porifera) and possibly Bryozoans. Before conclusions can be drawn about the nature of the communities, specimens would need to be collected and identified.[9] 2. ***Presence of hard substrata/reef in Big Bay /Recommendations*** [10] i. Given the presence of low-lying reef detected during the baseline surveys and instrument deployments in the finfish area in Big Bay, it is recommended that a side scan sonar survey be undertaken across the whole of Big Bay to establish the actual extent of this reef and that reef biota be surveyed.[11] ii. Once the extent and nature of the reef and associated benthic communities have been assessed and quantified, the management measures, mitigation measures and monitoring measures should be reassessed.[12]		

[9] Annex 9 – page 21

[10] Annex 9 – page 24

[11] Annex 9 – page 24

[12] Annex 9- page 24

iii. West Coast Rock Lobster (Jasus Lalandi) are evident in the video footage recorded from the Molapong dives was and were noted by AR&M divers deploying instruments.[13] iv. While Rock Lobster would benefit from increased organic matter originating from the aquaculture as a food source, their habitat may ultimately become smothered by fall off biofouling and culture animals.[14] ***3. Conclusions/ Presence of hard substrata and reef in the big bay precinct*** [15] i. The presence of hard substrata and low lying reef (besides that identified at Lynch Blinder) within the Big Bay ADZ precinct has been highlighted for the first time. [16] ii. The reef appears to be low-profile that is mostly < 1m in height, although some		

[13] Annex 9 – page 22

[14] Annex 9 – page 22

[15] Annex 9 – page 27

[16] Annex 9 – page 27

outcrops greater than 1 m in height are present.[17] iii. The extent and nature of the reef needs to be quantified throughout Big Bay which is frequently impacted by scouring and sand deposition.[18] iv. The nature of the macro-faunal/epifaunal assemblages associated with the reef needs to be quantified.[19] v. Once the above aspects are completed, the impacts of aquaculture in the Big Bay precinct in light of there being reef present should be re-assessed. [20] ***4. Extract from the "Saldanha Bay ADZ Baseline Benthic Survey Report – Final Draft, (Annex 2), in support of the contention that the ADZ poses an immitigable threat to this marine eco-system.*** "The impact assessment for bivalve aquaculture did not assess the impact of		

[17] Annex 9 – page 27
[18] Annex 9 – page 27
[19] Annex 9 – page 27
[20] Annex 9 – page 27

placing the culture structures over hard substrata (SRK BAR 2017, appendix D2), and while the impact assessment for finfish culture does consider the presence of reef, it assumed limited distribution which was confined to Lynch Blinder (SRK BAR 2017, appendix D2). The effects of aquaculture on patches of low-lying reef with some substantial outcrops exceeding 1m in height and their associated epifaunal communities has thus not been considered in the Big Bay precinct beyond Lynch Blinder. Given the identification of reef in this precinct further studies should be conducted to address this omission. It is important to note that this is **ONLY** applicable to areas of the Big Bay precinct (not the ADZ as a whole) where reef occurs (the present day extent of reef in Big Bay is yet to be determined and a detailed bathymetry/side scan sonar survey should be undertaken)." [21] ***5. Annex 10 refers: "Preliminary way***		

[21] Annex 8 – page 40

forward with regards to scientific findings to be undertaken forward by the DEFF: Fisheries Management", published in Management Actions 2020 scientific findings, as communicated to the members of the ADZ Consultative Forum. In consideration of the findings identified in the Benthic Survey Presentation and Report, Save Langebaan Lagoon Action Group therefore avers that the recommendations by DEFF in Annex 3 are inadequate and/or inappropriate, in addition to lacking the necessary sense of urgency to meaningfully address these additional ecological risks to the receiving environment. [22] ***6. In addition to the above, please clarify:*** i. Why the Flemming report/side scan sonar report as mentioned in the Benthic Survey was not included in the environmental impact assessment studies conducted as part of the Final Basic Assessment Report? ii. Why no investigation was conducted by DEFF regarding the presence of a reef as identified by Pulfrich (2018)?		

[22] Annex 10

We therefore request that the concerns raised and the gaps in knowledge identified by Anchor Research and Monitoring in the Benthic Survey Presentation and Report be addressed immediately by DEFF. Further, we request independent oversight of the steps to be taken to ameliorate such risk and that all interested and affected parties are comprehensively apprised of such action. The Benthic Survey Presentation and Report raise numerous critically important questions regarding the impact of aquaculture on the habitats of these rocky outcrops, including the health of the rock lobster population, and the dispersion of pollutants, issues germane to assessment of the risk of ecological harm posed by the ADZ and the type and efficacy of mitigation measures. ***In conclusion:*** We submit that the omission of a comprehensive assessment of the sea-bed in the area of the sited ADZ in the final basic assessment report must render the		

Environmental Authorisation granted fatally and technically flawed. Mitigations submitted in the final BAR are incomplete or lacking and therefore should not have been relied upon by the Minister of Environmental Affairs to inform a positive authorisation. We therefore call on DEFF to immediately suspend the current Saldanha Bay ADZ operations until these critical deficiencies of the approved Environmental Management Programme for the ADZ have been comprehensively addressed. Yours Sincerely Clifford Wright Chairman – Save Langebaan Lagoon		

To be completed by the DMR, PASA and or DEA

ARR comments by Case Officer

Name & Surname:

Date:

Signature:

……

Approved by Supervior

Name & Surname:

Date:

Signature:

……..

environment, forestry & fisheries
Department:
Environment, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA 0001· Environment House 473 Steve Biko Road, Arcadia· PRETORIA

DEA Reference: 14/12/16/3/3/1/1728/AM2
Enquiries: Ms Matlhodi Mogorosi
Telephone: (072) 761 0720 **E-mail:** MMogorosi@environment.gov.za

Mr Asanda Njobeni
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Aquaculture and Economic Development
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ROGGEBAAI
8012

Telephone Number: (021) 402 3116
Email Address: AsandaN@daff.gov.za

PER MAIL / EMAIL

Dear Mr Njobeni

AMENDMENT OF THE ENVIRONMENTAL AUTHORISATION ISSUED ON 08 JANUARY 2018 FOR THE SEA-BASED AQUACULTURE DEVELOPMENT ZONE (ADZ) IN SALDANHA BAY WITHIN SALDANHA BAY LOCAL MUNICIPALITY IN THE WESTERN CAPE PROVINCE

The Environmental Authorisation (EA) issued for the abovementioned application by this Department on 08 January 2018, the amendment to the EA dated 10 July 2019, your application for amendment of the EA received by the Department on 30 July 2020, the acknowledgement letter dated 11 August 2020 and the additional information received by the Department on 17 August 2020, refer.

Based on a review of the reasons for requesting amendments to the above EA, this Department, in terms of Chapter 5 of the Environmental Impact Assessment Regulations, 2014 as amended, has decided to amend the EA dated 08 January 2018 as amended, as follows:

Amendment 1: Amendment of the Small Bay (SB) North precinct coordinates to include West Coast Aquaculture Operator (existing operator prior to the issuing of the EA) on page 5 of the EA:

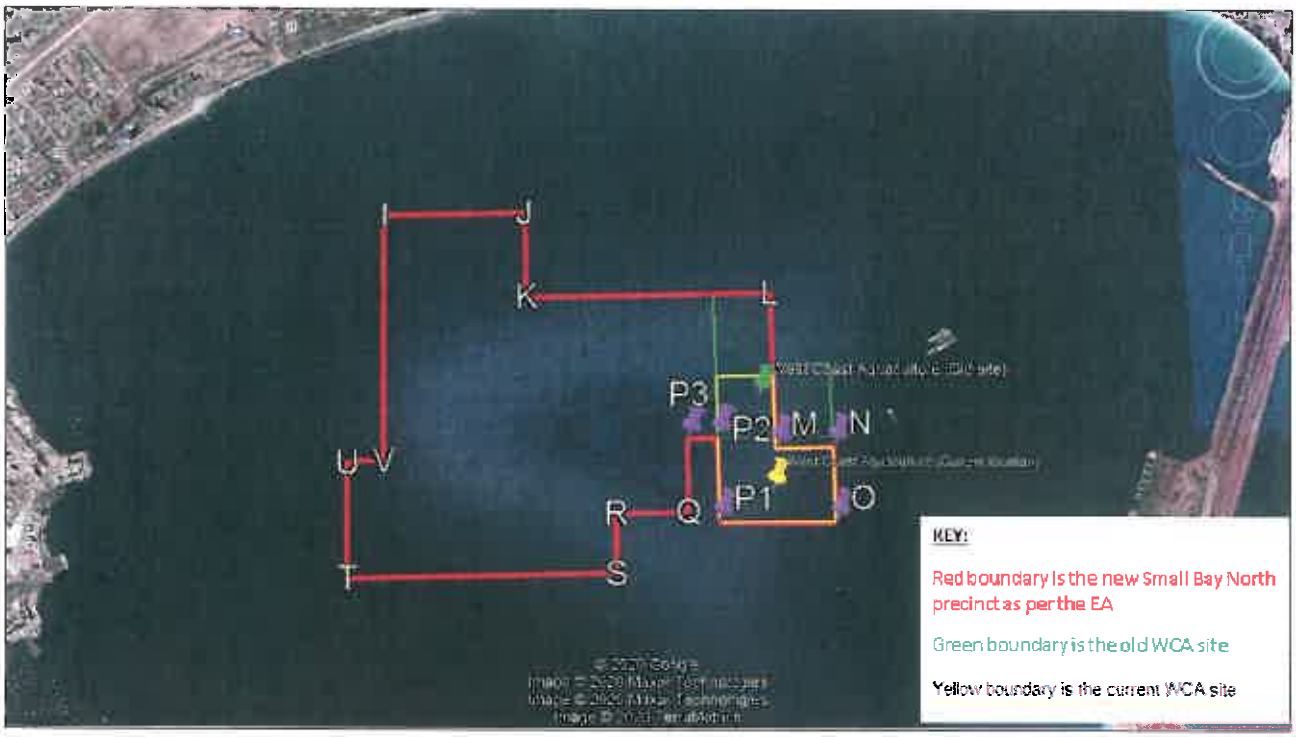
From:

	Point	Latitude (S)			Longitude (E)		
		DEG	MIN	SEC	DEG	MIN	SEC
Small Bay North	I	33	0	12.6	17	57	42.6
Small Bay North	J	33	0	12.78	17	58	1.8
Small Bay North	K	33	0	22.5	17	58	1.68
Small Bay North	L	33	0	22.8	17	58	34.5
Small Bay North	M	33	0	30.9	17	58	34.38
Small Bay North	N	33	0	31.02	17	58	42.12
Small Bay North	O	33	0	39.12	17	58	42
Small Bay North	P	33	0	38.88	17	58	22.74
Small Bay North	Q	33	0	46.98	17	58	22.62

Small Bay North	R	33	0	46.92	17	58	13.02
Small Bay North	S	33	0	53.4	17	58	12.9
Small Bay North	T	33	0	53.34	17	57	37.32
Small Bay North	U	33	0	40.2	17	57	37.38
Small Bay North	V	33	0	40.26	17	57	42.24

To:

	Point	Latitude (S)			Longitude (E)		
		DEG	MIN	SEC	DEG	MIN	SEC
Small Bay North	I	33	0	12.6	17	57	42.6
Small Bay North	J	33	0	12.78	17	58	1.8
Small Bay North	K	33	0	22.5	17	58	1.68
Small Bay North	L	33	0	22.8	17	58	34.5
Small Bay North	M	33	0	40.32	17	58	34.38
Small Bay North	N	33	0	40.35	17	58	42.07
Small Bay North	O	33	0	48.64	17	58	41.97
Small Bay North	P1	33	0	48.29	17	58	26.55
Small Bay North	P2	33	0	38.97	17	58	26.69
Small Bay North	P3	33	0	38.98	17	58	22.75
Small Bay North	Q	33	0	46.98	17	58	22.62
Small Bay North	R	33	0	46.92	17	58	13.02
Small Bay North	S	33	0	53.4	17	58	12.9
Small Bay North	T	33	0	53.34	17	57	37.32
Small Bay North	U	33	0	40.2	17	57	37.38
Small Bay North	V	33	0	40.26	17	57	42.24



Map of amended boundary for the Small Bay North precinct

The reason for Amendment 1 is as follows:

The boundary for the Small Bay North precinct required amendment to include the current position of an existing operator, namely West Coast Aquaculture (coordinates M – P3). An error occurred when drafting the boundary for this precinct in the Final Basic Assessment Report, and as a result this error depicting the old boundary of the West Coast Aquaculture was then carried over into the EA. The boundary for the Small Bay North precinct was determined by using approved water space lease coordinates issued by the Transnet Ports Authority during the drafting of the Final Basic Assessment Report. The lease coordinates for the West Coast Aquaculture were not amended when the farm was granted permission by the Transnet Ports Authority to move from the allocated lease area to the current lease area a number of years ago. West Coast Aquaculture has recently applied to the Transnet Ports Authority for an amendment of their lease to include the current coordinates. This amendment does not increase the approved total ADZ area of 884ha; the current area of the West Coast Aquaculture in the Small Bay North would be repositioned to accommodate for this amended boundary while remaining within the approved total area for the ADZ.

Amendment 2: Amendment of the Big Bay (BB) North precinct coordinates (to include the correct boundary of the ADZ and to rename coordinate AC to Big Bay North) on pages 5-6 the EA:

From:

	Point	Latitude (S)			Longitude (E)		
		DEG	MIN	SEC	DEG	MIN	SEC
Big Bay North	W	33	1	2.7	18	1	9.36
Big Bay North	X	33	1	53.52	18	1	49.32
Big Bay North	Y	33	2	51.06	18	1	34.5
Big Bay North	Z	33	3	1.86	18	0	22.26
Big Bay North	AA	33	1	56.88	18	0	53.4
Big Bay North	AB	33	1	54.6	18	0	46.2
Outer Bay South	AC	33	4	23.58	17	56	57.66

To:

	Point	Latitude (S)			Longitude (E)		
		DEG	MIN	SEC	DEG	MIN	SEC
Big Bay North	W	33	1	18.6	18	1	2.28
Big Bay North	X	33	2	1.86	18	1	40.44
Big Bay North	Y	33	2	53.4	18	1	18.84
Big Bay North	Z	33	2	57.84	18	0	49.08
Big Bay North	AA	33	2	39.72	18	0	13.02
Big Bay North	AB	33	2	17.22	18	0	4.32
Big Bay North	AC	33	1	53.52	18	0	44.94

The reason for Amendment 2 is as follows:

The EA coordinates for the Big Bay North precinct required amendment, as the current boundary contains an administrative error. The incorrect and correct coordinates were listed in the Final Basic Assessment Report, however a table of the incorrect coordinates in the Final Basic Assessment Report was carried over into the approved EA. These coordinates and the illustration of the boundary for the Big Bay North precinct were correctly depicted in the locality plan in Annexure 2 of the EA. Only the coordinates on page 5-6 of the EA were erroneous. The name of coordinate AC also belonged to the Big Bay North precinct, as depicted in the EA locality plan.

Amendment 3: Amendment of the Outer Bay (OB) South precinct coordinates to include the omitted coordinates for point AG on page 6 of the EA:

From:

	Point	Latitude (S)			Longitude (E)		
		DEG	MIN	SEC	DEG	MIN	SEC
Outer Bay South	AD	33	4	8.64	17	57	51.66
Outer Bay South	AE	33	4	42.36	17	57	51.66
Outer Bay South	AF	33	4	34.26	17	56	57.66

To:

	Point	Latitude (S)			Longitude (E)		
		DEG	MIN	SEC	DEG	MIN	SEC
Outer Bay South	AD	33	4	8.64	17	57	51.66
Outer Bay South	AE	33	4	42.36	17	57	51.66
Outer Bay South	AF	33	4	34.26	17	56	57.66
Outer Bay South	AG	33	4	34.26	17	56	57.66

The reason for Amendment 3 is as follows:
The list of coordinates for the Outer Bay South precinct on page 6 of the EA required amendment, as they omitted point AG. Point AG and its associated coordinates were correctly depicted in the locality plan in Annexure 2 of the EA.

Amendment 4: Approval of the revised Environmental Management Programme (EMPr) and the inclusion of a condition to confirm that future amendments to the impact management actions of the EMPr may be approved by the ADZ Management Committee (AMC):

The revised EMPr dated May 2020 (Document name: Environmental Management Programme: Sea-Based Aquaculture Development Zone in Saldanha Bay) **is hereby approved**. An updated layout map for the entire ADZ, which illustrates the amended boundary of the Small Bay (SB) North precinct (as amended to include the West Coast Aquaculture Operator) must be included in the EMPr.

Condition 19.5 on page 14 of the EA is hereby amended to include the following key function of the AMC:

19. "*Key functions of the AMC are to*
19.5 Make recommendations for improvements and amendments to the DAFFs overarching approved EMPr when required. Future amendments to the EMPr may be approved by the AMC, provided that the amendments are in terms of Regulation 36(1) of the EIA Regulations, 2014, as amended, which states that: "Where an amendment is required to the impact management actions of an EMPr, such amendments may immediately be effected by the holder and reflected in the next environmental audit report submitted as contemplated in the environmental authorisation and regulation 34";

Reason for amendment 4 is as follows:
The approved ADZ EMPr has been revised to allow for impact management actions to be added for the ease of implementation of the ADZ. According to the Regulation 36(1) of the NEMA EIA Regulations of 2014, as amended, changes to the impact management actions do not require a Public Participation Process to be conducted, however the amended EMPr will be circulated to the AMC as well as the Consultative Forum for transparency. Condition 19.5 of the EA has also been amended to confirm that future EMPr amendments to

the impact management actions may be approved by the AMC of Saldanha Bay ADZ in terms of Regulation 36(1) of the EIA Regulations, 2014, which does not require amendments to the impact management actions to be approved by the Competent Authority.

Amendment 5: Amendment of Condition 32 of the EA to stipulate the frequency of the auditing and submission of the audit report:

From:

32. "The frequency of auditing and of submission of the environmental audit reports must be as per the frequency indicated in the EMPr, taking into account the processes for such auditing as prescribed in Regulation 34 of GN R. 982."

To:

32. "Auditing and of submission of the environmental audit reports must be undertaken annually, conducted over the period of five (5) consecutive years, after which the audit frequency can be reviewed based on the audit findings, taking into account the processes for such auditing as prescribed in Regulation 34 of GN R. 982."

Reason for Amendment 5 is as follows:
Condition 32 of the EA stated that the frequency of auditing and of submission of the environmental audit reports must be as per the frequency indicated in the EMPr, however, the EMPr did not stipulate the frequency for reporting and instead referred back to the frequency as stipulated in the EA. Condition 32 therefore required an amendment to specify the frequency of the environmental audits and the requirement for submission of the reports to the competent authority. The recent external audit commissioned by the Branch Fisheries, for the year 1 ADZ reporting recommended that annual environmental audits be conducted for the next 5 years and that during the year 5 audit, the frequency is reviewed.

Amendment 6: Amendment of condition 33 of the EA to specify final audit report submission requirements more appropriate to the type of development:

From:

33. "The holder of the authorisation must, in addition, submit an environmental audit report to the Department within 30 days of completion of the construction phase (i.e. within 30 days of site handover) and a final environmental audit report within 30 days of completion of rehabilitation activities."

To:

33. "The holder of the authorisation must, in addition, submit an environmental audit report to the Department within 30 days of completion of the installation of the infrastructure of the last aquaculture farm to be established within the ADZ."

The reason for Amendment 6 is as follows:
Condition 33 of the EA stated the holder of the authorisation to submit an environmental audit report to the Department within 30 days of completion of the construction phase and a final environmental audit report within 30 days of completion of rehabilitation activities. The construction phase has as yet not been completed. The project, entailing multiple operations each in different stages in the project life-cycle, means that the closure of the construction phase is not clear-cut or imminent. Condition 32 therefore required an amendment to specify final audit report submission requirements more appropriate to the type of development.

Amendment 7: Amendment of Condition 55.1 of the EA to specify the location where documents may be located for inspection by authorities:

From:

55. "A copy of this environmental authorisation, the audit and compliance monitoring reports, and the approved EMPr, must be made available for inspection and copying-

55.1 at the site of the authorised activity;"

To:

55. "A copy of this environmental authorisation, the audit and compliance monitoring reports, and the approved EMPr, must be made available for inspection and copying-

55.1 at the Chief Fisheries Compliance Monitoring Office located in Pepper Bay Harbour Saldanha Bay, as well as at the onshore office of each operator within the ADZ;"

Reason for amendment 7 is as follows:
Condition 55.1 required amendment as it is impractical to keep documents relating to the ADZ at the site, since it is a sea based site in Saldanha Bay and there is no site office. The holder of the authorisation's, Branch Fisheries Management, offices are based in Cape Town, however Chief Fisheries Compliance Monitoring offices are based in Pepper Bay, Saldanha Bay and a copy of the EA can be held at these offices for audit and compliance monitoring reporting.

No negative environmental impacts are anticipated as a result of these amendments. The amendments are administrative in nature and will enable practical implementation of the EA.

General

This EA amendment letter must be read in conjunction with the EA dated 08 January 2018 as amended.

In terms of the Promotion of Administrative Justice Act, 2000 (Act No 3 of 2000), you are entitled to the right to fair, lawful and reasonable administrative action; and to written reasons for administrative action that affects you negatively. Further your attention is drawn to the provisions of the Protection of Personal Information Act, 2013 (Act no. 4 of 2013) which stipulate that the Department should conduct itself in a responsible manner when collecting, processing, storing and sharing an individual or another entity's personal information by holding the Department accountable should the Department abuse or compromise your personal information in any way.

In terms of Regulation 4(2) of the Environmental Impact Assessment Regulations, 2014, as amended (the EIA Regulations), you are instructed to notify all registered interested and affected parties, in writing and within 14 (fourteen) days of the date of the EA, of the Department's decision, as well as the provisions regarding the submission of appeals that are contained in the Regulations.

Your attention is drawn to Chapter 2 of National Environmental Management Act, 1998 (Act No. 107 of 1998) National Appeal Regulations published under Government Notice R993 in Government Gazette No. 38303 dated 08 December 2014 (National Appeal Regulations, 2014), which prescribes the appeal procedure to be followed. Kindly include a copy of this document (National Appeal Regulations, 2014) with the letter of notification to interested and affected parties in this matter.

Should any person wish to lodge an appeal against this decision, he/she must submit the appeal to the appeal administrator, and a copy of the appeal to the applicant, any registered interested and affected party, and any organ of state with interest in the matter within 20 days from the date that the notification of the decision was sent to the registered interested and affected parties by the applicant; or the date that the notification of the decision was sent to the applicant by the Department, whichever is applicable.

Appeals must be submitted in writing in the prescribed form to:

The Director: Appeals and Legal Review of this Department at the below mentioned addresses.

By email: appeals@environment.gov.za;

By hand: Environment House
473 Steve Biko,
Arcadia,
Pretoria,
0083; or

By post: Private Bag X447,
Pretoria,
0001;

Please note that in terms of Section 43(7) of the National Environmental Management Act, Act No. 107 of 1998, as amended, the lodging of an appeal will suspend the environmental authorisation or any provision or condition attached thereto. In the instance where an appeal is lodged, you may not commence with the activity until such time that the appeal is finalised.

To obtain the prescribed appeal form and for guidance on the submission of appeals, please visit the Department's website at https://www.environment.gov.za/documents/forms#legal_authorisations or request a copy of the documents at appeals@environment.gov.za.

Yours faithfully

MI Solomons

Ms Milicent Solomons
Acting Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Date: 16/09/2020.

CC:	M Pretorius	Department of Environment, Forestry & Fisheries: Branch: Fisheries Management	E-mail: MichellePR@daff.gov.za
	Z Toefy	Western Cape DEADP	E-mail: Zaahir.Toefy@westerncape.gov.za
	N Duarte	Saldanha Bay Municipality	Email: Nazeema.Duarte@sbm.gov.za

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Enquiries: Mr Ishaam Abader Telephone: 012 399 9330 E-mail: iabader@environment.gov.za

Mrs. Millicent Solomons
Director: Strategic Infrastructure Development

Dear Mrs. Solomons

APPOINTMENT AS ACTING CHIEF DIRECTOR: INTEGRATED ENVIRONMENTAL AUTHORISATIONS FOR THE PERIOD 15 SEPTEMBER 2020 UNTIL 22 SEPTEMBER 2020

I hereby inform you that I have decided to appoint you as the Acting Chief Director: integrated environmental authorisations for the period 15 September 2020 until 22 September while Mr. Sabelo Malaza is on Annual Leave.

All the correspondence and other documents that are usually signed by the Chief Director: integrated environmental authorisations must be signed under Acting Chief Director: integrated environmental authorisations during the above-mentioned period.

Your appointment in the above acting position remains subject to the provisions of the Public Service Act, 1994 (Proclamation No. 103 of 1994), as amended, the Government Employees Pension Fund Act, 1996 (Proclamation No. 21 of 1996), the regulations promulgated under these Acts and relevant circulars.

In the execution of your duties and the exercising of the powers delegated to you, you will furthermore be subjected to the provisions of the Public Finance Management Act, compliance with the Promotion of Access to Information Act, Promotion of Administrative Justice Act, the Minimum Information Security Standard, Departmental Policies and other applicable legislations with the Republic of South Africa. You are therefore advised to make yourself familiar with the provisions of this legislations and policies and the amendments thereof. (Copies of Departmental policies can be obtained from the Human Resource Office).

Please accept my heartfelt gratitude for all your assistance on behalf of the department.

Yours sincerely

L. Garlipp
Ms. Linda Garlipp
DDG(Act) : RCSM
Date: 14/09/2020

ACKNOWLEDGEMENT

I ACCEPT / ~~DO NOT ACCEPT~~ appointment as Acting Chief Director: integrated environmental authorisations
Signed: _____

Date: 14/09/2020

APPENDIX 1

Letters of Mandate for Save Langebaan Lagoon

For proof of letters of mandate please refer to

https://drive.google.com/drive/folders/1PmVM6_zAUzYARYnuhnzmyo0AC-1wTqoc

Appendix 2 - SLL ADZ APPEAL DOC 5TH FEB 2018

https://drive.google.com/drive/folders/1gcIdKk9OrzjXEpPa8Lf-epk8ShdQpbSL?usp=sharing

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Private Bag X 447· PRETORIA · 0001· Environment House · 473 Steve Biko, Arcadia· PRETORIA
Tel (+ 27 12) 399 9372

DEA Reference: 14/12/16/3/3/1/1728
Enquiries: Nyiko Nkosi
Telephone: 012-399-9392 **E-mail:** nnkosi@environment.gov.za

Ms Asanda Njobeni
Department of Agriculture, Forestry and Fisheries
Aquaculture and Economic Development
Private Bag X2
ROGGEBAAI
8012

Tel No: 021-402-3116
E-mail: AsandaN@daff.gov.za

PER MAIL / E-MAIL

Dear Ms Njobeni

APPLICATION FOR ENVIRONMENTAL AUTHORISATION IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998: GN R. 982/983: SEA BASED AQUACULTURE DEVELOPMENT ZONE (ADZ) IN SALDANHA BAY WITHIN SALDANHA BAY LOCAL MUNICIPALITY IN THE WESTERN CAPE PROVINCE

With reference to the above application, please be advised that the Department has decided to grant authorisation. The Environmental Authorisation (EA) and reasons for the decision are attached herewith.

Note that the following areas which formed part of this application are not authorised as part of this decision and the reason for not authorising them is because this Department has issued separate EAs to other applicants:

1. Southern Cross Salmon Farming (Pty) Ltd application located within a recommended ADZ area within Outer Bay South area (10 ha) and Outer Bay North area (20 ha) with the following coordinates and DEA Reference number 14/12/16/3/3/1/1728/1:

Point- Outer Bay South (10 ha)	Latitude	Longitude
SC-E	33° 4'34.80"S	17°57'45.70"E
SC-F'	33° 4'34.83"S	17°57'51.66"E
SC-G'	33° 4'42.36"S	17°57'51.66"E
SC-H'	33° 4'41.46"S	17°57'45.63"E

Point- Outer Bay North (20ha)	Latitude	Longitude
SC-A	33° 1'55.80"S	17°56'50.80"E
SC-B	33° 1'55.90"S	17°57'13.13"E
SC-C	33° 2'8.20"S	17°57'12.90"E
SC-D	33° 2'8.00"S	17°56'50.70"E

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2. Molapong Aquaculture (Pty) Ltd application located within a recommended ADZ area within Big Bay North area (approximately 40ha) and a site near Jutten Island (to be expanded from 1 ha to 15ha) with following the coordinates and DEA reference number 14/12/16/3/3/1/1728/2:

3.

Sea area 1- Big Bay (40 ha)		
Point-	Latitude	Longitude
J	33° 02' 17.2"S	18°00' 04.3"E
K	33° 02' 13.0"S	18°00' 24.7"E
L	33° 02' 35.3"S	18°00' 33.6"E
M	33° 02' 39.7"S	18°00' 13.0"E
Sea Area 3- Near Jutten Island (to be expanded from 1 ha to 15ha)		
Point-	Latitude	Longitude
N	33° 04' 23.9"S	17°57' 24.5"E
G	33° 04 40.0"S	17°57' 36.1"E
P	33° 04' 23.9"S	17°57' 36.1"E
Q	33° 04' 40.1"S	17°57' 24.5"E

In terms of Regulation 4(2) of the Environmental Impact Assessment Regulations, 2014, as amended (the Regulations), you are instructed to notify all registered interested and affected parties, in writing and within 14 (fourteen) days of the date of the EA, of the Department's decision in respect of your application as well as the fact that an appeal may be lodged against the decision in terms of the National Appeals Regulations, and the provisions regarding the submission of appeals as contained in the Regulations.

Should any person wish to lodge an appeal against this decision, he/she must submit the appeal to the appeal administrator, and a copy of the appeal to the applicant, any registered interested and affected party, and any organ of state with interest in the matter within 20 days from the date that the notification of the decision was sent to the registered interested and affected parties by the applicant; or the date that the notification of the decision was sent to the applicant by the Department, whichever is applicable.

Appeals must be submitted in writing in the prescribed form to:

Mr Z Hassam, Director: Appeals and Legal Review of this Department at the below mentioned addresses.

By email: appealsdirectorate@environment.gov.za;

By hand: Environment House
473 Steve Biko,
Arcadia,
Pretoria,
0083; or

By post: Private Bag X447,
Pretoria,
0001

Please note that in terms of Section 43(7) of the National Environmental Management Act, 1998, the lodging of an appeal will suspend the environmental authorisation or any provision or condition attached thereto. In the instance where an appeal is lodged, you may not commence with the activity until such time that the appeal is finalised.

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To obtain the prescribed appeal form and for guidance on the submission of appeals, please visit the Department's website at https://www.environment.gov.za/documents/forms#legal_authorisations or request a copy of the documents at appealsdirectorate@environment.gov.za.

Yours faithfully

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs
Date: 07/07/2014

CC:	Ms Sue Reuther	SRK Consulting	Email: sreuther@srk.co.za
	Mr Adri La Meyer	DEA&DP	Email: adri.lameyer@westerncape.gov.za

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

Environmental Authorisation

In terms of regulation 25 of the Environmental Impact Assessment Regulations, 2014

Sea Based Aquaculture Development Zone (ADZ) in Saldanha Bay within Saldanha Bay Local Municipality in the Western Cape Province

West Coast District Municipality

Authorisation register number:	*14/12/16/3/3/1/1728*
Last amended:	*First issue*
Holder of authorisation:	*DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES: AQUACULTURE AND ECONOMIC DEVELOPMENT*
Location of activity:	*WESTERN CAPE PROVINCE: Within Saldanha Bay*

This environmental authorisation does not negate the holder of the authorisation's responsibility to comply with any other statutory requirements that may be applicable to the undertaking of the activity.

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Decision

The Department is satisfied, on the basis of information available to it and subject to compliance with the conditions of this environmental authorisation, that the applicant should be authorised to undertake the activities specified below.

Non-compliance with a condition of this environmental authorisation may result in criminal prosecution or other actions provided for in the National Environmental Management Act, 1998 (NEMA) and the Environmental Impact Assessment (EIA) regulations.

Details regarding the basis on which the Department reached this decision are set out in Annexure 1.

Activities authorised

By virtue of the powers conferred on it by the National Environmental Management Act, 1998 (Act No.107 of 1998) and the Environmental Impact Assessment Regulations, 2014 the Department hereby authorises –

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES: AQUACULTURE AND ECONOMIC DEVELOPMENT

(hereafter referred to as the **holder of the authorisation**)

with the following contact details –

Ms Asanda Njobeni
Department of Agriculture, Forestry and Fisheries: Aquaculture and Economic Development
Private Bag X2
ROGGEBAAI
8012Tel: 021 402 3116
E-mail: AsandaN@daff.gov.za

to undertake the following activities (hereafter referred to as "the activity") indicated in Listing Notice 1 (GN R. 983):

Listed activities	Activity/Project description
GN R. 983 Item 7: *The development and related operation of facilities, infrastructure or structures for aquaculture of sea-based cage culture of finfish, crustaceans, reptiles, amphibians, molluscs, echinoderms and aquatic plants where the facility, infrastructure or structures will have a production output exceeding 50 000 kg per annum (wet weight).*	The ADZ aims to establish new facilities, infrastructure or structures in Saldanha Bay for sea-based cultivation, primarily of molluscs (e.g. mussels, oysters), seaweeds and finfish. The ADZ area is projected to potentially produce up to: - 27 597 ungraded / 15 203 graded tpa of bivalves; and - 5 000 tpa of finfish. Anticipated production will thus exceed the threshold of 50 tpa at full operation of the ADZ. Anticipated ADZ facilities, infrastructure or structures include: • Structures such as mussel rafts, longlines, fish cages and barrels, moored to the sea bed and held afloat by buoys, in four designated ADZ precincts within Saldanha Bay; and • Navigational buoys and lights to demarcate the position of aquaculture areas / infrastructure. It is expected that operators will initially make use of existing land-based facilities and vessel (off-) loading and mooring structures.
GN R. 983 Item 17: *Development* *(i) in the sea;* *in respect of*	The aquaculture structures (such as mussel rafts, longlines, fish cages and barrels) will be moored to the sea bed. The combined footprint of moorings for each

Listed activities	Activity/Project description
(f) infrastructure or structures with a development footprint of 50 square metres or more.	structure is well below 50 m². The combined footprint of all moorings for all structures within the ADZ may however exceed 50 m².
GN R. 983 Item 18A: *The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from:* *(iii) the sea.*	The development may result in the moving of more than 5m³ of sand, shells or rock in the sea and depositing of material of more than 5 m³ (e.g. anchor blocks and/or mussel shells) into the sea.
GN R.983 Item 42: *The expansion and related operation of facilities, infrastructure or structures for aquaculture of sea-based cage culture of finfish, crustaceans, reptiles, amphibians, molluscs, echinoderms and aquatic plants where the annual production output of such facility, infrastructure or structures will be increased by 50 000 kg (wet weight) or more.*	A total of 464 ha are currently allocated for aquaculture in Saldanha Bay; of these 151 ha are operational. Existing operators also manage a number of on-shore processing facilities. The existing aquaculture areas will be located in and incorporated into the future ADZ areas. The ADZ will increase the total allocated aquaculture area by 420 ha to 884 ha in future. Annual production is expected to increase by more than 50 000 kg (wet weight) per annum at full operation of the ADZ. Spatially, the ADZ may thus be considered an expansion of existing aquaculture facilities, infrastructure or structures. However, the new farms in the ADZ may also be considered new (though similar) structures, which may be operated by a range of (existing and/or new) operators, in which case GN R. 983 Activity 7 applies.
GN R.983 Activity 54: *Expansion of facilities (i) in the sea in respect of (f) infrastructure or structures where the development footprint is expanded by 50 square metres or more.*	The aquaculture structures (such as rafts, longlines and fish cages) will be moored to the sea bed. The combined footprint of moorings for each structure is well below 50

Listed activities	Activity/Project description
	m^2. The combined footprint of all moorings for all structures within the ADZ may, however, exceed 50 m^2. As aquaculture structures are already moored in Saldanha Bay, the ADZ may thus spatially be considered an expansion of existing infrastructure in the sea by more than 50 m^2. However, the new farms in the ADZ may also be considered new (though similar) structures, which may be operated by a range of (existing and/or new) operators, in which case GN R. 983 Activity 42 applies.

as described in the Basic Assessment Report (BAR) dated August 2017 at:

	Point	Latitude (S)			Longitude (E)		
		DEG	MIN	SEC	DEG	MIN	SEC
Outer Bay North	A	33	2	32.1	17	55	51.3
Outer Bay North	B	33	1	56.04	17	57	26.52
Outer Bay North	C	33	2	48.06	17	56	30.24
Outer Bay North	D	33	2	39.18	17	56	7.56
Small Bay South	E	33	1	39.9	17	57	52.2
Small Bay South	F	33	1	32.22	17	58	7.62
Small Bay South	G	33	2	9.18	17	58	32.22
Small Bay South	H	33	2	21.9	17	58	25.92
Small Bay North	I	33	0	12.6	17	57	42.6
Small Bay North	J	33	0	12.78	17	58	1.8
Small Bay North	K	33	0	22.5	17	58	1.68
Small Bay North	L	33	0	22.8	17	58	34.5
Small Bay North	M	33	0	30.9	17	58	34.38
Small Bay North	N	33	0	31.02	17	58	42.12
Small Bay North	O	33	0	39.12	17	58	42
Small Bay North	P	33	0	38.88	17	58	22.74
Small Bay North	Q	33	0	46.98	17	58	22.62
Small Bay North	R	33	0	46.92	17	58	13.02
Small Bay North	S	33	0	53.4	17	58	12.9
Small Bay North	T	33	0	53.34	17	57	37.32
Small Bay North	U	33	0	40.2	17	57	37.38
Small Bay North	V	33	0	40.26	17	57	42.24
Big Bay North	W	33	1	2.7	18	1	9.36
Big Bay North	X	33	1	53.52	18	1	49.32
Big Bay North	Y	33	2	51.06	18	1	34.5

Big Bay North	Z	33	3	1.86	18	0	22.26
Big Bay North	AA	33	1	56.88	18	0	53.4
Big Bay North	AB	33	1	54.6	18	0	46.2
Outer Bay South	AC	33	4	23.58	17	56	57.66
Outer Bay South	AD	33	4	8.64	17	57	51.66
Outer Bay South	AE	33	4	42.36	17	57	51.66
Outer Bay South	AF	33	4	34.26	17	56	57.66

the location indicated in the locality plan, attached as Annexure 2 of this authorisation

- for the establishment of a Sea-Based Aquaculture Development Zone (ADZ) in Saldanha Bay in the Western Cape Province, hereafter referred to as "the property".

The recommended post-mitigation scenario for the project will include the following:

(a) ADZ Areas

The recommended post-mitigation ADZ area comprises four precincts in Saldanha Bay, adding 420ha of new aquaculture areas in Saldanha Bay for a total ADZ comprising 884ha:

- Small Bay: no additional aquaculture areas;
- Big Bay North: north of Mykonos entrance channel;
- Outer Bay North: north of Port entrance channel, near Malgas Island; and
- Outer Bay South: south of Port entrance channel, near Jutten Island.

Currently farmed areas will be incorporated into the ADZ:

Area	Currently allocated	Currently farmed	New areas	Total future
Small Bay	163	125	-	163
Big Bay North	254	25	155	409
Outer Bay North	37	1	179	216
Outer Bay South	10	-	96	96
Total	464	151	420	884

(b) Species and methods for aquaculture production

The following species are considered for farming in the ADZ:

- Currently cultivated bivalve species:
  - Pacific oyster (*Crassostrea gigas*)
  - Mediterranean mussel (*Mytilus galloprovincialis*)
  - Black mussel (*Choromytilus meridionalis*)
  - New indigenous shellfish species:
  - Abalone (*Haliotis midae*)
  - South African scallop (*Pecten sulcicostatus*)
- New indigenous finfish species:
  - White Stumpnose (*Rhabdosargus globiceps*)
  - Kabeljou (*Argyrosomus inodorus*)
  - Yellowtail (*Seriola lalandi*)
- Alien finfish species:
  - Atlantic salmon (*Salmo salar*)
  - Coho salmon (*Oncorhynchus kisutch*)
  - King/Chinook salmon (*Oncorhynchus tshawytscha*)
  - Rainbow trout (*Oncorhynchus mykiss*)
  - Brown trout (*Salmo trutta*)
- Seaweed:
  - *Gracilaria gracilis*

Viable production methods for farming in the ADZ:

- Longlines for bivalve culture, comprising a surface rope with floats and moored at each end to fix the line in position. The production ropes for mussels or oyster racks are then suspended from the surface rope;
- Rafts for bivalve culture, comprising of a floating top structure moored to the seabed from which mussel ropes are suspended;
- Cages for finfish production, constructed of circular flexible high density polyethylene with multi-mooring systems; and
- Barrel culture for abalone, which can be deployed from rafts and longlines.

Table below shows summarises the Saldanha Bay ADZ areas, species and methods:

ADZ Precinct	Recommended species (*individual species as per list provided above)	Recommended Production Method
Small Bay	Currently cultivated bivalve species* Indigenous shellfish species not currently cultivated* Seaweed*	Rafts/longlines
Big bay-North	Currently cultivated bivalve species* Indigenous shellfish species not currently cultivated* Seaweed*	Rafts/longlines
	Indigenous finfish species* Alien finfish*	Floating cages (depths of more than 13m)
Outer Bay - North	Mediterranean mussel (Mytilus galloprovincialis) Black mussel (Choromytilus meridionalis)	Sub-surface longlines
	Indigenous finfish species* Alien finfish species*	Floating cages
Outer Bay - South	Mediterranean mussel (Mytilus galloprovinclalis) Black mussel (Choromytilus meridionalis)	Sub-surface longlines
	Indigenous finfish species* Alien finfish species*	Floating cages

(c) Extent of identified post-mitigation ADZ areas for bivalves and fish (ha)

Area	Total ADZ Area	Bivalves	Fish
Small Bay	163	163	-
Big Bay North	409	367	42
Outer Bay North	216	76	140
Outer Bay South	96	-	96
Total	884	606	278

(d) Production Volumes

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- **Bivalve Production**

  Based on calculations of the ecological carrying capacity of Saldanha Bay, the ADZ could support total aquaculture bivalve production of up to 27 597 tpa ungraded / 15 203 tpa graded production.

- **Finfish Production**

  Based on estimated production of nutrients from fish farming, finfish production should be limited to 5 000 tpa. Assuming an average fish farming density of 40 t/ha, the recommended ADZ area could accommodate up to 10 000 tpa finfish production. However, 5 000 tpa will only be exceeded if deemed acceptable based on stringent environmental monitoring.

(e) Sea-based Aquaculture Activities

Sea-based activities associated with aquaculture in the ADZ include:

- Servicing and maintenance of aquaculture structures (such as rafts, lines, cages);
- Harvesting of cultivated species;
- Initial processing of bivalves, including de-clumping and grading, typically on the raft or support vessel; and
- Vessel trips between the shore and aquaculture areas, e.g. to service structures or harvest species.

(f) Associated Sea-based Infrastructure

Besides the rafts, lines, cages and barrels (including moorings and flotation devices) required for aquaculture, the following associated sea-based infrastructure is required:

- Navigational lights demarcating aquaculture areas; and
- Mooring facilities for boats.

Note that this environmental authorisation ***does not include:***

1) *authorisation of the land based facilities, since the detailed information for land based facilities will depend on the specific cultivated species and production methods chosen by the individual operators within the ADZ. Should the land based activities of the individual operators leasing areas within the ADZ trigger any listed activities in terms of the NEMA EIA Regulations, authorisation for those land based activities will need to be obtained from the Competent Authority prior to commencement of the activity by the individual operators;*

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2) authorisation of currently allocated and farmed areas within the ADZ, since these areas are already existing; and

3) authorisation of the following areas, which formed part of the application for environmental authorisation. The reason for not authorising them is because separate environmental authorisations have been issued to other aquaculture operators for the same areas:

a) Southern Cross Salmon Farming (Pty) Ltd application located within a recommended ADZ area within Outer Bay South area (10 ha) and Outer Bay North area (20 ha) with the following coordinates and DEA Reference number 14/12/16/3/3/1/1728/1:

Point- Outer Bay South (10 ha)	Latitude	Longitude
SC-E	33° 4'34.80"S	17°57'45.70"E
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SC-D	33° 2'8.00"S	17°56'50.70"E

b) Molapong Aquaculture (Pty) Ltd application located within a recommended ADZ area within Big Bay North area (approximately 40ha) and a site near Jutten Island (to be expanded from 1 ha to 15ha) with following the coordinates and DEA reference number 14/12/16/3/3/1/1728/2:

Sea area 1- Big Bay (40 ha)		
Point-	Latitude	Longitude
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K	33° 02' 13.0"S	18°00' 24.7"E
L	33° 02' 35.3"S	18°00' 33.6"E
M	33° 02' 39.7"S	18°00' 13.0"E
Sea Area 3- Near Jutten Island (to be expanded from 1 ha to 15ha)		
Point-	Latitude	Longitude
N	33° 04' 23.9"S	17°57' 24.5"E
G	33° 04 40.0"S	17°57' 36.1"E
P	33° 04' 23.9"S	17°57' 36.1"E
Q	33° 04' 40.1"S	17°57' 24.5"E

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Conditions of this Environmental Authorisation

Scope of authorisation

1. The post-mitigation scenario for the construction of the Sea-Based Aquaculture Development Zone in Saldanha Bay within West Coast District Municipality in the Western Cape Province is approved as per the geographic coordinates cited above (excluding currently allocated and farmed areas, and areas where authorisations have been issued to other aquaculture operators for the same areas, as per the above).
2. Authorisation of the activity is subject to the conditions contained in this environmental authorisation, which form part of the environmental authorisation and are binding on the holder of the authorisation.
3. The holder of the authorisation is responsible for ensuring compliance with the conditions contained in this environmental authorisation. This includes any person acting on the holder's behalf, including but not limited to, an agent, servant, contractor, sub-contractor, employee, consultant or person rendering a service to the holder of the authorisation.
4. The activities authorised may only be carried out at the property as described above.
5. Any changes to, or deviations from, the project description set out in this environmental authorisation must be approved, in writing, by the Department before such changes or deviations may be effected. In assessing whether to grant such approval or not, the Department may request such information as it deems necessary to evaluate the significance and impacts of such changes or deviations and it may be necessary for the holder of the authorisation to apply for further environmental authorisation in terms of the regulations.
6. The holder of an environmental authorisation must apply for an amendment of the environmental authorisation with the competent authority for any alienation, transfer or change of ownership rights on the property on which the activity is to take place.
7. This activity must commence within a period of five (05) years from the date of issue of this environmental authorisation. If commencement of the activity does not occur within that period, the authorisation lapses and a new application for environmental authorisation must be made in order for the activity to be undertaken.
8. Commencement with one activity listed in terms of this environmental authorisation constitutes commencement of all authorised activities.

Notification of authorisation and right to appeal

9. The holder of the authorisation must notify every registered interested and affected party, in writing and within 14 (fourteen) calendar days of the date of this environmental authorisation, of the decision to authorise the activity.
10. The notification referred to must –
10.1. specify the date on which the authorisation was issued;
10.2. inform the interested and affected party of the appeal procedure provided for in the National Appeal Regulations, 2014;
10.3. advise the interested and affected party that a copy of the authorisation will be furnished on request; and
10.4. give the reasons of the competent authority for the decision.

Commencement of the activity

11. The authorised activity shall not commence until the period for the submission of appeals has lapsed as per the National Appeal Regulations, 2014 and no appeal has been lodged against the decision. In terms of section 43(7), an appeal under section 43 of the National Environmental Management Act, 1998 will suspend the environmental authorisation or any provision or condition attached thereto. In the instance where an appeal is lodged you may not commence with the activity until such time that the appeal has been finalised.

Management of the activity

12. The Environmental Management Programme (EMPr) submitted as part of the Application for EA is hereby approved. This EMPr must be implemented and strictly adhered to. Individual operators must compile individual site specific EMPrs for the individual farms that are to be leased in the ADZ. The individual EMPrs must be in line with the recommendations of this overarching approved EMPr and the conditions of this EA. The individual EMPrs must be submitted to the ADZ Monitoring Committee (AMC) (see Condition 12 below) for endorsement and to the Department for record keeping purposes, before commencement of operations by the individual operator.

ADZ Management

13. To ensure appropriate ADZ management, two management bodies must be established by the holder of the authorisation prior to commencement of the activity.
    13.1. An ADZ Management Committee (AMC), comprising of, but not limited to, the Department of Agriculture, Forestry and Fisheries (DAFF), the Department of Environmental Affairs (DEA) *(Oceans and Coasts / Biodiversity Branches)*, DEA (Integrated Environmental Authorisations), DEA Compliance and Monitoring, the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) and the Transnet National Ports Authority (TNPA), to fulfil a coordinating and supervising role and ensure compliance with the EMPr throughout all phases of aquaculture farming in the ADZ ; and
    13.2. A Consultative Forum that includes other relevant government departments, authorities and relevant local / public interest organisations, to review environmental monitoring data, advise on ADZ management and make recommendations to the AMC. The Consultative Forum will therefore feed into the AMC through the outputs (recommendations and advice) that it provides to the AMC for consideration.
14. Upon establishment of the Consultative Forum, a notice must be published in a local newspaper announcing the inception of the Consultative Forum, providing contact details for the Consultative Forum Secretariat and inviting interested stakeholders to register on a stakeholder database to receive relevant notifications about the ADZ.

ADZ Management Committee

15. The function of the AMC is to oversee, facilitate, manage and monitor aquaculture operations in the ADZ. DAFF, as the applicant, is primarily responsible for day-to-day management of the ADZ and ensuring the implementation of and adherence to the overarching approved EMPr, with appropriate support and guidance provided by the other AMC members:
16. *The AMC must be consulted before the appointment of the project ECO, to ensure that they are suitably qualified and have the relevant expertise to monitor and ensure compliance with the conditions of the EA and EMPr.*
17. The AMC must meet before the commencement of construction activities to appoint a Chairperson and to discuss the Terms of Reference (the member constitution, purpose, outcomes, roles and

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functions of the AMC, including but not limited those specified in this authorisation). From then on, the AMC must sit once every two months and special meetings can be convened on special or emergency situations.

18. The Chairperson must be an independent person, with experience in the environmental management and marine aquaculture field and/ or industry.
19. Key functions of the AMC are to:
    19.1. Monitor aquaculture operators' compliance with the EMPr and ADZ EA conditions;
    19.2. Oversee environmental monitoring related to ADZ aquaculture activities in Saldanha Bay;
    19.3. Monitor production volumes in the ADZ;
    19.4. Make decisions based on the outcomes of environmental monitoring, which could lead to the amendment of operations within the authorised ADZ;
    19.5. Make recommendations for improvements and amendments to the DAFFs overarching approved EMPr when required;
    19.6. Settle disputes regarding the interpretation of requirements in the EMPr and EA;
    19.7. Consider the advice, recommendations and inputs of the Consultative Forum with regards to environmental monitoring within Saldanha Bay and the management of the ADZ.
    19.8. Receive and manage stakeholder comments;
    19.9. Record and, if necessary, coordinate a response to environmental incidents related to aquaculture operations;
    19.10. Review and comment on new / expanded aquaculture farm proposals within the approved ADZ; and
    19.11. Provide updated information to the Consultative Forum for distribution to the public (e.g. farm coordinates, water quality information, and notification of new aquaculture operations).
20. The AMC organisational structure must make provision for various functions, including:
    20.1. Chairperson: Calls and chairs meetings of the AMC;
    20.2. Secretariat: Fulfils secretariat functions, including:
        20.2.1. Maintenance of member details and arrangement of meetings;
        20.2.2. Compiling and distribution of meeting notes;
        20.2.3. Distribution of communication to AMC members, Consultative Forum and aquaculture farmers in the ADZ;
        20.2.4. Maintenance of a database of registered (public) stakeholders;
        20.2.5. Drafting and distribution of regular (at least quarterly) AMZ Reports to all Consultative Forum members and registered stakeholders on activities in the ADZ;

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20.2.6. Administration of and responding to stakeholder comments on aquaculture activities in the ADZ; and

20.2.7. Reporting on stakeholder aspects at AMC meetings

20.3. Environmental Representative: Fulfils environmental control functions, including:

20.3.1. Liaising with the suitably qualified service provider(s) appointed to attend to environmental sampling, monitoring and auditing aspects in the ADZ to ensure that monitoring is implemented as per the requirements;

20.3.2. Receiving and reviewing monthly Farm Monitoring Reports;

20.3.3. Receiving and reviewing environmental sampling, monitoring and audit results;

20.3.4. Notifying the Chairperson in the event any aspects require immediate attention of the AMC;

20.3.5. Notifying the Secretariat in the event any aspects require immediate attention of other aquaculture farmers in the ADZ; and

20.3.6. Reporting on environmental aspects at AMC meetings.

Consultative Forum

21. The holder of the authorisation must invite representatives of other relevant government departments, authorities, relevant local / public interest organisations and ADZ operators to become members of the Consultative Forum, including the following institutions / organisations:

21.1. Government and authorities: South African National Parks (SANParks); Western Cape Department of Agriculture (DoA); CapeNature; and Saldanha Bay Municipality;

21.2. Aquaculture Industry;

21.3. Local industry association representing operators in the ADZ;

21.4. Farmers operating in the ADZ;

21.5. Other organisations: South African National Defence Force (SANDF) / South African Navy (SAN); Saldanha Bay Water Quality Forum Trust (SBWQFT); and Representatives of the local fishing industry.

22. Forum members will join on a voluntary basis and at no costs to DAFF.

23. Key functions of the Consultative Forum are to:

23.1. Review environmental monitoring data related to aquaculture in Saldanha Bay;

23.2. Make recommendations to the AMC based on the outcomes of environmental monitoring; and

23.3. Provide a platform for discussion of environmental management in the ADZ and advise the AMC on ADZ Management.

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Frequency and process of updating the EMPr

24. The EMPr must be updated where the findings of the environmental audit reports, contemplated in Condition 29 below, indicate insufficient mitigation of environmental impacts associated with the undertaking of the activity, or insufficient levels of compliance with the environmental authorisation or EMPr.
25. The updated EMPr must contain recommendations to rectify the shortcomings identified in the environmental audit report.
26. The updated EMPr must be submitted to the Department for approval together with the environmental audit report, as per Regulation 34 of GN R. 982. The updated EMPr must have been subjected to a public participation process, which process has been agreed to by the Department, prior to submission of the updated EMPr to the Department for approval.
27. In assessing whether to grant approval of an EMPr which has been updated as a result of an audit, the Department will consider the processes prescribed in Regulation 35 of GN R.982. Prior to approving an amended EMPr, the Department may request such amendments to the EMPr as it deems appropriate to ensure that the EMPr sufficiently provides for avoidance, management and mitigation of environmental impacts associated with the undertaking of the activity.
28. The holder of the authorisation may apply for an amendment of an EMPr, if such amendment is required before an audit is required. In assessing whether to grant such approval or not, the Department will consider the processes and requirements prescribed in Regulation 37 of GN R. 982.

Monitoring

29. The holder of the authorisation must appoint a suitably qualified and experienced independent Environmental Control Officer (ECO) for the construction phase of the development that will have the responsibility to ensure that the mitigation/rehabilitation measures and recommendations referred to in this authorisation are implemented and to ensure compliance with the provisions of the EMPr.
    29.1. The ECO must be appointed before commencement of any authorised activities.
    29.2. Once appointed, the name and contact details of the ECO must be submitted to the *Director: Compliance Monitoring* of the Department.
    29.3. The ECO must keep record of all activities on site, problems identified, transgressions noted and a schedule of tasks undertaken by the ECO.

29.4. All monitoring studies conducted/commissioned by the Department of Agriculture, Forestry and Fisheries within Saldanha Bay must be reviewed by an independent specialist to verify findings before the report is submitted to the AMC.

29.5. Findings of the daily monitoring by the ECO must be summarised into a monthly report which must be presented by the ECO to the AMC at the bi-monthly meetings.

29.6. The ECO must also submit a detailed monitoring report to the Directorate: Compliance Monitoring on a monthly basis. A summarised version of this report must also be made available to all AMC members on a monthly basis.

Recording and reporting to the Department

30. All documentation e.g. audit/monitoring/compliance reports and notifications, required to be submitted to the Department in terms of this environmental authorisation, must be submitted to the *Director: Compliance Monitoring* of the Department at Directorcompliance@environment.gov.za.
31. The holder of the environmental authorisation must, for the period during which the environmental authorisation and EMPr remain valid, ensure that project compliance with the conditions of the environmental authorisation and the EMPr are audited, and that the audit reports are submitted to the *Director: Compliance Monitoring* of the Department at Directorcompliance@environment.gov.za.
32. The frequency of auditing and of submission of the environmental audit reports must be as per the frequency indicated in the EMPr, taking into account the processes for such auditing as prescribed in Regulation 34 of GN R. 982.
33. The holder of the authorisation must, in addition, submit an environmental audit report to the Department within 30 days of completion of the construction phase (i.e. within 30 days of site handover) and a final environmental audit report within 30 days of completion of rehabilitation activities.
34. The environmental audit reports must be compiled in accordance with Appendix 7 of the EIA Regulations, 2014 and must indicate the date of the audit, the name of the auditor and the outcome of the audit in terms of compliance with the environmental authorisation conditions as well as the requirements of the approved EMPr.
35. Records relating to monitoring and auditing must be kept on site and made available for inspection to any relevant and competent authority in respect of this development.

Notification to authorities

36. A written notification of commencement must be given to the Department no later than fourteen (14) days prior to the commencement of the activity. Commencement for the purposes of this condition includes site preparation. The notice must include a date on which it is anticipated that the activity will commence, as well as a reference number.

Operation of the activity

37. A written notification of operation must be given to the Department no later than fourteen (14) days prior to the commencement of the activity operational phase.

Site closure and decommissioning

38. Should the activity ever cease or become redundant, the holder of the authorisation must undertake the required actions as prescribed by legislation at the time and comply with all relevant legal requirements administered by any relevant and competent authority at that time.

Specific conditions

39. An integrated waste management approach must be implemented that is based on waste minimisation and must incorporate reduction, recycling, re-use and disposal where appropriate. Any solid waste must be disposed of at a landfill licensed in terms of section 20 (b) of the National Environment Management Waste Act, 2008 (Act No.59 of 2008).
40. No new mooring blocks must be placed within a 200m of the Merestein site (33.087355°S, 17.955044°E – WGS84,Decimal Degrees)
41. A detailed anchor distribution plan must be provided to the Maritime and Underwater Cultural Heritage Unit at SAHRA once this has been finalised. This plan can be used to reassess potential shipwreck impacts to assist developers in determining whether to amend placement plans to avoid incurring further heritage intervention costs.
42. Diver surveys must be completed during the activities required for setting anchor arrays. Commercial divers working on the project must be provided with brief orientation training. If wreck material is identified, archaeologists must be contracted to make an assessment.

43. The location and nature of any identified maritime and underwater cultural heritage resource must be provided to a maritime archaeologist and to the South African Heritage Resources Agency for inclusion on their Shipwreck Database.
44. Should evidence of archaeological material be identified, the Maritime and Underwater Cultural Heritage Unit at SAHRA must be notified and an archaeologist must assess the findings
45. Should any wreck site, or part thereof, or object or artefacts from a wreck site be disturbed during operations, a permit from SAHRA must be acquired prior to continuing with activities.
46. Benthic Mapping / survey of the area under individual farms must be undertaken by prospective operators before the commencement of the operational phase in order to establish baseline conditions for monitoring purposes.
47. Monitoring points must be established before the commencement of farming activities on each site in order to measure pre-farming baseline conditions with observed conditions during the operational phase. The number and placement of these monitoring points, and the parameters measured, must be appropriate to the mariculture activity type (and its by-products) at that site, the benthic habitat at that site, as well as the prevailing environmental conditions (such as the dominant current directions). The information gathered from monitoring points must be used to guide the phased development of each site.
48. Predictive dispersion models must be developed within 2 years of new aquaculture activities commencing and these must be used together with monitoring and other information to inform the continuous management of the Saldanha Aquaculture Development Zone.

ADZ phasing-in of aquaculture expansion

49. The holder of the authorisation must limit annual ungraded **shellfish** production to 10 000 tpa for the first two years, increasing thereafter annually by up to 5 000 tpa, only if monitoring results indicate that environment health has been maintained and impacts remain manageable, to a maximum of 27 600 tpa ungraded production.
50. The holder of the authorisation must implement a phased approach for the development of **finfish** cage culture in the ADZ by:
    50.1. Limiting annual increases in finfish production to no more than 1 000 tpa to a maximum of 5 000 tpa achieved over a 5 year period, only if monitoring results indicate that environment health has been maintained and impacts remain manageable.
    50.2. Splitting the recommended annual increase in production between Big Bay and Outer Bay.

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51. Finfish production beyond 5 000 tpa, to a maximum of 10 000 tpa, must only be pursued if:
    51.1. Ecological monitoring indicates that production of 5 000 tpa has no adverse ecological effects, and there is adequate information to permit further expansion in fish production;
    51.2. Intensified monitoring is applied (a detailed monitoring plan to be implemented) and that expanded production can only occur by following a more precautionary ramp up approach (where the expanded production is phased in over at least a five-year period, provided ongoing monitoring has indicated that resource quality objectives are maintained); and
    51.3. In the ramp up period, and for any production beyond five years, a further period of strict monitoring and environmental quality standards is introduced. Should standards or precautionary limits be approached or exceeded, sampling and monitoring plans must include a response procedure that leads to appropriate downward adjustments of fish production.
52. "These detailed monitoring plans, for intensified monitoring in the expanded finfish production scenario (i.e. finfish production beyond 5 000 tpa, to a maximum of 10 000 tpa), must be submitted to the Department for approval, prior to this expansion in finfish production commencing".
53. The holder of the authorisation must ensure that the findings of the dispersion modelling inform the site specific EMPrs (to be compiled individual operators), Sampling Plan, ADZ layout and expansion.
54. Environmental monitoring must be implemented to inform management and expansion of operations as part of the phased approach

General

55. A copy of this environmental authorisation, the audit and compliance monitoring reports, and the approved EMPr, must be made available for inspection and copying-
55.1. at the site of the authorised activity;
55.2. to anyone on request; and
55.3. where the holder of the environmental authorisation has a website, on such publicly accessible website.
56. National government, provincial government, local authorities or committees appointed in terms of the conditions of this authorisation or any other public authority shall not be held responsible for any damages or losses suffered by the holder of the authorisation or his/her successor in title in any instance where construction or operation subsequent to construction be temporarily or permanently stopped for reasons of non-compliance by the holder of the authorisation with the conditions of authorisation as set out in this document or any other subsequent document emanating from these conditions of authorisation.

Date of environmental authorisation: 05/07/2018

Mr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Environmental Affairs

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Annexure 1: Reasons for Decision

1. Information considered in making the decision

In reaching its decision, the Department took, *inter alia*, the following into consideration -

a) The information contained in the BAR dated August 2017;
b) The comments received from DEA Ocean and Coast, SANParks, West Coast District Municipality, Department of Environmental Affairs and Development Planning, Saldanha Bay Local Municipality, Cape Nature and Interested and Affected Parties as included in the BAR dated August 2017;
c) Mitigation measures as proposed in the BAR dated August 2017 and the EMPr;
d) The information contained in the specialist studies contained on the BAR; and
e) The objectives and requirements of relevant legislation, policies and guidelines, including section 2 of the National Environmental Management Act, 1998 (Act No.107 of 1998).

2. Key factors considered in making the decision

All information presented to the Department was taken into account in the Department's consideration of the application. A summary of the issues which, in the Department's view, were of the most significance is set out below.

a) The existing areas are not authorised as part of this environmental authorisation, however the approved ADZ EMPr must inform and be used to manage any future expansion of allocated existing areas.
b) The findings of all the specialist studies conducted and their recommended mitigation measures.
c) The need for the project stems from the requirement to develop and facilitate aquaculture (the sea-based or land-based rearing of aquatic animals or the cultivation of aquatic plants for food) in South Africa to supply food, create jobs in marginalised coastal communities and contribute to the national income.
d) The project forms part of a presidential initiative to unlock the potential of the oceans to create employment and income in coastal communities, and specifically aims to create incentives for development of the aquaculture industry in Saldanha Bay, which has historically already provided skills development and employment in the area. As such, the project forms part of a government

initiative and aims to further the objectives of the National Development Plan in terms of economic development.

e) The need and motivation for an ADZ approach was satisfactorily addressed:

I. Key challenges identified in realising the full potential of aquaculture in Saldanha Bay are the lack of an enabling regulatory environment, short duration of leases and relatively high start-up costs for operators, including the need to conduct EIAs. The Operation Phakisa Aquaculture Lab has prioritised this matter in order to attract investment into aquaculture in Saldanha Bay;

II. Existing projects are not able to expand and new projects are not able to produce more than 50 tons per annum without Environmental Authorisation. The undertaking of a bay-wide EIA for aquaculture in Saldanha Bay is considered critical to create an enabling environment for aquaculture in Saldanha Bay and to address cumulative impacts of aquaculture on the bay. It also reduces the risk and cost for individual operators and contributes to the provision of long-term leases in the bay;

iii. An ADZ approach is further considered critical to achieve an integrated, holistic and sustainable management of aquaculture in Saldanha Bay. Sustainable aquaculture is achieved when the environmental, social and economic aspects of a project are adequately addressed and integrated;

iv. Aquaculture requires good water quality and any negative impacts on the environment of Saldanha Bay will directly affect the growth of produce and underlying viability of the operations. Water quality therefore needs to be carefully monitored and managed. In Saldanha Bay, DAFF is conducting ongoing environmental monitoring to assess the impact of the mussel and oyster rafts on the seabed and the food safety of the mussels and oysters. Mussels are extensively used as biological indicators of pollution, as they accumulate contaminants in their tissue;

v. Shellfish and seaweed culture do not require the addition of feed for production, but can lead to depletion of natural nutrients and primary production. Finfish culture requires the use of feed which, if managed incorrectly, can cause eutrophication of a water body and algal blooms, with associated negative impacts on the cage culture of finfish. This can be mitigated by selecting sites with appropriate flushing and depth and applying the principle of Integrated Multi-Trophic Aquaculture (IMTA), which aims to recapture portions of nutrient waste lost from fish species as nutritional inputs for shellfish or seaweed culture. The simultaneous culture of various species in the bay, specifically finfish, shellfish and seaweed, can thus positively impact one another and reduce environmental impacts. The DAFF therefore supports the use of multiple species in Saldanha Bay, which can be more effectively achieved and managed in an ADZ.

The DAFF also has a vested interest in ensuring that adequate monitoring is implemented on a continuous basis to ensure that:

(aa) External pollution does not negatively impact the aquaculture within the bay;

(bb) The carrying capacity of the bay as a whole is not exceeded and that different species cultures do not negatively impact each other;

(cc) The community in the area receives the maximum socio-economic benefit of the development; and

(dd) The regulatory environment creates an enabling environment for current and new investment into aquaculture in the bay.

f) The post-mitigation scenario eliminated a number of areas which were initially identified for inclusion in the ADZ. These areas have been avoided in the mitigation of marine ecology, socio-economic, visual, tourism and heritage impacts. These areas included the following:

vi. Big Bay North: 100 m wide buffer around reefs and blinders and 1 km buffer from residents along the eastern shoreline (to mitigate marine ecology and visual impacts). This reduced the precinct by 43%;

vii. Big Bay South: entire precinct (to mitigate marine ecology and socio-economic impacts). This reduced the precinct by 100% (i.e. it willnot be developed for aquaculture);

viii. Outer Bay North: 1 000 m buffer for finfish and 500 m buffer for shellfish around the Malgas Island Marine Protected Area (MPA) and 100 m wide buffer around reefs and blinders (to mitigate marine ecology impacts). This reduced the precinct by 40%; and

ix. Outer Bay South: 250 m wide buffer around Jutten Island MPA (aligned with the island) and the entire channel between Jutten Island and Donkergat Peninsula (to mitigate marine ecology, socio-economic and heritage impacts). This reduced the precinct by 73%.

g) The post-mitigation scenario has thus been reduced by 70% from 1 404 ha in the pre-mitigation scenario to 420 ha in the approved post mitigation scenario. The total ADZ, including areas for which leases are currently held (not all of which are farmed) would be 884 ha in the post-mitigation scenario. This equates to approximately 10% of Saldanha Bay (Small, Big and Outer Bay).

h) The authorisation provides for a precautionary approach to fish farming in Saldanha Bay through the implementation of a phased approached for expansion of aquaculture in the ADZ (as indicated the conditions above). Development of the ADZ will be undertaken in a phased approach, so that cumulative impacts can be detected as they arise, and adaptive management implemented concurrently. Only once environmental monitoring has revealed acceptable impacts as defined by the environmental quality objectives, indicators and performance measures, will further expansion in terms of fish production quantities be considered.

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i) The establishment of an ADZ Management Committee (AMC) and Consultative Forum will also help to ensure compliance with the approved EMPr and appropriate ADZ management.

j) The BAR dated August 2017 identified all relevant environmental legislation and guidelines that have been considered in the preparation of the BAR dated August 2017.

k) The methodology used in assessing the potential impacts identified in the BAR dated August 2017 and the specialist studies has been adequately indicated.

l) A sufficient public participation process was undertaken and the applicant has satisfied the minimum requirements as prescribed in the EIA Regulations, 2014 for public involvement.

3. Findings

After consideration of the information and factors listed above, the Department made the following findings -

a) The identification and assessment of impacts are detailed in the BAR dated August 2017 and sufficient assessment of the key identified issues and impacts have been completed.

b) The procedure followed for impact assessment is adequate for the decision-making process.

c) The proposed mitigation of impacts identified and assessed adequately curtails the identified impacts.

d) According to the Independent Environmental Assessment Practitioner, the information contained in the BAR dated August 2017 is accurate and credible.

e) EMPr measures for the pre-construction, construction and rehabilitation phases of the development were proposed and included in the BAR and will be implemented to manage the identified environmental impacts during the construction phase.

In view of the above, the Department is satisfied that, subject to compliance with the conditions contained in the environmental authorisation, the authorised activities will not conflict with the general objectives of Integrated environmental management laid down in Chapter 5 of the National Environmental Management Act, 1998 and that any potentially detrimental environmental impacts resulting from the authorised activities can be mitigated to acceptable levels. The environmental authorisation is accordingly granted.

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Annexure 2: Locality Plan

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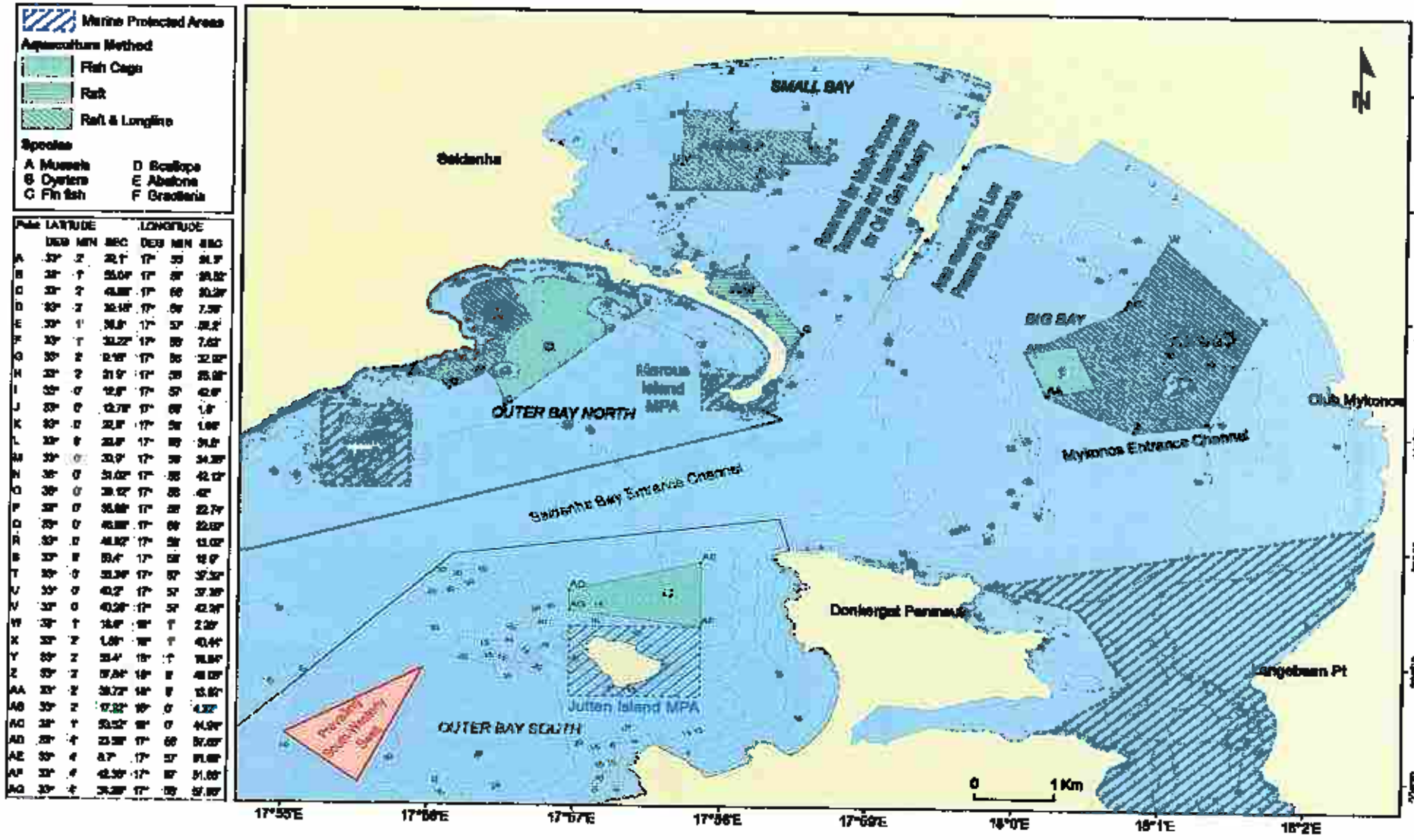

Pole	LATITUDE			LONGITUDE		
	DEG	MIN	SEC	DEG	MIN	SEC
A	33°	2'	20.1"	17°	55'	36.9"
B	33°	1'	55.04"	17°	56'	39.82"
D	33°	2'	49.88"	17°	56'	30.24"
D	33°	2'	39.16"	17°	56'	7.56"
E	33°	1'	36.8"	17°	57'	28.4"
F	33°	1'	33.22"	17°	56'	7.62"
G	33°	2'	9.16"	17°	56'	32.82"
H	33°	2'	21.9"	17°	56'	35.66"
I	33°	0'	12.8"	17°	57'	42.6"
J	33°	0'	13.78"	17°	58'	1.8"
K	33°	0'	22.8"	17°	58'	1.66"
L	33°	0'	28.8"	17°	58'	34.8"
M	33°	0'	33.9"	17°	58'	34.38"
N	33°	0'	34.02"	17°	58'	42.12"
O	33°	0'	38.12"	17°	58'	42"
P	33°	0'	35.88"	17°	58'	22.74"
Q	33°	0'	45.66"	17°	58'	22.62"
R	33°	0'	46.92"	17°	58'	13.02"
S	33°	0'	59.4"	17°	58'	18.6"
T	33°	0'	33.36"	17°	57'	37.32"
V	33°	0'	40.2"	17°	57'	37.38"
V	33°	0'	40.26"	17°	57'	42.24"
W	33°	1'	16.8"	18°	1'	2.28"
X	33°	2'	1.68"	18°	1'	40.44"
Y	33°	2'	33.4"	18°	1'	18.84"
Z	33°	2'	57.84"	18°	0'	48.06"
AA	33°	2'	38.72"	18°	0'	15.66"
AB	33°	2'	17.32"	18°	0'	4.32"
AC	33°	1'	53.52"	18°	0'	44.94"
AD	33°	4'	23.88"	17°	58'	57.66"
AE	33°	4'	8.7"	17°	57'	51.66"
AF	33°	4'	42.36"	17°	57'	51.66"
AG	33°	4'	36.66"	17°	56'	57.66"

Proposed Sea-Based Aquaculture Development Zone in Saldanha Bay

Environmental Management Programme

Report Prepared for

Department of Agriculture, Forestry and Fisheries

Report Number 499020 / 6

Report Prepared by

srk consulting

August 2017

Proposed Sea-Based Aquaculture Development Zone in Saldanha Bay

Environmental Management Programme

Department of Agriculture, Forestry and Fisheries

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SRK Project Number 499020

August 2017

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Profile and Expertise of EAPs

SRK Consulting (South Africa) (Pty) Ltd (SRK) has been appointed by the Department of Agriculture, Forestry and Fisheries (DAFF) as the independent consultants to undertake the Environmental Impact Assessment (EIA) process required in terms of the National Environmental Management Act 107 of 1998 (NEMA).

SRK Consulting comprises over 1 300 professional staff worldwide, offering expertise in a wide range of environmental and engineering disciplines. SRK's Cape Town environmental department has a distinguished track record of managing large environmental and engineering projects and has been practising in the Western Cape since 1979. SRK has rigorous quality assurance standards and is ISO 9001 accredited.

As required by NEMA, the qualifications and experience of the key individual practitioners responsible for this project are detailed below.

Project Director: Christopher Dalgliesh, BBusSc (Hons); MPhil (EnvSci)
Chris Dalgliesh is a Partner and Principal Environmental Consultant with over 24 years' experience, primarily in South Africa, Southern Africa, West Africa and South America (Suriname). Chris has worked on a wide range of projects, notably in the natural resources, Oil & Gas, waste, infrastructure (including rail and ports) and industrial sectors. He has directed and managed numerous Environmental and Social Impact Assessments (ESIAs) and associated management plans, in accordance with international standards. He regularly provides high level review of ESIAs, frequently directs Environmental and Social Due Diligence studies for lenders, and also has a depth of experience in Strategic Environmental Assessment (SEA), State of Environment Reporting and Resource Economics. He holds a BBusSci (Hons) and MPhil (Env) and is a Certified Environmental Practitioner of South Africa (CEAPSA).

Project Manager: Sue Reuther, BSc Hons (Econ); MPhil (EnviroMan)
Certified with the Interim Board for Environmental Assessment Practitioners South Africa (CEAPSA)
Sue Reuther has been involved in environmental assessment sector in South Africa for the past 13 years. Her expertise includes the management of environmental impact assessments, which she has undertaken for a variety of sectors and projects, in South Africa and overseas. Sue also has extensive experience with strategic environmental projects as well as economic and resource economic, visual and social impact assessments. Sue has two years of previous experience in strategy and financial research and assessment (London). She holds a BSc (Hons) in Economics and MPhil in Environmental Management and is a Certified Environmental Practitioner of South Africa (CEAPSA).

Statement of SRK Independence

Neither SRK nor any of the authors of this Report have any material present or contingent interest in the outcome of this Report, nor do they have any pecuniary or other interest that could be reasonably regarded as being capable of affecting their independence or that of SRK.

SRK has no prior association with DAFF in regard to the development that is the subject of this Report. SRK has no beneficial interest in the outcome of the assessment which is capable of affecting its independence.

SRK's fee for completing this Report is based on its normal professional daily rates plus reimbursement of incidental expenses. The payment of that professional fee is not contingent upon the outcome of the Report.

Disclaimer

The opinions expressed in this report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK) by DAFF. SRK has exercised all due care in reviewing the supplied information, but conclusions from the review are reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

Note:

The Final BAR and EMPr were released for stakeholder comment from 19 May to 19 June 2017. Comments received on the Final BAR / EMPr are captured and responded to in Table 1 of the Comments and Responses Report provided in Appendix E10 of the BAR.

In response to stakeholder comments on the Final BAR / EMPr, some minor changes were made to this Final EMPr for submission to DEA vis-a-vis the Final EMPr released for stakeholder comment; these changes are italicised and underlined for easier reference.

None of these changes affect the impact assessment.

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Acronyms and Abbreviations

ADZ	Aquaculture Development Zone
AMC	ADZ Management Committee
BA	Basic Assessment
BAR	Basic Assessment Report
BEE	Black Economic Empowerment
DAFF	Department of Aquaculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme
GN	Government Notice
ICMA	Integrated Coastal Management Act 24 of 2008
IMTA	Integrated Multi-Trophic Aquaculture
MPA	Marine Protected Area
MSDS	Material Safety Data Sheets
NEMA	National Environmental Management Act 107 of 1998 as amended
NSRI	National Sea Rescue Institute
SABS	South African Bureau of Standards
SAHRA	South African Heritage Resources Agency
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SRK	SRK Consulting (South Africa) (Pty) Ltd
TNPA	Transnet National Ports Authority

Glossary

Activity	An activity or operation carried out as part of the construction or operation of the power plant
Aspect	An action, event, product or service, occurring as a component or result of an activity, which interacts with the existing environment (or which results in impacts to it)
Community	Those people who may be impacted upon by the construction and operation of the project. This includes neighbouring landowners, local communities and other occasional users of the area.
Contractor	Any company appointed by the Proponent to undertake construction or related activities on site, and will include the main Contractor, as well as any Sub-Contractors.
Construction Phase	The stage of project development comprising site preparation as well as all construction activities associated with the development.
Contaminated water	Water contaminated by activities on site, e.g. concrete water and run-off from plant / personnel wash areas.
Design Phase	The stage during which detailed layout and development plans are prepared, including the drafting of contract documents for construction.
Environment	The external circumstances, conditions and influences that surround and affect the existence and development of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.
Environmental Authorisation	The authorisation by a competent authority of a listed activity or specified activity in terms of NEMA.
Environmental Impact Assessment	A process of evaluating the environmental and socio-economic consequences of a proposed course of action or project
Environmental Management Measures	Requirements or specifications for environmental management, as presented in the EMPr, some of which are based on the mitigation measures identified in the EIA Report (in this case the BAR).
Hazardous substance	A substance (including materials and waste) that can have a deleterious (harmful) effect on the environment and those substances declared hazardous substances in terms of the Hazardous Substances Act 15 of 1973.
Impact	A change to the existing environment, either adverse or beneficial, that is directly or indirectly due to the development of the project and its associated activities.
Method Statement	A mandatory written submission by the aquaculture operator to the AMC setting out the location, species, structures, mooring plan and production volume the operator proposes to establish.
Mitigation Measures	Actions identified in the BAR to manage (avoid, minimise or optimise) potential environmental impacts which may result from the development.
Operation Phase	The stage of the works (including maintenance) following the Construction Phase, during which the development will function or be used as anticipated in the Environmental Authorisation.

Performance indicator	A measurable indicator of the outcome of environmental management, used to assess the success with which mitigation measures have been implemented. Often captures the results of several different monitoring activities.
Phase	A defined period during the life of the power plant project, e.g. the *construction* and *Operation* phases.
Proponent	The person or organisation implementing the project.
Resources	The personnel, financial, equipment and technical requirements necessary for the successful completion of mitigation measures and for monitoring activities.
Schedule	The schedule or deadline for completion of each mitigation measure, which are recorded to ensure that mitigation measures are implemented in good time and in the correct sequence.
Solid waste	All solid waste including construction debris, chemical waste, broken / redundant equipment, oil filters, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

1 Introduction

1.1 Background

DAFF proposes to establish a sea-based Aquaculture Development Zone (ADZ) in Saldanha Bay, Western Cape. SRK Consulting (South Africa) Ltd (SRK) undertook the Basic Assessment (BA) process required in terms of the National Environmental Management Act 107 of 1998, as amended (NEMA). NEMA requires that an Environmental Management Programme (EMPr) be submitted with the Basic Assessment Report (BAR) to demonstrate how environmental management and mitigation measures will be implemented.

The EMPr for the Saldanha ADZ addresses aspects applicable to each individual farming operation within the ADZ as well as aspects applicable to the ADZ as a whole, to allow for the management of cumulative effects of all farms. Measures applicable at the farm level must be compatible with and supportive of measures applicable at the ADZ level. Additional aquaculture areas / operations in Saldanha Bay approved through individual processes will be incorporated into the ADZ, and the measures in this EMPr will apply.

The management and mitigation measures identified during the BA process apply to the following phases of the development process:

- ***The Design Phase***: These measures relate to the detailed layout, planning and design of individual aquaculture farms and the ADZ, and will be implemented prior to the commencement of physical expansion activities. The measures are presented in Section 3;
- ***The Construction Phase*****:** These measures are applicable during construction of individual aquaculture farms within the ADZ and are presented in Section 4;
- ***The Operation Phase:*** These measures are applicable during the long-term operation and maintenance of individual aquaculture farms and the ADZ and are presented in Section 5; and
- ***The Decommissioning Phase:*** These mitigation measures are applicable during the decommissioning of individual aquaculture farms within the ADZ (and potentially decommissioning of the ADZ as a whole) and are presented in Section 6.

Management and mitigation measures must typically be implemented by individual farm operators. The ADZ Management Committee has a coordinating and supervising role, as detailed in Section 2.

As new farming operations in the ADZ will be incrementally added to the existing operations, it is expected that **design, construction, operation and decommissioning of individual farms will occur in parallel** throughout much of the lifespan of the ADZ.

The measures listed for the various phases are either:

- **Essential**: best practice measures which must be implemented and are non-negotiable; or
- **Best Practice**: recommended to comply with best practice, with adoption dependent on the proponent's risk profile and commitment to adhere to best practice, and which must be shown to have been considered and sound reasons provided by the proponent if not implemented. *These measures have been italicized for ease of reference.*

Note: The EMPr will be submitted to DEA for approval along with the BAR. Once an environmental authorisation has been issued by DEA, this document may need to be updated to ensure that all relevant conditions of authorisation are adequately captured.

It is also recommended that the EMPr is reviewed and, where necessary, amended based on experience acquired during the initial years of operating the ADZ, and submitted to DEA for acceptance if required.

1.2 Content of the EMPr

The EIA Regulations, 2014 (Government Notice (GN) 982) prescribe the required content of an EMPr. These requirements, and the sections of this EMPr in which they are addressed, are summarised in Table 1-1.

Table 1-1: Content of the EMPr as prescribed by the EIA Regulations, 2014

GN 982 Ref.:	Item	Section Ref.:
(a) (i)	Details of the person who prepared the EMPr	Page i
(a) (ii)	Expertise of that person to prepare an EMPr	Page i
(b)	A detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	1.3
(c)	A map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	1.3
(d)	A description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-	1.4
(d)(i)	Planning and design;	3
(d)(ii)	Pre-construction activities;	3 to 4
(d)(iii)	Construction activities	4
(d)(iv)	Rehabilitation of the environment after construction and where applicable post closure; and	n/a
(d)(v)	Where relevant, operation activities;	
(e)	A description and identification of impact management outcomes required for the aspects contemplated in paragraph (d);	3 to 6
(f)	A description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to-	3 to 6
(f)(i)	Avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	3 to 6
f(ii)	Comply with any prescribed environmental management standards or practices;	3 to 6
f(iii)	Comply with any applicable provisions of the Act regarding closure, where applicable; and	n/a
f(iv)	Comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	n/a
(g)	The method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	3 to 7
(h)	The frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);	3 to 7
(i)	An indication of the persons who will be responsible for the implementation of the impact management actions;	3 to 6
(j)	The time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	3 to 6
(k)	The mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f)	3 to 7
(l)	A program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	7
(m)	An environmental awareness plan describing the manner in which-	
(m)(i)	The applicant intends to inform his or her employees of any environmental risk which may result from their work; and	3 to 6
(m)(ii)	Risks must be dealt with in order to avoid pollution or the degradation of the environment; and	3 to 6

GN 982 Ref.:	Item	Section Ref.:
(n)	Any specific information that may be required by the competent authority.	n/a

1.3 Site and Project Description

1.3.1 Background

The Department of Agriculture, Forestry and Fisheries (DAFF) aims to develop and facilitate aquaculture (the sea-based or land-based rearing of aquatic animals or the cultivation of aquatic plants for food) in South Africa to supply food, create jobs in marginalised coastal communities and contribute to national income.

Saldanha Bay is a highly productive marine environment and has an established aquaculture industry, with potential for growth. Some 468 ha of the Bay are currently leased for aquaculture production. Of these, some 152 ha are actively farmed, mostly in Small Bay, for mussels and oysters (see Table 1-2). Research has determined that the carrying capacity of the Bay can support higher bivalve production.

DAFF proposes to establish a sea-based ADZ in Saldanha Bay, Western Cape to encourage investor and consumer confidence, create incentives for industry development, provide marine aquaculture services, manage the risks associated with aquaculture and provide skills development and employment for coastal communities.

1.3.2 Proposed ADZ Areas

The recommended **post-mitigation ADZ area**[1] BAR comprises four precincts in Saldanha Bay, adding 420 ha of new aquaculture areas in Saldanha Bay for a total ADZ comprising 884 ha (see Table 1-2 and Figure 1-1):

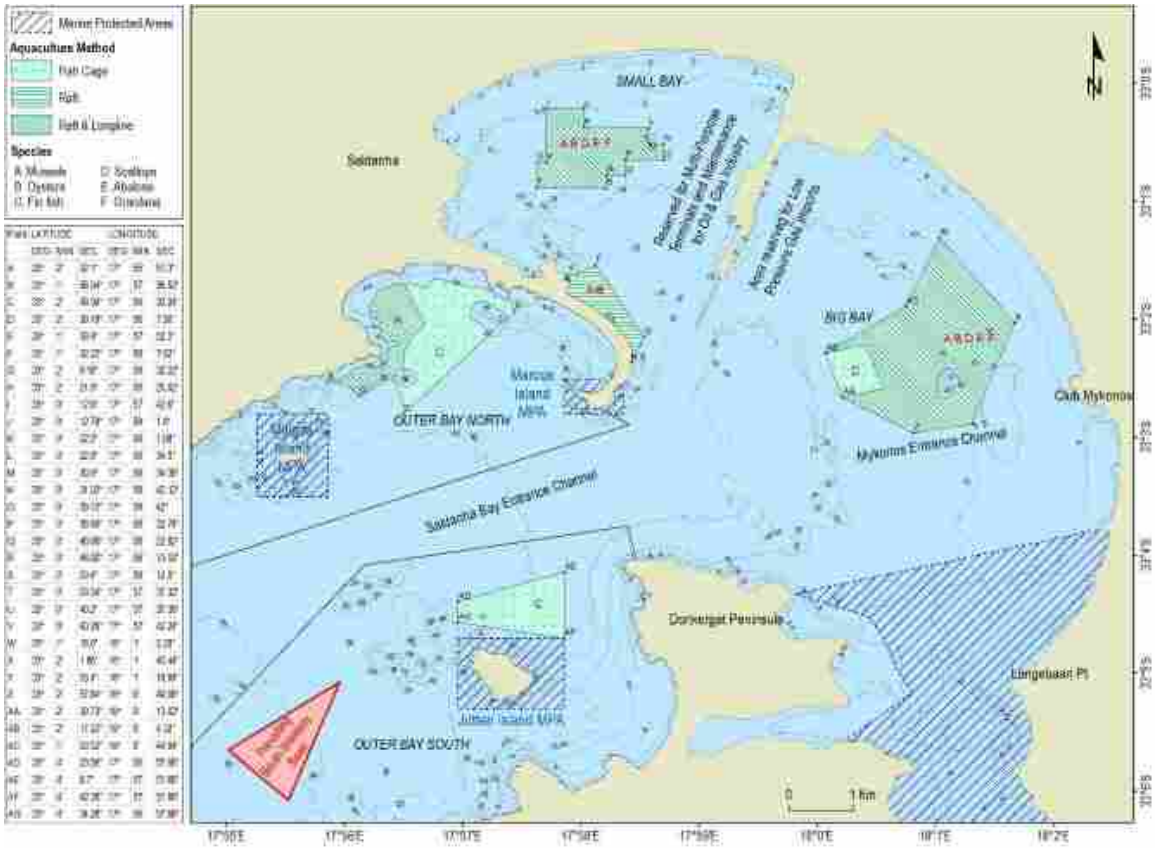
- Small Bay: no additional aquaculture areas are proposed;
- Big Bay North: north of Mykonos entrance channel;
- Outer Bay North: north of Port entrance channel, near Malgas Island; and
- Outer Bay South: south of Port entrance channel, near Jutten Island.

Table 1-2: Post-mitigation ADZ precincts in Saldanha Bay

Area	Currently allocated	Currently farmed	New areas	Total future
Small Bay	163	125	-	163
Big Bay North	254	25	155	409
Outer Bay North	37	1	179	216
Outer Bay South	10	-	86	96
Total	**464**	**151**	**420**	**884**

Coordinates of the recommended post-mitigation ADZ areas are provided in Table 1-3.

[1] Note that only the post-mitigation scenario is described in the EMPr, since this is the scenario that is recommended for authorisation. A description of the pre-mitigation scenario is provided in the BAR.



srk consulting	**SALDANHA ADZ** RECOMMENDED POST-MITIGATION ADZ AREAS	Project No. 499020

Figure 1-1: Recommended (post-mitigation) ADZ areas

Table 1-3: Coordinates of recommended post-mitigation ADZ areas

Point	Latitude_S		Longitude	
A	33°	2.535´	17°	55.855´
B	33°	1.934´	17°	57.442´
C	33°	2.801´	17°	56.504´
D	33°	2.653´	17°	56.126´
E	33°	1.665´	17°	57.870´
F	33°	1.537´	17°	58.127´
G	33°	2.153´	17°	58.537´
H	33°	2.365´	17°	58.432´
I	33°	0.21´	17°	57.71´
J	33°	0.213´	17°	58.03´
K	33°	0.375´	17°	58.028´
L	33°	0.38´	17°	58.575´
M	33°	0.515´	17°	58.573´
N	33°	0.517´	17°	58.702´
O	33°	0.652´	17°	58.7´
P	33°	0.648´	17°	58.379´
Q	33°	0.783´	17°	58.377´

Point	Latitude_S		Longitude	
R	33°	0.782´	17°	58.217´
S	33°	0.89´	17°	58.215´
T	33°	0.889´	17°	57.622´
U	33°	0.67´	17°	57.623´
V	33°	0.671´	17°	57.704´
W	33°	1.310´	18°	1.038´
X	33°	2.031´	18°	1.674´
Y	33°	2.890´	18°	1.314´
Z	33°	2.964´	18°	0.818´
AA	33°	2.662´	18°	0.217´
AB	33°	2.287´	18°	0.072´
AC	33°	1.892´	18°	0.749´
AD	33°	4.393´	17°	56.961´
AE	33°	4.145´	17°	57.861´
AF	33°	4.706´	17°	57.861´
AG	33°	4.571´	17°	56.961´

1.3.3 Proposed Species and Methods

The following species are considered for farming in the ADZ:

- Currently cultivated bivalve species:
  - Pacific oyster (*Crassostrea gigas*)
  - Mediterranean mussel (*Mytilus galloprovincialis)*
  - Black mussel (*Choromytilus meridionalis*)
- New indigenous shellfish species:
  - Abalone (*Haliotis midae*)
  - South African scallop (*Pecten sulcicostatus*)
- New indigenous finfish species:
  - White Stumpnose (*Rhabdosargus globiceps*)
  - Kabeljou (*Argyrosomus inodorus*)
  - Yellowtail (*Seriola lalandi*)
- Alien finfish species:
  - Atlantic salmon (*Salmo salar*)
  - Coho salmon (*Oncorhynchus kisutch*)
  - King/Chinook salmon (*Oncorhynchus tshawytscha*)
  - Rainbow trout (*Oncorhynchus mykiss*)
  - Brown trout (*Salmo trutta*)
- Seaweed:
  - *Gracilaria gracilis*

The following production methods are considered most viable for farming in the ADZ:

- Longlines for bivalve culture, comprising a surface rope with floats and moored at each end to fix the line in position. The production ropes for mussels or oyster racks are then suspended from the surface rope;
- Rafts for bivalve culture, comprising of a floating top structure moored to the seabed from which mussel ropes are suspended;
- Cages for finfish production, constructed of circular flexible high density polyethylene with multi-mooring systems; and
- Barrel culture for abalone, which can be deployed from rafts and longlines.

Table 1-4 summarises the proposed species and production methods per ADZ precinct. These are

also shown in Figure 1-1.

Table 1-4: Proposed Saldanha Bay ADZ areas, species and production methods

ADZ Precinct	Recommended species *(*individual species as per list provided above)*	Recommended Production Method
Small Bay	Currently cultivated bivalve species* Indigenous shellfish species not currently cultivated* Seaweed*	Rafts / longlines
Big Bay - North	Currently cultivated bivalve species* Indigenous shellfish species not currently cultivated* Seaweed*	Longlines / rafts
	Indigenous finfish species* Alien finfish species*	Floating cages (depths of more than 13m)
Outer Bay - North	Mediterranean mussel (*Mytilus galloprovincialis*) Black mussel (*Choromytilus meridionalis*)	Sub-surface longlines
	Indigenous finfish species* Alien finfish species*	Floating cages
Outer Bay - South	Mediterranean mussel (*Mytilus galloprovincialis*) Black mussel (*Choromytilus meridionalis*)	Sub-surface longlines
	Indigenous finfish species* Alien finfish species*	Floating cages

Table 1-5 indicates the extent of identified post-mitigation ADZ areas for bivalves and fish, as shown in Figure 1-1 above. It is assumed that areas identified as suitable for fish are also suitable for bivalve cultivation, though the reverse does not necessarily apply.

Table 1-5: Extent of identified post-mitigation ADZ areas for bivalves and fish (ha)

Area	Total ADZ Area	Bivalves	Fish
Small Bay	163	163	-
Big Bay North	409	367	42
Outer Bay North	216	76	140
Outer Bay South	96	-	96
Total	**884**	**606**	**278**

1.3.4 Production Volumes

1.3.4.1 Bivalve Production

Based on calculations of the ecological carrying capacity of Saldanha Bay (refer to the BAR), the ADZ could support total aquaculture bivalve production of up to 27 597 tpa ungraded / 15 203 tpa graded production.

1.3.4.2 Finfish Production

Based on estimated production of nutrients from fish farming, finfish production should be limited to 5 000 tpa. Assuming an average fish farming density of 40 t/ha, the recommended ADZ area could accommodate up to 10 000 tpa finfish production. However, 5 000 tpa should only be exceeded if deemed acceptable based on stringent environmental monitoring (see later sections in the EMPr).

1.3.5 Sea-based Aquaculture Activities

Sea-based activities associated with aquaculture in the ADZ include:

- Servicing and maintenance of aquaculture structures (such as rafts, lines, cages);
- Harvesting of cultivated species;
- Initial processing of bivalves, including de-clumping and grading, typically on the raft or support vessel; and
- Vessel trips between the shore and aquaculture areas, e.g. to service structures or harvest species.

1.3.6 Associated Sea-based Infrastructure

Besides the rafts, lines, cages and barrels (including moorings and flotation devices) required for aquaculture, the following associated sea-based infrastructure is required:

- Navigational lights demarcating aquaculture areas;
- Mooring facilities for boats.

1.3.7 Associated Land-based Infrastructure and Activities

Land-based infrastructure and activities depend on cultivated species, production methods and processing. Mussels can largely be harvested, de-clumped and graded on the raft or support vessel. Basic land-based support infrastructure includes:

- Landing quays (catering to personnel, equipment and product) that are accessible for vehicles;
- Mooring space in protected harbour areas for support vessels; and
- Product holding facilities (which can be off-site if they do not rely on seawater).

The capacity of existing quays is deemed sufficient to accommodate a moderate expansion of the aquaculture industry.

Detailed information on land-based facilities, as would be required for the authorisation of such facilities in terms of NEMA and the ICMA, could not be provided as part of this study. As such, no land-based facilities that require Environmental Authorisation are included in this assessment. Where authorisations or permits are required, these must be obtained by individual applicants.

A more detailed project description is provided in Section 1 of the BAR (SRK Report 499020/1).

1.4 Potential Impacts

A summary of the potential impacts of the proposed development identified and assessed in the BAR is presented in Table 1-6. Additional details on the nature of these impacts are provided in the BAR.

Table 1-6: Potential impacts of the proposed project

Impact	Description	Post-mitigation impact
Construction Phase		
Biological	Crushing of biota in sediments during placement of mooring infrastructure	Low (-)
Socio-economic	Investment in the economy	Low (+)
	Increased employment, income and skills development	Very low (+)
Cultural-historical	Destruction, damage or alteration of heritage material or sites	Very low (-)
Operation Phase		
Biological	Modification of seabed characteristics by:	
	- Shellfish farming	Low (-)

Impact	Description	Post-mitigation impact
	- Finfish farming	Medium (-)
	Modification of water column characteristics	Low (-)
	Creation of habitat	Medium (+)
	Alteration of behaviour and entanglement of seabirds and marine fauna	
	- Shellfish farming	Low (-)
	- Finfish farming	Low (-)
	Introduction of alien invasive species or spread of fouling pests	Medium (-)
	Transmission of diseases to wild populations	Very low (-)
	Risk of genetic interaction with wild populations	
	- Shellfish farming	Low (-)
	- Finfish farming	Low (-)
	Contamination by therapeutants and trace contaminants from finfish farming	Low (-)
Socio- economic	Contribution to the economy	Medium (+)
	Increased employment, income and skills development	Medium (+)
	Possible reduction in water sport activities and associated decline in tourism and business activities	Low (-)
	Possible restrictions to military activities	Low (-)
	Pressures on resources and infrastructure due to an influx of people	Very low (-)
Visual	Altered sense of place and visual intrusion from the proposed development	Medium (-)
	Altered sense of place and visual quality caused by light pollution at night	Very low (-)

2 ADZ Management

The ADZ comprises of a number of aquaculture farms that are managed by different operators. The EMPr contains measures applicable both to individual farming operation and the ADZ as a whole. To ensure appropriate ADZ management, two bodies are proposed:

- An ADZ Management Committee (AMC), comprising of DAFF, DEA *(Oceans and Coasts / Biodiversity Branches)*, DEA&DP and TNPA, to fulfil a coordinating and supervising role and ensure compliance with the EMPr throughout all phases of aquaculture farming in the ADZ (see Section 2.1); and
- A Consultative Forum that includes other relevant government departments, authorities and relevant local */ public interest* organisations, to review environmental monitoring data, advise on management and recommend measures (see Section 2.2).

2.1 ADZ Management Committee (AMC)

2.1.1 Inception

The AMC comprises of DAFF, DEA *(Oceans and Coasts / Biodiversity Branches)*, DEA&DP and TNPA. Since aquaculture farming is already taking place in Saldanha Bay, DAFF must establish the AMC promptly after the formal establishment of the ADZ.

Upon establishment, a notice shall be published in a local newspaper announcing the inception of the AMC, providing contact details for the AMC Secretariat and inviting interested stakeholders to register on a stakeholder database to receive relevant notifications about the ADZ.

2.1.2 Functions of the AMC

The overarching function of the AMC is to oversee, facilitate, manage and monitor aquaculture operations in the ADZ. *DAFF, as the applicant, is primarily responsible for day-to-day management of the ADZ and ensuring the implementation of and adherence to the EMPr, with appropriate support and guidance provided by the other AMC members:*

Key functions of the *DAFF /* AMC are to:

- Monitor aquaculture operators' compliance with the EMPr and ADZ EA conditions;
- Oversee environmental monitoring related to aquaculture in Saldanha Bay;
- Monitor production volumes in the ADZ;
- Make decisions based on the outcomes of environmental monitoring, which could lead to the amendment of operations within the authorised ADZ;
- Settle disputes regarding the interpretation of requirements in the EMPr and EA;
- Receive and manage stakeholder comments;
- Record and, if necessary, coordinate a response to environmental incidents related to aquaculture operations;
- Review and comment on new / expanded aquaculture farm proposals within the approved ADZ; and
- Provide updated information to the public (e.g. farm coordinates, water quality information, notification of new aquaculture operations).

2.1.3 Structure and Roles

It is suggested that the AMC organisational structure should make provision for various functions, including:

- Chairperson: Calls and chairs meetings of the AMC;
- Secretariat: Fulfils secretariat functions, including:
    - Maintenance of member details and arrangement of meetings;
    - Compiling and distribution of meeting notes;
    - Distribution of communication to AMC members and aquaculture farmers in the ADZ;
    - Maintenance of a database of registered (public) stakeholders;
    - Drafting and distribution of regular (at least biannual) AMZ Reports to all Consultative Forum members and registered stakeholders on activities in the ADZ;
    - Administration of and responding to stakeholder comments on aquaculture activities in the ADZ; and
    - Reporting on stakeholder aspects at AMC meetings;
- Environmental Representative: Fulfils environmental control functions, including:
    - Liaising with the suitably qualified service provider(s) appointed to attend to environmental sampling, monitoring and auditing aspects in the ADZ to ensure that monitoring is implemented as per the requirements;
    - Receiving and reviewing monthly Farm Monitoring Reports;
    - Receiving and reviewing environmental sampling, monitoring and audit results;
    - Notifying the Chairperson in the event any aspects require immediate attention of the AMC;
    - Notifying the Secretariat in the event any aspects require immediate attention of other aquaculture farmers in the ADZ; and
    - Reporting on environmental aspects at AMC meetings.

The suggested AMC organisational structure is shown in Figure 2-1.

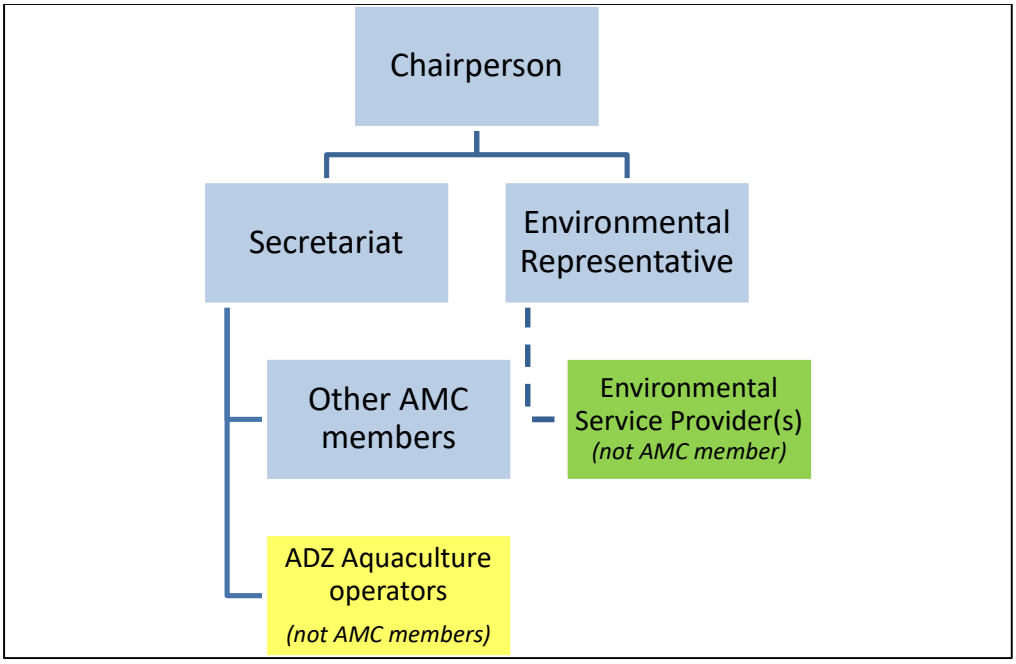


Figure 2-1: Suggested Organisational structure of the AMC

2.2 Consultative Forum

2.2.1 Membership of the Consultative Forum

DAFF should invite representatives of relevant government departments, authorities, local organisations and ADZ operators to become members of the Consultative Forum, including following institutions / organisations:

- Government and authorities:
    1. South African National Parks (SANParks);
    2. Western Department of Agriculture (DoA);
    3. CapeNature;
    4. Saldanha Bay Municipality;
- Aquaculture industry:
    5. Local industry association representing operators in the ADZ;
    6. Farmers operating in the ADZ;
- Other organisations:
    7. South African National Defence Force (SANDF) / South African Navy (SAN);
    8. Saldanha Bay Water Quality Forum Trust (SBWQFT); and
    9. *Representatives of the local fishing industry.*

Forum members will join on a voluntary basis and at no costs to DAFF.

2.2.2 Functions of the Consultative Forum

The overarching function of the Consultative Forum is to review environmental monitoring data, advise on ADZ management and recommend measures.

Key functions of the Consultative Forum are to:

- Review environmental monitoring data related to aquaculture in Saldanha Bay;
- Make recommendations based on the outcomes of environmental monitoring; and
- Provide a platform for discussion of environmental management in the ADZ.

3 Measures Applicable to the Design Phase

Design Phase measures will apply to:

- The formulation of aquaculture specifications in the ADZ during ADZ inception;
- New farms that are in the process of establishing; and
- Existing farms that are in the process of expanding.

3.1 Roles and Responsibilities

The key role players during the design phase of the project are:

- AMC *(with DAFF primarily responsible)*; and
- Proponents of new / expanding ADZ aquaculture farms.

Their roles and responsibilities during the detailed design phase with respect to the implementation of the EMPr are outlined below.

AMC *(with DAFF primarily responsible)*:

- Ensure that the individual aquaculture operators are aware of and take into consideration relevant measures in the EMPr and EA;
- Review and comment on new / expanded aquaculture farm proposals within the ADZ;
- Review and approve EMPr for individual farming operations;
- Make decisions based on the outcomes of environmental monitoring, which could lead to the amendment of operations within the authorised limits;
- Settle disputes regarding the interpretation of requirements in the EMPr and EA; and
- Provide updated information to the public (e.g. notification of proposed new aquaculture operations).

Aquaculture Operators:

- Take cognisance of all relevant measures in the EMPr and ensure integration thereof in the design of aquaculture operations;
- Submit proposals for aquaculture farm establishment / expansion to the AMC for review and comment prior to installation; and
- Take into account formal AMC review comments and amend proposals accordingly.

DAFF and other authorities will fulfil specific authority oversight functions as per legal requirements.

3.2 Environmental Management Measures

The environmental management and mitigation measures that must be implemented during the design phase, as well as timelines for the implementation of these measures and monitoring thereof, are laid out below:

- Table 3-1 specifies ADZ-level measures that must be implemented by the *DAFF /* AMC; and
- Table 3-2 specifies farm-level measures that must be implemented by individual operators.

Environmental monitoring requirements during the design phase are addressed in Section 7.

Table 3-1: ADZ-level management and mitigation measures that must be implemented during the Design Phase by the *DAFF* / AMC

ADZ-level Design Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
ADZ layout	1.	Avoid the following areas to mitigate impacts (these are already excluded in Figure 1-1): • *Big Bay North:* 100 m-wide buffer around reefs and blinders and 1 km buffer from residents along the eastern shoreline (to mitigate marine ecology and visual impacts); • *Big Bay South:* entire precinct (to mitigate marine ecology and socio-economic impacts); • *Outer Bay North:* 1 000 m buffer for finfish and 500 m buffer for shellfish around the Malgas Island MPA and 100 m-wide buffer around reefs and blinders (to mitigate marine ecology impacts); and • *Outer Bay South:* 250 m-wide buffer around Jutten Island MPA (aligned with the island) and portion between Jutten Island and Donkergat Peninsula (to mitigate marine ecology, socio-economic and heritage impacts).	Upon establishment of the ADZ	Survey and map farm boundaries
	2.	Compile detailed site-layout plans for ADZ precincts approved as part of the EA, including recommended layout of farms within precincts and longlines / rafts / cages within individual farms.	Within 6 months of establishment of the ADZ	Review layout maps against approved boundaries
	3.	*Do not restrict access to fishing rights areas where practically possible.*	*Upon establishment of the ADZ*	*Map fishing areas and confirm access is maintained*
ADZ phasing	4.	Implement a phased approach for the expansion of **shellfish** farms in the ADZ, limiting annual ungraded shellfish production to 10 000 tpa for the first two years, increasing thereafter annually by up to 5 000 tpa only if monitoring results indicate that environment health has been maintained and impacts remain manageable, to a maximum of 27 600 tpa ungraded production.	Until full production is phased in, or production limits are reduced due to environmental impacts	Compare actual production to phasing requirements
	5.	Implement a phased approach for the development of **finfish** cage culture in the ADZ: • Limit annual increases in finfish production to no more than 1 000 t to a maximum of 5 000 tpa only if monitoring results indicate that environment health has been maintained and impacts remain manageable. • Split the recommended annual increase in production between Big Bay and Outer Bay.	Until production of 5 000 tpa is phased in, or production limits are reduced due to environmental impacts	Compare actual production to phasing requirements

ADZ-level Design Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
	6.	Finfish production beyond 5 000 tpa, to a maximum of 10 000 tpa, should only be pursued if: • Ecological monitoring indicates that production of 5 000 tpa has no adverse ecological effects, and there is adequate information to permit further expansion in fish production; • Intensified monitoring is applied (a detailed monitoring plan to be implemented) and that expanded production can only occur by following a more precautionary ramp up approach; and • In the ramp up period, and for any production beyond five years, a further period of strict monitoring and environmental quality standards is introduced. Should standards or precautionary limits be approached or exceeded, sampling and monitoring plans must include a response procedure that leads to appropriate downward adjustments of fish production.	Until full production is phased in, or production limits are reduced due to environmental impacts	Compare actual production to phasing requirements
	7.	*Commission dispersion modelling to inform the detailed EMPr / Sampling Plan, ADZ layout and expansion.*	*Prior to establishment of the ADZ*	*Availability of model / study*
ADZ management specifications	8.	Specify requirements applicable to all existing and future operators with regards of aquaculture farms, which must be in compliance with farm-specific measures listed in the EMPr and include specifications with regards to: • Lighting; • Equipment visible at the surface; • Safety and security; • Waste management; • Biosecurity management; and • Vessel launch, mooring and loading / offloading protocols. Communicate such requirements to all existing and prospective operators.	Within 6 months for existing farms and at least 2 months before the first new farms establish	Relevant guidelines and communication
	9.	Confirm with key stakeholders (notably Port Captain, representatives of water users in the area and the South African National Defence Force / South African Navy) whether certain boundaries of the ADZ located away from night-time traffic require lighting at all.	At least 1 month before the first new farms establish	Relevant guidelines and communication
	10.	Develop maintenance and operational guidelines and standards in relation to potential entanglement risks at farms, including loose ropes, lines, buoys or floats.	At least 1 month before the first new farms establish	Relevant guidelines and communication
	11.	Specify a period within in which existing operators must adhere to specifications applicable to all operators.	Within 6 months of establishment of the ADZ	Relevant guidelines and communication
Expansion of existing / establishment of new farms	12.	Develop a template for individual operators to provide farm establishment / expansion proposals to the *DAFF* for review and comment. Such proposals should contain information on the proposed: - Location;	At least 2 month before the first new farms establish	Relevant guidelines and communication

ADZ-level Design Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
		- Layout; - Stocking density, with reference to the maximum production volume authorised; - Mooring plan, with reference to heritage resources on the seabed; - Measures to ensure equipment is securely in place; - Emergency procedures in the event of loose equipment, loss of stock, entanglement of animals etc; and - Any other aspects deemed relevant.		
	13.	Review farm establishment / expansion proposals of individual operators and provide comment to proponents.	Within 1 month of submission of proposal to the *DAFF*	Clear advice to prospective operators on way forward
	14.	*Give consideration to the development of Integrated Multi-Trophic Aquaculture (IMTA), which combines, in appropriate proportions, the cultivation of organic extractive aquaculture species (e.g. shellfish) and inorganic extractive aquaculture species (e.g. seaweeds) in close proximity to fed aquaculture species (e.g. finfish).*	*Throughout lifetime of the ADZ*	
Emergency response	15.	Draw up species-specific emergency response protocol(s) to respond to a range of potential incidents in the ADZ, including: - Loose / drifting equipment; - Accidents (collisions) with other water users; - Loss of stock; and - Disease outbreak or algal bloom. Communicate the protocol to all ADZ aquaculture operators and registered stakeholders.	Within 6 months of establishment of the ADZ	Relevant guidelines and communication
	16.	Develop disentanglement protocols in collaboration with DAFF, DEA and the SA Whale Disentanglement Network and establish a rapid response unit to deal with entanglements.	Within 6 months of establishment of the ADZ	Relevant guidelines and communication
Stakeholder communication	17.	Invite the general public to register as stakeholders on a stakeholder database maintained by the AMC.	Within 6 months of establishment of the ADZ	Advert / communication to public
	18.	Make available updates to all registered stakeholders / consultative forum on aspects relating to the ADZ, including: - Location of existing and planned aquaculture farms; - Results of environmental monitoring in the reporting period; - Any other relevant aspects.	At least biannually	Relevant regular communication

Table 3-2: Farm-level management and mitigation measures that must be implemented during the Design Phase by individual operators

Farm-level Design Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
EMP	1.	Compile an individual environmental management plan (EMP) for each farm to allow for efficient management at the individual farm scale. The EMP must be compatible, supportive and facilitative of the EMPr for the ADZ.	During design of farm / application for marine right Within 6 months of EA for existing farms	Review farm-level EMP
Farm layout	2.	Consult the AMC specifications regarding the layout of aquaculture farms.	Before design of farm	Compliance of layout
	3.	Ensure a minimum width of 10 m between lines to allow for access.	During design of farm	Review layout
	4.	**Fish farming:** Ensure that finfish cages are suspended at least 5 m above the seabed to allow for adequate dispersion to prevent build-up of wastes (uneaten food and faeces) below the cages.	During design of farm	Proposed layout
	5.	Ensure that finfish cages do not occupy more than 30% of the total area allocated for finfish farming at any one time, both within individual licence areas and overall within the portions of the ADZ identified for finfish culture.	During design of farm	Proposed layout
	6.	Submit detailed proposals for expansions / new farms to the *DAFF*, reporting on the following aspects: - Location (coordinates, size); - Species; - Equipment specifications; - Layout (location and orientation of individual structures); - Mooring plan; - Surveys to be conducted prior to installation; - Measures to ensure equipment is securely in place; - Stocking density; - Feeding protocols (if any); and - Any other information deemed relevant or requested by the AMC.	At least 2 months before installation of farm	Relevant submission
Equipment	7.	Use aquaculture structures and equipment that are suitable for the environmental conditions in the farming area, e.g. that can withstand the maximum recorded wave / swell heights.	During design of farm	*DAFF* / AMC approval of layout and design Proven design in similar conditions Review order specifications
	8.	Ensure mooring systems will prevent / limit movement of anchors and chains over the sea floor.	During design of farm	*DAFF* / AMC approval of layout and design Proven design in similar conditions Review order specifications

Farm-level Design Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
	9.	Minimise entanglement by using mesh size less than 6 cm.	During design of farm	Review netting specifications Review order specifications
	10.	Use environmentally safe aquaculture infrastructure to prevent entanglement of faunal species such as fish, whales, dolphins and turtles.	During design of farm	Proven design in similar conditions Review order specifications
Visual impacts	11.	Use grey based hues for all project components visible above the water surface (rafts, cages, barrels, buoys / flotation devices) as far as possible.	During design of farm	Review order specifications
	12.	Ensure project components are of a similar style, scale and have a consistent spacing between them as far as possible to promote visual cohesiveness.	During design of farm	Review order specifications
	13.	Utilise the minimum number of safety / warning buoys as far as possible. Only demarcate the corner points of each precinct and the minimum interval distance along the precinct boundary to meet Ports Authority (Transnet) safety requirements.	During design of farm	Review TNPA requirements
	14.	*Use only minimal non-navigational lighting at night.*	*During design of farm*	
	15.	*Use downward-pointing and shaded lights where possible.*	*During design of farm*	
	16.	Mark all equipment (buoys, raft and cage components) with an identifier unique to the operator to enable tracing of loose equipment / debris.	Before installation of farm commences	Review equipment prior to installation
Decommissioning	17.	Plan and make adequate financial provision for removal of all infrastructure upon cessation of farming operations.	Before installation of farm commences	Review financial provision documents

4 Measures Applicable to the Construction Phase

Construction Phase measures will apply to:

- New farms that are installing infrastructure and equipment in the ADZ; and
- Existing farms that are installing new infrastructure and equipment in the ADZ as part of an expansion.

4.1 Roles and Responsibilities

The key role players during the construction phase of the project are anticipated as follows:

- AMC *(with DAFF primarily responsible)*;
- DAFF;
- Aquaculture operators; and
- Contractors responsible for construction / placement of infrastructure.

Individual operators retain the final responsibility with regards to compliance with the EMPr and EA. All instructions relating to the EMPr will be given to contractors via the respective aquaculture operators. Contractors will report issues of concern to the aquaculture operator, who in turn will report on progress to the AMC.

Key roles and responsibilities during the construction phase with respect to the implementation of the EMPr are outlined below.

Roles and responsibilities relating to environmental monitoring are laid out in Section 7.1.

AMC *(with DAFF primarily responsible)*:

The AMC has oversight over environmental management at the ADZ. In terms of environmental management, the AMC will:

- Make decisions based on the outcomes of environmental monitoring, which could lead to the amendment of operations within the authorised limits;
- Settle disputes regarding the interpretation of requirements in the EMPr and EA;
- Receive and manage stakeholder comments;
- Record and, if necessary, coordinate a response to environmental incidents related to aquaculture operations;
- Provide information to the public (updated maps/coordinates, water quality information, notification before new aquaculture operations start); and
- Record and if necessary, respond to, environmental aquaculture-related incidents.

Aquaculture operators:

Individual aquaculture operators retain the overall responsibility for the management of construction activities and the implementation of the EMPr. Operators are required to:

- Ensure that contractors are aware of and comply with the conditions of the EMPr;
- Ensure that staff are aware of and comply with the conditions of the EMPr;
- Inform the DAFF / AMC should there be any notable changes to submitted plans; and
- Report any incidents and initiate the emergency protocol if required.

Contractors:

All contractors will be required to:

- Ensure that all employees are aware of and comply with the EMPr;
- Ensure that all activities on site are undertaken in accordance with the EMPr;
- Immediately notify the aquaculture operator of any non-compliance with the EMPr, or any other issues of environmental concern; and
- Ensure that non-compliance is remedied timeously and to the satisfaction of the AMC.

4.2 Environmental Management Measures

The environmental management and mitigation measures that must be implemented during the construction phase, as well as timelines for the implementation of these measures and monitoring thereof, are laid out below:

- Table 4-1 specifies ADZ-level measures that must be implemented by the *DAFF /* AMC; and
- Table 4-2 specifies farm-level measures that must be implemented by individual operators.

Environmental monitoring requirements during the construction phase are addressed in Section 7.

Table 4-1: ADZ-level management and mitigation measures that must be implemented during the Construction Phase by the *DAFF* / AMC

ADZ-level Construction Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
Stakeholder communication	1.	Make available updates to all registered stakeholders on aspects relating to the ADZ, including: - Location of existing and planned aquaculture farms; - Results of environmental monitoring in the reporting period; - Any other relevant aspects.	At least biannual	Relevant communication
Complaints Register	2.	Maintain and disclose a complaints / comments register. The register must record: • Name and contact details of person complaining / commenting; • Date submission was lodged; • Person who initially received the submission; • Nature of the submission; • Operator that is subject to the submission; • Actions taken to investigate a complaint and outcome of the investigation; • Action taken to remedy the situation; and • Date on which feedback was provided to the complainant.	Duration of farm installation activities	Keep record of all complaints
Response to environmental incidents	3.	Record all environmental incidents related to aquaculture farm construction / expansion, including: - Loose / drifting equipment; - Accidents (collisions) with other water users; - Entanglement of marine animals; - Spill of pollutants; and - Waste in the marine environment.	In the event of an incident	Maintain register of incidents and response Following resumption of activities, frequently inspect area to ensure issue was properly addressed
	4.	Coordinate a response to environmental incidents related to aquaculture operations, if necessary.	In the event of an incident	Time taken to address incident
	5.	Initiate the emergency response protocol to respond to an environmental incident if it cannot be dealt with at farm level.	In the event of an incident	Time taken to address incident

Table 4-2: Farm-level management and mitigation measures that must be implemented during the Construction Phase by individual operators

Farm-level Construction Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
ECO	1.	Appoint an Environmental Control Officer (ECO) during the construction phase (installation of new farms) to ensure compliance with stipulations in the Environmental Authorisation and EMPr.	During installation of new (including extension of existing) farms	ECO reports submitted to the *DAFF /* AMC
Visual impacts	2.	Use grey based hues for all project components visible above the water surface (rafts, cages, barrels, buoys / flotation devices) as far as possible.	During installation of farms Within specified timeframe for existing farms	Visual inspection
	3.	Ensure project components are of a similar style, scale and have a consistent spacing between them as far as possible to promote visual cohesiveness.	During installation of farms Within specified timeframe for existing farms	Visual inspection
	4.	Utilise the minimum number of safety / warning buoys as far as possible. Only demarcate the corner points of each precinct and the minimum interval distance along the precinct boundary to meet Ports Authority (Transnet) safety requirements.	During installation of farms Within specified timeframe for existing farms	Visual inspection
	5.	Demarcate all equipment (buoys, raft and cage components) with the operators logo / name to enable tracing of lose equipment / debris.	During installation of farms Within specified timeframe for existing farms	Visual inspection
Protection of heritage resources	6.	Undertake diver surveys prior to / while setting anchor / mooring arrays, and do not place mooring blocks on visible shipwreck features.	During installation of farm	Record of diver surveys
	7.	Contact an archaeologist if shipwreck material is identified at mooring sites.	During installation if required	
	8.	Provide the location and nature of any identified maritime and underwater cultural heritage resources to a maritime archaeologist and to SAHRA for inclusion on their shipwreck database.	During installation if required	Appropriate communication
	9.	Obtain a permit from SAHRA prior to continuing with activities that have disturbed a wreck site or part thereof, including objects or artefacts.	During installation if required	Appropriate communication
	10.	*Submit a detailed anchor / mooring distribution plan to the Maritime and Underwater Cultural Heritage Unit at the South African Heritage Resources Agency (SAHRA).*	*Before installation commences*	*Record of diver surveys* *Placement of farms*

Farm-level Construction Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
Equipment	11.	Ensure that, upon installation of the aquaculture structures: - Primary longline / raft / net is secured appropriately so that it is kept taut and rigid at all times. Nets of fish cages should be weighted; - Ropes and anchor lines are taut, especially after rough seas; and - There is adequate separation between rafts and longlines, even during strong currents and rough seas; *or* - There is adequate separation between the primary and secondary nets of fish cages, even during strong currents and rough seas.	Following installation	Visual inspection (above and below water)
Vessel operation	12.	Implement maritime safety protocols while working on vessels and at sea.	Throughout farm installation	Visual inspection of bay
	13.	Do not discard any waste overboard.	Throughout farm installation	Visual inspection of bay
	14.	Take waste generated on vessels back to shore and dispose of properly.	Throughout farm installation	Visual inspection of bay
	15.	In the event of litter and debris entering the sea, remove these as soon as possible.	Throughout farm installation	Visual inspection of bay
Land-based activities Hazardous substances	16.	Ensure that contaminants are not placed directly on the ground to prevent runoff reaching the marine environment.	Throughout farm installation	Visual inspection of hazardous materials handling and storage areas
	17.	Develop (or adapt and implement) procedures for the safe transport, handling and storage of potential pollutants.	Throughout farm installation	Visual inspection of hazardous materials handling and storage areas
	18.	Avoid unnecessary use and transport of hazardous substances.	Throughout farm installation	
	19.	Keep Material Safety Data Sheets (MSDS) for all hazardous materials on site and ensure that they are available for reference by staff responsible for handling and storage of materials.	Throughout farm installation	Visual inspection of MSDS
Waste management	20.	Ensure that no litter and debris reaches the marine environment during construction activities.	Throughout farm installation	Visual inspection of waste collection and disposal areas Check waste disposal slips
	21.	Train all staff in the effects of debris and litter in the marine environment.	Throughout farm installation	Training manual and attendance register
	22.	Minimise waste through reducing and re-using (packaging) material.	Throughout farm installation	Visual inspection of waste collection and disposal areas Check waste disposal slips
	23.	Prevent littering by construction staff at work sites by providing bins or waste bags in sufficient locations.	Throughout farm installation	Visual inspection of site
	24.	Provide separate bins for hazardous / polluting materials and mark these clearly.	Throughout farm installation	Visual inspection of waste collection and disposal areas

Farm-level Construction Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
Employment / Procurement	25.	Utilise local labour (Saldanha Bay municipality) as much as possible.	Throughout farm installation	Staff profiles
	26.	Procure goods and services from local, provincial or South African suppliers as far as possible, with an emphasis on BEE suppliers where possible.	Throughout farm installation	Procurement records
	27.	Procure ancillary services for goods purchased overseas, such as installation, customisation and maintenance, from South African companies as far as possible.	Throughout farm installation	Procurement records
Environmental awareness training	28.	Provide environmental awareness training to all personnel on site at the start of their employment. Training should include discussion of: • Potential impact of waste and construction activities on the environment; • Suitable disposal of waste; • Key measures in the EMPr relevant to worker's activities; • How incidences and suggestions for improvement can be reported. Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names.	Before workers start working on-site Before new activities are undertaken	Training attendance register Observe whether activities are executed in line with EMPr requirements
Complaints Register	29.	Forward all public submissions received by operators the DAFF / AMC.	Within 1 week of receiving the submission	Keep record of all complaints
	30.	Provide a response to the submission, where required.	Within 1 week of receiving the submission	Keep record of all complaints
Response to environmental pollution	31.	In the event of environmental pollution, e.g. through spillages, immediately stop the activity causing the problem.	Throughout farm installation	Maintain register of pollution events and response Following resumption of activities, frequently inspect area
	32.	Only resume activity once the problem has been stopped, the equipment has been repaired and/or the pollutant can be captured without reaching the marine environment.	Throughout farm installation	Maintain register of pollution events and response Following resumption of activities, frequently inspect area
	33.	Repair faulty equipment as soon as possible.	Throughout farm installation	Visual inspection Time to address issue

Farm-level Construction Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
Response to environmental incidents	34.	Report all environmental incidents related to aquaculture farm construction / expansion to the *DAFF*, including: - Loose / drifting equipment; - Accidents (collisions) with other water users; - Entanglement of marine animals; - Spill of pollutants; and - Waste in the marine environment.	Throughout farm installation	Maintain register of pollution events and response Appropriate communication
	35.	Initiate steps to contain the environmental incident at a farm level.	Throughout farm installation	Record of events
	36.	Request and support assistance with environmental incidents from the *DAFF /* AMC if the incident cannot be dealt with at farm level.	Throughout farm installation	Appropriate communication

5 Measures Applicable to the Operation Phase

Operation Phase measures will apply to aquaculture farms that are operating with the ambit of the ADZ in Saldanha Bay.

5.1 Roles and Responsibilities

The key role players during the construction phase of the project are anticipated as follows:

- AMC *(with DAFF primarily responsible)*; and
- Aquaculture operators.

Individual operators retain the final responsibility with regards to compliance with the EMPr and EA.

Key roles and responsibilities during the operation phase with respect to the implementation of the EMPr are outlined below.

Roles and responsibilities relating to environmental monitoring are laid out in Section 7.1.

AMC *(with DAFF primarily responsible)*:

The AMC has oversight over environmental management at the ADZ. In terms of environmental management, the AMC will:

- Make decisions based on the outcomes of environmental monitoring, which could lead to the amendment of operations within the authorised limits;
- Settle disputes regarding the interpretation of requirements in the EMPr and EA;
- Receive and manage stakeholder comments;
- Record and, if necessary, coordinate a response to environmental incidents related to aquaculture operations;
- Provide information to the public (updated maps/coordinates, water quality information, notification before new aquaculture operations start);
- Record and if necessary, respond to, environmental aquaculture-related incidents.

Aquaculture operators:

Individual aquaculture operators retain the overall responsibility for the management of operations and the implementation of the EMPr. Operators are required to:

- Comply with the conditions of the EMPr;
- Ensure that staff are aware of and comply with the conditions of the EMPr;
- Inform the *DAFF /* AMC should there be any notable changes to operations;
- Report any incidents and initiate the emergency protocol if required.

5.2 Reporting

The AMC must make available biannual **ADZ Reports** to registered stakeholders including at a minimum the following information:

- Extent of current operations;
- Location and type of proposed new operations;
- Key environmental monitoring results;
- Feedback on stakeholder concerns; and
- Any other relevant aspects.

Note that environmental monitoring reports are addressed in Section 7.2.

5.3 Environmental Management Measures

The environmental management and mitigation measures that must be implemented during the operation phase, as well as timelines for the implementation of these measures and monitoring thereof, are laid out below:

- Table 5-1 specifies ADZ-level measures that must be implemented by the *DAFF /* AMC; and
- Table 5-2 specifies farm-level measures that must be implemented by individual operators.

Environmental monitoring requirements during the operation phase are addressed in Section 7.

Table 5-1: ADZ-level management and mitigation measures that must be implemented during the Operation Phase by the *DAFF/* AMC

ADZ-level Operation Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
Demarcation of ADZ precincts	1.	Ensure that all active aquaculture farms are accurately marked on navigational charts.	Throughout operations	Accurate charts Notification of stakeholders
	2.	Ensure that the outside boundaries of all active aquaculture areas are accurately marked day and night using markers compliant with South African Marine Safety Authority (SAMSA) regulations.	Throughout operations	Visual inspection
	3.	Monitor that markers are fully functional.	Throughout operations	Visual inspection
	4.	If the Ports Authority requires flashing lights, ensure the lights flash simultaneously.	Throughout operations	Visual inspection
	5.	*Do not restrict access to fishing rights areas where practically possible.*	*Upon establishment of the ADZ*	*Map fishing areas and confirm access is maintained*
Supervision of farming activities	6.	Enforce maintenance and operational guidelines and standards in relation to potential entanglement risks at farms, including loose ropes, lines, buoys or floats.	Throughout operations	Record of visual inspection and (non)compliances
	7.	Implement monitoring as per the environmental monitoring requirements stipulated in Section 7 of the EMPr.	Within 3 months of establishment of the ADZ	Monitoring records
	8.	*Update the dispersion model with monitoring information as it becomes available to inform further monitoring and the phased implementation of the ADZ.*	*Throughout operations as advised by AMC*	*Record of model updates*
Stakeholder communication	9.	Notify registered stakeholders before installation of new farms commences. Provide detail on the proposed farm type and location.	Throughout operations	Record of notification of stakeholders
	10.	Make available ADZ Report updates to all registered stakeholders on aspects relating to the ADZ, including: - Location of existing and planned aquaculture farms; - Results of environmental monitoring in the reporting period; - Any other relevant aspects.	At least biannual	Record of stakeholder communication
Complaints Register	6.	Maintain and disclose a complaints / comments register. The register must record: • Name and contact details of person complaining / commenting; • Date submission was lodged; • Person who initially received the submission; • Nature of the submission; • Operator that is subject to the submission; • Actions taken to investigate a complaint and outcome of the investigation; • Action taken to remedy the situation; and • Date on which feedback was provided to the complainant.	Duration of operations	Keep record of all complaints

ADZ-level Operation Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
Response to environmental incident	11.	Record all environmental incidents related to aquaculture farm operations, including: - Loose / drifting equipment; - Accidents (collisions) with other water users; - Entanglement of marine animals; - Loss of stock; and - Disease outbreak or algal bloom. - Spill of pollutants; and - Waste in the marine environment.	Throughout operations	Maintain register of pollution events and response
	12.	Coordinate a response to environmental incidents related to aquaculture operations, if necessary.	Throughout operations	Maintain register of pollution events and response
	13.	Activate the emergency response protocol to respond to an environmental incident if it cannot be dealt with at farm level.	Throughout operations	Maintain register of pollution events and response
Sector development	14.	*Liaise with relevant authorities to encourage the development of South African spat and fingerling hatcheries to reduce the reliance on import, and associated risk of non-intentional introduction of associated alien species and diseases.*	*As early as possible*	
	15.	*Encourage the municipality, in cooperation with aquaculture operators and the AMC, to initiate a study to identify industries or projects that could benefit from the direct and indirect opportunities generated by the ADZ, and mechanisms to promote or establish such industries or projects.*	*As early as possible*	
	16.	*Encourage the municipality, in cooperation with aquaculture operators and the AMC, to encourage and support projects and / or networks that provide training and support for small and medium enterprises in the Saldanha Bay Municipality to benefit from the opportunities generated by the ADZ.*	*As early as possible*	

Table 5-2: Farm-level management and mitigation measures that must be implemented during the Operation Phase by individual operators

Farm-level Operation Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
Bio-fouling	1.	Undertake routine surveillance for indications of non-native fouling species on and around marine farm structures and associated vessels and infrastructure.	At least monthly throughout operations	Visual inspection
	2.	Maintain effective antifouling coatings and monitor for fouling.	Throughout operations	Visual inspection
	3.	Clean structures and hulls regularly to ensure eradication of pests before they become established.	Throughout operations	Visual inspection
	4.	Avoid using chemicals for the cleaning of cage nets. It is recommended that high-pressure water hoses and drying or sunning be used to clean cage nets of algae and debris.	Throughout operations	Record of materials used
	5.	Minimise the impact of bio-fouling organisms by using smooth, plastic coated, knotless mesh on nets, or copper-alloy mesh.	Throughout operations	Visual inspection
	6.	Do not use of antifouling products based on heavy metals.	Throughout operations	Record of materials used
	7.	Use only prescribed veterinary chemicals and antifoulants.	Throughout operations	Record of materials used Prescription
	8.	Establish and adhere to guidelines around the use of anti-fouling products in the mariculture industry.	Throughout operations	Record of materials used
	9.	Do not apply antifoulants on site and use environmentally friendly alternatives where effective.	Throughout operations	Record of materials and methods used
	10.	Ensure that veterinarian protocols to eliminate any pests, parasites and diseases are strictly adhered to.	Throughout operations	Record of implementation
	11.	Obtain health certificates for any new batches of fry / finfish introduced into the bay (finfish and oysters).	Throughout operations	Health certificates
Biosecurity	12.	Ensure that a high level of biosecurity management and planning is in place to limit the introduction of pests and diseases and to be able to respond quickly and effectively should biosecurity risks be identified. Comply with procedures prescribed by the DAFF Aquatic Animal Health Plans. Key components to biosecurity management include: • Prevention of incursions, focussing on the management of: - High-risk pathways (including international source regions); - New pathways; and - Regional sources known to be infected by recognised high-risk pests; • Surveillance (detection), focussing on: - Passive surveillance (screening at airports and ports) - Routine surveillance (undertaken on and around marine farm structures and associated vessels and infrastructure by farm operators); and	Throughout operations	Record of implementation Farm Monitoring Report

Farm-level Operation Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
		- Targeted surveillance of high-risk areas; and • Control of populations and outbreaks through coordination with, and support from: - All marine stakeholders whose activities can spread unwanted organisms; and - Agencies at local, regional and national scales. Eradication measures and / or application of therapeutants (pharmaceutical products, or 'medicines') are only advised if the risk of re-invasion can be managed and pests can be detected before they become widespread.		
Maintenance of aquaculture infrastructure	13.	Maintain all project infrastructure in good working order.	Throughout operations	Visual inspection Maintenance records Farm Monitoring Report
	14.	Regularly clean cages, rafts etc and inspect for alien species.	Throughout operations	Visual inspection Maintenance records
	15.	Regularly inspect aquaculture infrastructure for integrity of the structure, anchorage and general wear and tear.	Throughout operations	Visual inspection Maintenance records
	16.	Keep all lines taught through regular inspections and maintenance.	Throughout operations	Visual inspection
	17.	Leave mooring anchors or blocks in place when undertaking cage or raft maintenance or fallowing sites to avoid repetitive impacts on the seabed.	Throughout operations	Visual inspection
	18.	Keep marine structures clean and free of unnecessary equipment.	Throughout operations	Visual inspection
	19.	Maintain service barges and boats to withstand local weather conditions and fit them with the necessary safety equipment to provide a safe working environment.	Throughout operations	Visual inspection Maintenance records
Vessel operation	37.	Implement maritime safety protocols while working on vessels and at sea.	Throughout operations	
	20.	*Minimise noise and air emissions from vessels.*	*Throughout operations*	*Check complaints register*
Safety	21.	Clearly mark cages and other offshore infrastructure with clear warning markers, bells and radar reflectors to ensure visibility to marine traffic.	Throughout operations	Visual inspection
	22.	Keep necessary safety equipment (e.g. life rings) on platforms in an accessible position.	Throughout operations	Visual inspection
Human consumption	23.	Ensure that products intended for human consumption are of an acceptable quality and comply with health standards for seafood as prescribed by the relevant authorities such as the South African Bureau of Standards (SABS) and DAFF.	Throughout operations	Compliance with health prescribed standards
Waste management	24.	Minimise waste through reducing and re-using material (e.g. packaging).	Throughout operations	Visual inspection of waste collection areas
	25.	Collect recyclables separately and deliver these to suitable facilities or arrange for collection.	Throughout operations	Visual inspection of waste collection areas

Farm-level Operation Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
	26.	Collect all waste in bins and/or skips. Prevent littering by staff at work sites by providing bins or waste bags in sufficient locations.	Throughout operations	Visual inspection of waste collection areas
	27.	Provide separate bins for hazardous / polluting materials and mark these clearly.	Throughout operations	Visual inspection of waste collection areas
	28.	Ensure no debris and waste material used at the operations enters the marine environment (particularly plastics), to minimise the risk of attraction, harming and entanglement by seabirds, marine mammals and large predators.	Throughout operations	Visual inspection of bay areas Reports of non-compliance
	29.	Do not discard non-organic waste overboard vessels.	Throughout operations	Visual inspection of bay areas Reports of non-compliance
	30.	In the event of equipment, litter and debris entering the sea, remove these as soon as possible.	Throughout operations	Visual inspection of bay areas Reports of non-compliance
	31.	Remove debris washed onshore. This should be done / paid for by the operator the debris belongs to (which should be marked).	Throughout operations	Visual inspection of shore Reports of non-compliance
	32.	Investigate alternative uses for wastes (such as using shell grit for driveway gravel, gardening or chicken farming) prior to disposing to landfill.		
Employment	33.	Procure goods and services from local, provincial or South African suppliers as far as possible, with an emphasis on BEE suppliers where possible.	Throughout operation	Staff records
	34.	Procure ancillary services for goods purchased overseas, such as installation, customisation and maintenance, from South African companies as far as possible.		
	35.	Utilise local labour (Saldanha Bay municipality) as much as possible. Where non-local specialist staff is required, implement a training programme to upskill local labour to assume these positions over a period of 5 years.	Throughout operation	Staff records Training programmes Farm Monitoring Report
	36.	Implement a local recruitment policy, to discourage an uncoordinated influx of outside workers.	Throughout operation	
	37.	Collect data on staff numbers, composition and origin and report these to the *DAFF*.	Throughout operation	Farm Monitoring Report
Environmental awareness training	38.	Provide environmental awareness training to all personnel on site at the start of their employment. Training should include discussion of: • Potential impact of waste and farming activities on the environment; • Suitable disposal of waste; • Key measures in the EMPr relevant to worker's activities; • How incidences and suggestions for improvement can be reported. Ensure that all attendees remain for the duration of the training and on completion sign an attendance register that clearly indicates participants' names.	Before workers start working on-site Before new activities are undertaken	Check training attendance register Observe whether activities are executed in line with EMPr requirements
Mussel farm management	39.	Seed ropes with specimens present in the area and do not introduce mussels from other areas.	Throughout operation	

Farm-level Operation Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
	40.	Do not dispose of mussels in the Bay during red tides.	Throughout operation	Visual inspection Reports of non-compliance
	41.	Avoid high density culture (overcrowding). The recommended density is: • One raft of 800 droppers per ha; or • 11 longlines of 832 droppers per ha.	Throughout operations	Visual inspection Farm Monitoring Report
Oyster farm management	42.	Use only spat sourced from biosecure certified hatcheries and/or quarantine facilities.	Throughout operations	Certificate
	43.	Inspect imported spat for other species before introduction into the Bay. Destroy any other species associated with oyster spat and report the incident to the *DAFF*.	Throughout operations	Visual inspection Farm Monitoring Report
	44.	Avoid high density culture (overcrowding). The recommended density is 11 longlines of 176 oyster stacks / abalone barrels per ha.	Throughout operations	Visual inspection Farm Monitoring Report
	45.	Do not discard fouling organisms removed from cultured stock taken onshore for maintenance back into the marine environment.	Throughout operation	Reports of non-compliance Disposal record
Finfish farm management Farm layout and density	46.	Ensure that finfish cages do not occupy more than 30% of the total area allocated for finfish farming at any one time, both within individual licence areas and overall within the portions of the ADZ identified for finfish culture.	Throughout operations	Visual inspection Farm Monitoring Report Approved layout
	47.	Rotate cages within a production area to allow recovery of benthos.	Throughout operations	Visual inspection Farm Monitoring Report
	48.	Destock, or fallow, a site after a growing cycle to allow seabed recovery prior to restocking.	Throughout operations	Visual inspection Farm Monitoring Report
Feed	49.	Purchase only registered aquaculture feeds from recognised feed companies that produce high quality feeds of which the ingredients, composition and manufacturing methods are known.	Throughout operations	Certificates Order records
	50.	Use palatable feeds of the correct pellet or grain size to ensure low levels of feed loss.	Throughout operations	Farm Monitoring Report
	51.	Use high digestibility, high energy and low phosphorus feeds, species and system-specific feeds and maximize food conversion ratios (and minimize waste).	Throughout operations	Certificates Order records
	52.	Store and use feed on a “first-in-first-out” basis to prevent unnecessary aging and deterioration in quality.	Throughout operations	Visual inspection of feed quality
	53.	Ensure that feed storage areas are well ventilated, cool, dry and free of vermin that can damage, contaminate and consume feeds.	Throughout operations	Visual inspection of feed storage areas

Farm-level Operation Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
	54.	Use feeding regimes that minimise direct feed wastage and excessive faecal and metabolite releases from fish.	Throughout operations	Visual inspection Farm Monitoring Report
	55.	Record feed types and feeding rates daily so that conversion efficiency can be calculated and monitored.	Daily, throughout fish farming	Farm Monitoring Report
	56.	Monitor and manage feeding regimes to minimise feed wastage and chemical usage.	Throughout operations	Farm Monitoring Report
Genetics	57.	Use all female or triploid salmonids in the farms.	Throughout operations	Certificate Veterinary record
	58.	Implement suitable management and planning measures to limit the possibility of genetic interactions.	Throughout operations	Farm Monitoring Report
	59.	Adhere to DAFF genetic management guidelines.	Throughout operations	Certificate
	60.	Use appropriate spawning regimes in the hatchery to maintain genetic diversity in the offspring.	Throughout operations	Appropriate records
	61.	Implement annual genetic monitoring between wild caught and farmed fish to monitor for any significant differences.	Throughout operations	Monitoring results
	62.	Implement the “Genetic Best Practice Management Guidelines for Marine Finfish Hatcheries” developed by DAFF and ensure adequate genetic monitoring of brood stock rotation.	Throughout operations	Appropriate records
Escapes	63.	Ensure good physical and biological containment to limit the effects of escaped stocks.	Throughout operations	Visual inspection
	64.	Use robust, well-maintained containment systems.	Throughout operations	Visual inspection
	65.	Maintain cage integrity through regular maintenance and replacement.	Throughout operations	Visual inspection Maintenance records Farm Monitoring Report
	66.	Develop and implement recovery procedures should escapes occur.	Throughout operations	Farm Monitoring Report
Maintenance	67.	Keep cage netting clean, free of algal growth and free of any damage that could lead to the escape of farmed organisms or the penetration of predators.	Throughout operations	Visual inspection
	68.	Keep nets well maintained (e.g. repair holes immediately)	Throughout operations	Visual inspection Maintenance records
Waste	69.	Do not discard fouling organisms removed from netting taken onshore for maintenance back into the marine environment.	Throughout operation	Reports of non-compliance Disposal record

Farm-level Operation Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
	70.	Do not discard sick or dead fish into the marine environment.	Throughout operation	Reports of non-compliance Disposal record
	71.	Provide fish mortality to fishmeal farms in the area, where possible. Where not possible, dispose of fish mortality in line with legal requirements.	Throughout operation	Disposal record
Predators	72.	Remove any injured or dead fish from cages promptly.	Throughout operation	Visual inspection Farm Monitoring Report
	73.	Do not release any blood and/or offal (organic waste) from finfish into the bay.	Throughout operation	Visual inspection
	74.	Use predator exclusion nets. Enclose nets at the bottom to minimise entanglement, keep nets taut, use mesh sizes of < 6 cm and keep nets well maintained (e.g. repairing holes).	Throughout operation	Visual inspection
	75.	*Monitor whether predators are attracted to cages, e.g. through the presence of wild fish close to the cages.*	*Throughout operation*	*Visual inspection*
Diseases	76.	Ensure all fry undergoes a health examination prior to stocking in sea cages.	Throughout operation	Veterinary records
	77.	Take necessary action to eliminate pathogens through the use of therapeutic chemicals or improved farm management as per veterinary identification and prescriptions.	Throughout operation	Appropriate records Farm Monitoring Report
	78.	Regularly inspect stock for disease and/parasites as part of a formalised stock health monitoring programme approved by DAFF.	Throughout operation	Veterinary records Farm Monitoring Report
	79.	Maintain comprehensive records of all pathogens and parasites detected as well as logs detailing the efficacy of treatments applied.	Throughout operation	Veterinary records Farm Monitoring Report
	80.	Locate cages stocked with different cohorts of the same species as far apart as possible; if possible stock different species in cages successively.	Throughout operation	Visual inspection Approved farm layout
	81.	Implement good house-keeping practices in place at all times i.e. keep nets clean and allow sufficient fallowing time on sites to ensure low environmental levels of intermediates hosts and or pathogens.	Throughout operation	Visual inspection Farm Monitoring Report Sampling records
	82.	Treat adjacent finfish cages simultaneously even if infections have not yet been detected if prescribed by veterinarian.	As required	Farm Monitoring Report
	83.	Quarantine new juveniles or new broodstock when introduced to identify and treat potential diseases and parasites under the supervision of a veterinary professional. OR Ensure all newly introduced organisms undergo a health exam by a suitably qualified veterinarian and are certified as disease free.	Throughout operation	Veterinary records Farm Monitoring Report
	84.	Humanely euthanize production animals that are injured or diseased to a point that causes excessive suffering.	Throughout operation	Farm Monitoring Report

Farm-level Operation Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
	85.	Remove and dispose of dead organisms daily (weather permitting) and dispose of in a responsible manner.	Throughout operation	Reports of non-compliance Disposal record Farm Monitoring Report
	86.	Clean and sanitise equipment used for disposing of dead organisms.	Throughout operation	
	87.	Appoint an aquaculture veterinarian to conduct a health assessment at least annually.	At least annually throughout operations	Veterinary records Farm Monitoring Report
	88.	Take the following actions in the event of a disease breakout: • Notify the *DAFF* immediately; • Isolate the affected individuals / cages; • Identify the disease; • Consult a veterinarian for treatment advice; • Apply treatment recommended by veterinarian; and • Monitor the efficacy of the treatment.	As required	Appropriate communication and records
Medication and pesticides	89.	Seek assistance of an aquaculture veterinarian in the use of therapeutics and treatments, where required.	Throughout operations	Veterinary records Farm Monitoring Report Record of treatments
	90.	Avoid using excessive amounts of medication, antibiotics, hormones and pesticides.	Throughout operations	Veterinary records Record of treatments
	91.	The use of chemicals in disease management is discouraged due to negative impacts on the aquatic environment, consumer reluctance, and because the frequent use of traditional therapeutics may trigger the emergence of disease-resistant strains of pathogens.	Throughout operations	Veterinary records Record of treatments
	92.	Reduce levels of nutritional therapeutants and trace contaminants in feed, using only the lowest effective doses.	Throughout operations	Veterinary records Record of treatments
	93.	Use the most efficient drug delivery mechanisms that minimise the concentrations of biologically active ingredients entering the environment.	Throughout operations	Veterinary records Record of treatments
	94.	Malachite Green as a bactericide or fungicide is prohibited.	Throughout operations	Veterinary records Record of treatments
	95.	Reduce reliance on therapeutic chemicals through the use of sound husbandry practices aimed at disease and stress prevention.	Throughout operations	
	96.	Antibiotics use as a prophylactic or preventative measure is prohibited.	Throughout operations	
	97.	Use bait type pesticides with care to prevent poisoning of non-target species.	Throughout operations	Veterinary records Record of treatments

Farm-level Operation Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
	98.	Use only recognised and registered chemicals as treatments, medicines, herbicides, insecticides, pesticides and for other purposes.	Throughout operations	Veterinary records Record of treatments
	99.	Record dosages, application methods and the resultant outcome of all treatments in a treatment register.	Throughout operations	Veterinary records Record of treatments
	100	File Material Safety Data Sheets (MSDS) or medicine datasheets and reference during use, storage and disposal.	Throughout operations	
***Gracilaria* management**	101	Use only locally sourced *Gracilaria* for stocking the ropes.	Throughout operations	Visual inspection Records
	102	*Avoid the use of fertilizers or chemicals in the culture of seaweeds.*	*Throughout operations*	*Farm Monitoring Report*
	103	*Use as a co-culture species for use in Integrated Multi-Trophic Aquaculture (IMTA) rather than as monoculture, if possible.*	*Throughout operations*	*Approved farm layout*
Predatory birds	104	Use exclusion devices to prevent killing of stock by predatory birds and do not kill predatory birds.	Throughout operations	Visual inspection
Other	105	Comply with all management programmes required by DAFF (e.g. health management programme) including the reporting requirements of these programmes.	Throughout operations	
Response to environmental incidents	106	In the event of environmental pollution, immediately stop the activity causing the problem.	Throughout operations	Visual inspection Farm Monitoring Report
	107	Initiate steps to contain the environmental incident at a farm level.	Throughout operations	Maintain register of pollution events and response Farm Monitoring Report
	108	Only resume activity once the problem has been stopped or (in the case of spillages) the pollutant can be captured without reaching the marine environment.	Throughout operations	Maintain register of pollution events and response Farm Monitoring Report
	109	Repair faulty equipment as soon as possible.	Throughout operations	Maintain register of pollution events and response Farm Monitoring Report

Farm-level Operation Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
	110	Report all environmental incidents related to aquaculture farm operation to the *DAFF*, including: - Loose / drifting equipment; - Accidents (collisions) with other water users; - Entanglement of marine animals; - Loss of stock; and - Disease outbreak or algal bloom. - Spill of pollutants; and - Waste in the marine environment.	Throughout operations	Appropriate communication Farm Monitoring Report
	111	Request assistance with environmental incidents from the *DAFF /* AMC if the incident cannot be dealt with at farm level.	Throughout operations	Appropriate communication Record of incidents
	112	*Rectify activities that elicit noise or odour complaints.*	*Throughout operations*	*Record of rectification*
Entanglement	113	Ensure that exclusion nets are clearly visible under and above water.	Throughout operations	Visual inspection
	114	*Ensure all mooring lines and rafts are highly visible (use thick lines and bright antifouling coatings).*	*Throughout operations*	*Visual inspection*
	115	Implement the relevant AMC protocol in case of entanglement.	Throughout operations	Farm Monitoring Report
	116	Request assistance with entanglement incidents from the *DAFF /* AMC if the incident cannot be dealt with at farm level.	Throughout operations	Appropriate communication Record of incidents
	117	Contact experts from the NSRI in the event of large marine mammals becoming entangled in cage systems.	Throughout operations	Record of contact with NSRI
	118	Keep record of all incidents of entanglement and the outcome of these incidents.	Throughout operations	Record of entanglements
Incident logging	119	Maintain an incident register in which all events caused by farming activities or farm infrastructure, such as escape events or the dislodging of infrastructure, which may have environmental risks, are recorded.	Throughout operations	Incident register on file
	120	Report all non-routine events that may have an environmental impact to the *DAFF /* AMC.	Throughout operations	Appropriate communication Farm Monitoring Report

6 Measures Applicable to the Decommissioning Phase

Decommissioning Phase measures will apply to:

- Individual farms in the ADZ that are decommissioning part or all of their infrastructure and equipment; and
- Decommissioning of the ADZ as a whole.

6.1 Roles and Responsibilities

The key role players during the decommissioning phase of the project are anticipated as follows:

- AMC *(with DAFF primarily responsible)*;
- Aquaculture operators; and
- Contractors responsible for decommissioning / removal of infrastructure.

Individual operators retain the final responsibility with regards to the compliance of aquaculture operations with the EMPr and EA. All instructions relating to the EMPr will be given to contractors via the respective aquaculture operators. Contractors will report issues of concern to the aquaculture operator, who in turn will report on progress to the *DAFF*.

Key roles and responsibilities during the decommissioning phase with respect to the implementation of the EMPr are outlined below.

Roles and responsibilities relating to environmental monitoring are laid out in Section 7.1.

AMC *(with DAFF primarily responsible)*:

The AMC has oversight over environmental management at the ADZ. In terms of environmental management, the AMC will:

- Ensure that environmental monitoring is undertaken in line with the monitoring plan until decommissioning is complete;
- Make decisions based on the outcomes of environmental monitoring, which could lead to the recommendations about the decommissioning process;
- Settle disputes regarding the interpretation of requirements in the EMPr and EA;
- Receive and manage stakeholder comments;
- Record and, if necessary, coordinate a response to environmental incidents related to aquaculture operations during decommissioning;
- Provide information to the public (updated maps/coordinates, water quality information, notification when aquaculture operations cease); and
- Record and if necessary, respond to, environmental aquaculture-related incidents.

Aquaculture operators:

Individual aquaculture operators retain the overall responsibility for the management of decommissioning activities and the implementation of the EMPr. Operators are required to:

- Ensure that contractors are aware of and comply with the conditions of the EMPr;
- Ensure that staff are aware of and comply with the conditions of the EMPr;
- Ensure that aquaculture infrastructure is secure during decommissioning and removed completely;
- Report any incidents and initiate the emergency protocol if required; and
- Reports to the AMC when decommissioning is complete.

Contractors:

All contractors will be required to:

- Ensure that all employees are aware of and comply with the EMPr;
- Ensure that all activities on site are undertaken in accordance with the EMPr;
- Immediately notify the aquaculture operator of any non-compliance with the EMPr, or any other issues of environmental concern; and
- Ensure that non-compliance is remedied timeously and to the satisfaction of the *DAFF /* AMC.

6.2 Environmental Management Measures

The environmental management and mitigation measures that must be implemented during the decommissioning phase, as well as timelines for the implementation of these measures, are laid out below:

- Table 6-1 specifies farm-level measures that must be implemented by individual operators.

Environmental monitoring requirements during decommissioning are addressed in Section 7.

Table 6-1: Farm-level management and mitigation measures that must be implemented during decommissioning by individual operators

Farm-level Decommissioning Phase Measures				
Aspect	**ID**	**Mitigation measure / Procedure**	**Implementation Timeframe**	**Monitoring Methods**
Determine requirements	1.	Initiate consultation with the AMC before decommissioning to discuss potential decommissioning options, methods and requirements.	While preparing for decommissioning	Record of consultation with AMC
	2.	Determine other potential commercial uses for the plant equipment and infrastructure to be decommissioned.	While preparing for decommissioning	
	3.	Identify and assess any potential environmental and societal risks associated with the preferred method of decommissioning and implement mitigation to minimise risks.	While preparing for decommissioning	
	4.	Notify the AMC before decommissioning activities commence.	While preparing for decommissioning	Record of notification of AMC
Removal of aquaculture equipment	5.	Remove all aquaculture infrastructure and equipment and disposed of it appropriately.	Upon decommissioning	Visual inspection
	6.	Do not deposit any parts of the decommissioned infrastructure and equipment in the bay.	Upon decommissioning	Visual inspection
	7.	Ensure that no litter and debris reaches the marine environment during the removal of equipment, cleaning of infrastructure and general decommissioning activities.	Upon decommissioning	Visual inspection
	8.	In the event of equipment, litter and debris entering the sea, remove these as soon as possible.	Upon decommissioning	Visual inspection Reports of non-compliance
	9.	Train all staff in the effects of debris and litter in the marine environment and appropriate disposal procedures.	Before decommissioning	Training records
	10.	Aim to reuse or recycle decommissioned items.	Upon decommissioning	Disposal records
	11.	Collect recyclables separately and deliver these to suitable facilities or arrange for collection.	Upon decommissioning	Disposal records
	12.	Do not allow any burning or burying of waste on site.	Upon decommissioning	Visual inspection

7 Environmental Monitoring and Corrective Action

Monitoring is essential for the ADZ and will inform the phasing of aquaculture expansion in Saldanha Bay, maximum production that can sustainably be achieved in the ADZ and an adaptive management strategy to environmental management of the ADZ.

Monitoring will be undertaken at two levels:

- ADZ-level monitoring, implemented / coordinated by the *DAFF /* AMC, includes monitoring for wider spatial and cumulative impacts of farms, including monitoring further afield and at control sites, to determine the ADZ footprint and inform expansion of aquaculture within the approved limits / boundaries. In addition, monitoring for the ADZ EMPr would include studies of disease and parasites and genetic variability within wild stocks, and status of ecosystem indicators further afield (e.g. bird nesting success on islands, cetacean use of important feeding and breeding habitats, habitat use by fish, cetaceans and sharks via telemetry studies).

  Many of these programmes will need to and should be undertaken in collaboration with existing studies and monitoring programmes in Saldanha Bay, e.g. State of the Bay reporting. (Partial) funding for environmental monitoring may be sought from individual farm operators; and

- Farm-level monitoring must be implemented by individual operators and is specific to monitoring and record keeping of animal husbandry, stock health and feeding programmes, as well as water quality sampling within and adjacent to farms and, in the case of finfish farms, plans to deal with escapees and predators.

This monitoring plan applies to:

- All phases of the ADZ (which are likely to overlap throughout lifetime of the ADZ); and
- All farms under design, construction, operation or decommissioning within the Saldanha Bay ADZ.

Additional monitoring data may be collected outside of this EMPr framework:

- As part of other authorisations;
- In compliance with some form of code of practice;
- By regulatory authorities as part of enforcement; and
- By regulatory authorities as part of monitoring in the wider environment.

7.1 Roles and Responsibilities

The key role players during the construction phase of the project are anticipated as follows:

- AMC *(with DAFF primarily responsible)*;
- Aquaculture operators; and
- Specialists appointed / nominated to undertake environmental sampling and monitoring.

The DAFF retains the final responsibility with regards to the compliance of aquaculture operations with the EMPr and EA. *Some of the responsibility will be transferred to individual operators through permit and Right conditions, where applicable.* Individual operators also retain responsibility for undertaking any monitoring required at farm level and in terms of other authorisations.

All instructions relating to the service providers appointed to conduct sampling and monitoring on behalf of the AMC will only be given by the *DAFF /* AMC, and service providers will report directly to the *DAFF /* AMC.

Key roles and responsibilities relating to sampling and monitoring are outlined below.

AMC *(with DAFF primarily responsible)*:

The AMC has oversight over environmental management at the ADZ. In terms of environmental management, the AMC will:

- Ensure that environmental monitoring is undertaken in line with the EMPr and sampling / monitoring plans;
- Monitor ADZ aquaculture operators' compliance with the EMPr and EA conditions; and
- Monitor production volumes in the ADZ.

Aquaculture operators:

Individual aquaculture operators retain the overall responsibility for the management of their activities and the implementation of the EMPr. Operators are required to:

- Undertake all necessary farm-level monitoring required in terms of authorisations and/or for the sustainable operation of the farm;
- Record and monitor farm-related aspects as per this EMPr;
- Provide monthly Farm Monitoring Reports to the AMC; and
- Provide service provider(s) appointed by the AMC with access to farm areas and requested information.

Specialists:

Specialists appointed by *the DAFF and approved by* the AMC to conduct environmental sampling and monitoring will be required to:

- Conduct all sampling and monitoring in line with the requirements in the EMPr and specific plans;
- Provide an independent and impartial account of environmental conditions and compliance with the EMPr to the AMC; and
- Submit reports to the AMC as required by the EMPr and AMC.

7.2 Sampling Plan

The *DAFF* must appoint / nominate a suitably qualified specialist to compile a comprehensive Sampling Plan for the ADZ. The plan must clearly lay out:

- Sampling aspects (e.g. water column, seabed sediments);
- Sampling locations;
- Sampling methods and procedures;
- Sampling frequency;

- Parameters to be analysed;
- Applicable guideline limits for individual parameters; and
- "Trigger" limits for individual parameters, considering the existing conditions in Saldanha Bay based on historical measurements undertaken by the SBWQFT and other parties and applicable guidelines and standards.

Consider including the following aspects in the Sampling Plan:

- Water column monitoring at the following locations:
  - Within farms;
  - 50 m from farms; and
  - At control sites at least 10 km from the nearest farm structures;

  for parameters including:
    - Temperature;
    - pH;
    - Dissolved oxygen;
    - Ammonia;
    - Nitrite;
    - Dissolved oxygen levels;
    - Organic matter / suspended solids;
    - Dissolved trace minerals;
    - Copper leachate from antifouling paint;
    - Inorganic nitrogen;
    - Organic nitrogen and carbon;
    - Pathogenic microorganisms; and
    - Hydrocarbons;
    - Dissolved carbon;
    - Phosphorus;
    - Clorophyll a; and
    - Phytoplankton abundance and species composition;
- Seabed monitoring, including:
  - Monitoring beneath aquaculture infrastructure to assess the extent of deposition;
  - Benthic monitoring prior to aquaculture expansion to describe broad scale sediment characteristics and benthic macrofauna communities; and
  - Benthic monitoring during aquaculture operation near selected farms and at control sites, using grab sampling and/or diving and/or video and photographic methods, for:
    - Sediment physical and chemical characteristics (e.g. particle size, organic content, redox, pH, hydrogen sulphide concentration and concentration of any potentially harmful chemicals such as antifoulant constituents);
    - Infaunal and epifaunal macrobenthic communities; and
    - Presence of bacterial mats and black anoxic sediments;
- Relevant aspects of international standards and guidelines (such as Modelling – On growing fish farms – Monitoring (MOM) [see Appendix B] and Aquaculture Stewardship Council (ASC));
- Disease, parasites and genetic variability within wild stocks; and
- Ecosystem indicators further afield (e.g. bird nesting success on islands, cetacean use of important feeding and breeding habitats, habitat use by fish, cetaceans and sharks).

7.3 Reporting

Environmental monitoring reports are listed in Table 7-1.

Table 7-1: Monitoring reports required throughout the lifespan of the ADZ

Report	Frequency[2]	From	To
Farm Monitoring Report	Monthly	Operator	DAFF / AMC
Environmental Sampling Report	Quarterly	Appointed service provider	DAFF / AMC
EMPr Compliance Report	Quarterly	Appointed service provider	DAFF / AMC
EA and EMPr Compliance Audit	As indicated in the EA	Independent person	DEA

7.3.1 Farm Monitoring Report

Individual aquaculture operators must submit monthly Farm Monitoring Reports to the *DAFF* including at a minimum the following information:

- Species farmed;
- Farming methods (equipment, feeds, stock volume, production cycle etc);
- Maintenance activities (equipment, stock health etc);
- Staff (number, skill level, origin etc);
- Issues encountered (e.g. disease, pollution events, damage, dislodging of infrastructure, collisions); and
- Sighting of marine animals (mammals, birds, sharks, etc.).

A pro forma report template for the Farm Monitoring Report is attached in Appendix A, although a suitable template format should be agreed between the AMC and Operator.

7.3.2 Environmental Sampling Report

A suitably qualified specialist must submit quarterly Environmental Sampling Reports to the *DAFF and* AMC. The frequency of report submission can be amended by the AMC after 1 year. Reports must include at a minimum the following information:

- Sampling / monitoring activities undertaken in reporting period;
- Sampling / monitoring results;
- Key trends; and
- Items of concern.

7.3.3 EMPr Compliance Report

A suitably qualified specialist must submit quarterly EMPr Compliance Reports to the *DAFF and* AMC. The frequency of report submission can be amended by the AMC after 1 year. Reports must include at a minimum the following information:

- Monitoring / audit activities undertaken in reporting period;
- Overall compliance with the EMPr across the ADZ;
- Key aspects of non-compliance; and

[2] or as amended by the AMC

- Operators where non-compliance was identified.

7.3.4 EA and EMPr Compliance Audit Report

In accordance with Section 34 of the EIA Regulations, 2014, compliance with the conditions of the EA and the EMPr must be audited by an independent person at intervals indicated in the EA. Audit reports must be submitted to the relevant competent authority. Environmental audit reports must comply with the specifications in Section 34 and Appendix 7 of the EIA Regulations, 2014.

7.4 Corrective Action

Corrective action is a critical component of the implementation–review–corrective action–implementation cycle and it is through corrective action that continuous improvement can be achieved. Where repeated non-compliance is recorded, procedures may need to be altered accordingly to avoid the need for repeated corrective action.

If environmental compliance monitoring indicates non-conformance with the EMPr, the *DAFF* will formally notify the operator through a Corrective Action Request. The Corrective Action Request documents:

- The nature of the non-conformance / environmental damage;
- The actions or outcomes required to correct the situation; and
- The date by which each corrective or preventive action must be completed.

Upon receipt of the Corrective Action Request, the aquaculture operator will be required to report in the Farm Monitoring Report how the required actions were implemented and success or failure of the corrective action.

Should proposed standards or targets be regularly exceeded, an independent committee or service provider should investigate and objectively assess the effectiveness of mitigation measures. If effective mitigation cannot be implemented, stocked biomass should be reduced until targets are consistently achieved.

7.5 Monitoring Measures

The monitoring measures that must be implemented for the ADZ, as well as timelines for the implementation of these measures, are laid out below:

- Table 7-2 specifies ADZ-level measures that must be implemented by the *DAFF /* AMC; and
- Table 7-3 specifies farm-level measures that must be implemented by individual operators.

A timeline for initial ADZ monitoring and sampling steps is provided in Figure 7-1.

Table 7-2: ADZ-level monitoring requirements that must be implemented by the *DAFF*

ADZ-level Monitoring Measures				
Aspect	**ID**	**Monitoring measure**	**Timeline**	**Standard / target**
General	1.	Ensure that the aquaculture industry association in Saldanha Bay designates an individual to monitor the shoreline of the Bay weekly for any aquaculture equipment washed ashore. The frequency of monitoring can be reduced after 6 months with the approval of the AMC if incidents of equipment washing ashore are very limited.	Within 1 months of establishment of the ADZ	Appointment and Terms of Reference
	2.	Ensure that the shoreline of the bay is monitored for any aquaculture equipment washed ashore.	Weekly monitoring Frequency can be amended by the AMC after 6 months.	Any debris is quickly removed, and owner is notified.
	3.	Appoint / nominate a suitably qualified specialist to compile a comprehensive Sampling Plan for the ADZ and present the Sampling Plan to the AMC and consultative forum for review.	Within 6 months of establishment of the ADZ Sampling Plan to be compiled within 2 months of appointment of service provider.	Appointment and Terms of Reference Sampling Plan includes appropriate parameters and is (cost) effective and efficient
	4.	Ensure that a suitably qualified specialist conducts sampling and sample analysis in line with the Sampling Plan.	Initiate sampling within 2 month of completion and approval of the Sampling Plan	Good understanding of aquaculture impact on bay, to inform phased implementation of aquaculture
	5.	Appoint a suitably qualified specialist to monitor / audit compliance of aquaculture operators with specifications in the EMPr.	Within 6 months of establishment of the ADZ	Appointment and Terms of Reference
	6.	Ensure that a suitably qualified specialist monitors / audits compliance of aquaculture operators with specifications in the EMPr and submits EMPr Compliance Reports.	Audits to be undertaken at least quarterly initially. Frequency can be amended by the AMC after 1 year.	Compliance of aquaculture activities with EMPr
	7.	Support ongoing State of the Bay monitoring and aim to include parameters that are also relevant to monitoring potential impacts of aquaculture and respective baselines.	Throughout the lifespan of the ADZ	Complementary monitoring and reporting
	8.	Review and interpret results of environmental monitoring in Saldanha Bay and make decisions based on the outcomes of environmental monitoring, which could lead to the amendment of operations within the authorised limits.	At least quarterly Throughout the lifespan of the ADZ	Expansion / phasing in of activities does not compromise marine ecology of the bay
	9.	Develop effective protocols to report on stocking densities, mortalities, graded and ungraded production, biofouling discards.	Throughout the lifespan of the ADZ	Data to be used in ADZ management

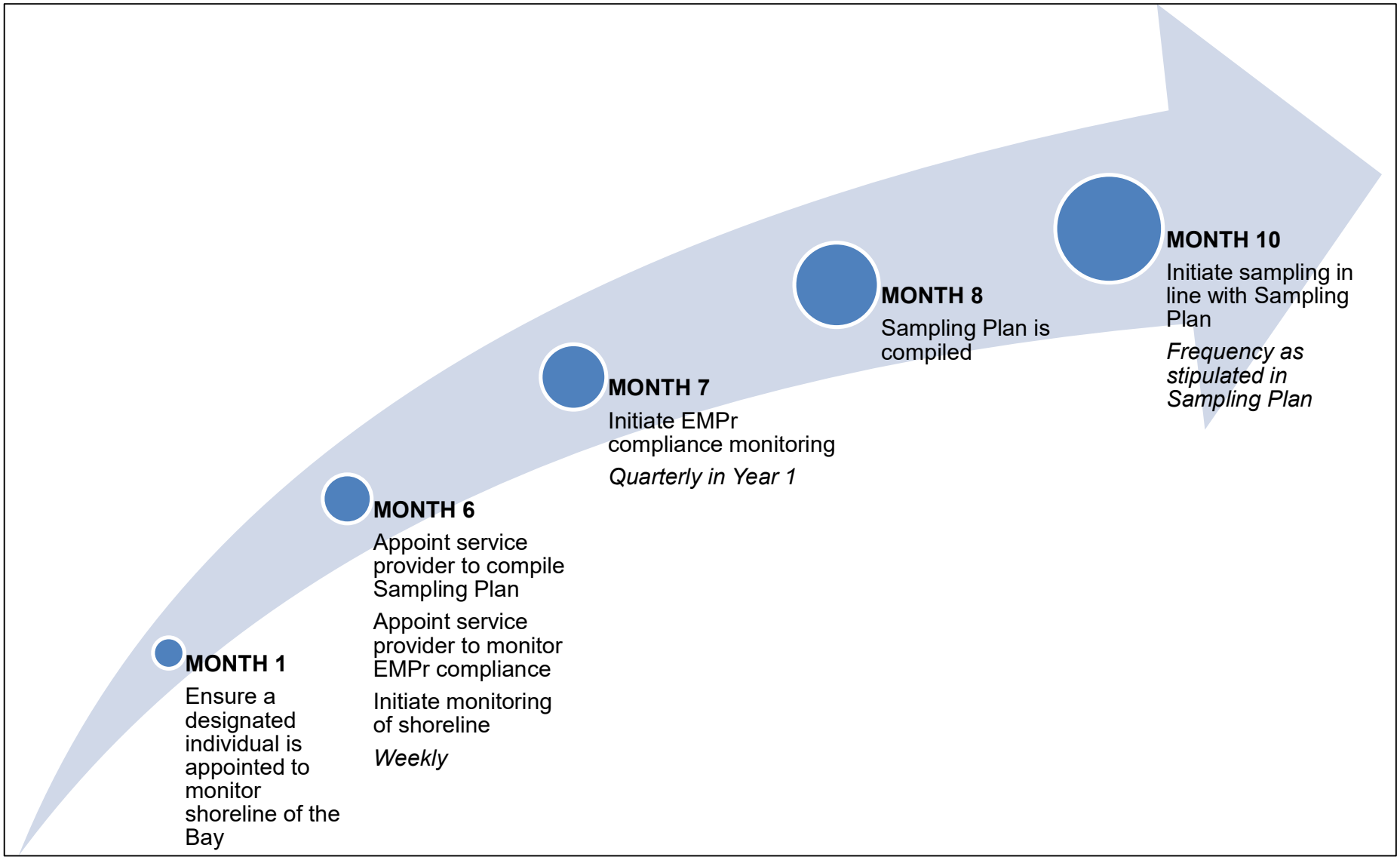


Figure 7-1: Timeline for initial implementation of monitoring at the ADZ

Table 7-3: Farm-level monitoring requirements that must be implemented by individual operators

Farm-level Monitoring Measures				
Aspect	**ID**	**Monitoring measure**	**Frequency**	**Standard / target**
Equipment	1.	Establish an effective monitoring protocol to ensure that longline / raft / net integrity and supporting infrastructure are maintained. Ensure that: - Primary longline / raft / net is secured appropriately so that it is kept taut and rigid at all times. Nets of fish cages should be weighted; - Ropes and anchor lines are taut, especially after rough seas; - Ropes are routinely inspected for wear, especially after rough conditions, and replaced as and when required; and - There is adequate separation between rafts and longlines, even during strong currents and rough seas; *or* - There is adequate separation between the primary and secondary nets of fish cages, even during strong currents and rough seas.	Surface infrastructure: Daily Subsurface infrastructure: Weekly and after storm events	Zero system failure resulting in loss of farm structure integrity. Fewer than 10 entanglements of any species per year and zero mortalities.
	2.	Maintain a comprehensive and detailed register of the quantities of chemicals, antibiotics, antifoulants and hormones etc. that are utilised.	Throughout operations	All substances are accounted for.
Water quality	3.	Monitor water quality and sediment quality as required for operations and/or by other authorisations.	Throughout operations	Produce is suitable for human consumption.
Biosecurity	4.	Establish a traceability protocol of the cultured finfish / shellfish and its products.	Continuous as required by marine compliance officers, at processing, distribution and retail outlets.	100% traceability of cultured fish product
	5.	Develop and implement a stock health monitoring programme, including regularly inspecting stock for disease and parasites, in collaboration with DAFF.	Throughout ADZ	Stock is free of disease and parasites.
	6.	Ensure that facilities are inspected by an aquaculture veterinarian to allow for monitoring of the health status of cultured stock.	Every two years	Overall health of stock should be of a suitable quality to promote and ensure efficient growth rates of particular species being cultured
Fish farming	7.	Monitor culture-fish mortalities to ensure dead fish are quickly removed, to minimise contamination and fluxes in waste production.	Daily	Zero mortalities left in cages for a period exceeding 24 hours.
	8.	Monitoring feed input and uptake to ensure feed waste is limited (i.e. prevent overfeeding by maximising the feed conversion ratio of cultured fish).	Daily	Achieve Food Conversion Ratio of 1.2 or better.
	9.	Develop and implement a protocol to monitor escapes from finfish farms.	Daily	Target = Zero escapees. AMC to decide on standard.
	10.	Adopt the MOM management system (or similar) for monitoring.	Throughout operations	

Farm-level Monitoring Measures				
Aspect	**ID**	**Monitoring measure**	**Frequency**	**Standard / target**
	11.	Ensure adequate genetic monitoring of brood stock rotation.	Throughout operations	No inbreeding / genetic interference.
Marine animals	12.	Keep a log of all cetaceans, seabirds and predators recorded in the vicinity of fish farms, including behavioural observations. These data should be periodically compiled and analysed by experts.	Daily	Behaviour is not significantly altered to the detriment of the species.
	13.	If predator deterrents are used, closely monitor cetacean, seal, shark and seabird behaviour.	Daily	Zero predation of cultured stock. Zero cases of physical harm to any predator caused by deterrents.
	14.	Record all marine vertebrate mortalities resulting either directly or indirectly from aquaculture operations. Where appropriate modify equipment and/or implement other measures to reduce mortalities.	Daily	Target = zero mortalities. Acceptable level to be determined by EMPr advisory committee

Prepared by

Sue Reuther

Principal Environmental Consultant

Reviewed by

Chris Dalgliesh

Partner

Appendix A:

Farm Monitoring Report Pro Forma

FARM MONITORING REPORT – PRO FORMA TEMPLATE

FARM: …….. **DATE:** ……

REPORTING PERIOD:	Start Date:	End Date:

AREA (Provide coordinates of outer boundaries of actively farmed area):

-

SPECIES CURRENTLY FARMED:

-

PRODUCTION METHOD(S) (number of rafts, longlines, cages, feed, stock volume, production cycle):

-
-

MAINTENANCE ACTIVITIES (equipment repairs and maintenance, health checks, treatments etc):

-
-

STAFF (number, skill level, origin):

-
-

ISSUES ENCOUNTERED (e.g. disease, pollution events, damage, dislodging of infrastructure, collisions. Provide outcome of issues, where possible):

-
-
-
-
-

SIGHTING OF MARINE ANIMALS (e.g. mammals, birds, sharks, etc.; frequency, location, behaviour):

-
-
-
-
-

Appendix B:

Summary of MOM Sampling Requirements

SUMMARY OF MOM SAMPLING REQUIREMENTS

The MOM monitoring system is focussed on three impact zones relative to the farm. These can be assigned as follows:

- Local - under and close to the farm.
- Intermediate – main area of sedimentation of smaller organic particles. Will depend on hydrodynamics of site and nature of particles. Generally 30 to 50 m downstream from the farm.
- Regional/far-field – greater distances from the farm potentially influenced by dissolved nutrients of farmed origin. Difficult to specify a distance, but 500 m could be an appropriate initial estimate.

A-Investigation

Provides an estimate of organic output from the farm as faeces and uneaten feed. The volume of particulates collected in a sediment trap(s) under the cages are measured twice a month (not every 3 months as the MOM manual seems to indicate).

B-Investigation

Comprises the main component of the monitoring programme and is aimed at the local impact zone. Samples are taken with a grab or core (diver) or diameter of 0.02 m^2 (200 cm^2)

Initial survey

During the first survey at a site the seafloor under the fish farm is mapped by taking 15-20 grab samples evenly spread out over the area occupied by the farm and the bottom substratum and water depth is noted. This is not a full B-investigation requirement in the MOM manual but it would be prudent to perform the more detailed analysis.

On-farm monitoring

A full B-Investigation of the three classes of parameters comprising fauna, pH/redox and qualitative physical measures are taken at a frequency dependant on the Environmental Condition at the site. Site condition is determined from the initial C-investigation.

C-Investigation

Establishes conditions along a transect from the site, through an intermediate impact zone to the far-field or regional impact zone. Such transect should be orientated with the predominant current direction (Note this will not necessarily align with surface currents). The C-investigation is aimed at detecting long-term changes in the broader environmental setting.

Site Classification

Prior to stocking or soon thereafter, 2-3 samples are taken at the farm site for detailed faunal analysis. Sample area should be at least 0.2 m^2 (note larger area requirement than for B-Investigation) and should penetrate to at least 10 cm depth. This will most likely involve compositing smaller samples depending on the sampling gear. These data are used to establish the initial Environmental Condition at the site (Paragraph 7.7 of MOM).

Repeat sampling

The MOM manual recommends a comparative survey 4 years after establishment of the farm. Parameters measured encompass faunal, chemical and physical characteristics. Two samples (0.2 m^2 area, 10 cm depth) are taken at each of the local impact zone (farm), intermediate zone and far-field.

These sampling points should be assigned as fixed monitoring points if farm continues production.

SRK Report Distribution Record

Report No.	499020 / 6
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	This report is being distributed as an annexure to the BAR, and as such to the same stakeholders as that report.			

Approval Signature:

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The Department of Environment, Forestry and Fisheries
473 Steve Biko & Soutpansberg Roads,
Arcadia, Pretoria,
0083
Private Bag X447,
Pretoria, 0001
25 September 2020

For Attention:

Ms Barbara Creecy (Minister of Environment, Forestry and Fisheries)
Ms Maggie Sotyu (Deputy Minister of Environment, Forestry and Fisheries)

Ms Nosipho Ngcaba (Director General: Environment, Forestry and Fisheries)

Mr Ishaam Abader (Deputy Director General: Legal, Authorisation and Compliance and Enforcement)
Ms Judy Beaumont (Deputy Director General: Oceans and Coasts)
Mr Shonisani Munzhedzi (Deputy Director General: Biodiversity and Conservation)

Dear Madam / Sir

Re: New scientific information concerning current operations of aquaculture facilities in the Saldanha Bay Aquaculture Development Zone

Introduction

On behalf of the Save Langebaan Lagoon Action Group, I bring the following to your attention and request an urgent response thereto.

Save Langebaan Lagoon (SLL) is a registered Voluntary Association, duly constituted under the

Non-Profit Organisations Act, 71 of 1997, and has a current membership of 1478 registered I&APs.

SLL was formed to educate the public regarding the impacts of the aquaculture development zone on the Langebaan Lagoon and the greater Saldanha Bay marine system, the quality of and access to its waters and the socio-economic prosperity of Langebaan.

Further, SLL's role is to represent I&APs in interactions with the developers/proponents, their agents and the Competent Authorities.

Supportive documentation attached to this letter

Annex 1: *"Saldanha Bay Sea Based Aquaculture Development Zone Baseline Benthic Survey – Final Presentation."*

Annex 2: *"Saldanha Bay Sea Based Aquaculture Development Zone Baseline Benthic Survey Report – Final Draft."*

Annex 3: Management Actions 2020 scientific findings – Final.

Annex 4: Environmental Authorisation 14/12/16/3/3/1/1728.

Annex 5: Environmental Management Programme (Number 499020/6).

Please note: Page numbers referenced in the footnotes of this letter align with the page numbers of the PDF files attached.

Background

The Baseline Benthic Survey was commissioned in 2020 by the Department of Environment, Forestry and Fisheries (DEFF), Branch Fisheries, the holder of an Environmental Authorisation for the Saldanha Bay Aquaculture Development Zone (ADZ), and conducted by Anchor Research and Monitoring.

The new findings of the above survey indicate that the Saldanha Bay Aquaculture Development Zone (ADZ) presents an untenable risk to the receiving environment of the Big Bay precinct of Saldanha Bay, for which no mitigations were submitted in the Basic Assessment Report, in application for environmental authorisation.

This research was conducted post the granting of the environmental authorization, Annex 4, no impact mitigations to avoid/reduce harm to the sensitive reef ecosystems were investigated, nor has a programme to contain/reduce such impact been set out in the approved Environmental Management Programme (Number 499020/6) for the ADZ, Annex 5.

Below, please find relevant extracts from the Saldanha Bay ADZ Baseline Benthic Survey Presentation (Annex 1), in support of our contention that these new findings show conclusively that the ADZ presents an immitigable risk to this marine eco-system.

Statement of Concerns

1. ***Results and Discussion: Presence of hard substrata/reef in Big Bay*** [1]

   i. The marine specialist report for the Saldanha ADZ EIA considered subtidal reef habitat to be scarce in Saldanha Bay (Pulfrich 2018).[2]

   ii. Only identified Lynch blinder and North Bay blinder as important reef areas. [3]

   iii. Reports from divers during this assessment revealed the presence of calcrete rock at several sampling sites during the baseline survey (Capfish 2019). [4]

   iv. Difficulties in obtaining grab samples at several stations in Big Bay during 2020 (AR&M) sediment surveys also suggests that rock which may form reef is more widespread in Big Bay than originally suspected. [5]

   v. Observations by ARM divers deploying water quality monitoring instruments during April 2020, also indicated reef in several areas of the Big Bay ADZ precinct.[6]

   vi. Subsequent literature review revealed the existence of an extensive abrasion platform (areas of exposed calcrete rock) throughout much of Big Bay (Flemming 2015).[7]

   vii. The distribution of the abrasion platform is overlaid on a map of Big Bay and the ADZ boundaries as well as the sampling sites on the following slide.[8]

   viii. Pictures of the rock/reef type habitat found in the finfish area were taken during instrument servicing in the finfish area on the 29th of June 2020. These images were taken in extremely poor visibility but indicate the presence of basket stars (Phylum Echinodermata), sponges (Phylum Porifera) and possibly Bryozoans. Before conclusions can be drawn about the nature of the communities, specimens would need to be collected and identified.[9]

2. ***Presence of hard substrata/reef in Big Bay /Recommendations*** [10]

   i. Given the presence of low-lying reef detected during the baseline surveys and instrument deployments in the finfish area in Big Bay, it is recommended that a side scan sonar survey be undertaken across the whole of Big Bay to establish the actual extent of this reef and that reef biota be surveyed.[11]

   ii. Once the extent and nature of the reef and associated benthic communities have been assessed and quantified, the management measures, mitigation measures and monitoring measures should be reassessed.[12]

[1] Annex 1 – page 17
[2] Annex 1 – page 17
[3] Annex 1 – page 17
[4] Annex 1 – page 17
[5] Annex 1 – page 17
[6] Annex 1 – page 17
[7] Annex 1 – page 17
[8] Annex 1 – page 17
[9] Annex 1 – page 21
[10] Annex 1 – page 24
[11] Annex 1 – page 24
[12] Annex 1- page 24

iii. West Coast Rock Lobster (Jasus Lalandi) are evident in the video footage recorded from the Molapong dives was and were noted by AR&M divers deploying instruments.[13]

iv. While Rock Lobster would benefit from increased organic matter originating from the aquaculture as a food source, their habitat may ultimately become smothered by fall off biofouling and culture animals.[14]

3. Conclusions/ Presence of hard substrata and reef in the big bay precinct [15]

i. The presence of hard substrata and low lying reef (besides that identified at Lynch Blinder) within the Big Bay ADZ precinct has been highlighted for the first time. [16]

ii. The reef appears to be low-profile that is mostly < 1m in height, although some outcrops greater than 1 m in height are present.[17]

iii. The extent and nature of the reef needs to be quantified throughout Big Bay which is frequently impacted by scouring and sand deposition.[18]

iv. The nature of the macro-faunal/epifaunal assemblages associated with the reef needs to be quantified.[19]

v. Once the above aspects are completed, the impacts of aquaculture in the Big Bay precinct in light of there being reef present should be re-assessed. [20]

4. Extract from the "Saldanha Bay ADZ Baseline Benthic Survey Report – Final Draft, (Annex 2), in support of the contention that the ADZ poses an immitigable threat to this marine eco-system.

"The impact assessment for bivalve aquaculture did not assess the impact of placing the culture structures over hard substrata (SRK BAR 2017, appendix D2), and while the impact assessment for finfish culture does consider the presence of reef, it assumed limited distribution which was confined to Lynch Blinder (SRK BAR 2017, appendix D2). The effects of aquaculture on patches of low-lying reef with some substantial outcrops exceeding 1m in height and their associated epifaunal communities has thus not been considered in the Big Bay precinct beyond Lynch Blinder. Given the identification of reef in this precinct further studies should be conducted to address this omission. It is important to note that this is **ONLY** applicable to areas of the Big Bay precinct (not the ADZ as a whole) where reef occurs (the present day extent of reef in Big Bay is yet to be determined and a detailed bathymetry/side scan sonar survey should be undertaken)." [21]

[13] Annex 1 – page 22
[14] Annex 1 – page 22
[15] Annex 1 – page 27
[16] Annex 1 – page 27
[17] Annex 1 – page 27
[18] Annex 1 – page 27
[19] Annex 1 – page 27
[20] Annex 1 – page 27
[21] Annex 2 – page 40

5. ***Annex 3 refers: "Preliminary way forward with regards to scientific findings to be undertaken forward by the DEFF: Fisheries Management", published in Management Actions 2020 scientific findings, as communicated to the members of the ADZ Consultative Forum.***

   In consideration of the findings identified in the Benthic Survey Presentation and Report, Save Langebaan Lagoon Action Group therefore avers that the recommendations by DEFF in Annex 3 are inadequate and/or inappropriate, in addition to lacking the necessary sense of urgency to meaningfully address these additional ecological risks to the receiving environment. [22]

6. ***In addition to the above, please clarify:***

i. Why the Flemming report/side scan sonar report as mentioned in the Benthic Survey was not included in the environmental impact assessment studies conducted as part of the Final Basic Assessment Report?

ii. Why no investigation was conducted by DEFF regarding the presence of a reef as identified by Pulfrich (2018)?

We therefore request that the concerns raised and the gaps in knowledge identified by Anchor Research and Monitoring in the Benthic Survey Presentation and Report be addressed immediately by DEFF.

Further, we request independent oversight of the steps to be taken to ameliorate such risk and that all interested and affected parties are comprehensively apprised of such action.

The Benthic Survey Presentation and Report raise numerous critically important questions regarding the impact of aquaculture on the habitats of these rocky outcrops, including the health of the rock lobster population, and the dispersion of pollutants, issues germane to assessment of the risk of ecological harm posed by the ADZ and the type and efficacy of mitigation measures.

In conclusion:

We submit that the omission of a comprehensive assessment of the sea-bed in the area of the sited ADZ in the final basic assessment report must render the Environmental Authorisation granted fatally and technically flawed. Mitigations submitted in the final BAR are incomplete or lacking and therefore should not have been relied upon by the Minister of Environmental Affairs to inform a positive authorisation.

We therefore call on DEFF to immediately suspend the current Saldanha Bay ADZ operations until these critical deficiencies of the approved Environmental Management Programme for the ADZ have been comprehensively addressed.

We respectfully request that DEFF responds with a proposed plan of action with regard to this matter by Friday 9th October 2020

[22] Annex 3

Yours sincerely

Clifford Wright

Chairperson: Save Langebaan Lagoon Action Group

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EXECUTIVE SUMMARY: FINAL BASIC ASSESSMENT REPORT
BA PROCESS FOR A PROPOSED SEA-BASED AQUACULTURE DEVELOPMENT ZONE IN SALDANHA BAY

SRK Project Number: 499020 DEA Project Number: 14/12/16/3/3/1/1728 *August* 2017

1 INTRODUCTION

The Department of Agriculture, Forestry and Fisheries (DAFF) aims to develop and facilitate aquaculture (the sea-based or land-based rearing of aquatic animals or the cultivation of aquatic plants for food) in South Africa to supply food, create jobs in marginalised coastal communities and contribute to national income.

Saldanha Bay is a highly productive marine environment and has an established aquaculture industry, with potential for growth.

Operation Phakisa was launched in 2014 to unlock the economic potential of South Africa's oceans through innovative programmes that bring together many stakeholders to plan major economic projects. Aquaculture was identified as a key priority of Operation Phakisa, as it is considered a sustainable strategy to contribute to job creation and South African Gross Domestic Product. Operation Phakisa has triggered increased interest in starting new aquaculture projects and expanding existing projects within Saldanha Bay.

DAFF proposes to establish a sea-based Aquaculture Development Zone (ADZ) in Saldanha Bay, Western Cape to encourage investor and consumer confidence, create incentives for industry development, provide marine aquaculture services, manage the risks associated with aquaculture and provide skills development and employment for coastal communities.

SRK Consulting (Pty) Ltd (SRK) has been appointed as the independent consultant to undertake the Environmental Impact Assessment (EIA) process required in terms of the National Environmental Management Act 107 of 1998, as amended (NEMA) and the EIA Regulations, 2014.

Figure 1: (Partial) View of Saldanha Bay

Note: *In response to stakeholder comments on the Final BAR, released 19 May – 19 June 2017, some minor changes were made to the Final BAR for submission to DEA vis-a-vis the Final BAR released for stakeholder comment; these are italicised and underlined for easier reference.*

2 GOVERNANCE FRAMEWORK

Sections 24 and 44 of NEMA make provision for the promulgation of regulations that identify activities which may not commence without an Environmental Authorisation (EA) issued by the competent authority, in this case, the national Department of Environmental Affairs (DEA). The Environmental Impact Assessment (EIA) Regulations, 2014 (Government Notice (GN) R982, which came into effect on 8 December 2014), promulgated in terms of NEMA, as amended by GN R326 of 2017, govern the process, methodologies and requirements for the undertaking of EIAs in support of EA applications. The EIA Regulations are accompanied by Listing Notices (LN) 1-3 that list activities that require EA.

The EIA Regulations, 2014 lay out two alternative authorisation processes. Depending on the type of activity that is proposed, either a Basic Assessment (BA) process or a Scoping and Environmental Impact Reporting (S&EIR) process is required to obtain EA. LN 1 lists activities that require a BA process, while LN 2 lists activities that require S&EIR. LN 3 lists activities in certain sensitive geographic areas that require a BA.

SRK has determined that the proposed project triggers activities listed in terms of LN 1 of the EIA Regulations, 2014, requiring a BA.

Table 1: Listed activities triggered by the project

No	Description *(abbreviated)*
LN 1 (requiring BA)	
7	The development and related operation of facilities, infrastructure or structures for aquaculture of sea-based cage culture of finfish, molluscs and aquatic plants of more than 50 000 kg per annum.
17	Development in the sea in respect of infrastructure and structures with a development footprint of 50 m^2 or more.
19 A	The infilling or depositing of any material of more than 5 m^3 into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 m^3 from the sea.
42	The expansion and related operation of facilities, infrastructure or structures for aquaculture of sea-based cage culture of finfish, molluscs and aquatic plants with an increase of more than 50 000 kg per annum.
54	Expansion of facilities in the sea in respect of infrastructure and structures with a development footprint of 50 m^2 or more.

3 ENVIRONMENTAL PROCESS

The EIA Regulations, 2014 define the detailed approach to the BA process. *The BA process followed for the Saldanha ADZ BA process is provided in Figure 2.*

The objectives of the BA process are to:

- Identify relevant authorities and key stakeholders to engage in the stakeholder engagement process;
- Facilitate the dissemination of information to the relevant authorities and stakeholders and provide them with an opportunity to raise issues or concerns related to the project;
- Identify potential issues and environmental impacts;
- Assess the significance of the potential environmental impacts identified;
- Describe and investigate alternatives that have been and / or could be considered; and
- Provide feasible mitigation measures to address any significant impacts identified.

The above objectives are achieved through the technical evaluation of the proposed activity, the undertaking of the stakeholder engagement process and the submission of the relevant information and documentation to DEA.

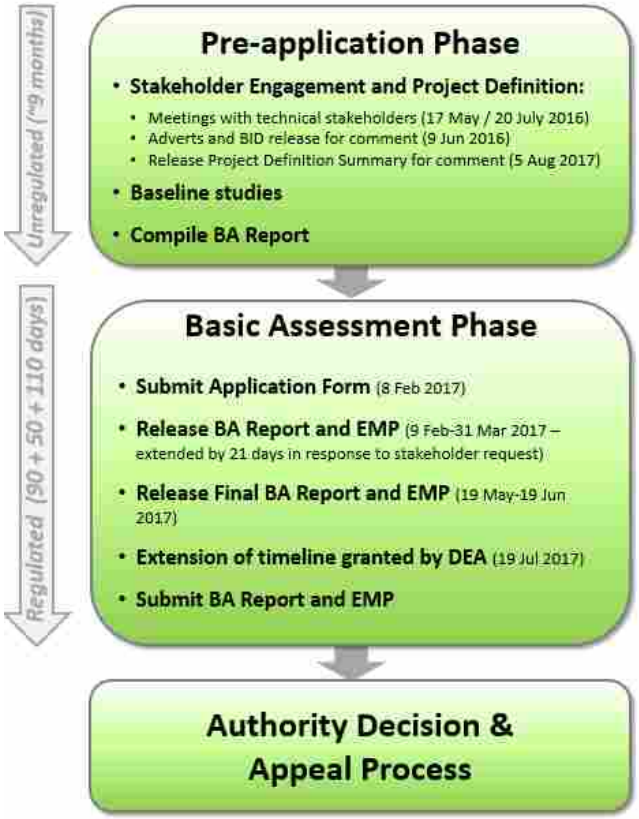

Figure 2: Saldanha ADZ BA Process

4 OVERVIEW OF THE SITE AND ENVIRONMENT

Saldanha Bay is located on the semi-arid West Coast of South Africa, in the Western Cape, approximately 120 km north of Cape Town. The Port of Saldanha is the main iron ore export terminal in South Africa. A number of other vessel types, primarily oil tankers, also frequent the port.

Saldanha Bay supports many economic activities. An aquaculture industry (mostly mussels and oysters) has been established in Saldanha Bay for decades (see Figure 3). Fishing is also a historically important activity and a number of fish processing plants are located in Saldanha.

Figure 3: Existing aquaculture in Small Bay

Tourism is an important income source in the area. Numerous recreational activities attracting tourists are water-based and take place in Saldanha Bay and Langebaan Lagoon (e.g. sailing, kiting, kayaking and recreational fishing).

The Port of Saldanha is South Africa's premier iron ore export port and also supports a number of industrial operations in the area, including the ArcelorMittal steel plant and Tronox smelter. The Saldanha Bay Industrial Development Zone (SBIDZ) has been established at the back of the Port and aims to provide services to the oil and gas sector and marine repair cluster.

Saldanha Bay falls within the Cape West Coast Biosphere Reserve. Langebaan Lagoon, located south of and connected to Saldanha Bay, has been declared a RAMSAR wetland of international importance. Langebaan Lagoon, as well as a number of islands in Saldanha Bay, form part of the West Coast National Park located south of Saldanha Bay. Freshwater is scarce and the marine environment is regarded as sensitive.

Saldanha Bay is regularly monitored as part of the State of the Bay reporting. The 2016 report concludes that developments in Saldanha Bay and Langebaan Lagoon during the past 30 years have inevitably impacted on the environment. Long-term decreases in populations of fish (e.g. white stumpnose) and many bird species most likely reflect long-term changes in exploitation levels (fish), habitat quality (sediment and water quality and increasing levels of disturbance) and important forage species (e.g. benthic macrofauna). Recent improvements in some of these underlying indicators (e.g. sediment quality and macrofauna abundance and composition) are encouraging and will hopefully translate into improvements in the higher order taxa as well. Considerable work remains to be done in maintaining and restoring the health of the Bay, especially in respect of the large volumes of effluent that are discharged to the Bay, very little of which is compliant with the existing effluent quality standards.

5 PROJECT DESCRIPTION

Saldanha Bay presently supports a number of aquaculture operations, mostly mussel and oyster farms. Research has determined that the Bay can support additional aquaculture production. To facilitate investment and development of additional aquaculture in the Bay, DAFF proposes to establish and obtain EA for an ADZ in Saldanha Bay for sea-based aquaculture.

Potentially suitable areas for aquaculture were identified based on oceanographic conditions such as depth, waves and swell. Aspects such as nutrients and dissolved oxygen in any one area were not taken into account in the selection of areas, but will have to be considered by prospective farmers in relation to individual operations.

The potential **ADZ areas that were (originally) assessed in the BA** process comprise five precincts, totalling 1 404 ha of **new** aquaculture areas in Saldanha Bay for a total ADZ comprising 1 872 ha (see Table 2, Figure 4)[1]:

[1] *Please see Section 9 for the **recommended** post-mitigation scenario for the ADZ, with a reduction of ~70% in proposed new ADZ areas and phased introduction of aquaculture.*

- Small Bay: no additional aquaculture areas are proposed (though allocated areas are not fully utilized);
- Big Bay North: north of Mykonos entrance channel;
- Big Bay South: south of Mykonos entrance channel – two alternative layouts are proposed for this area;
- Outer Bay North: north of Port entrance channel, near Malgas Island; and
- Outer Bay South: south of Port entrance channel, near Jutten Island.

Currently farmed areas will be incorporated into the ADZ.

Table 2: ADZ precincts originally assessed in the BA

Precinct	Currently allocated	Currently farmed	New areas	Total future
Small Bay	163	125	-	163
Big Bay North	254	25	271	525
Big Bay South	4	1	517	521
Outer Bay North	37	1	299	336
Outer Bay South	10	-	317	327
Total	**468**	**152**	**1 404**	**1 872**

The following **species** are considered for the ADZ:

- Currently cultivated bivalve species:
  - Pacific oyster *(Crassostrea gigas)*
  - Mediterranean mussel *(Mytilus galloprovincialis)*
  - Black mussel *(Choromytilus meridionalis)*
- Indigenous shellfish species not currently cultivated:
  - Abalone *(Haliotis midae)*
  - South African scallop *(Pecten sulcicostatus)*
- Indigenous finfish species:
  - White Stumpnose *(Rhabdosargus globiceps)*
  - Silver Kob *(Argyrosomus inodorus)*
  - Yellowtail *(Seriola lalandi)*
- Alien finfish species:
  - Atlantic salmon *(Salmo salar)*
  - Coho salmon *(Oncorhynchus kisutch)*
  - King/Chinook salmon *(Oncorhynchus tshawytscha)*
  - Rainbow trout *(Oncorhynchus mykiss)*
  - Brown trout (Salmo trutta)
- Seaweed:
  - *Gracilaria gracilis*

The following **production methods** are considered most viable for farming in the ADZ:

- Longlines for bivalve culture (and abalone barrels);
- Rafts for bivalve culture (and abalone barrels); and
- Cages for finfish production.

The ADZ **bivalve production volumes** assessed in the BA were determined based on:

- Estimated ecological carrying capacity for bivalves;
- Discussion with industry and industry proposals submitted to DAFF for fish farming.

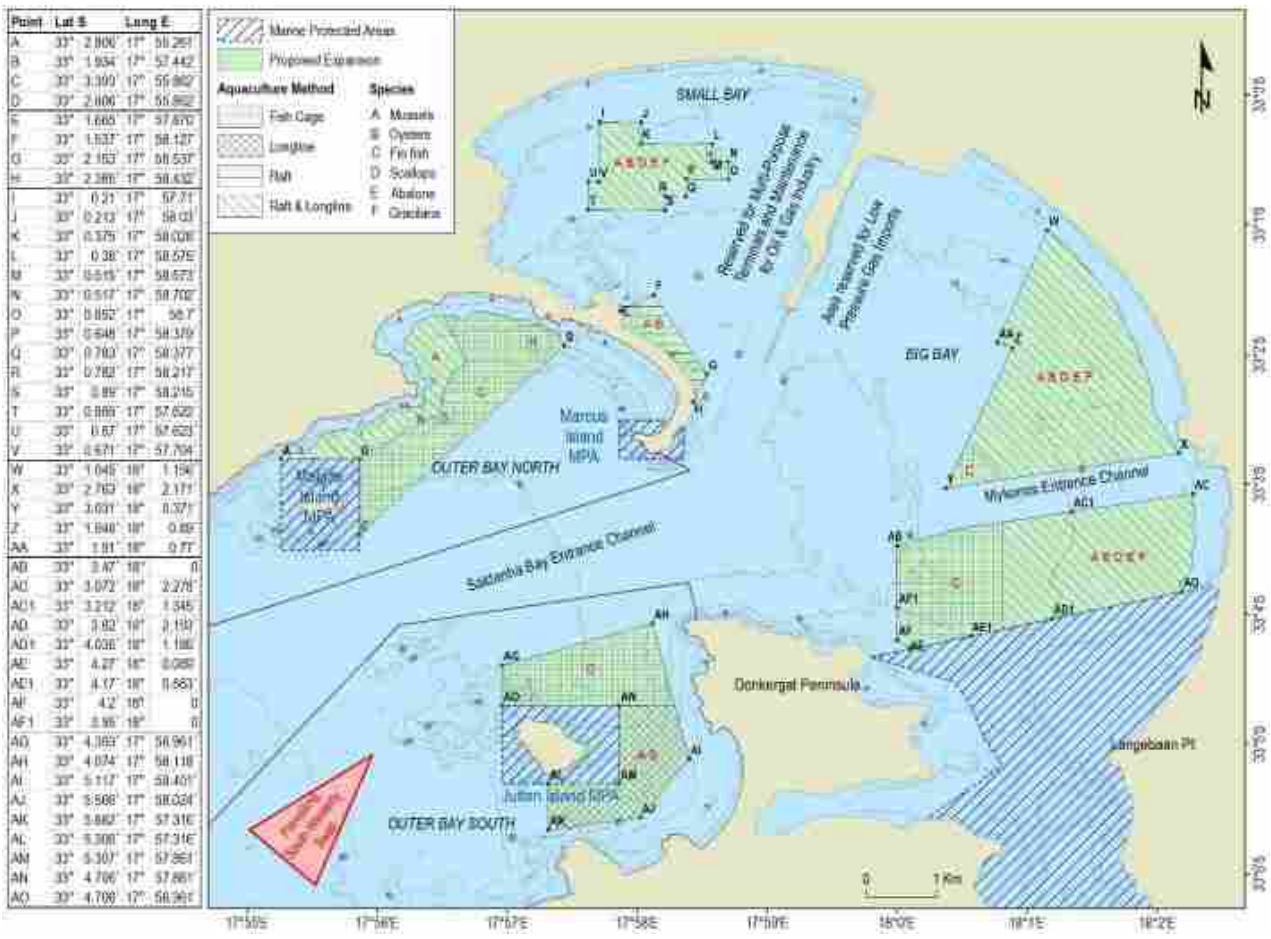

Figure 4: Originally assessed Saldanha Bay ADZ areas, species and production methods

Based on estimates, the full ADZ could support total annual graded aquaculture bivalve production of up to 15 203 t, more than a six-fold increase over current graded production of ~2 000 tpa.

The ADZ **finfish production volumes** assessed in the BA were determined based on:

- The area available for finfish farming, with an assumed average farming density of 40 t of fish per ha based on current proposals by the industry; and
- Estimated generation of nutrients from waste as Nitrate (N) as a proportion of overall estimated N in Saldanha Bay.

As a precautionary measure, DAFF has accepted that finfish production be initially capped so that estimated N produced by finfish farming does not exceed 15% of the estimated N load in the Bay. This equates to a finfish production limit of ~5 150 tpa.

Research on cultivating seaweed commercially in southern Africa is limited, and realizing the potential of this resource will require cooperation between research agencies and industry. In the Saldanha ADZ, potentially suitable areas for *Gracilaria* production are likely located in Small Bay and Big Bay in areas shallower than 6 m.

Sea-based activities associated with the ADZ include:

- Servicing and maintenance of aquaculture structures;
- Harvesting of cultivated species;
- Initial processing of bivalves, including de-clumping and grading, typically on a raft or support vessel;
- Vessel trips between the shore and aquaculture areas, e.g. to service structures or harvest species.

No land-based facilities that require EA are included in this assessment, and obtaining authorisation will be the responsibility of individual operators/farmers.

6 ALTERNATIVES

The EIA Regulations, 2014, require that all EIA processes must identify and describe feasible and reasonable alternatives.

The project relates to the establishment of a marine ADZ in Saldanha Bay, and no **site alternatives** were investigated. DAFF advises that South Africa has a very exposed coastline and a limited number of sheltered bays that allow for sea based aquaculture. Saldanha Bay has been producing shellfish since the 1980s, and large portions of the bay were, and continue to be, zoned for aquaculture. Saldanha Bay is a prime existing site for aquaculture due to the sheltered conditions and high primary productivity. The area accounts for some 50% of current marine aquaculture production in South Africa.

Since the launch of Operation Phakisa Oceans Economy in October 2014, the number of registered Operation Phakisa aquaculture projects in Saldanha Bay has increased from four to fifteen due to the economic potential of salmon, oysters and mussels culture and progress achieved in unlocking water space and leases for aquaculture through Operation Phakisa. No projects have registered or expressed interest in equivalent new seawater lease areas that would require an EA in other parts of South Africa, and from this perspective there is no (demand for) alternative sites.

A feasibility study conducted for DAFF in 2016 identified Saldanha Bay as the primary site available for mussel and oyster culture in South Africa. When read together, a financial feasibility study commissioned by DAFF (2016) and a national Strategic Environmental Assessment (SEA) for finfish culture (2012) identified Saldanha Bay as the only area suitable for cage-based salmon production in South Africa based on environmental conditions, specifically temperature and sea conditions. The experimental salmon and trout cage farming currently underway in Saldanha Bay (independently from the ADZ) has yielded promising results to date, with industry indicating their interest in further investment and commercialisation of the operation.

The West Coast north of Saldanha Bay does not provide appropriate cage culture opportunities due to the frequency and intensity of harmful algal blooms (HAB) in the area and the exposed shoreline. The South and East Coasts of South Africa are not suitable for salmon production due to the warmer sea temperatures, which exceed 20◦C.

St Helena Bay, specifically, is unsuitable for both finfish and shellfish culture due to the frequency and intensity of HAB that affect the animals and food safety of the products. Saldanha Bay is less susceptible to HAB due to the hydrodynamics of the bay.

Two **layout alternatives** were considered:

- Full Big Bay South Alternative, which extends from the Mykonos harbour entrance channel towards the Langebaan Lagoon MPA, and from the 5 m depth contour towards the Donkergat Peninsula; and
- Reduced Big Bay South Alternative, which extends from the Mykonos harbour entrance channel towards the Langebaan Lagoon MPA, and from the 10 m depth contour towards the Donkergat Peninsula.

The **No-Go alternative** was also assessed. It implies that existing aquaculture production in Saldanha Bay will continue while lease agreements / authorisations are valid (and aquaculture remains viable). Management measures recommended as part of the ADZ development would, however, not become binding on existing aquaculture operations.

7 STAKEHOLDER ENGAGEMENT

Stakeholder engagement is a key component of the BA process and is undertaken in accordance with Chapter 6 of the EIA Regulations, 2014. The key stakeholder engagement activities during the BA process are summarised in Table 3 below.

Table 3: Stakeholder engagement activities

Activity	Date
Pre-application phase	
Notification (adverts and emails)	9 June 2016
Release of a Background Information Document (BID)	9 June 2016
Placement of notices	Week of 13 June 2016
TNPA focus group meeting	17 May 2016
Technical workshop	20 July 2016
Release of the Project Definition Summary	5 August 2016
Basic Assessment phase	
Release of draft BAR for comment	8 February – 31 March 2017
Focus group meetings	23 February 2017
Public open day	23 February 2017
Release of Final BAR for comment	18 May – 19 June 2017

Some 185 people attended the public open day. SRK received 60 comments and ~1 600 petitions in response to the draft BAR *and 20 comments and two petitions signed by ~1 250 people on the Final BAR.* Key comments and concerns raised by stakeholders relate to:

- The extent of the ADZ relative to Saldanha Bay;
- Potential impacts on watersports due to spatial overlap and associated impacts on tourism and businesses;
- Potential visual impacts and associated impacts on tourism and property values;
- Creation and loss of jobs as a result of the ADZ;
- Potential impacts on water quality;
- Management and monitoring of the ADZ;
- Potential impacts of fish farming, including introduction of aliens and diseases;
- The need for modelling of potential impacts; and
- Lack of alternative sites.

Comprehensive answers to all comments are provided in the Comments and Responses Table in BAR Appendix E10. Summarised responses are given in the BAR.

8 ASSESSMENT OF POTENTIAL IMPACTS

Potential impacts associated with the project were assessed according to SRK's impact assessment methodology. For all potentially significant impacts, the significance of the anticipated impact was rated without and with recommended mitigation measures. These impacts are presented in Table 4 which summarises:

- The impacts assessed in the BA Report;
- Their significance before and after the implementation of essential mitigation measures; and
- The key mitigation measures on which the significance rating is based (where applicable).

The following specialists were consulted to identify and assess potential issues and impacts within their particular field of study and to identify practicable mitigation and optimisation measures to avoid or minimise potential negative impacts and/or enhance any benefits:

- Pisces – Marine Ecology;
- SRK – Socio-economic
- African Centre for Heritage Activities - Heritage; and
- SRK – Visual.

An independent review of the visual impact assessment supports the findings, recommendations and conclusions of the VIA.

Impact Significance Ratings Legend:

Rating	+ve	-ve
Insignificant	I	I
Very Low	VL	VL
Low	L	L
Medium	M	M
High	H	H
Very High	VH	VH

Table 4: Summary of Impacts

Impact	Significance rating		Key mitigation/optimisation measures *(abbreviated, without repetition where mitigation measures apply to more than one impact)*
	Without	With	
CONSTRUCTION PHASE IMPACTS			
Crushing of biota in sediments during placement of mooring infrastructure	L	L	• Avoid potentially sensitive and valuable habitats such as conservation areas, biogenic habitats and reefs. • Ensure mooring systems are well designed to prevent / limit movement of anchors and chains over the sea floor.
Investment in the economy	L	L	• Procure goods and services from local, provincial or South African suppliers as far as possible, with an emphasis on Black Economic Empowerment (BEE) suppliers where possible.
Increased employment, income	VL	VL	• Procure goods and services from local, provincial or South African suppliers as far as possible, with an emphasis on BEE suppliers where possible.

Impact	Significance rating Without	With	Key mitigation/optimisation measures *(abbreviated, without repetition where mitigation measures apply to more than one impact)*
and skills development			
Destruction, damage or alteration of heritage material or sites	L	VL	• Do not place mooring blocks within 200 m of the Merestein site. • Undertake diver surveys prior to placing anchors / moorings, and do not place mooring blocks on visible shipwreck features (above the seabed). • Contact archaeologists should shipwreck material be identified to agree on any interventions required. • Provide the location and nature of any identified maritime and underwater cultural heritage resources to a maritime archaeologist and SAHRA for inclusion on their shipwreck database.
OPERATIONS PHASE IMPACTS			
Modification of seabed characteristics by:			
- Shellfish farming	M	L	• Select sites favouring well-flushed, deep and productive areas. • Avoid potentially sensitive and valuable habitats. • Leave mooring anchors or blocks in place when undertaking structure maintenance or fallowing sites to avoid repetitive impacts of the same activity at each site. • Avoid high density culture (overcrowding). The recommended density is one raft of 800 droppers per ha; 11 longlines of 832 droppers per ha. • Implement recommended monitoring in seabed properties at farming sites and compile annual monitoring reports.
- Finfish farming	H	M	• Select suitably deep sites that allow cages to be suspended at least 5 m above the seabed. • Implement buffers and a phased-in development of finfish farms. • Ensure that finfish cages do not occupy more than 30% of the total area allocated for finfish farming at any one time. • Manage stocking densities at levels to ensure that environment health is maintained, as determined by the environmental sampling and monitoring programme (see EMPr). • Monitor and manage feeding regimes to minimise feed wastage and chemical usage. • Rotate cages within a production area to allow recovery of benthos. • Limit annual increases in finfish production to no more than 1 000 t, and only if monitoring results indicate that environment health has been maintained and impacts remain manageable, up to 5 000 tpa ungraded production. • Only exceed finfish production of 5 000 tpa (after at least 5 years) to a maximum of 10 000 tpa if a precautionary approach is applied, involving strict and intensified monitoring programmes and adherence to environmental quality standards. Should standards or precautionary limits be approached or exceeded, the sampling and monitoring plans must include a response procedure that leads to appropriate downward adjustment of fish production. • Adopt the (relevant aspects of) MOM (Modelling-Outgrowing-Monitoring) management system (or similar) to monitor infaunal and epifaunal macrobenthic communities at farming sites.
Modification of water column characteristics	M	L	• Undertake ongoing, detailed water quality monitoring; including baseline surveys at control and impact sites, and decrease the ADZ carrying capacity should the environmental quality indicator be exceeded outside of the accepted sacrificial footprint. • Monitor for copper leachate from antifouling paint.
Creation of habitat	M	M	• None
Alteration of behaviour and entanglement of seabirds and marine fauna:			
- Shellfish farming	M	L	• Implement buffer zones at MPAs. • Minimise the potential for litter entering the marine environment. • Keep a log of all cetaceans, seabirds and predators recorded in the vicinity of fish farms, including behavioural observations.
- Finfish farming	H	L	• Remove any injured or dead fish from cages promptly. • Do not release any blood and/or offal (organic waste) from finfish into the bay. • Keep a log of all cetaceans, seabirds and predators recorded in the vicinity of fish farms, including behavioural observations. • Use predator exclusion nets as necessary. • Develop disentanglement protocols in collaboration with DAFF, DEA and the SA Whale Disentanglement Network and establish a rapid response unit to deal with entanglements.
Risk of introduction of alien invasive species or spread of fouling pests	VH	M	• Ensure that a high level of biosecurity management and planning is in place. • Undertake routine surveillance on and around marine farm structures and associated vessels and infrastructure for indications of non-native fouling species. • Maintain effective antifouling coatings and regularly inspect farm structures and farm vessels for pests. • Clean structures and hulls regularly to ensure eradication of pests. • If spat import cannot be avoided, only use spat from biosecure certified hatcheries and/or quarantine facilities. • Adhere to veterinarian protocols to eliminate any pests, parasites and diseases.

Impact	Significance rating Without	With	Key mitigation/optimisation measures *(abbreviated, without repetition where mitigation measures apply to more than one impact)*
Transmission of diseases to wild populations	H	VL	• Use only prescribed veterinary chemicals.
Risk of genetic interaction with wild populations:			
- Shellfish farming	M	L	• Ensure good physical and biological containment to limit the effects of escaped stocks.
- Finfish farming	H	L	• Implement suitable management and planning measures to limit the possibility of genetic interactions. • Implement the "Genetic Best Practice Management Guidelines for Marine Finfish Hatcheries" developed by DAFF. • Implement annual genetic monitoring between wild caught and farmed fish. • Use appropriate spawning regimes in the hatchery to maintain genetic diversity. • Use all female or triploid salmonids in the farms. • Use robust, well-maintained containment systems. • Maintain cage integrity through regular maintenance and replacement. • Ensure appropriate training of staff. • Develop and implement recovery procedures should escapes occur.
Contamination by therapeutants and trace contaminants from finfish farming	M	L	• Use only approved veterinary chemicals and antifoulants. • Use the lowest effective doses of nutritional therapeutants. • Use the most efficient drug delivery mechanisms. • Establish and adhere to guidelines around the use of anti-fouling products. • Do not apply antifoulants on site and use environmentally friendly alternatives.
Contribution to the economy	M*	M*	• Procure goods and services from local, provincial or South African suppliers as far as possible, with an emphasis on BEE suppliers where possible. • Procure ancillary services for goods purchased overseas, such as installation, customisation and maintenance, from South African companies as far as possible.
Increased employment, income and skills development	M*	M*	• Utilise local labour (Saldanha Bay Municipality) as much as possible. Where non-local specialist staff is required, implement a training programme to upskill local labour to assume these positions over a period of 5 years. • Collect monthly data on staff numbers, composition and origin and report these at least annually to the respective authorities (e.g. DAFF).
Possible reduction in water sport activities and associated decline in tourism and business activities	H	L	• Avoid placing aquaculture structures in the Big Bay South precinct to allow continued access by watersports crafts. • Avoid placing aquaculture structures in the section between Jutten Island and Dongergat Peninsula in the Outer Bay South precinct to allow continued access by watersports crafts. • Invite the general public to register as stakeholders on a stakeholder database maintained by the ADZ Management Committee (AMC). Provide regular updates to all registered stakeholders on activities in the ADZ. • Provide at least 2 months' notice to registered stakeholders before installation of new farms commences. Provide detail on the proposed farm type and location. • Ensure that all active aquaculture farms are accurately marked on navigational charts. • Ensure that the outer boundaries of all active aquaculture areas are accurately marked day and night using markers compliant with SAMSA regulations. • Monitor markers to ensure they are always fully functional.
Possible restrictions to military activities	H	L	• *As above*
Pressures on resources and infrastructure due to an influx of people	VL	VL	• Implement a local recruitment policy, to discourage an uncoordinated influx of outside workers.
Altered sense of place and visual intrusion from the proposed development	H	M	• Use grey based hues for all project components (rafts, cages, barrels, buoys/flotation devices) visible above the surface of the water as far as possible. • Ensure project components are of a similar style and scale to promote visual cohesiveness. • Utilise the minimum number of safety / warning buoys as far as possible. Only demarcate the corner points of each precinct and the minimum interval distance along the precinct boundary to meet Ports Authority (Transnet) safety requirements. • Maintain all project infrastructure in good working order. • Incorporate a 1 km buffer from residents along the eastern shoreline in the design of the Big Bay North precinct.
Altered sense of place and visual quality caused by light pollution at night	L	VL	• Restrict operations at night. • Utilise the minimum number of safety/warning lights as far as possible. Only locate lights on the corner points of each precinct and the minimum interval distance along the precinct boundary to meet Ports Authority (Transnet) safety requirements. • Confirm with key stakeholders (notably Port Captain, representatives of water users in the area and the South African Navy) whether certain boundaries of the ADZ located away from night-time traffic require lighting. • If the Ports Authority requires flashing lights, ensure the lights flash simultaneously.

** High (+) if full production is ecologically sustainable.*

9 CONCLUSIONS AND RECOMMENDATIONS

The ADZ in Saldanha Bay aims to create incentives for the further development of aquaculture in Saldanha Bay, thereby creating jobs, providing skills development and contributing to the economy under the umbrella of the Operation Phakisa initiative. *Investment in the ADZ was estimated at potentially R400 million at full production, while employment was estimated at ~800 additional jobs*. Aquaculture is well-established in Saldanha Bay, and the bay is one of very few sheltered waterbodies off the South African coast deemed suitable for marine-based aquaculture.

The most significant potential negative impacts of the project (after mitigation) are related to marine ecology and visual aspects. Most notably, expanding shellfish aquaculture in Saldanha Bay, and introducing finfish aquaculture, is likely to:

- Modify seabed characteristics by deposition of fish waste (faeces and excess feed);
- Increase the risk of introducing alien invasive species or spread of fouling pests through the importation of seed stock and deployment of aquaculture structures on which fouling organisms establish; and
- Alter the sense of place and present a visual intrusion as a result of the aquaculture structures that will be visible on the water surface.

The above impacts are rated as having Medium (negative) residual significance. It is recommended that additional aquaculture production of shellfish and finfish in Saldanha Bay is gradually phased in, based on environmental monitoring, to avoid unacceptable impacts on the bay. While total shellfish and finfish production volumes have been stipulated for the ADZ, these may have to be revised if environmental (water and sediment quality) monitoring during early implementation phases indicates that impacts exceed acceptable thresholds with regards to marine ecology.

Other post-mitigation negative impacts related to marine ecology, socio-economic activities and the visual environment are rated as having Low or Very Low (negative) residual significance.

Implementation of mitigation measures is critical to achieve these ratings and include:

- Avoiding areas that are ecologically sensitive or significantly interfere with other uses in the bay (see Figures 6, 7 and 8), including:
  - Reducing the Big Bay South area by 100% (i.e. not developing the area) due to socio-economic (user conflict) and ecological (proximity to Langebaan Lagoon) concerns;
  - Reducing the Big Bay North area by 43%, to incorporate a 1 km buffer to residential areas at Club Mykonos and Paradise Beach;
  - Reducing the Outer Bay North area by 40% to incorporate a 500 m - 1 km buffer to the Malgas Island MPA; and
  - Reducing the Outer Bay South area by 73% to avoid all areas between Jutten Island and the coast.

  In the post-mitigation scenario, the new proposed ADZ area has thus reduced by 70% from 1 404 ha in the pre-mitigation scenario to 420 ha (see Figure 7). The total ADZ, including areas for which leases are currently held (not all of which are farmed) would be 884 ha in the post-mitigation scenario. This equates to approximately 10% of Saldanha Bay (Small, Big and Outer Bay) (see Figure 9 and Table 5);
- Implementing good biosecurity measures to prevent the introduction of alien invasive species and minimise the risk of diseases and genetic interaction with wild fish populations;
- Utilising aquaculture equipment and methods that are suitable for the conditions, notably maximum wave and swell heights, in the respective precincts; and
- Implementing good housekeeping at all times.

It is recommended that a **phased approach** to the expansion of aquaculture in the ADZ is implemented, notably:

- Limit annual ungraded **shellfish** production to 10 000 t for the first two years, increasing thereafter annually by 5 000 tpa only if monitoring results indicate that environment health has been maintained and impacts remain manageable, to a maximum of 27 600 tpa ungraded production; and
- Limit annual increases in **finfish** production to 1 000 t, and only if monitoring results indicate that environment health has been maintained and impacts remain manageable, up to 5 000 tpa. Split the allowable annual increase in production between Big Bay and Outer Bay. Finfish production beyond 5 000 tpa should only be pursued under specific conditions.

The **Big Bay North ADZ area was subsequently amended** to ensure that the Molapong application area, located adjacent to but outside of Big Bay North and subject of a separate BA process, is integrated into the ADZ to avoid an overall increase of the aquaculture area in Saldanha Bay.

The Big Bay North area was amended in such a way as to retain the same 409 ha size of this area by excluding portions along the shore and the south-western point (see Figure 5 – green indicates the original post-mitigation area, pink indicates the amended post-mitigation area including the Molapong application area).

Figure 5: Amendment of Big Bay North area to integrate Molapong application area

This further reduces visual impacts and potential interference with watersports and also reduces potentially suitable seaweed farming areas.

Implementation of mitigation measures and phasing in of aquaculture expansion is deemed to effectively mitigate negative impacts of the ADZ.

It is recommended that an **ADZ Management Committee** (AMC), comprising DAFF, DEA, DEA&DP and TNPA representatives, is established to coordinate and supervise activities, environmental monitoring and environmental compliance of operators in the ADZ.

DAFF, as the applicant, is primarily responsible for day-to-day management of the ADZ and ensuring the implementation of and adherence to the EMPr, with appropriate support and guidance provided by the other AMC members. Management measures will also apply to and improve management at existing aquaculture farms in Saldanha Bay.

It is further proposed that a **Consultative Forum**, constituted of other relevant government departments and local organisations, is established to review environmental monitoring data, advise on management and recommend measures.

Benefits of the project relate to development of the aquaculture industry in Saldanha Bay and the resultant contribution to the economy, increased employment (particularly at a low-skill level), income generation and skills development.

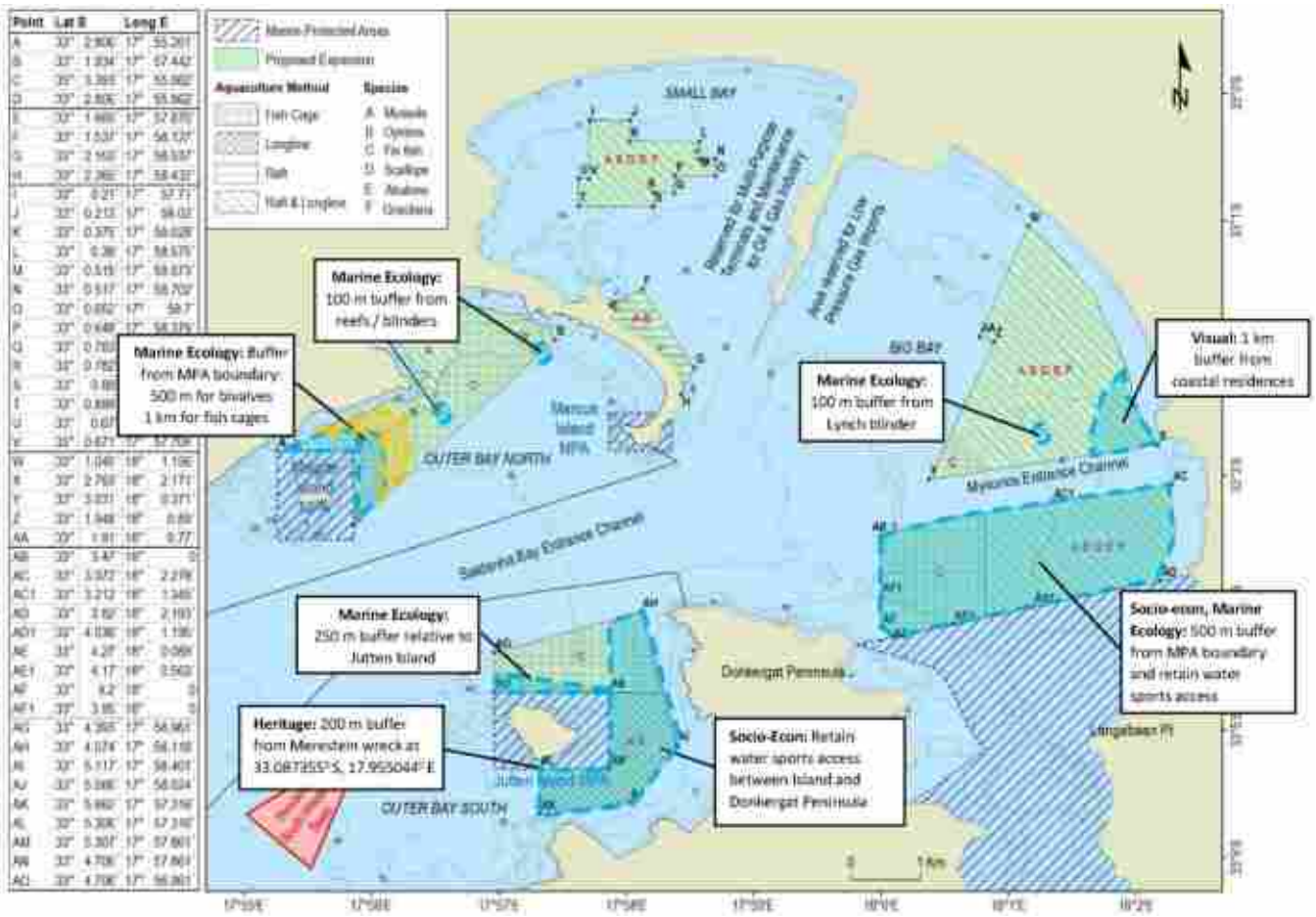

Figure 6: Areas of the pre-mitigation scenario to avoid in mitigation of impacts

Figure 7: Comparison of pre- and post-mitigation ADZ areas

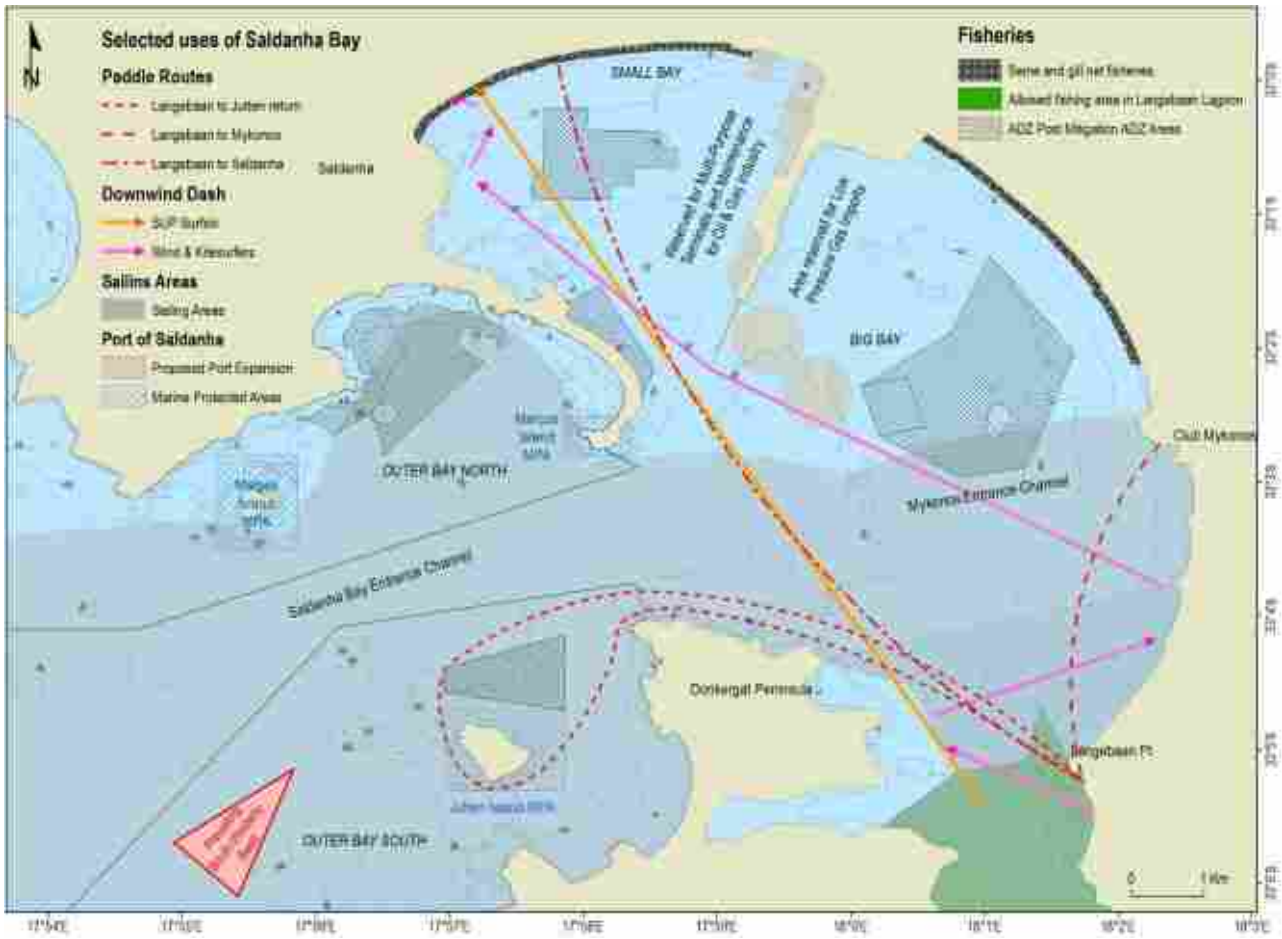

Figure 8: Other use areas in Saldanha Bay relative to the post-mitigation (recommended) ADZ areas

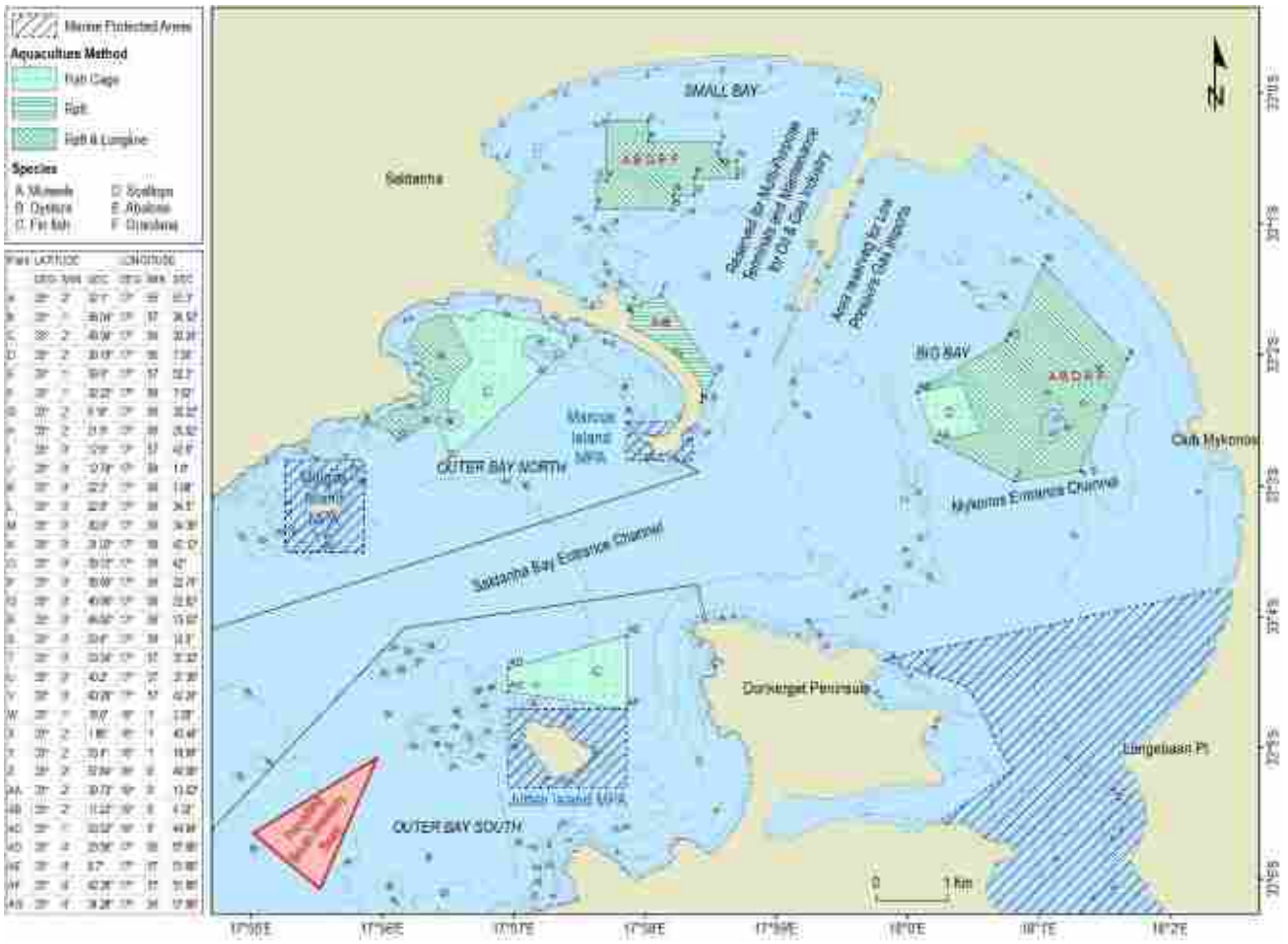

Figure 9: Post-mitigation (recommended) ADZ areas

Table 5: Post-mitigation (recommended) ADZ precincts (ha)

Precinct	Currently allocated	Currently farmed	New areas	Total future	Bivalves*	Finfish*
Small Bay	163	125	-	163	163	-
Big Bay North	254	25	155	409	367	42
Outer Bay North	37	1	179	216	76	140
Outer Bay South	10	-	86	96	-	96
Total	**464**	**151**	**420**	**884**	**606**	**278**

** Note that fish areas are also likely suitable for bivalves, but less vice versa.*

SRK believes that sufficient information is available for DEA to take a decision regarding the authorisation of the development. The BA has identified essential mitigation measures that will mitigate the impacts associated with this project to within acceptable limits.

In conclusion SRK is of the opinion that on purely 'environmental' grounds (i.e. the project's potential socio-economic and biophysical implications) the application as it is currently articulated, **with** the recommendations stipulated above, should be approved.

The Final BAR will now be submitted to DEA for a decision on the ADZ. All registered stakeholders will be notified of the decision.

environment, forestry & fisheries

Department:
Environment, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA

SALDANHA BAY SEA BASED AQUACULTURE DEVELOPMENT ZONE BASELINE BENTHIC SURVEY REPORT

Final Draft

July 2020

ANCHOR
research & monitoring

Anchor Research and Monitoring Report No. 1895/5

SALDANHA BAY SEA BASED AQUACULTURE DVELOPMENT ZONE BASELINE BENTHIC SURVEY REPORT

July 2020

Department of Environment Forestry and Fisheries

Report Prepared by:
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EXECUTIVE SUMMARY

Introduction

Saldanha Bay is the primary area for bivalve production in South Africa, with the majority of oyster and mussel production to date originating here. The Department of Environment, Forestry and Fisheries (DEFF) appointed independent Environmental Assessment Practitioner (EAP) to undertake an to undertake an Environmental Impact Assessment (EIA) for the establishment of an Aquaculture Development Zone (ADZ) in Saldanha Bay in 2016/2017 with a view to supporting shellfish and finfish mariculture expansion in the Bay and Environmental Authorisation (EA) was granted on the 8th January 2018. The Environmental Management Programme (EMPr) approved with this EA included detailed baseline and ongoing monitoring. The DEFF, Branch Fisheries as the holder of the EA for the Saldanha Bay ADZ appointed independent service providers who completed dispersion modelling (PRDW) and baseline sample collection (Capricorn Fisheries Monitoring) for the ADZ. Additionally, over and above the requirements of the monitoring programme (Sampling Plan), specialist scientist at DEFF have undertaken research and rapid synoptic survey of oxygen and nutrients in the Bay around aquaculture areas. The baseline survey included collection of sediment samples that were analysed for particle size distribution, total organic carbon (TOC), total organic nitrogen (TON) and in samples collected ion the identified fish farm site, copper and zinc. Macrofauna samples were sorted, identified and counted resulting in abundance data. The DEFF, Branch Fisheries, as the holder of the EA appointed an independent service provider, Anchor Research and Monitoring (AR&M), to compile the baseline technical report using data derived from the baseline sample collection for the Saldanha Bay ADZ. This report presents the findings of these analyses.

Sediment Quality

The particle size composition of the sediments occurring in Saldanha Bay are strongly influenced by wave energy and circulation patterns in the Bay. Under natural circumstances, the prevailing high wave energy and strong currents would have flushed fine sediment and mud particles out of the Bay, leaving behind the heavier, coarser sand and gravel fractions. However, obstructions to current flow and wave energy can result in increased deposition of finer sediment (mud). Higher proportions of mud, relative to sand or gravel, can lead to high organic loading and trace metal contamination and can have a negative impact on the environment when they are re-suspended. Baseline data collected across the lease areas in Big Bay, Outer Bay North and Outer Bay South all had sand as the dominant particle size composition. While levels of finer (mud) and coarser sediment (gravel) were detected; these were minimal. The sediment granulometry findings were in the line with the sediment trace metal and organic matter content measured. Zn and Cu were the two metals measured only in the designated finfish farming sites in Big Bay; whereby Zn had greater concentrations compared Cu. However, both Cu and Zn fell significantly below their ERL threshold of 34 and 150 mg/kg respectively. Total sediment organic carbon and nitrogen at all three lease areas were similar to those recorded in the State of the Bay 2019 survey. Furthermore, levels of TOC and TON were also not significantly different between the reference and impact sites across the lease areas, indicating that sediments in these areas are not being unduly impacted by farming operations. Importantly, both the low trace metal content and organic matter loading is largely influenced by the low mud content recorded at these sites. Overall, the baseline data for sediment quality is comparable between impact and

reference sites, as well as sites sampled elsewhere in the Bay, and anthropogenic disturbances to the physico-chemical nature of the sediments were not detected.

Benthic macrofauna

Soft-bottom benthic macrofauna (animals living in the sediment that are larger than 1 mm) are frequently used as a measure to detect changes in the health of the marine environment as a result of anthropogenic disturbance. Indeed, some research has shown that benthic macrofauna are more sensitive to stressor impacts than other benthic organisms, resulting in macrofauna being widely used as environmental indicators. This is largely because these species are short lived and, as a consequence, their community composition responds rapidly to environmental changes.

Benthic macrofauna in sediment samples collected from reference and impact sites in three lease areas were identified to the lowest possible taxonomic level and counted. Statistical analyses were performed on these data to assess spatial variability in the benthic macrofauna community structure and composition (1) between the three areas, (2) between reference and impact sites within each area, and (3) between samples collected in Big Bay for the annual Saldanha State of the Bay report and those collected for the purposes of ADZ monitoring in this area. In addition, values of biological indices were compared to suggested threshold values to determine if aquaculture activities are causing a detectable disturbance in macrofaunal communities.

Multivariate statistical analyses of baseline survey data indicate that the current aquaculture operations are having a negligible effect on benthic macrofauna present in the lease areas. Univariate analyses show that comparisons of four community indices (Shannon Weiner Diversity, Total number of species, Abundance per sample and Pielou's Evenness) between reference and impact sites of all three lease areas were for most comparisons not significantly different. Outer Bay North showed a significant increase in species abundance in Impact sites, suggesting some impact of shellfish aquaculture operations in this lease area. Additionally, the total number of species in Outer Bay South reference sites was significantly lower than at sites marked out for future aquaculture development, despite the lack of any aquaculture operations currently.

The Infaunal Trophic Index (ITI) and AZTI Marine Biotic Index (AMBI) scores show some level of agreement and generally indicate that current aquaculture operations are having a limited effect on benthic macrofauna in the three lease areas. These indices show some community change, with communities classified as slightly disturbed at the Outer Bay North site but undisturbed at the Big Bay and Outer Bay South sites.

Presence of reef in the Big Bay precinct

The marine specialist report for the Saldanha ADZ EIA considered subtidal reef habitat to be scarce in Saldanha Bay and only identifies Lynch blinder and North Bay blinder as important reef areas. Reports from divers of calcrete reef surrounding some sampling sites during the baseline survey (Capfish 2019), difficulties in obtaining grab samples at several stations in Big Bay during 2020 (AR&M) sediment surveys, and observations by AR&M divers deploying water quality monitoring instruments during April 2020, indicated reef in several areas of the Big Bay ADZ precinct. Subsequent literature review revealed the existence of an extensive abrasion platform (areas of exposed calcrete rock) throughout much of Big Bay (Flemming 2015).

The marine ecology specialist study had recommended a bathymetry survey should be undertaken and a bathymetric map should be submitted along with a sketch of the important habitats in the lease area as well as adjacent potentially sensitive and valuable habitats (conservation areas, biogenic habitats and reefs) (SRK BAR 2017, appendix D2, Pg. 82). The finfish lease holder did provide a bathymetry map of their lease area which indicates extensive low-profile reef throughout the site. Underwater video footage obtained from one of the Big Bay finfish lease holders revealed that the depth of sediment varied considerably within their lease area, and was frequently less than 50 cm. Photographs of the benthic environment taken by AR&M indicate low lying reef which is possibly periodically inundated with a fine layer of sediment. The patches of exposed reef provided habitat for upright epifauna (basket stars, sponges, bryozoans etc.) and west coast rock lobster were present (currently unquantified). Further images extracted from video footage provided by finfish lease holder indicated substantial outcrops of reef which may exceed 1 m in height. Due to poor visibility the nature of the macrofaunal communities (established communities vs pioneer species) associated with the reef was hard to establish. Overall, the reef would be described as low-profile roughly < 1m in height from the sea floor and may be subject to periodic, natural sand inundation, however substantial outcrops >1m in height are present which may form habitat for a well established epifaunal community.

The presence of low-lying reef was noted during the baseline surveys and deployment of monitoring instruments in the finfish area. The effects of aquaculture on patches on this habitat type and its associated epifaunal communities has not previously been assessed in the Big Bay precinct beyond Lynch Blinder. Given the identification of reef in this precinct further studies should be conducted to address this omission. It is important to note, however, that this is **ONLY** applicable to areas of the Big Bay precinct (not the ADZ as a whole) where reef occurs (the present day extent of reef in Big Bay is yet to be determined and a detailed bathymetry survey should be undertaken).

Findings Summary

Based on the above analysis of the baseline survey data and further confirmation of rocky reef areas within the Big Bay ADZ Precinct, the following provides a summary of key findings:

1. Due to the presence of hard substrata, the number of sites sampled does not meet the required amount stipulated in the sample plan. Monitoring macrofauna at the replacement sites surveyed during the 2020 chemical survey (Appendix 1), where known soft substrata is present would increase the number of impact sites to required amount. The timing of future chemical, sediment and macrofauna surveys to coincide with the SOB sampling (Autumn) would facilitate comparisons between sediment chemical characteristics and macrofauna communities without seasonal effects.
2. Access to the invertebrate taxonomic reference collections from previous surveys would facilitate refinement of the overall species list for the area, resolving ambiguous species identifications among service providers. A macrofauna reference collection of the specimens collected from the ADZ would be invaluable.
3. Despite high abundance and species richness in Saldanha Bay, the natural occurrence of certain dominant species causes the Shannon-Weiner Diversity index to fall below the stipulated threshold of H’ = 3 throughout the three ADZ precincts. A revised H statistic

threshold calculated from reference or baseline sites would be a more locally applicable threshold value.

4. Cumulative abundance-biomass plots (ABC curves) of macrobenthic communities (Warwick 1993), also called k-dominance curves, would be additional useful tools in the analysis of macrobenthic invertebrate data.
5. Infaunal Trophic Index (ITI) and AZTI Marine Biotic Index (AMBI) are more suited to analysing Northern Hemisphere macrofaunal communities, while the locally developed Biological Traits Analysis (BTA) with Fuzzy logic may be more suitable for future macrobenthos surveys in Saldanha Bay.
6. The extent of the abrasion platform present in Big Bay is currently unquantified and the proportion of this habitat type impacted by current and future mariculture activities unknown, especially in view of the fact that the dispersion model shows strong scouring here. A full detailed bathymetry survey using side scan sonar or multibeam echosounder of the ADZ precinct and historical extent of the abrasion platform would map the current extent of the abrasion platform in Big Bay.
7. The video footage and bathymetry provided by Molapong as well as the photographs taken by AR&M divers shows patches of exposed reef present in the finfish lease area. The reef appears to be mostly low profile <1m in height which may be periodically inundated with sand, however, outcrops of reef >1m in height were evident. This is a poorly/unstudied habitat type within Saldanha Bay and there is a dearth of information on its extent, and the nature and type of biotic communities present. The ADZ monitoring programme should be updated to include suitable methods for monitoring potential aquaculture impacts on this habitat type.
8. Suitable reef impact sites (n=3) in the finfish area and suitable reference sites (n=3) should be surveyed by scientific divers using transect or quadrat surveys to quantify key biotic components of this reef habitat. An alternative approach could be the use of underwater visual survey by means of divers with cameras, drop cameras or a Remote Operated Vehicle (ROV). All methods of surveying this habitat will rely on acceptable underwater visibility which is not common in Big Bay. In situ benthic surveys by divers, however, may be more easily undertaken than underwater video surveys in conditions of reduced visibility, but all options should be considered. It is critical that whichever survey method is employed, it must be repeatable for ongoing future monitoring. Ideally this monitoring should (as per the soft sediment monitoring programme) follow a BACI design, although it may not be practically feasible to complete a survey prior to installation of fish cages on the site.
9. Analysis and interpretation of the results of the bathymetric and underwater reef habitat surveys must provide practical advice to support the ongoing adaptive management of the Big Bay ADZ precinct.

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1 BACKGROUND

With the support of finances and capacity allocated to the Operation Phakisa Delivery Unit, the Department of Environment, Forestry and Fisheries (DEFF), Branch Fisheries obtained Environmental Authorisation (EA) on 8 January 2018 to establish a sea-based Aquaculture Development Zone (ADZ) in Saldanha Bay. An ADZ is an area that has been earmarked specifically for aquaculture activities with the purpose of encouraging investor and consumer confidence, creating incentives for industry development, to provide marine aquaculture services, manage the risks associated with aquaculture, as well as to provide skills development and employment for coastal communities. The development of ADZs supports the Policy for the Development of a Sustainable Marine Aquaculture sector in South Africa (2007) objective aimed at creating an enabling environment that will promote growth and sustainability of the marine aquaculture sector in South Africa, as well as to enhance the industry's contribution to economic growth. The DEFF intends on expanding the ADZ operations in the existing aquaculture areas in Small Bay and Big Bay and will further extend operations into Outer Bay (North Bay/Entrance Channel). The authorized species for cultivation include both alien and indigenous species of finfish and shellfish, and seaweeds.

Saldanha Bay is the primary area for bivalve production in South Africa, with the majority of oyster and mussel production to date originating here. As a result of improved opportunities for local mussel import substitution, the opening up of export markets for oysters, and improved access to water and land space through Operation Phakisa, there is a renewed interest in expanding and fully utilizing the bay for further oyster and mussel production, as well as exploring potential finfish production in the outer more exposed parts of the bay.

The DAFF (now DEFF) appointed an Environmental Assessment Practitioner (EAP) to undertake an Environmental Impact Assessment for the establishment of an Aquaculture Development Zone in Saldanha Bay in 2016/2017 and Environmental Authorisation (EA) was granted on the 8th January 2018. Appeals against the authorisation were lodged to the Minister of Environmental Affairs and the authorisation was upheld as per the letter dated 7th June 2018.

As required in terms of the EA, the DEFF appointed an independant Environmental Control Officer in 2018 and set up a Consultative Forum (CF), which has grown to 140 members thus far [1]. The Aquaculture Management Committee (AMC) meets every two months to ensure that the implementation of the ADZ occurs in line with the requirements specified in the EA and Environmental Management Programme (EMPr). The DEFF recently published a "Guideline for Bivalve Production Estimates for the Saldanha Bay Aquaculture Development Zone". This document is one of the measures that ensures that the production per annum as specified in the EA are upheld by the operators in the ADZ. Coupled with environmental monitoring, the adherence to the authorised tonnages should facilitate adaptive environmental management of the ADZ as a whole.

The DEFF appointed an independent specialist to compile a monitoring programme for the ADZ which was reviewed by local and international stakeholders and experts (DAFF 2018). Dispersion modelling

[1] Clark BM, Massie V, Hutchings K, Biccard A, Brown E, Laird M, Gihwala K, Swart C, Makhosonke A, Sedick S, Turpie J. and Vermaak N. 2019. The State of Saldanha Bay and Langebaan Lagoon 2019, Technical Report. Report No. AEC 1841/1 prepared by Anchor Environmental Consultants (Pty) Ltd for the Saldanha Bay Water Quality Forum Trust, September 2019.

for the ADZ was completed by PRDW and baseline macrofauna sampling was done by Capricorn Fisheries Monitoring. Over and above the requirements of the monitoring programme (Sampling Plan), specialist scientist at DEFF have undertaken research and rapid synoptic survey of oxygen and nutrients in the Bay around aquaculture areas.

The Branch Fisheries as the holder of the authorisation has appointed an independent service provider, Anchor Research and Monitoring (AR&M), to compile the baseline technical report using data derived from the baseline sample collection the for the Saldanha Bay ADZ.

2 INTRODUCTION

It is important to monitor biological components of the ecosystem in addition to physico-chemical and eco-toxicological variables, as biological indicators provide a direct measure of the state of the ecosystem at a selected point in space and time. Benthic macrofauna are the biotic component most frequently monitored to detect changes in the health of the marine environment. This is largely because these species are short lived and, as a consequence, their community composition responds rapidly to environmental changes (Warwick 1993). Given that they are also relatively non-mobile (as compared with fish and birds) they tend to be directly affected by pollution and they are easy to sample quantitatively (Warwick 1993). Furthermore, they are scientifically well-studied compared with other sediment-dwelling components (e.g. meiofauna and microfauna), and taxonomic keys are available for most groups. In addition, benthic community responses to a number of anthropogenic influences have been well documented.

Organic matter is one of the most universal pollutants affecting marine life and it can lead to significant changes in community composition and abundance, particularly in semi-enclosed or closed bays where water circulation is restricted, such as Saldanha Bay. High organic loading typically leads to eutrophication, which can lead to a range of different community responses amongst the benthic macrofauna. These include increased growth rates, disappearance of species due to anoxia, changes in community composition and reduction in the number of species following repeat hypoxia and even complete disappearance of benthic organisms in severely eutrophic and anoxic sediments (Warwick 1993). The community composition of benthic macrofauna is also likely to be impacted by increased levels of other contaminants such as trace metals and hydrocarbons in the sediments. Furthermore, areas that are frequently disturbed by mechanical means (e.g. through dredging, anchoring) are likely to be inhabited by a greater proportion of opportunistic pioneer species as opposed to larger, longer lived species.

The main aim of monitoring the health of an area is to detect the effects of stress, as well as to monitor recovery after an environmental perturbation. There are numerous indices, based on benthic invertebrate fauna information, which can be used to reveal conditions and trends in the state of ecosystems. These indices include those based on community composition, diversity and species abundance and biomass. Given the complexity inherent in environmental assessment it is recommended that several indices be used (Salas *et al.* 2006).

Copper (Cu) and Zinc (Zn) are two metals that are commonly monitored in finfish growing areas (DAFF 2018). Copper is the primary active agent in most antifouling products applied to submerged farm structures and Zn is a fish health additive included in feed. Some antifoulants also include Zn as active agent (Macleod and Erikson 2009). These metals are ubiquitous in the environment and are essential trace elements for nearly all organisms (DAFF 2018). However, when these trace elements accumulate in high concentrations of bioavailable forms, they become toxic (DAFF 2018). Antifoulants leeching Cu results in this metal primarily being present in the dissolved phase, however, due to its low solubility, Cu is rapidly partitioned to suspended particulate matter and ultimately deposited in the sediments. Initially, Molapong Aquaculture used copper based anti-fouling treatments on the culture nets to reduce the speed of biofouling growth on the nets. This worked to decrease and slow the growth of bio-foulants, but it provided not to be environmentally sustainable. Molapong thus ceased the use of the copper-based paints and prefer to manage biofouling with insitu net cleaning The bioavailable

fraction of Cu in the dissolved phase can be orders of magnitude lower than the total Cu concentration because of binding to naturally occurring organic material (Clement *et al.* 2010). Zn in uneaten feed and fish faeces will also rapidly settle to the seabed. Thus sediments are the primary concern in the accumulation of Cu and Zn and both are consistently associated with finfish farming at environmentally significant levels beneath and adjacent to fish cages (Clement *et al.* 2010).

The accumulation of both metals is mediated by settlement processes and as a result may be expected to follow the pattern predicted for organic matter (Keeley *et al.* 2014). Metals, however, are neither broken down over time or utilized by biota at any significant rate (DAFF 2018). Consequently, they may persist for long periods in environments where physical dispersion is limited. Although model simulations for the finfish site suggest very little accumulation of particulate matter and their associated contaminants into benthic sediments (PRDW 2017), Cu and Zn should be monitored until sufficient data are collected to validate model predictions.

3 METHODS

3.1 Site selection

Baseline sample site selection and the sampling requirements are described in the sampling report compiled by Capricorn Fisheries Monitoring (2019).

3.2 Benthic sampling

A total of eight sampling stations were randomly selected in Big Bay and three in the finfish area, relative positions and geographical coordinates are shown in Table 1 and Figure 1. Samples from two stations numbers B7 and B8 were not sampled for either sediment or macrofauna, as the seabed was rock for a radius of 25 m from the selected sample position. One finfish station could also not be sampled for macrofauna as the seabed consisted of a solid calcrete rock layer out to a radius of more than 40 m from the selected position. It was, however, possible to scrape up a sediment sample from the surface layer that covering the calcrete.

In the outer bay northern area, four stations were randomly selected and sampled, the relative positions and geographical coordinates shown in Table 1 and Figure 1. In the outer bay southern area around Outer Bay South three stations were sampled, the relative positions and geographical coordinates shown in Table 1 and Figure 1.

A total of nine control stations were selected and sampled, three for big bay and three each for outer bay north and south.

Table 1. Co-ordinates of the baseline survey sites from Big Bay, Outer Bay North and Outer Bay South.

Area	Site	Latitude	Longitude	Comments
		Decimal Degrees	**Decimal Degrees**	
Big Bay	B 1	-33.028808	18.019161	
	B 2	-33.030550	18.022083	
	B 3	-33.039167	18.021183	
	B 4	-33.035367	18.010983	
	B 5	-33.044667	18.014917	
	B 6	-33.043950	18.009850	
	B 7	-33.040983	18.013033	No sediment or macrofauna collected
	B 8	-33.040497	18.015473	No sediment or macrofauna collected
	BC 1	-33.029733	18.007400	
	BC 2	-33.048633	18.001550	
	BC 3	-33.065414	18.020089	
	FF 1	-33.039056	18.002878	
	FF 2	-33.040681	18.007119	Sediment scraped off the calcrete rock however, no macrofauna collected
	FF 3	-33.042911	18.004736	
Outer Bay North	NB 1	-33.032617	17.943633	
	NB 2	-33.034417	17.948867	
	NB 3	-33.038433	17.945633	
	NB 4	-33.045200	17.942067	
	NB C 1	-33.037283	17.960267	
	NB C 2	-33.042167	17.953733	
	NB C 3	-33.046983	17.931950	
Outer Bay South	JI 1	-33.071767	17.96245	
	JI 2	-33.075517	17.958383	
	JI 3	-33.076783	17.96275	
	JI C 1	-33.066625	17.959244	
	JI C 2	-33.067017	17.967400	
	JI C 3	-33.083350	17.965967	

Figure 1. **Map of Saldanha Bay showing the stations sampled during the baseline survey of the Saldanha ADZ, control sites are indicated with blue arrows while impact sites are indicated with red arrows, grey arrows indicate hard substrata.**

An airlift was used to suck up sediment for macrofauna. The airlift was constructed from a 120 mm diameter reinforced flexible hose 4 m long. A stainless-steel nozzle, 10 cm in diameter, with an air control valve was attached to the lower end. A stainless-steel frame covered with 1 mm nylon was attached to the top end (Figure 2). The meshed over the frame allowed air to escape while the sediment was captured in a removable muslin-cloth sock.

The air to the airlift was provided with a 15 mm hose from a 50-lt compressed air bottle pumped up to 200 bar. A regulator was used to maintain a constant 6 bar pressure in the hose. The diver could use the valve on the nozzle of the airlift to control the airflow and suction.

A stainless-steel tube 40 cm in diameter and 40 cm deep was used as a guide to obtaining a fixed sample area of 0.13 m^2 for each replicate sample (Figure 4). The handles on the sample tube were attached 30 cm from the lower rim and assisted the diver to gauge the suction depth of sediment down to a 30 cm (gives approximate volume of 0.04 m^3).

All three replicates were taken in a single dive and the sediment collected in a muslin-cloth sock that was attached to the frame at the top of the airlift. The diver would recover the muslin-cloth sock with the sediment on return to the surface.

Figure 2. Airlift array with stainless steel tube (400m diameter used to collect sediment samples for macrofauna) used by Capricorn Fisheries Monitoring (2019).

Benthic macrofauna have been sampled at more than 30 sites in Big Bay (9 sites), Small Bay (ten sites) and Langebaan Lagoon (12 sites) since the inception of the State of the Bay monitoring programme in 2004. The data collected during the Saldanha ADZ baseline survey is further compared to the Big Bay sites sampled during the 2019 Saldanha Bay Water Quality Trust (SBWQT) State of the Bay monitoring programme, (hereafter referred to as SOB 2019). For the SOB 2019, samples were also collected using a diver-operated suction sampler, which sampled an area of 0.08 m^2 to a depth of 30 cm and retained benthic macrofauna (>1 mm in size) in a 1 mm mesh sieve bag. Three samples are taken at each site and pooled, resulting in a total sampling surface area of 0.24 m^2 per site (cf. 0.39m^2 for the ADZ baseline sampling). All macrofauna abundance and biomass data were ultimately standardised per unit area (m^2). Samples were stored in plastic bottles and preserved with 5% formalin.

3.3 Sampling procedure to collect sediment for TOC/N, and granularity and porosity analysis

Sampling of the sediment was competed by Capricorn Fisheries Monitoring (2019) and the sampling procedure is as follows: Three sediment samples were collected by the diver at each sampling station. Sampling tubes were made out of 8 cm diameter PVC pipe, cut into 15cm lengths. Tight fitting caps were attached to each end to retain the sample cores. The top cap was painted yellow so that the top layers of sediment in the sample core could be identified.

The sample was taken by removing the caps and pushing the tube to its full length into the sediment. The painted top cap was then placed onto the tube and by excavating next to the tube the bottom cap was placed to secure the sediment in the tube.

When returning to the surface, the top 5 cm of sediment was scooped out. A plastic scoop was used to extract the sediment from the sampling tubes to ensure that no metal contamination of sediment destined for analysis of metals Al, Cu and Zn.

The combined sample of sediment was divided into three 500 ml plastic storage jars that were labelled with the sampling station number and date. The samples were then stored in an insulated cooler box with frozen packs. On shore the samples were transferred to a freezer and stored at -18°C.

3.4 Macrofauna Analysis

Macrofauna were analysed as per the analysis report prepared for the DEFF by Nina Steffani (Steffani 2019). The macrofauna samples were rinsed with freshwater to remove all traces of the formaldehyde, and hand-sorted to extract the preserved fauna from the sediment. The organisms were then transferred to a 1% phenoxyethanol (ethylenglycolmonophenyl-ether) solution for preservation. Any organisms considered dead at the time of collection (e.g. empty shells, decapitated polychaetes) were excluded from the study. Specimens were identified to the lowest taxonomic level possible, counted and densities expressed as no/sample. Literature used for identification purposes include amongst others Day (1967a, b), Fauchald (1977), Griffiths (1976), Kensley (1972, 1973, 1978, 1982), Kilburn and Rippey (1982), Barnard and Kamaran (1991a, b), Lowry and Springthorpe (2001), Wilson et al. (2003), Branch et al. (2010), and Milne and Griffiths (2013), as well as various internet web sites. All taxonomic names are verified against WoRMS (World Register of Marine Species 2019).

Information on species-specific feeding modes was sourced from a range of literature, (e.g. scientific publications, web databases (e.g. MarLIN 2006), general field books, technical papers (e.g. Macdonald et al. 2010). In the event that no information of a feeding mode at the species level was available, a search was conducted at the genus level, and if still no information was found, then at the family level. Information sourced at such higher level is marked by a question mark. For taxa that could only be identified at a high taxonomic level, (e.g. Brachyura), feeding modes were omitted. Macrofaunal species can have several feeding modes, and can switch between them in response to environmental conditions. A number of species have therefore more than one feeding mode allocated.

3.4.1 Statistical Analyses

The statistical program, PRIMER 6 (Clarke and Warwick 1993), was used to analyse benthic macrofauna abundance data. Data were root-root (fourth root) transformed and converted to a similarity matrix using the Bray-Curtis similarity coefficient. Multidimensional Scaling (MDS) plots

were constructed in order to find 'natural groupings' for the lease areas. Data collected during the 2019 SOB annual survey for Big Bay was included for further comparisons in the BB lease area.

Diversity indices provide a measure of diversity, i.e. the way in which the total number of individuals is divided up among different species. Understanding changes in benthic diversity is important because increasing levels of environmental stress generally decreases diversity. Two different aspects of community structure contribute to community diversity, namely species richness and equability (evenness). Species richness refers to the total number of species present while equability or evenness expresses how evenly the individuals are distributed among different species. A sample with greater evenness is considered to be more diverse. It is important to note when interpreting diversity values that predation, competition and disturbance all play a role in shaping a community. For this reason, it is important to consider physical parameters as well as other biotic indices when drawing a conclusion from a diversity index.

The *Shannon-Weiner diversity index* (H') was calculated for each sampling location using PRIMER V 6:

$H' = - \Sigma i p_i (\ln p_i)$ [2]

The mean Shannon-Weiner diversity index calculated for each of the lease areas (BB, NB and JI) was statistically compared to the prescribed threshold (H' = 3) separating the Oxic B category from the Hypoxic A (DAFF 2018):

Table 2. Ranges of biological indices in five sediment organic enrichment categories (Borja *et al.* 2000).

	Oxic A	Oxic B	Hypoxic A	Hypoxic B	Anoxic
Biological:					
Shannon-Weiner diversity index (H')	>4	4 - 3	3 - 2	2 -1	<1
Infaunal Trophic Index (ITI)	>50	50 - 25	<25	<25	<5
AZTI Marine Biotic Index (AMBI)	<1.2	1.2 - 3.3	3.3 - 5	5 - 6	>6

Average H' for each lease area was tested for a Hypoxic A decrease in diversity below the Oxic B category by a 1-sample t-test, with a reference constant set at the threshold value (Table 2):

H_0: $\mu \geq 3$; H_A: $\mu < 3$ Shannon-Weiner Index (1-tailed)

If there was evidence of a sub-optimal diversity an ANOVA was undertaken to test the following hypotheses:

[2] Where p_i is the proportion of the total count arising from the *i*th species. This is the most commonly used diversity measure and it incorporates both species richness and equability.

H_0: there is no interaction between farm/reference site and baseline/operational; H_A: there is an interaction (2-tailed).

The Infaunal Trophic Index (ITI) categorises invertebrates into four groups according to their feeding mode: Group 1 – suspension feeders; Group 2 – surface detritus feeders; Group 3 – surface deposit feeders; Group 4 – sub-surface deposit feeders.

The index is then calculated as: ITI = 100-(33.3(n2+2n3+3n4)/(n1+n2+n3+n4))

Where n1 is abundance of individuals in trophic group 1, and so on.

The ITI is a continuous statistic that falls between 0-100 and the relationship between ITI scores and the status of the community with regard to anthropogenic impacts can generally be given as follows: ITI >55 community normal with little anthropogenic effect, ITI between 25-55 community changed or anthropogenically enriched, and ITI <25 community degraded (derived from Somerfield 2009).

Average ITI for each lease area was tested to see if it dropped below the threshold level for Hypoxic A:

H_0: $\mu \geq 25$; H_A: $\mu < 25$ Infaunal Tropic Index (1-tailed).

In addition, ANOVA was undertaken to test the following hypotheses:

H_0: there is no interaction between farm/reference site and baseline/operational; H_A: there is an interaction (2-tailed).

The AZTI's Marine Biotic Index (AMBI) was also calculated for macrofauna samples from different lease areas. This biotic indicator was originally designed to assess the health of European estuarine and coastal soft bottom communities and has been widely used elsewhere, e.g. South America's Atlantic coast (Borja et al 2000, Borja 2005, Muniz et al 2005). Individual species are assigned to five ecological groups based on their sensitivity/tolerance to environmental stress/disturbance with the most sensitive assigned to Group I and the most tolerant assigned to Group V. The AMBI is a continuous statistic that falls between 0-7 and is derived from the proportion of individual abundance in the five ecological groups. These are related to the degree of sensitivity to environmental disturbance, with low AMBI scores (0-1.2) reflecting undisturbed benthic communities and high AMBI scores (>5) reflecting heavily disturbed communities that are dominated by species resilient to environmental degradation (Borja et al 2000, Borja 2005). The score is calculated using AMBI software developed by AZTI (https://ambi.azti.es/).

Average AMBI for each lease area was tested for a Hypoxic A decrease in score above the oxic B category by a 1-sample t-test:

H_0: $\mu \leq 3.3$; H_A: $\mu > 3.3$ AMBI (1-tailed)

In addition, ANOVA was undertaken to test the following hypotheses:

H_0: there is no interaction between farm/reference site and baseline/operational; H_A: there is an interaction (2-tailed).

3.5 Particle Size Analysis

Particle size analysis was undertaken by the CSIR and characteristics were analysed as per the methods described by Steffani (2019). A representative sub-sample of at least 250g is sieved through various meshed sieves (2mm - 0.064mm), dried and weighed. The particle size distribution is reported as the percentage retained on each sieve size.

3.6 Trace Metals

Trace metal analysis was undertaken by the CSIR and were analysed as per the methods described by Steffani (2019). For sample preparation, a representative sub-sample of 50 - 100g is either oven (105'C) or freeze-dried to remove all moisture. The dried sample is then homogenised with a zirconium ball in a mill to a fine powder. For the analysis of trace metals (Aluminium as Al Total (dry), Copper as Cu Total (dry), and Zinc as Zn Total (dry)), 0.5g of dried and homogenised sample is acid digested with concentrated Nitric Acid, Perchloric Acid and Hydrogen Peroxide in a closed vessel microwave digestor. The digestate is then analysed for metals via Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES), which is an analytical technique used for the detection of chemical elements. It is a type of emission spectroscopy that uses the inductively coupled plasma to produce excited atoms and ions that emit electromagnetic radiation at wavelengths characteristic of a particular element. It is a flame technique with a flame temperature in a range from 6 000 to 10 000 K. The intensity of this emission is indicative of the concentration of the element within the sample. The results are presented in mg/kg.

3.7 Total Organic Carbon (TOC) and Nitrogen

Total Organic Carbon (TOC) and Nitrogen analyses were undertaken by the CSIR as per the analysis report prepared for the DEFF by Nina Steffani (Steffani 2019). For the analysis of total organic carbon (TOC) and nitrogen, approximately 5 -10g of dried and homogenised sample is acidified with 0.1N HCl and agitated to remove inorganic carbonates as volatile CO2. The sample is copiously washed with Milli Q water after acidification and dried. A dry sub-sample is weighed and analysed for TOC and nitrogen via thermo-catalytic combustion in a VARIO Elementar

4 RESULTS AND DISCUSSION

4.1 Sediment physico-chemical properties

4.1.1 Particle Size Analysis

The particle size composition of the sediments occurring in Saldanha Bay are strongly influenced by wave energy and circulation patterns in the Bay (Clark et al 2019). Coarser or heavier sand and gravel particles are typically found in areas with high wave energy and strong currents as the movement of water in these areas suspends fine particles (mud and silt) and flushes these out of these areas. Disturbances to the wave action and current patterns, which reduce the movement of water, can result in the deposition of mud in areas where sediments were previously much coarser. The quantity and distribution of different sediment grain particle sizes (gravel, sand and mud) through Saldanha Bay influences the status of biological communities and the extent of contaminant loading that may occur in Saldanha Bay. Contaminants such as metals and organic toxic pollutants are predominantly associated with fine sediment particles (mud and silt). This is because fine grained particles have a relatively larger surface area for pollutants to adsorb and bind to. Higher proportions of mud, relative to sand or gravel, can thus lead to high organic loading and trace metal contamination (see Section 4.2 and 4.3).

Baseline particle size distribution data collected from various lease areas are shown in an ordination plot presented in Figure 3. Data collected from SOB 2019 clearly formed its own cluster and shows some form of dissimilarity to the rest of the sites sampled across the aquaculture lease areas. Furthermore, while the lease areas appear to share a certain degree of similarity; there is indeed high variability, effectively spacing all the impact and reference sites out. The latter appears to also imitate patterns observed in macrofaunal abundance (Figure 11). In addition, it was observed that inter-sample variation was greatest for samples collected at Outer Bay South impact sites and Outer Bay North reference sites; that are situated in the deeper and more exposed outer Bay area.

PERMANOVA analyses indicated that particle size distribution differed significantly across lease areas (Pseudo - $F_{2,32} = 2.24$, $p < 0.05$) but not between impact/reference sites (Pseudo – $F_{1,32} = 2.23$, $p > 0.05$). However, the interaction effect between lease area and impact/reference sites were found to have a significant effect on particle size distribution (Pseudo - $F_{2,32} = 4.95$, $p < 0.05$). Pairwise tests only detected a significant difference between reference and impact sites at the Big Bay area ($p < 0.05$) and not at the other two lease areas.

Particle size composition (gravel, mud and sand) of the impact/reference sites across the three lease areas are shown in Figure 4. It is evident that across all three lease areas and their impact/reference sites, sand is the dominant component. Big Bay has a higher proportion of mud compared to the other two lease areas. Furthermore, mud composition is greater at the impact and reference sites compared to those sampled in SOB 2019. This may once again be related to the presence of the abrasion platform in the ADZ area, with fine (muddy) sediment potentially settling in deeper protected areas between patch reefs. At impact sites some of this fine material could originate from current shellfish operations, but the results indicate that this does not currently exceed rates of natural deposition of fine particles seen at control sites. On the other hand, the composition of gravel is prominent across the Outer Bay North and Outer Bay South lease areas. Interestingly, it is noticeable that gravel is mostly present across the reference sites of all lease areas, apart from the two impact sites at Outer Bay South. While

there is variability in particle size composition across the sites and lease areas sampled; sand is the major composition of sediment particle size within the Bay. The latter findings are in line with sediment composition recorded in SOB 2019 as well as earlier detailed studies by Flemming (1977a,b); in which he found that sediments in Saldanha Bay were comprised mostly of fine (0.125-0.25 mm) or very fine sand (0.063-0.125 mm).

Particle size composition is strongly influenced by wave energy and strong currents as well as indirectly by anthropogenic induced disturbance events (e.g. dredging events). The SOB 2019 reports documents that historical dredge events, which re-suspended large amounts of mud from the deeper lying sediments, seem to be a dominant contributor to the elevated mud content in the Bay and results of surveys have shown a general pattern of an increase in mud content following dredge events, followed by a recovery in subsequent years. Any future dredging or other such large-scale disturbance to the sediment in Saldanha Bay are likely to result in similar increases in the mud proportion with accompanying increase in metal content. Maricultrure operation can also result in increases in the fine sediment fraction due to the biodeposition of particulate organic matter arising from faeces, pseudofaeces, uneaten food and other particulate matter (Pulfrich 2018). Based on the results of the baseline sediment survey; it appears that such disturbances are not clearly evident.

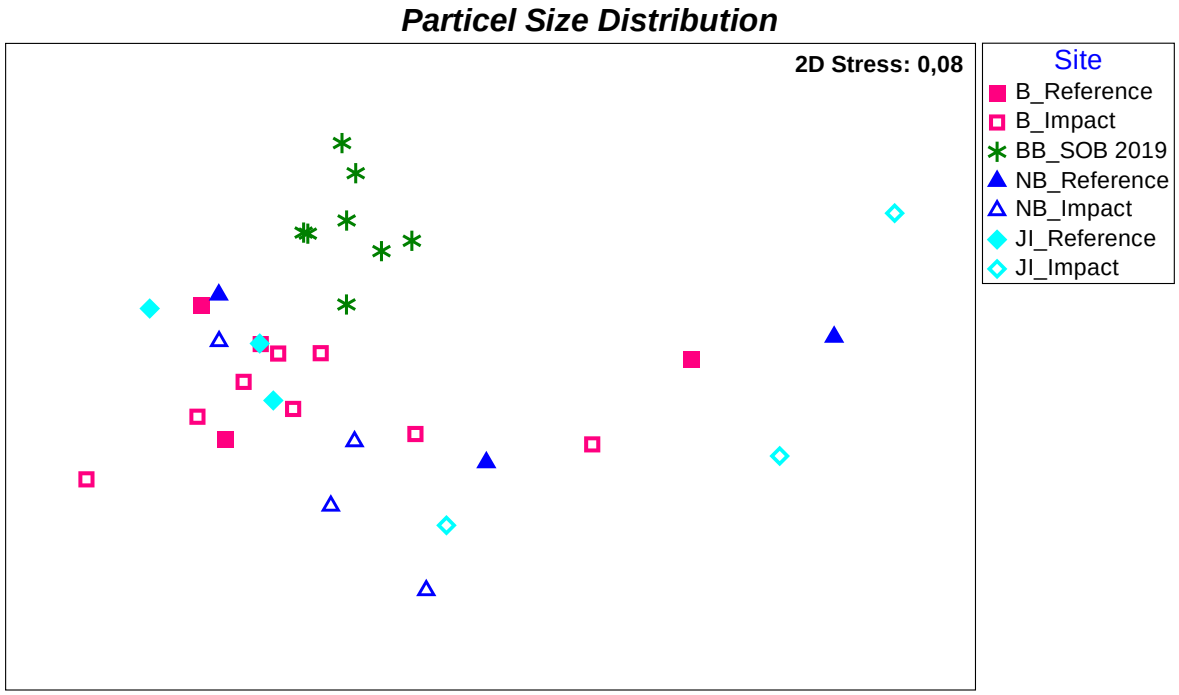

Figure 3 **MDS plot showing similarity amongst lease areas based on baseline particle size distribution data collected in 2019. Ordination plot comparing the 2019 baseline particle size distribution data to the data collected during the 2019 SOB survey. Symbols on the ordination plots are as follows: Big Bay (B), Outer Bay North (NB) and Outer Bay South (JI).**

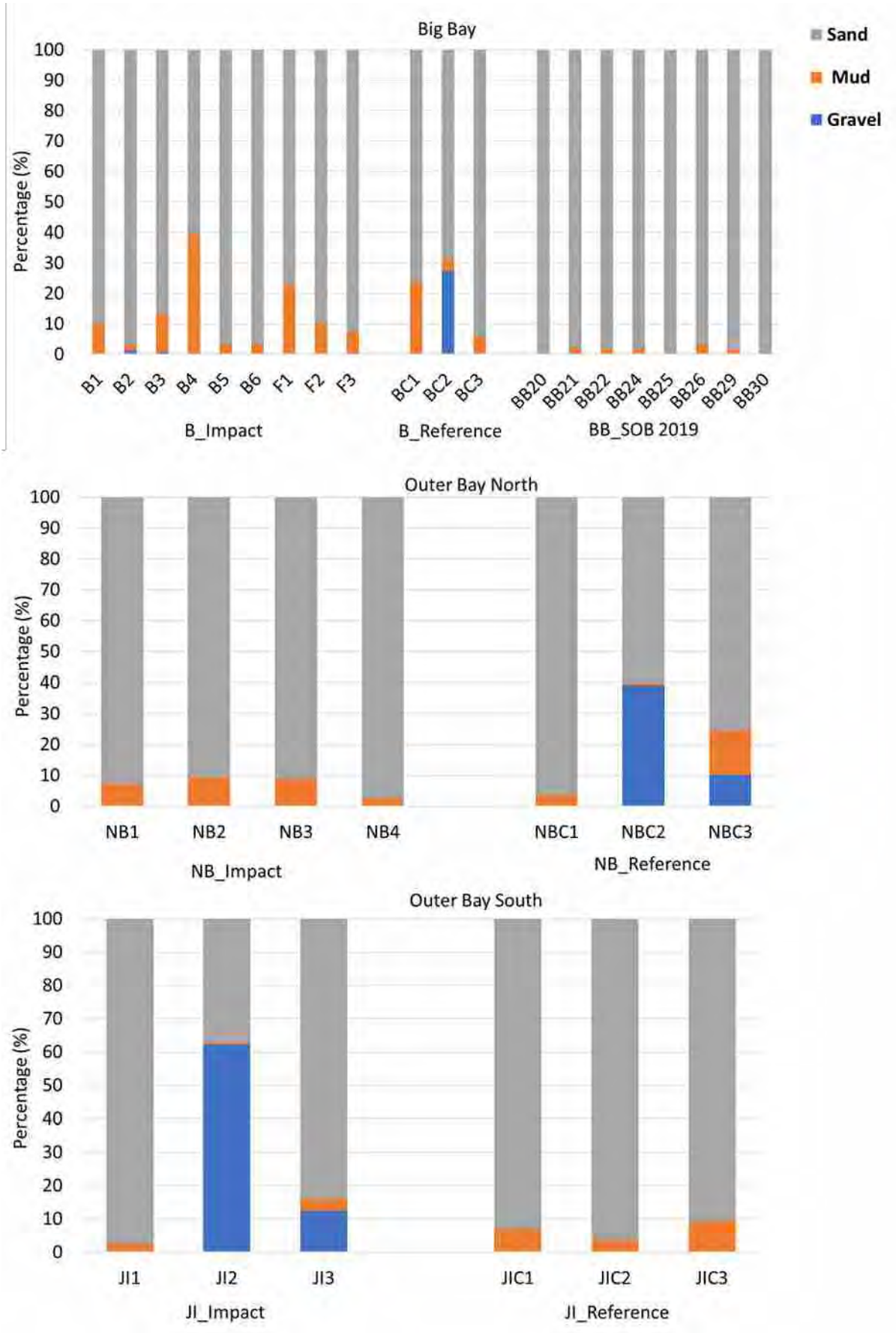

Figure 4 **Particle size composition (percentage gravel, sand and mud) of sediments at various sites within Big Bay, Outer Bay North and Outer Bay South in Saldanha Bay in 2019.**

4.1.2 Trace Metals

Trace metals occur naturally in the marine environment and some are important in fulfilling key physiological roles. Disturbance to the natural environment by either anthropogenic or natural factors can lead to an increase in metal concentrations occurring in the environment, particularly sediments. An increase in metal concentrations above natural levels, or at least above established safety thresholds, can result in negative impacts on marine organisms, especially filter feeders like mussels that tend to accumulate metals in their flesh. High concentrations of metals can also render these species unsuitable for human consumption. Metals are strongly associated with the cohesive fraction of sediment (i.e. the mud component) and with TOC. Metals occurring in sediments are generally inert (non-threatening) when buried in the sediment but can become toxic to the environment when they are converted to the more soluble form of metal sulphides. Metal sulphides are known to form as a result of natural re-suspension of the sediment (strong wave action resulting from storms) and from anthropogenic induced disturbance events like dredging activities.

The Benguela Current Large Marine Ecosystem (BCLME) program reviewed international sediment quality guidelines in order to develop a common set of sediment quality guidelines for the coastal zone of the BCLME (Angola, Namibia and west coast of South Africa) (Table 3). The BCLME guidelines cover a broad concentration range and still need to be refined to meet the specific requirements of each country within the BCLME region (CSIR 2006). There are thus no official sediment quality guidelines that have been published for the South African marine environment as yet, and it is necessary to adopt international guidelines when screening sediment metal concentrations. The National Oceanic and Atmospheric Administration (NOAA) have published a series of sediment screening values which cover a broad spectrum of concentrations from toxic to non-toxic levels as shown in Table 3

The Effects Range Low (ERL) represents the concentration at which toxicity may begin to be observed in sensitive species. The ERL is calculated as the lower 10th percentile of sediment concentrations reported in literature that co-occur with any biological effect. The Effects Range Median (ERM) is the median concentration of available toxicity data. It is calculated as the lower 50th percentile of sediment concentrations reported in literature that co-occur with a biological effect (Buchman 1999). The ERL values represent the most conservative screening concentrations for sediment toxicity proposed by the NOAA and ERL values have been used to screen the Saldanha Bay sediments.

Table 3 Summary of Benguela Current Large Marine Ecosystem and National Oceanic and Atmospheric Administration metal concentrations in sediment quality guidelines

Metal (mg/kg dry wt.)	BCLME region (South Africa. Namibia. Angola)		NOAA	
	Special care	Prohibited	ERL	ERM
Cu	50 – 500	>500	34.0	270.0
Zn	150 – 750	> 750	150.0	410.0
1(CSIR 2006). 2 (Long *et al.* 1995. Buchman 1999)				

Trace metals, particularly Cu and Zn, were only collected at the three sites within the finfish area and their relative baseline concentrations are shown in Figure 5. It is evident that there are higher concentrations of Zn compared to Cu across the sites sampled. However, both metals were significantly below their ERL threshold (1 sample t-test; Cu: $t = -109$, $p < 0.05$; Zn: $t = 130.1$, $p < 0.05$). Comparisons of these same metals were also made across sites sampled in Big Bay (SOB 2019) and are illustrated in Figure 6. Once again, Zn occurred at higher concentrations than Cu, furthermore, Zn concentrations at sites sampled in Big Bay are greater than those recorded at the finfish area; however these differences were not significant (t-test, $t = -1.74$, $p > 0.05$). The latter pattern was also observed for Cu, and concentrations between Big Bay and the finfish area were found to be significantly different (t-test, $t = -2.74$, $p = < 0.05$). As previously mentioned, both metals across both areas fell well below their ERL threshold (Table 3). This is intuitive, considering the low mud content found at these sites (refer to Section 4.1.1); effectively reducing the surface area for pollutants to adsorb and bind to. Furthermore, the low trace metal content is also attributed to limited pollution inputs as finfish farming is only operational at a pilot scale within Big Bay and there is limited (if any) application of antifouling products (Cu active agent) to submerged farm structures and limited inputs of fish feed (Zn is a fish health additive included in feed). Subsequently, Molapong has opted to not coat farming structures with antifoulant paint, and should this continue, analysis of Cu sediment content would become redundant.

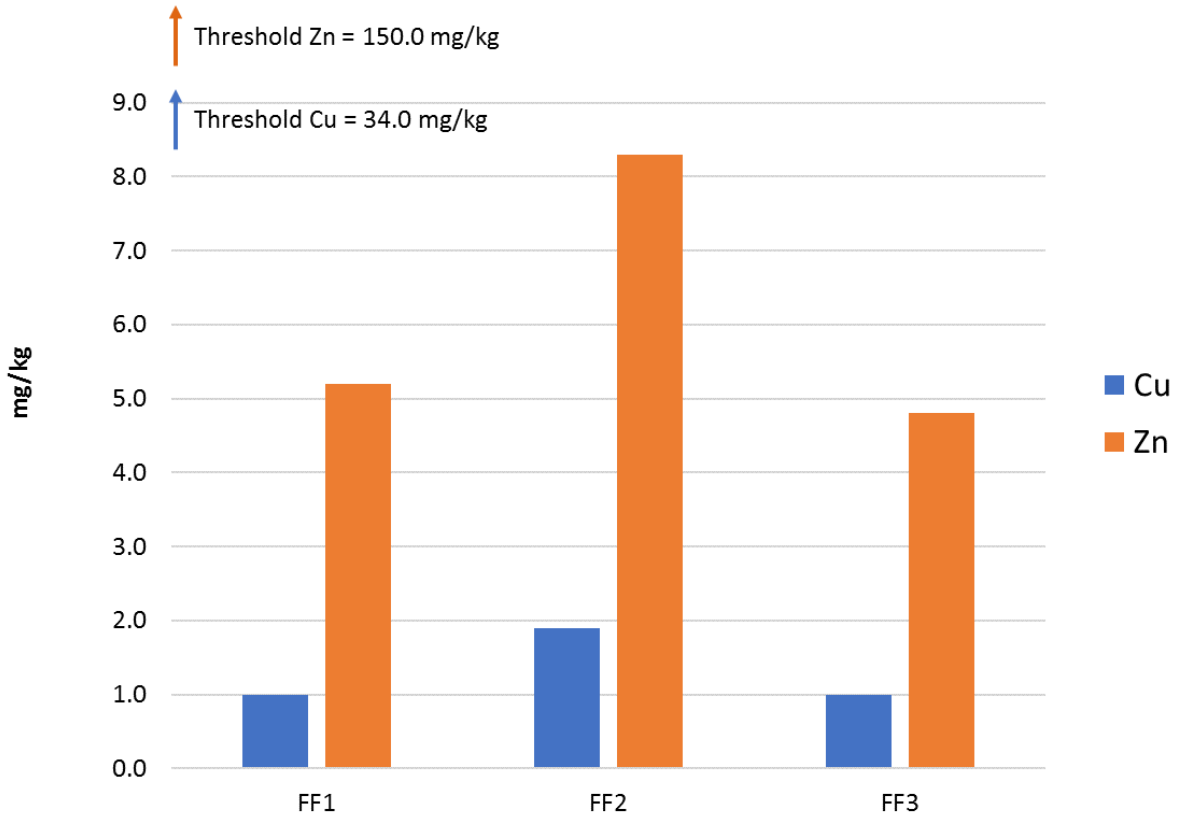

Figure 5 **Total concentrations of Copper (Cu) and Zinc (Zn) in mg/kg recorded at the three sites within the finfish area of Saldanha Bay in 2019.**

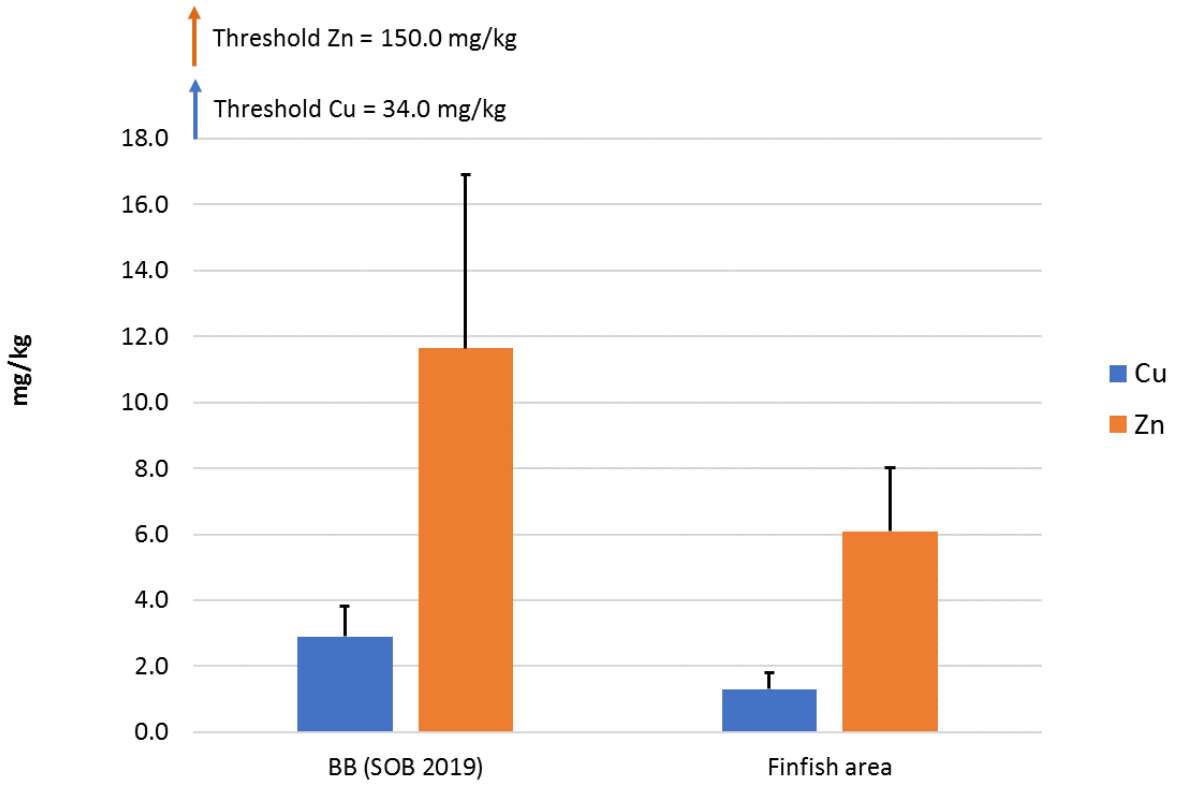

Figure 6 **Mean concentrations of Copper (Cu) and Zinc (Zn) in mg/kg recorded at the Finfish area and Big Bay (data from SOB 2019) in 2019.**

4.1.3 Total Organic Carbon (TOC) and Nitrogen (TON)

Total organic carbon (TOC) and total organic nitrogen (TON) accumulates in the same areas as mud as organic particulate matter is of a similar particle size range and density to that of mud particles (size <60 µm) and tends to settle out of the water column together with the mud. Hence, TOC and TON are most likely to Total organic carbon (TOC) and total organic nitrogen (TON) accumulates in the same areas as mud as organic particulate matter is of a similar particle size range and density to that of mud particles (size <60 µm). The accumulation of organic matter in the sediments doesn't necessarily directly impact the environment but the bacterial breakdown of the organic matter can (and often does) lead to hypoxic (low oxygen) or even anoxic (no oxygen) conditions. Under such conditions, anaerobic decomposition prevails, which results in the formation of sulphides such as hydrogen sulphide (H_2S). Sediments high in H_2S concentrations are characteristically black, foul smelling and toxic for living organisms. The most likely sources of organic matter in Saldanha Bay are from phytoplankton production at sea and the associated detritus that forms from the decay thereof, fish factory waste discharged into the Bay, faecal waste concentrated beneath the mussel and oyster rafts in the Bay, treated sewage effluent discharged into the Bay from the wastewater treatment works (Saldanha & Langebaan) and stormwater.

Total organic carbon and nitrogen in sediments were collected at impact and reference sites at various areas (Big Bay, Outer Bay North and Outer Bay South) within Saldanha Bay and are shown in Figure 7. TOC/TON levels were found to be greater at the impact sites in comparison to reference sites (particularly for Big Bay and Outer Bay South but these differences were not significant (t-tests, p >

0.05). In addition, no significant difference was found between the impact and reference sites in the Outer Bay North lease area for both TOC (t-test, t= -1.33, p > 0.05) and TON (t-test, t= -1.44, p > 0.05). Baseline data recorded in Big Bay at both the impact and reference sites are similar to levels recorded from SOB 2019. These low levels of organic carbon and nitrogen recorded across all three lease areas are also related to the low mud content measured at these sites (see Section 4.1.1); as higher proportions of mud are typically found in depositional areas that are also associated with organic loading. Conversely, data recorded in the SOB 2019 report reveal relatively high levels of TOC/TON especially within Small Bay. It was noted that sources of organic carbon and nitrogen in Small Bay include fish factory wastes, biogenic waste from mussel and oyster culture as well as sewage effluent from the wastewater treatment works. The Big Bay and Outer Bay lease areas are not be exposed to all these anthropogenic inputs, and are more exposed and flushed than Small Bay.

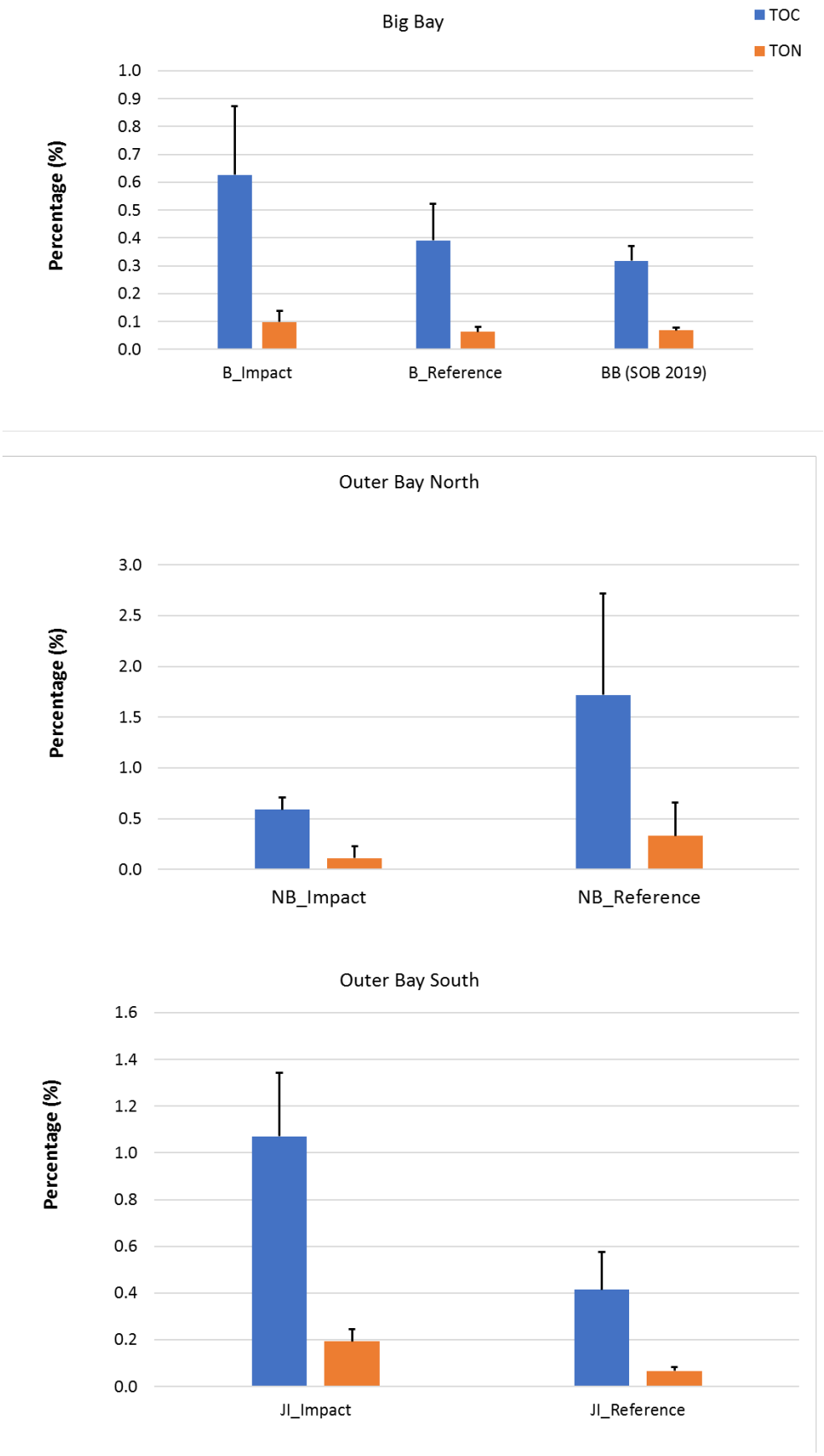

Figure 7 **Total organic carbon (TOC) and nitrogen (TON) in sediments collected at various sites within Big Bay (B), Outer Bay North (NB) and Outer Bay South (JI) in Saldanha Bay in 2019.**

4.2 Benthic Macrofauna

4.2.1 Univariate descriptors of community state

Univariate analyses of macrofaunal community descriptors in Big Bay revealed no statistically significant differences between average reference and impact values for Shannon Weiner Diversity, Total species, Abundance and Evenness (ANOVA, $p > 0.05$ for all) (refer to Figure 8). In Outer Bay North reference and impact areas were not significantly different for Shannon Weiner Diversity, Total species and Evenness, however the abundance in Outer Bay North reference sites was significantly lower than in the impact sites ($p = 0.01$), suggesting that the presence of shellfish aquaculture in Outer Bay North may be increasing species abundance. At Outer Bay South only the total number of species was significantly different between reference and "impact" sites ($p = 0.003$), with the impact sites having significantly less species than the reference sites. This is likely a natural condition as there is currently no aquaculture occurring in the vicinity of Outer Bay South. Shannon Weiner Diversity, Abundance and Evenness were not significantly difference between sites at Outer Bay South.

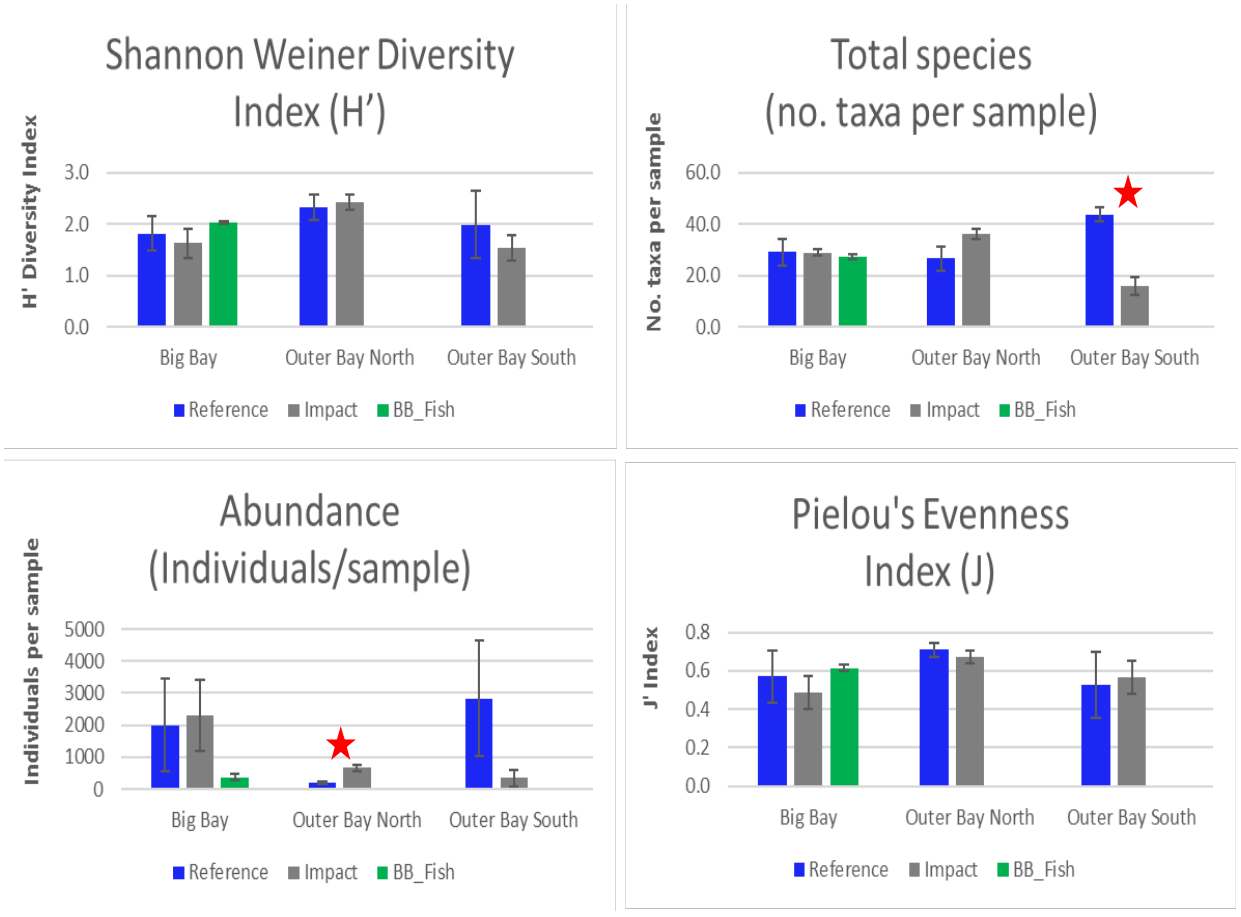

Figure 8. Variation in macrofaunal community descriptors Diversity, Taxonomic richness (no. of taxa/m2), Abundance (individuals/sample) and Evenness for all lease area. Values are means ± 1 SE. ★ Indicates instances where reference and impact sites were significantly different.

The Shannon-Wiener diversity index (H') was calculated for each of the lease areas and tested against the threshold values as prescribed by the sample plan for the BB, NB and JI lease areas (DAFF 2018). In all cases the average H' for each lease area was significantly lower ($P < 0.05$ in all cases) than the prescribed threshold of H' = 3 (Table 2). However, when an asymmetric ANOVA was preformed

comparing the impact sites to the reference sites no significant difference was detected between the Shannon-Wiener diversity index at impact sites and reference sites for all lease areas. At Outer Bay South there is currently no aquaculture, indicating the diversity seen at the impact sites is typical of this area and not a reflection of aquaculture impacts. Additionally, as there was no significant difference between impact and reference sites this further confirms that this area has a naturally lower H' than the expected threshold of H' = 3. The impacts sites in both the NB and BB lease areas also recorded significantly lower H' compared to the prescribed threshold of H' = 3. However, when compared to the reference stations there was no significant deference between impacted sites and reference stations. In addition, data from SOB 2019 indicates that no sites throughout Saldanha Bay or Langebaan exceeded a H' of 2.8. This indicates that Saldanha Bay naturally has a lower H' than the prescribed threshold.

As such it is recommend that in future, H' be statistically compared to between impact sites and reference stations to determine if there has been a significant decrease in diversity due to aquaculture activities or the threshold H' be reduced to a value more reflective of the natural state in Saldanha Bay. As a preliminary baseline value for the lease areas, an average H' of the reference stations could be used giving suitable thresholds of H' = 1.6 and H' = 2.32 for BB and NB respectively, while an average of all the sites at the JI lease area could be used (as there is currently no aquaculture operational), giving a H' of 1.99. The threshold H' values should be recalculated after each macrofaunal sampling event adding the H' of the reference stations.

4.2.2 Indices of community health

One sample t-tests showed that the average Infaunal Trophic Index (ITI) for all lease areas were significantly above the prescribed threshold value (Table 4, > 25, $p < 0.05$ for all). Additionally, there was no significant difference between the ITI of impact and reference sites within any of the three lease areas when compared using an asymmetric ANOVA ($p > 0.05$ for all). Based on the trophic index the macrofaunal communities at the majority of sites were normal or experiencing little anthropogenic impacts, however three stations within Outer Bay North (NB3, NBC1 and NBC3) and two stations at Outer Bay South (JI1 and JIC2) were showing signs of minor change that may in some cases may be attributable to anthropogenic enrichment e.g. at NB3. In the case of the Outer Bay South sites this is likely due to natural perturbation as no aquaculture is currently occurring in this lease area Table 4. The Outer Bay North and Outer Bay South sites are more exposed to open coast natural disturbances (storms, waves, temperature fluctuations, sediment movement etc) and process that sites within Big Bay and this may largely explain the "changed"/slightly disturbed" results for these sites.

The AZTI Marine Biotic Index (AMBI) was calculated for each of the sample sites as well as an average score calculated for each of the lease and control areas. The average AMBI score for each lease area was tested against the threshold values as prescribed by the sample plan for the BB, NB and JI lease areas (DAFF 2018). In all cases the AMBI score for each lease area (Table 4) was significantly lower ($p < 0.05$ in all cases) than the prescribed threshold of AMBI = 3.3 (Table 2). Asymmetric ANOVAs comparing the impact sites to the reference sites within a lease area showed no significant difference between AMBI scores for impact sites and reference sites in any of the lease areas ($p > 0.05$ for all). The average AMBI scores indicate that Big Bay impact and reference, and Outer Bay South impact and reference areas can be considered "undisturbed" while both areas in Outer Bay North are "Slightly

disturbed" (Figure 9), more detailed disturbance categories for each individual site are provided in Table 4.

Table 4. Calculated values for three macrofaunal biological indices for all sites. Threshold values prescribed for each index supplied (DAFF 2018).

Area	Site	Shannon-Weiner diversity index (H')	Infaunal Trophic Index (ITI)	ITI community description	AZTI Marine Biotic Index (AMBI)	AMBI disturbance category
Threshold		**≥ 3**	**≥ 25**		**≤ 3.3**	
Big Bay	B 1	2.41	67.3	Normal	0.70	Undisturbed
	B 2	2.02	57.2	Normal	0.77	Undisturbed
	B 3	2.22	66.1	Normal	1.24	Slightly disturbed
	B 4	1.51	99.2	Normal	0.09	Undisturbed
	B 5	0.79	99.7	Normal	0.05	Undisturbed
	B 6	0.83	99.0	Normal	0.07	Undisturbed
	B 7	-	-		-	
	B 8	-	-		-	
	BC 1	1.64	98.4	Normal	0.11	Undisturbed
	BC 2	2.52	63.2	Normal	1.41	Slightly disturbed
	BC 3	1.40	98.4	Normal	0.14	Undisturbed
	FF 1	2.05	86.5	Normal	0.42	Undisturbed
	FF 2	-	-		-	
	FF 3	2.00	90.3	Normal	0.57	Undisturbed
Outer Bay North	NB 1	2.12	65.5	Normal	1.07	Undisturbed
	NB 2	2.21	78.9	Normal	1.00	Undisturbed
	NB 3	2.69	46.9	Changed	1.81	Slightly disturbed
	NB 4	2.64	74.5	Normal	1.44	Slightly disturbed
	NB C 1	2.39	53.9	Changed	1.32	Slightly disturbed
	NB C 2	1.85	87.5	Normal	1.30	Slightly disturbed
	NB C 3	2.71	51.6	Changed	1.75	Slightly disturbed
Outer Bay South	JI 1	2.00	46.0	Changed	1.39	Slightly disturbed
	JI 2	1.51	65.8	Normal	0.73	Undisturbed
	JI 3	1.10	71.1	Normal	0.06	Undisturbed
	JI C 1	2.53	87.7	Normal	0.39	Undisturbed
	JI C 2	2.76	52.9	Changed	1.13	Undisturbed
	JI C 3	0.67	97.7	Normal	0.06	Undisturbed

The ITI and AMBI scores appear to show some level of agreement with sites classed as "changed" and "slightly disturbed" often coinciding (Table 4) and generally indicate that the aquaculture operations are having a negligible effect on benthic macrofauna present in the lease areas. However, A&RM has reservations about the use of both the ITI and AMBI index in South African ecosystems. Both indices were originally developed for use in European waters and they are therefore not easily applicable to species from South Africa. The ITI assumes that different trophic groups have different sensitivities to disturbance and the majority of species are not included in the provided species list meaning that an informed decision needed to be made depending on the available information of the feeding behaviour of the species. Somerfield (2009) accurately described the assignment of species to trophic groups as frequently being subjective and requiring a detailed knowledge of the biology of the species involved, which is often lacking. In addition, many of the species have been shown to use multiple feeding methods making it difficult to assign them to a single group, for this reason and/or because the taxonomic level identified was too unspecific for the determination of feeding mode only 47% of the species could be assigned to a group to be used in the calculation. Similarly, the AMBI index is calculated using a program developed for European waters and although the current list of AMBI

species assignments consists of 9 251 species (last updated in May 2019) they are predominantly for species from geographical areas in the Northern Hemisphere (Europe, North America, Central America, and Asia). The user therefore has to change the resolution from species level to genera, or else substitute a South African species with a similar species found in the northern hemisphere. This index also appears to be very robust, requiring a substantial amount of disturbance before indicating a severe disturbance level. Given this, it is recommended that alternative methods of identifying impacted sites or else a locally developed index should be used for the assessment of macrofaunal communities. Suggestions in this regard are provided below.

Macrofaunal species often respond to changes in environmental variables before they are chemically detectable (Cranford et al. 2006). These responses include: 1) a reduction in species biomass, 2) a decrease in the average body size of individuals, and 3) a shift in the relative dominance of trophic groups (Black et al. 2008, Cranford et al. 2012). It is therefore suggested that future sample analyses include the determination of species biomass. This can be used to construct ABC dominance curve (Cumulative abundance-biomass plots), which can provide information on the level of disturbance within a community.

Cumulative abundance-biomass plots of macrobenthic communities (Warwick 1993), also called k-dominance curves are used to visually assess patterns of abundance and biomass to identify if a disturbance is occurring within communities. When cumulative contributions by species to overall abundance and biomass are plotted together on the same graph (Figure 10), in the case of undisturbed communities, the curve for biomass generally lies above the curve for abundance for its entire length. Hypothetically, case A shows the expected response indicative of stable conditions, where the frequency or intensity of disturbance is low. Under these conditions k-selected (larger, long-lived species) make an important contribution to community structure (Warwick 1993) and while they seldom dominate numerically, these species usually provide the largest contribution to biomass. Smaller r-selected, opportunistic species with a shorter life-span are also represented, and usually dominate numerically but make a small (often insignificant) contribution to overall biomass (Warwick 1993). Under moderate or low levels of disturbance, the large competitive species are eliminated and the inequality between abundance and biomass dominants is reduced so that the curves coincide closely and may cross one another such as in hypothetical case B (Figure 10 middle). While in the case of high levels of disturbance, the larger dominant species die off or are displaced and the smaller r-selected, opportunistic species with a shorter life-span dominate, resulting in a high abundance of individuals but a low total biomass. In the case of highly/grossly disturbed communities, the curve for abundance generally lies above the curve for biomass for its entire length (Figure 10 C right)

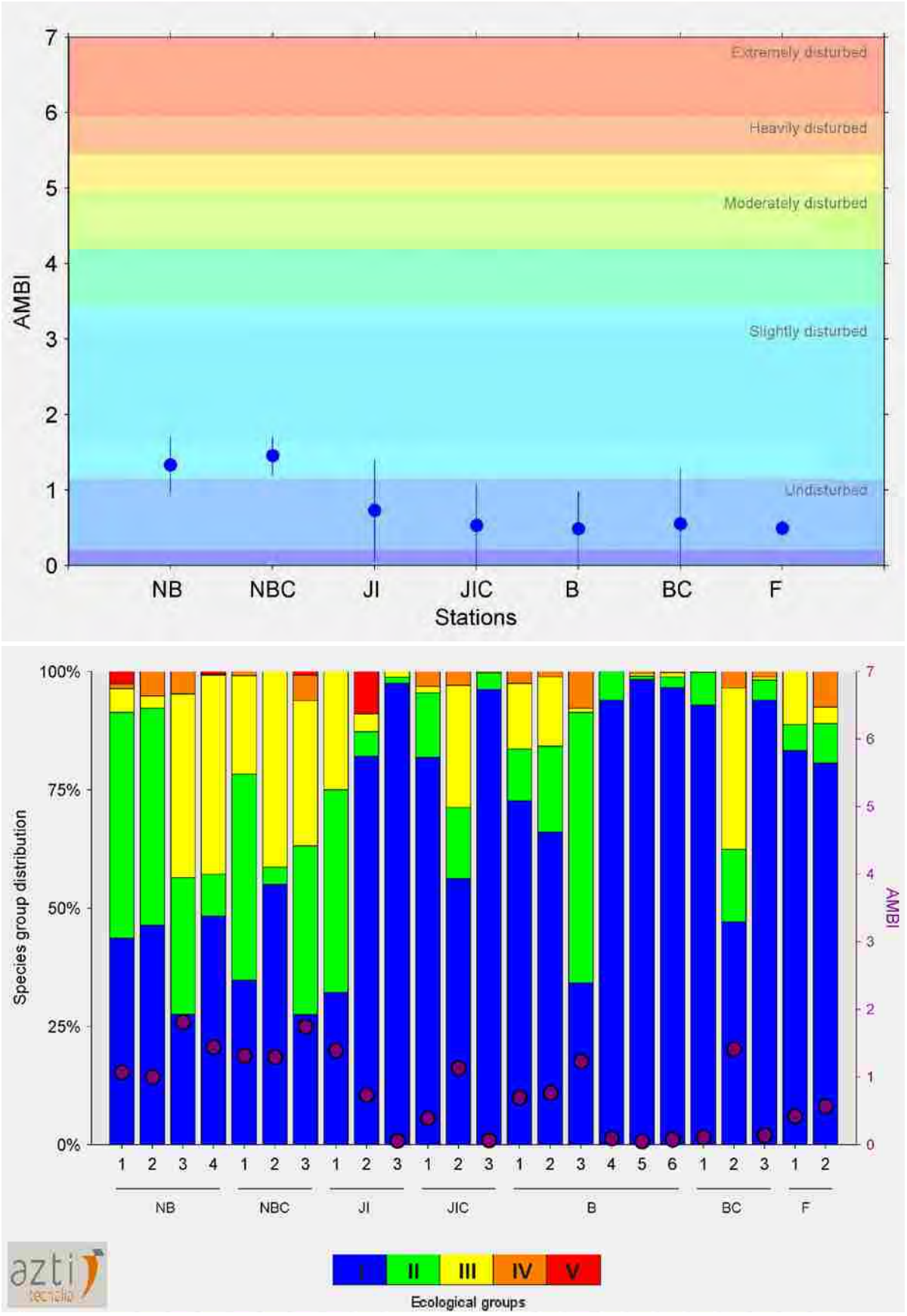

Figure 9 AMBI scores and disturbance classification for each of the lease areas and their control sites (top) and distribution of species ecological groups for all sites. Outer Bay North (NB), Outer Bay North Controls (NBC), Outer Bay South (JI), Outer Bay South Controls (JIC), Big Bay (B), Big Bay Controls (BC) and Big Bay Fish (F).

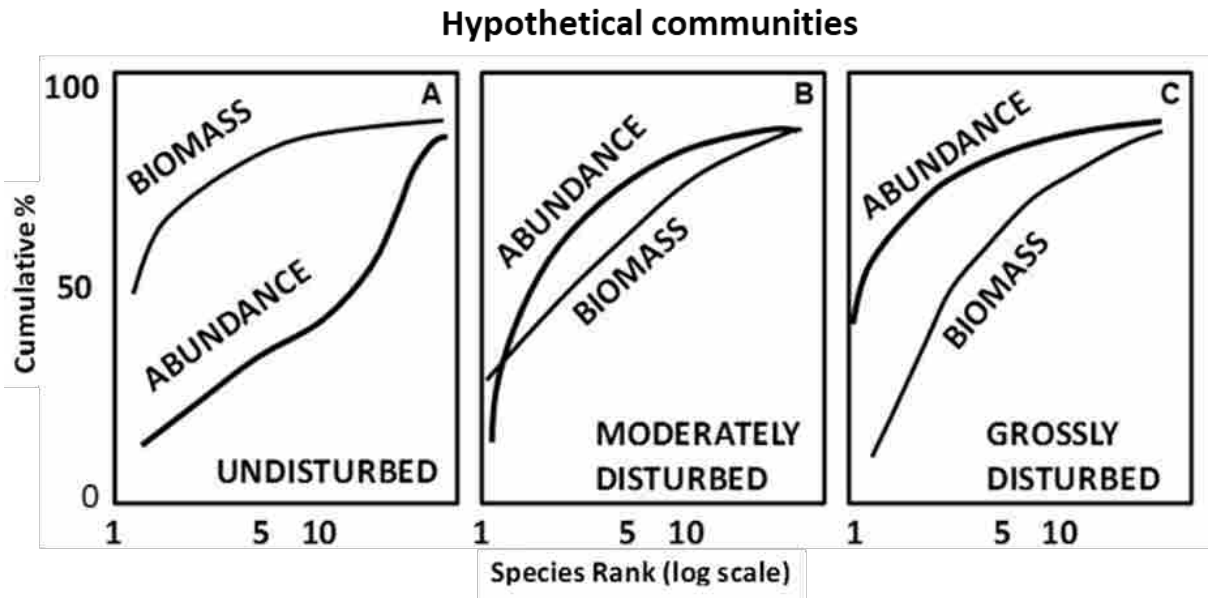

Figure 10 Hypothetical Abundance-Biomass Comparison (ABC) curves for species biomass and abundance showing undisturbed, moderately disturbed and grossly disturbed conditions (after Warwick 1993)

Another possible approach is the use of a biological traits index in which "fuzzy coding" (Chevenet et al. 1994) and may be more suitable than the ITI and AMBI index. Benthic invertebrate macrofauna have evolved certain biological characteristics or traits in response to the various environmental conditions present on the seafloor. These traits are associated with certain ecological processes (Hooper et al. 2005) and play an important role in recognising the functioning of an ecosystem e.g. sediment bioturbation, detritus degradation, biogenic habitat formation, sequestration of harmful substances etc. (Snelgrove 1998). Assessing these traits, expressed over a whole community of species, provides insight into how a particular ecosystem functions. Following disturbance to the benthic environment (natural or anthropogenic), a change in the in-situ community structure of the benthic macrofauna (and therefore the functioning of that ecosystem) would be expected. However, looking at the recovery of species assemblages or community structure may not reveal how well the ecosystem is functioning i.e. whether it is "functionally recovered" or not. A multi-trait approach is ideal as various traits can be implicated in functioning. One such approach, termed Biological Traits Analysis (BTA), has increasingly been used to describe aspects of ecosystem functioning (e.g. Bremner et al. 2003, 2006a,b; Bremner 2008, Cooper et al. 2008; Wan Hussin et al. 2012) and has been applied to studies within South Africa. Seven biological traits are chosen for the BTA analysis, reflecting life history characteristics, morphology and behaviour of species present in the sample. The traits are then subdivided into categories and the affinity of each taxon for a specific category scored from 0-3, where 0 is no affinity and 3 is total affinity. "Fuzzy coding" (Chevenet et al. 1994) is applied to taxa where several scores are allocated for the same trait e.g. one species with two types of feeding strategies is given the affinity 2 for both categories. Information on South African species-specific traits can be sourced from data provided by Dr Lara Atkinson from her PhD thesis.

4.2.3 Multivariate analysis

An ordination plot, that displays sites based on similarities in their macrofauna community composition in two dimensional space (sites with similar communities are closer together) prepared from baseline macrofaunal abundance data, is presented in Figure 12. This analysis reveals that macrofaunal communities present at the BB sites are clearly different to those at JI and NB. Both the reference and Impact sites in Big Bay show a degree of similarity forming a distinct cluster with no obvious distinction between impact and refernce sites. The sites at JI and NB share a degree of similarity with sites positioned in the same general area of the MDS, but the greater spacing bewteen individual sites indicates a higher degree of within area variability (cf. the tighter clustering of Big bay sites). Only the JI reference sites appear to have a high degree of macrofaunal similairty among themselves forming a cluster. It should be noted that in the absence of anthropogenic influences, differences in macrofaunal community structure are largely explained by the physical and environmental parameters (biological process such a recruitment, predation, competition etc. also play a role) present at each site i.e. currents, wave exposure, water quality, sediment granulometry and depth), these elements are likely to be distinctly different between the Big Bay and outer bay (NB & JI) lease areas.

PERMANOVA analyses indicated that there was a significant effect of lease area and impact/reference sites ($P < 0.05$). However, pairwise analyses indicated that there was no significant difference between impact and reference sites in both the BB and NB lease areas ($P > 0.05$) where bivalve aquaculture is currently operational, but detected a significant difference between reference and impact sites at the JI lease area where there is currently no aquaculture ($P < 0.05$).

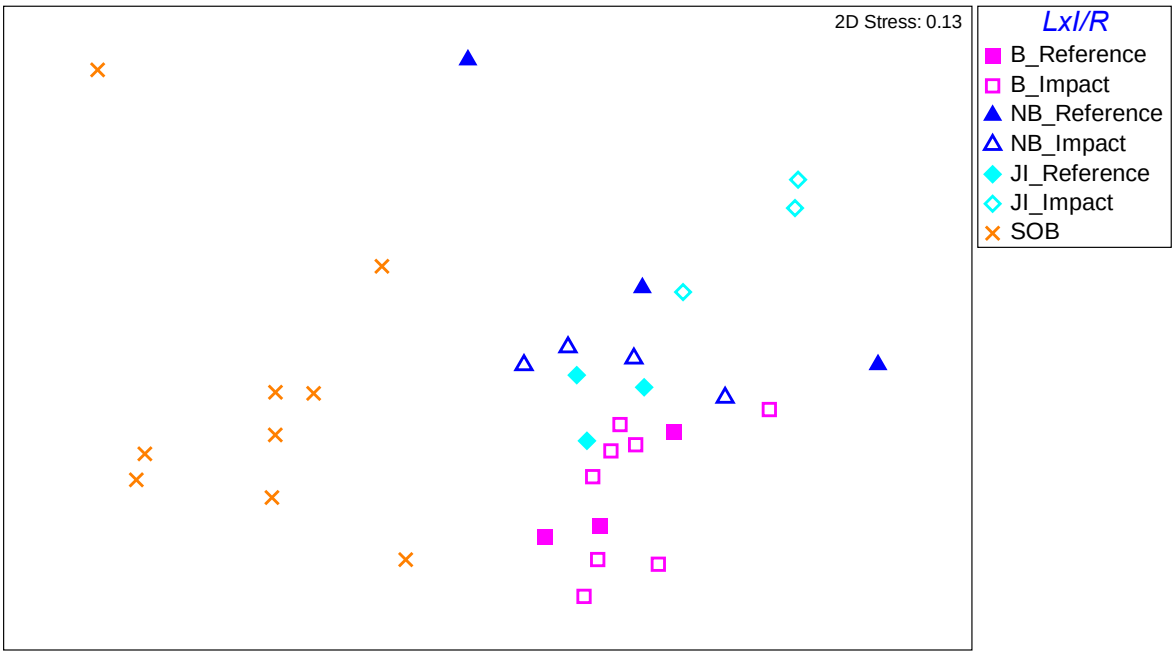

Figure 11. Ordination plots showing similarity amongst lease areas based on baseline benthic macrofauna abundance collected in 2019. Symbols on the ordination plots are as follows: Big Bay (B), Outer Bay North (NB) and Outer Bay South (JI) and State of the Bay 2019 (SOB).

The ordination plot comparing macrofauna data collected in Big Bay during the 2019 State of the Bay (SOB) annual survey with the baseline macrofaunal abundance data, is presented in Figure 12. The SOB sites are distinctly separate from and more dispersed than the baseline BB samples, suggesting a clear difference between the sample data. There are two factors that are likely influencing this result:

1. The SOB samples are generally located on the perimeter of the Bay where the substratum is exclusively sandy, and rock has never been encountered in annual diver operated suction sampling for the SOB surveys conducted since 2004. The ADZ Baseline samples, however, fall within the centre of the Bay an area where an extensive abrasion platform with emergent patch reef occurs (see section 4.5). Rocky reef community structure is thus also known to influence macrobenthic distribution and abundance in the adjacent soft bottom habitats, and it has been found that more benthic species occur close to rocky reefs (Barros et al. 2001). This suggests that the observed separation of SOB and ADZ sampling sites may be a "real" effect related to differences in habitat between the two areas.
2. An alternative explanation is that the observed pattern is an artefact of differences in taxonomic methodology. The species identification for the ADZ baseline survey was conducted by Nina Steffani, while that of the SOB was conducted by Anchor. It is therefore possible that species within the baseline samples are possibly being recorded under different names to those within Anchor samples or that the different laboratories have different species resolutions. This separation of communities collected in the same location but identified/analysed by two different laboratories in multivariate analysis is not unprecedented and has been seen in other studies. It is recommended that for future surveys the taxonomic service provider be given access to the reference collections for previous surveys such that the overall species list for the area can be refined, and ambiguous species can be resolved.

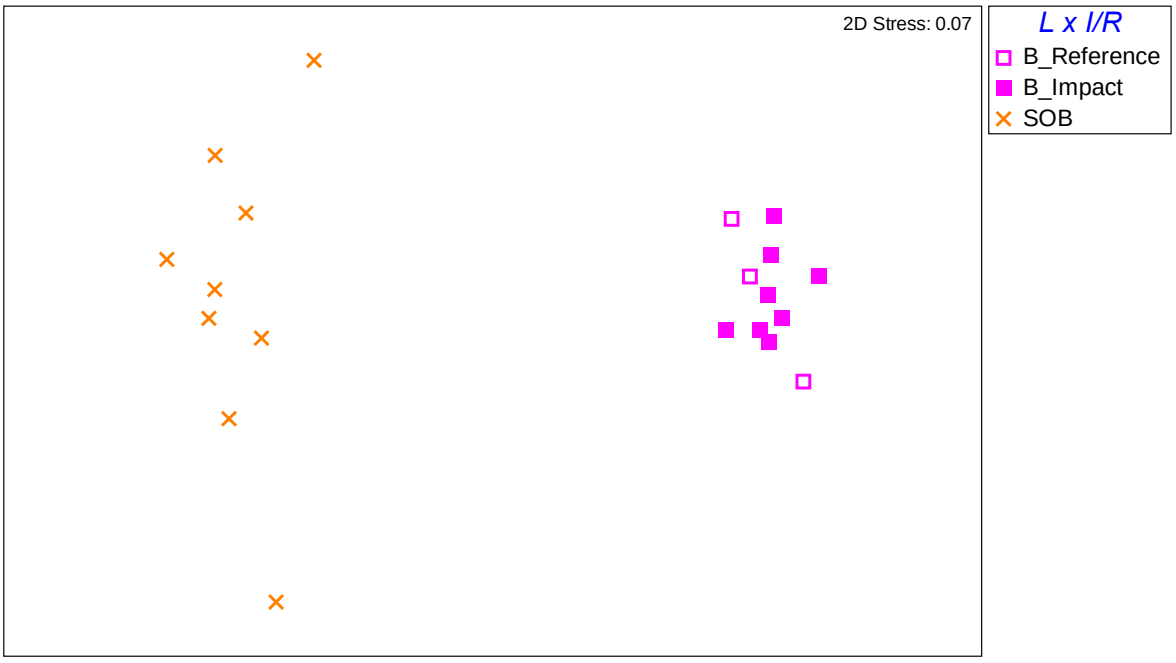

Figure 12. Ordination plots comparing the 2019 baseline macrofauna data for Big Bay to the data collected during the 2019 SOB survey. Symbols on the ordination plots are as follows: Big Bay (B) and State of the Bay 2019 (SOB).

Overall, the univariate and multivariate analyses presented here suggest that the aquaculture operations are currently having a negligible effect on soft sediment benthic macrofauna present in the lease areas.

4.3 Presence of reef in the Big Bay precinct

The marine specialist report for the Saldanha ADZ EIA considered subtidal reef habitat to be scarce in Saldanha Bay (pg. 21), and only identifies Lynch blinder and North Bay blinder as important reef areas (Pulfrich 2018). Reports from divers of calcrete rock surrounding sampling sites during the baseline survey (Capfish 2019), difficulties in obtaining grab samples at several stations in Big Bay during 2020 (AR&M) sediment surveys, and observations by AR&M divers deploying water quality monitoring instruments during April 2020, indicated patches of reef in several areas of the Big Bay ADZ precinct. Subsequent literature review revealed the existence of an extensive abrasion platform (areas of exposed calcrete rock) throughout much of Big Bay (Flemming 2015).

Side-scan sonar and seismic data collected in 1977 indicated that this abrasion platform is prominent in the western half of the Big Bay ADZ (Flemming 2015). The distribution of the abrasion platform is overlaid on a map of Big Bay and the ADZ boundaries as well as the sampling sites (Figure 14). It must be noted that Flemming's (2015) map is a rough overlay on a google earth image and the exact locations of the features depicted may not be accurate. Furthermore, the map indicating the extent of the abrasion platform dates from 1977, prior to the construction of the multipurpose terminal, which would alter water circulation patterns and sediment deposition in Big Bay. Consequently, the true extent of the abrasion platform is not known and nor are the benthic assemblages associated with it as it is a largely unstudied habitat within Saldanha Bay.

Underwater video footage obtained from one of the Big Bay finfish lease holders revealed that the depth of sediment varied considerably within their lease area, and was frequently less than 50 cm. Furthermore, patches of exposed reef that was habitat for upright epifauna (basket stars, sponges, bryozoans etc.) and west coast rock lobster was observed (currently unquantified). The finfish lease holder provided a bathymetry map of their lease area which indicates extensive patches of low-profile reef throughout the site (Figure 14- indicated by orange shading, approximately 13.2 – 14.8 m in depth). The green shading within the lease area (approximately 15.0 – 16.0 m in depth) indicates areas where soft sandy or muddy sediments would accumulate. Overall, the bathymetry shows patches of low-profile reef that is roughly < 1m in height from the sea floor and may be subject to periodic, natural sand inundation. Pictures of the rock/reef type habitat found in the finfish area were taken during instrument servicing in the finfish area on the 29th of June 2020 are shown in Figure 15 below. These images were taken in extremely poor visibility but indicate the presence of basket stars (Phylum Echinodermata), sponges (Phylum Porifera) and possibly Bryozoans.

The Molapong diver transects are shown in Figure 13 and the video footage taken during each of the dives, reveals that the visibility at the time (Figure 16; November 2019) considerably better than that at the time of instrument servicing during June 2020. The footage provided by Molapong showed substantial outcrops of reef which may exceed 1 m in height (Figure 16). The West Coast rock Lobster (*Jasus lalandi*) was noted both by AR&M divers deploying instruments and are evident in the video footage recorded from these dives.

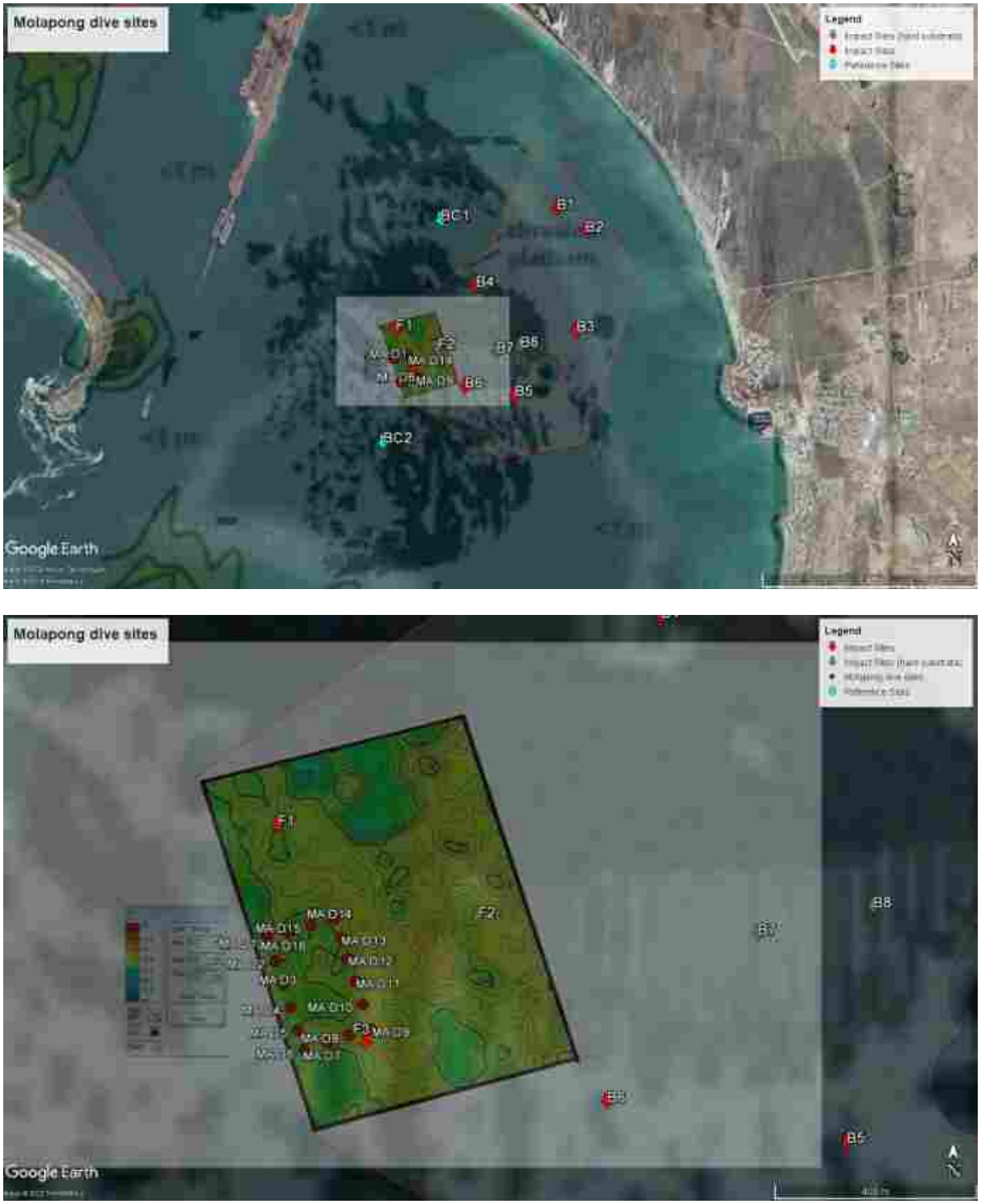

Figure 13. Map indicating the bathymetry of the finfish lease area within Big Bay (top), and the position of the dive sites surveyed by Molapong. Bathymetry courtesy of Malopong.

The initial marine ecology specialist study (SRK BAR 2017, appendix D2) and impact assessment (SRK BAR 2017, appendix F) of the Basic Assessment Report for the Saldanha Bay ADZ primarily assessed the impacts of the benthic environment on the basis of soft sediment being present throughout the Big Bay ADZ precinct. The BAR identified Lynch Blinder in Big Bay as sensitive habitat and recommended a 100 m buffer zone. However, no further consideration was given to the presence of possible low-level reef being present in the ADZ. The marine ecology specialist study recommended a

bathymetry survey should be undertaken and a bathymetric map should be submitted along with a sketch of the important habitats in the lease area as well as adjacent potentially sensitive and valuable habitats (conservation areas, biogenic habitats and reefs) (SRK BAR 2017, appendix D2, Pg. 82).

The impact assessment for bivalve aquaculture did not assess the impact of placing the culture structures over hard substrata (SRK BAR 2017, appendix D2), and while the impact assessment for finfish culture does consider the presence of reef, it assumed limited distribution which was confined to Lynch Blinder (SRK BAR 2017, appendix D2). The effects of aquaculture on patches of low-lying reef with some substantial outcrops exceeding 1m in height and their associated epifaunal communities has thus not been considered in the Big Bay precinct beyond Lynch Blinder. Given the identification of reef in this precinct further studies should be conducted to address this omission. It is important to note that this is **ONLY** applicable to areas of the Big Bay precinct (not the ADZ as a whole) where reef occurs (the present day extent of reef in Big Bay is yet to be determined and a detailed bathymetry/side scan sonar survey should be undertaken).

Figure 14. Map of Saldanha Bay showing the abrasion platform distribution (Flemming 2015) in Big Bay in relation to the sites sampled during the baseline survey of the Saldanha Bay ADZ.

Figure 15. Images of the rock/reef structures captured during the servicing of the instruments on the 29th of June 2020. Photo credit; Steve Benjamin.

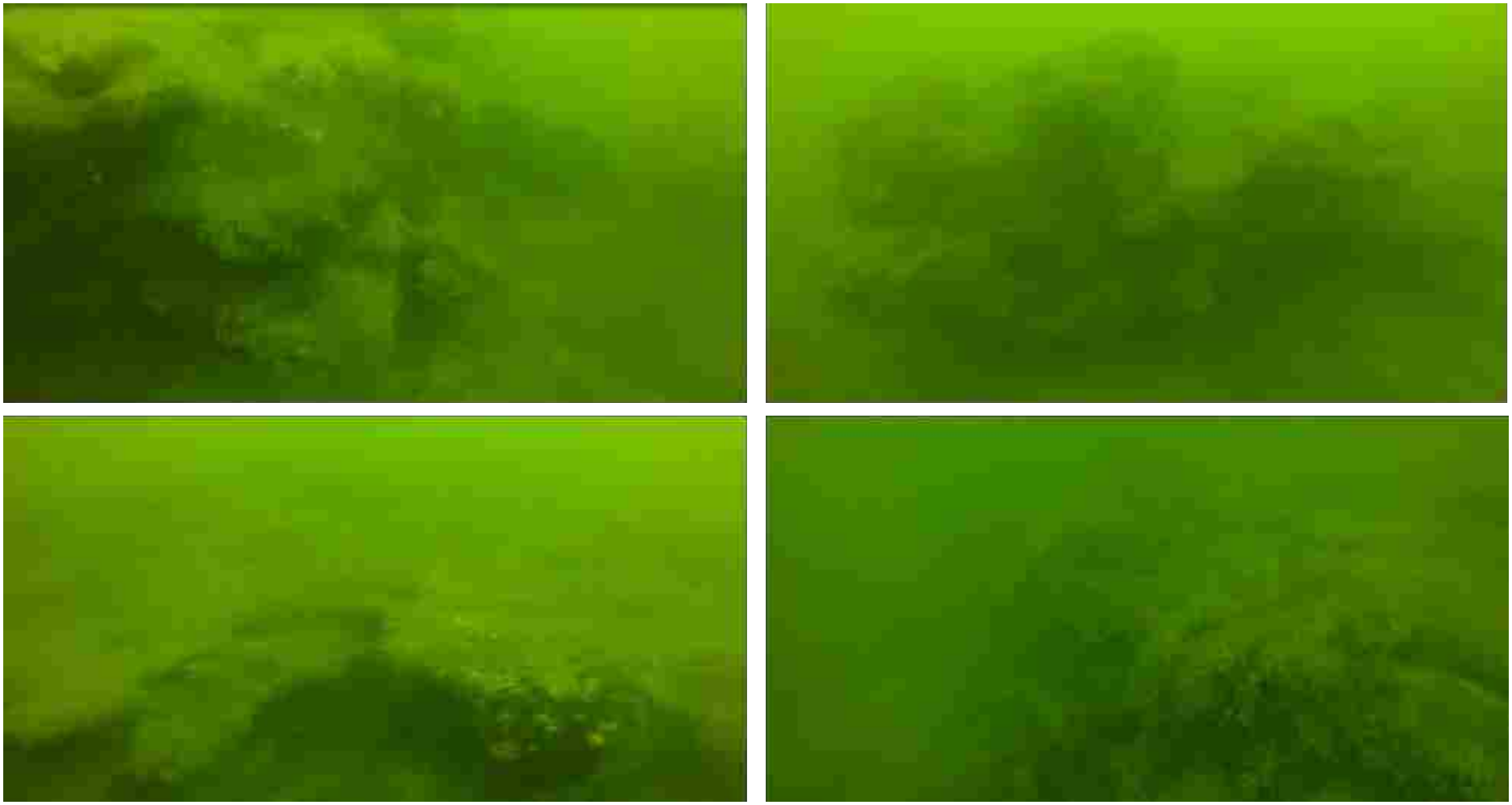

Figure 16. Images of the reef structures captured during a diving survey of the Molapong finfish lease area, which indicate reef >1m in height, the poor visibility obscures the nature of the biotic communities associated with the reef.

5 FINDINGS SUMMARY

Based on the above analysis of the baseline survey data and further confirmation of rocky reef areas within the Big Bay ADZ Precinct, the following provides a summary of key findings:

1. Due to the presence of hard substrata, the number of sites sampled does not meet the required amount stipulated in the sample plan. Monitoring macrofauna at the replacement sites surveyed during the 2020 chemical survey (Appendix 1) where known soft substrata is present would increase the number of impact sites to required amount. The timing of future chemical, sediment and macrofauna surveys to coincide with the SOB sampling (Autumn) would facilitate comparisons between sediment chemical characteristics and macrofauna communities without seasonal effects.
2. Access to the invertebrate taxonomic reference collections from previous surveys would facilitate refinement of the overall species list for the area, resolving ambiguous species identifications among service providers. A macrofauna reference collection of the specimens collected from the ADZ would be invaluable.
3. Despite high abundance and species richness in Saldanha Bay, the natural occurrence of certain dominant species causes the Shannon-Weiner Diversity index to fall below the stipulated threshold of H' = 3 throughout the three ADZ precincts. A revised H statistic threshold calculated from reference or baseline sites would be a more locally applicable threshold value.
4. Cumulative abundance-biomass plots (ABC curves) of macrobenthic communities (Warwick 1993), also called k-dominance curves, would be additional useful tools in the analysis of macrobenthic invertebrate data.
5. Infaunal Trophic Index (ITI) and AZTI Marine Biotic Index (AMBI) are more suited to analysing Northern Hemisphere macrofaunal communities, while the locally developed Biological Traits Analysis (BTA) with Fuzzy logic may be more suitable for future macrobenthos surveys in Saldanha Bay.
6. The extent of the abrasion platform present in Big Bay is currently unquantified and the proportion of this habitat type impacted by current and future mariculture activities unknown, especially in view of the fact that the dispersion model shows strong scouring here. A full detailed bathymetry survey using side scan sonar or multibeam echosounder of the ADZ precinct and historical extent of the abrasion platform would map the current extent of the abrasion platform in Big Bay.
7. The video footage and bathymetry provided by Molapong as well as the photographs taken by AR&M divers shows patches of exposed reef present in the finfish lease area. The reef appears to be mostly low profile <1m in height which may be periodically inundated with sand, however, outcrops of reef >1m in height were evident. This is a poorly/unstudied habitat type within Saldanha Bay and there is a dearth of information on its extent, and the nature and type of biotic communities present. The ADZ monitoring programme should be updated to include suitable methods for monitoring potential aquaculture impacts on this habitat type.
8. Suitable reef impact sites (n=3) in the finfish area and suitable reference sites (n=3) should be surveyed by scientific divers using transect or quadrat surveys to quantify key biotic components of this reef habitat. An alternative approach could be the use of underwater visual survey by means of Divers with cameras, drop cameras or a Remote Operated Vehicle (ROV). All methods of surveying this habitat will rely on acceptable underwater visibility which

is not common in Big Bay. In situ benthic surveys by divers, however, may be more easily undertaken than underwater video surveys in conditions of reduced visibility, but all options should be considered. It is critical that whichever survey method is employed, it must be repeatable for ongoing future monitoring. Ideally this monitoring should (as per the soft sediment monitoring programme) follow a BACI design, although it may not be practically feasible to complete a survey prior to installation of fish cages on the site.

9. Analysis and interpretation of the results of the bathymetric and underwater reef habitat surveys must provide practical advice to support the ongoing adaptive management of the Big Bay ADZ precinct.

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7 APPENDIX 1

Table 5. Co-ordinates of the ADZ benthic survey sites from Big Bay, Outer Bay North and Outer Bay South, replaced sites are highlighted in red.

Area	Site	Latitude	Longitude	Comments
		Decimal Degrees	Decimal Degrees	
Big Bay	B 1	-33.028808	18.019161	
	B 2	-33.030550	18.022083	
	B 3	-33.039167	18.021183	
	B 4	-33.035367	18.010983	
	B 5	-33.044667	18.014917	
	B 6	-33.043950	18.009850	
	B 7	-33.031920	18.024640	New site selected - 8th May 2020
	B 8	-33.028870	18.022320	New site selected - 8th May 2020
	BC 1	-33.029733	18.007400	
	BC 2	-33.048633	18.001550	
	BC 3	-33.065414	18.020089	
	FF 1	-33.039056	18.002878	
	FF 2	-33.040681	18.007119	
	FF 3	-33.042911	18.004736	
Outer Bay North	NB 1	-33.032617	17.943633	
	NB 2	-33.034417	17.948867	
	NB 3	-33.038433	17.945633	
	NB 4	-33.045200	17.942067	
	NB C 1	-33.037283	17.960267	
	NB C 2	-33.042167	17.953733	
	NB C 3	-33.048300	17.93773	New site selected - 8th May 2020
Outer Bay South	JI 1	-33.071767	17.96245	
	JI 2	-33.075533	17.96119	New site selected - 8th May 2020
	JI 3	-33.076783	17.96275	
	JI C 1	-33.066625	17.959244	
	JI C 2	-33.067017	17.967400	
	JI C 3	-33.083350	17.965967	

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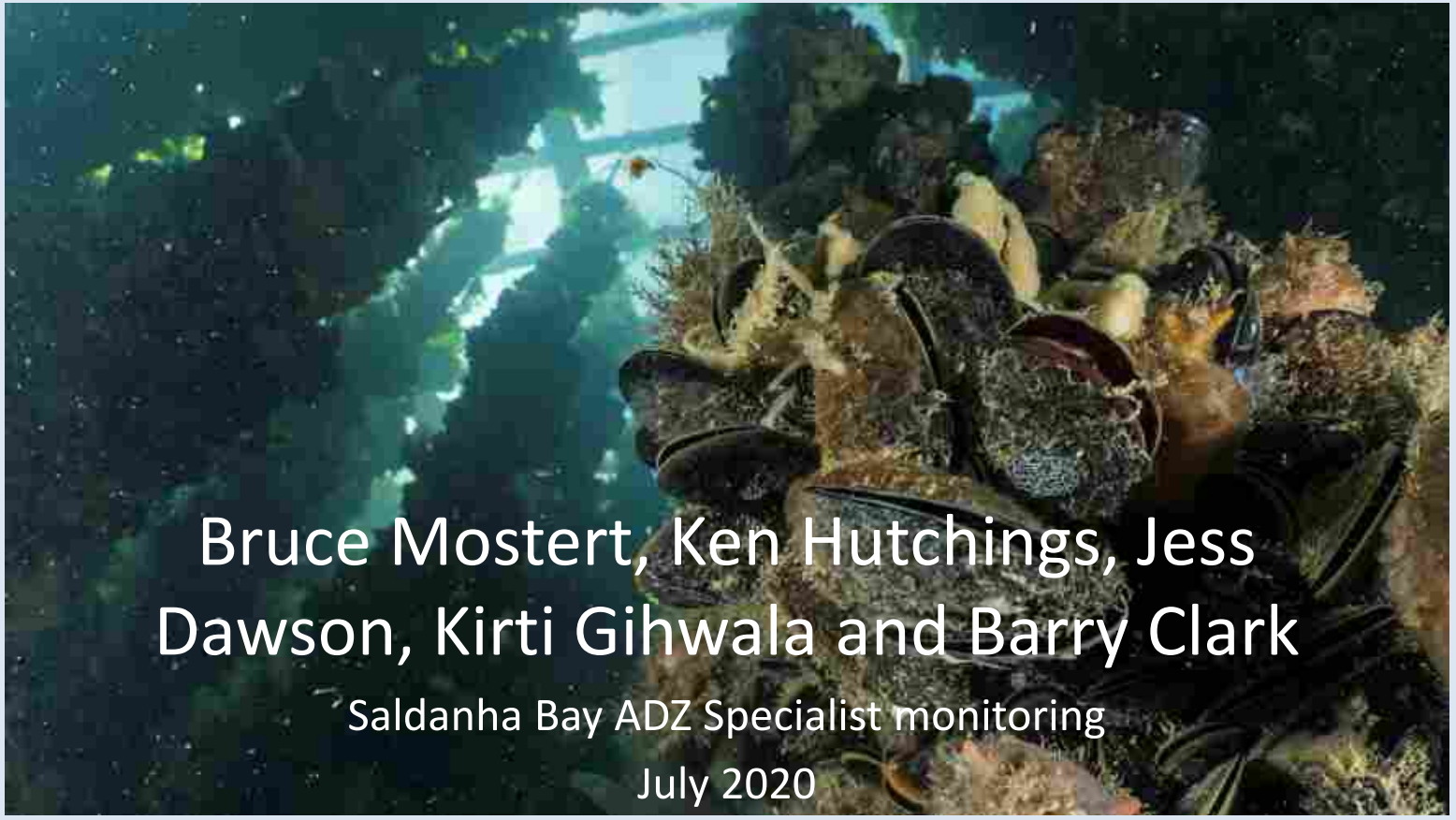
SALDANHA BAY SEA BASED AQUACULTURE DEVELOPMENT ZONE BASELINE BENTHIC SURVEY



Bruce Mostert, Ken Hutchings, Jess Dawson, Kirti Gihwala and Barry Clark

Saldanha Bay ADZ Specialist monitoring

July 2020

Background

- The Department of Environment, Forestry and Fisheries (DEFF), Branch Fisheries, as the holder of the Environmental Authorisation for the Saldanha Bay ADZ appointed an independent service provider Anchor Research and Monitoring (AR&M) to draft the baseline technical report for the Saldanha Bay ADZ. Shellfish aquaculture was operational in parts of the Big Bay and North Bay precincts at the time of the survey, but not at the Jutten Island precinct.

Introduction:

Sediment physico-chemical properties

- Organic matter is a universal pollutant affecting marine life, can lead to significant changes in community composition and abundance.
- High organic loading typically leads to eutrophication and hypoxia, which negatively affects biota (especially benthic macrofauna).
- Impacts can be increased by levels of other contaminants such as trace metals used in antifouling paints.
- Copper (Cu) and Zinc (Zn) are two metals that are commonly monitored in finfish growing areas (DAFF 2018).

Macrofauna:

- Important to monitor biological components of the ecosystem in addition to physico-chemical and eco-toxicological variables, as biological indicators provide a direct measure of the state of the ecosystem.
- Benthic macrofauna are the biotic component most frequently monitored to detect changes in the health of the marine environment.
- Used in the monitoring of health of an area by detecting effects of stress, as well as to monitor recovery after an environmental disturbances.

Sampling:

- Replicated Saldanha Bay Water Quality Trust (SBWQT) State of the Bay monitoring programme methods (hereafter referred to as SOB).
- An airlift was used to suck up sediment for macrofauna.
- Three replicates were taken in a single dive and pooled together.
- Sediment was sieved at the surface and macrofauna extracted.
- Macrofauna were sorted and identified.
- Three sediment samples were collected by scientific divers using PVC pipe cores – used for physio-chemical analysis of sediment.

- Relevant data collected during the during the 2019 SOB survey was included for further comparisons in the BB lease area.

Sampling:

- Sites in the Big Bay (BB), North Bay (NB) and Jutten island (JI) ADZ precincts were randomly selected and sampled by Capricorn Fisheries Monitoring between 17th January -11th April 2019. Yellow labels indicate sites sampled during SOB monitoring in 2019.
- Grey arrows indicate sites where **<u>hard substrata was encountered and samples were not collected.</u>**

Analysis:

Physio-chemical:

- Sediment characteristics were analysed by the CSIR.
- Trace metal content (Copper and Zinc) was statistically compared to sediment quality guidelines thresholds specified in the sample plan, highlighted below, as well as data from SOB 2019.

Table 1. Summary of Benguela Current Large Marine Ecosystem and National Oceanic and Atmospheric Administration metal concentrations in sediment quality guidelines

Metal (mg/kg dry wt.)	BCLME region (South Africa. Namibia. Angola)		NOAA	
	Special care	Prohibited	ERL	ERM
Cu	50 – 500	>500	34.0	270.0
Zn	150 – 750	> 750	150.0	410.0

- TOC and TON values from impact sites were statistically compared to those from reference station in the respective ADZ precincts, as well as data from SOB 2019.

Analysis

Macrofauna

- The statistical program, PRIMER 6 (Warwick and Clarke 1993), was used for multivariate analyses of benthic macrofauna abundance data.
- Multidimensional Scaling (MDS) plots were constructed in order to find 'natural groupings' of sites based on similarities in their macrofaunal communities.
- Biological indices were calculated for the three ADZ precincts and compared to thresholds stipulated in the sample plan (DAFF 2018).
- The thresholds which trigger management action are highlighted below:

Table 2. Ranges of biological indices in five sediment organic enrichment categories (Borja et al. 2000).

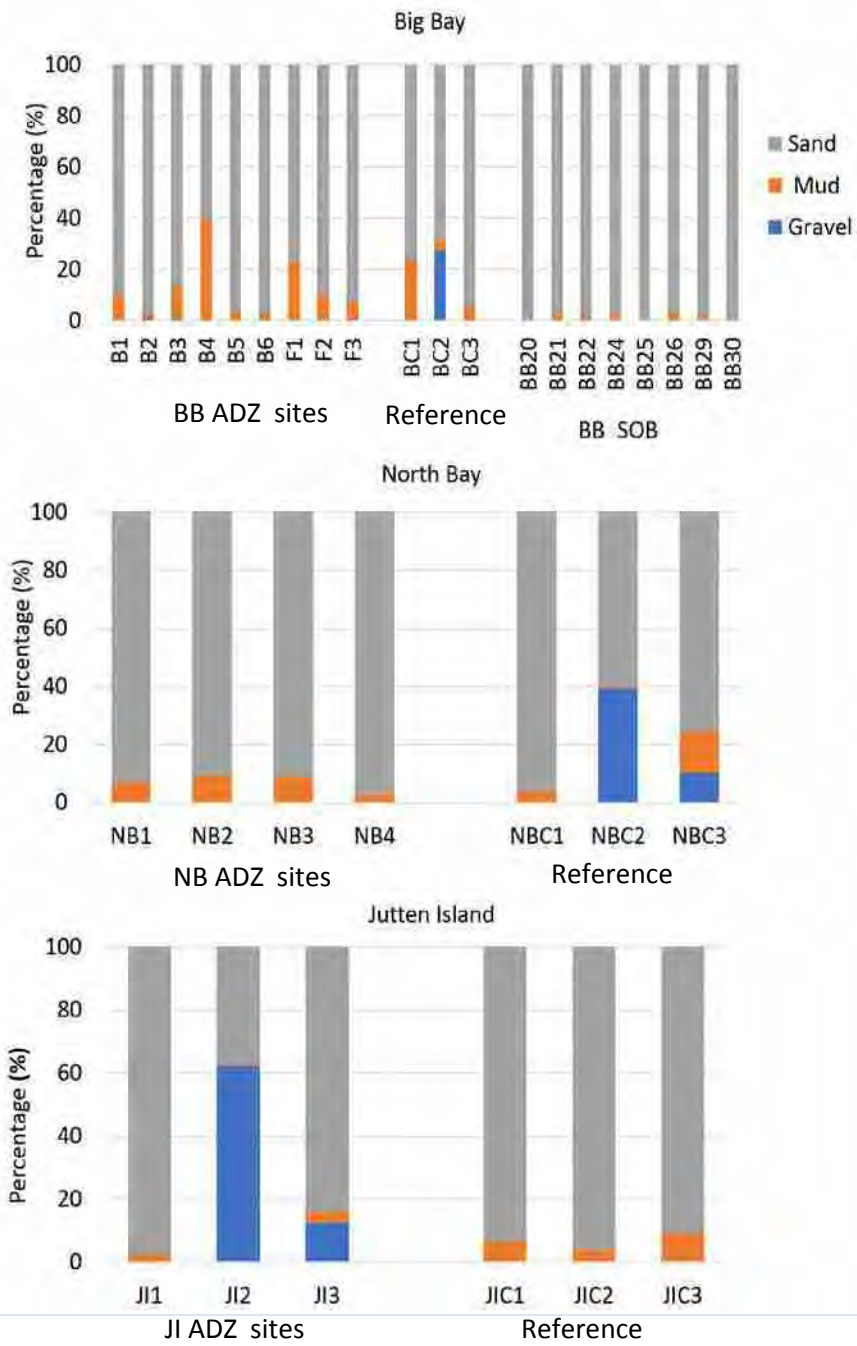
	Oxic A Well oxygenated	Oxic B Oxygen present	Hypoxic A Low oxygen	Hypoxic B Extremely low oxygen	Anoxic No oxygen
Biological:	Good				Bad
Shannon-Weiner diversity index (H')	>4	4 - 3	3 - 2	2 -1	<1
Infaunal Trophic Index (ITI)	>50	50 - 25	<25	<25	<5
AZTI Marine Biotic Index (AMBI)	<1.2	1.2 - 3.3	3.3 - 5	5 - 6	>6

Results and Discussion:

<u>Sediment physico-chemical properties</u>

Sediment Characteristics

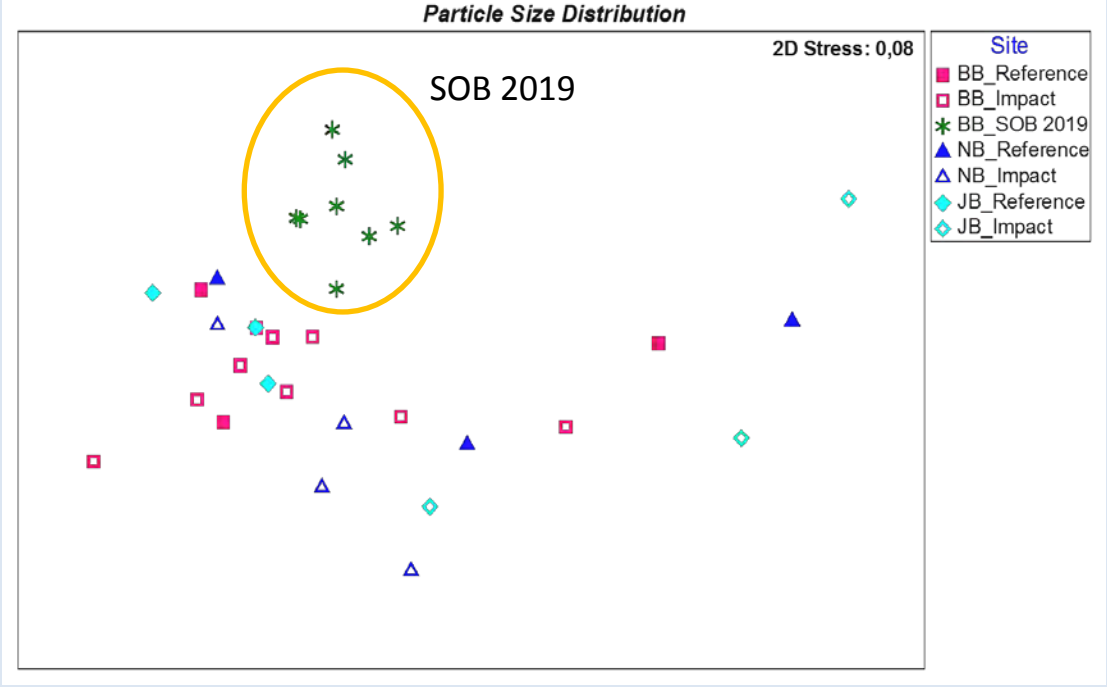
- Across all three ADZ precincts sand is the dominant component at both impact and reference sites.
- Big Bay – Differences noted in sediment composition between impact and reference sites and SOB 2019 data.
- Greater variability in sediment composition at Jutten Island (JI) impact sites and North Bay (NB) reference sites - situated in the deeper and more exposed outer Bay area.
- Sites B1, B3 and B4 are near mussel rafts and are likely affected by deposition of pseudo faeces from culture stock and biofouling organisms



Results and Discussion:

Sediment Characteristics

- Sediment data collected from SOB 2019 forms its own cluster indicating different sediment composition compared to aquaculture lease areas.
- There is high variability in particle size distribution, effectively spacing out all the impact and reference sites for the three ADZ precincts.
- Differences between SOB 2019 and ADZ baseline is likely due to the presence of hard substrata in the BB ADZ, with fine (muddy) sediment potentially due to deposition of particulate matter from shell fish farms, or natural settling in deeper protected areas between hard patches.



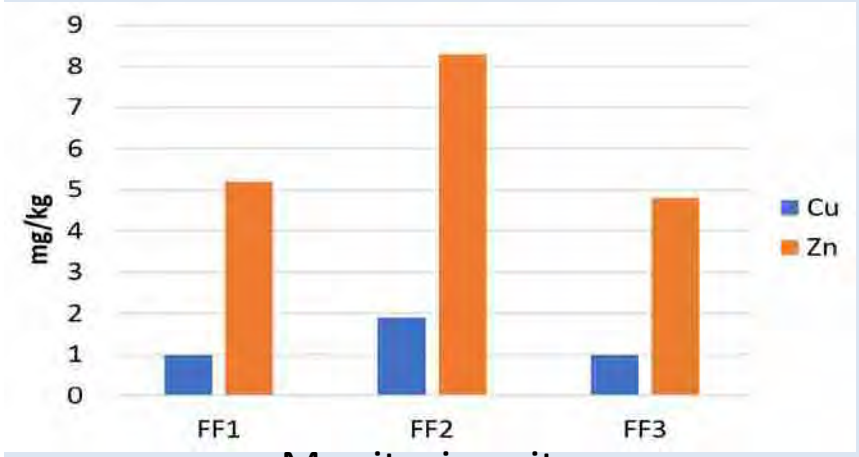
Results and Discussion:

Sediment physico-chemical properties

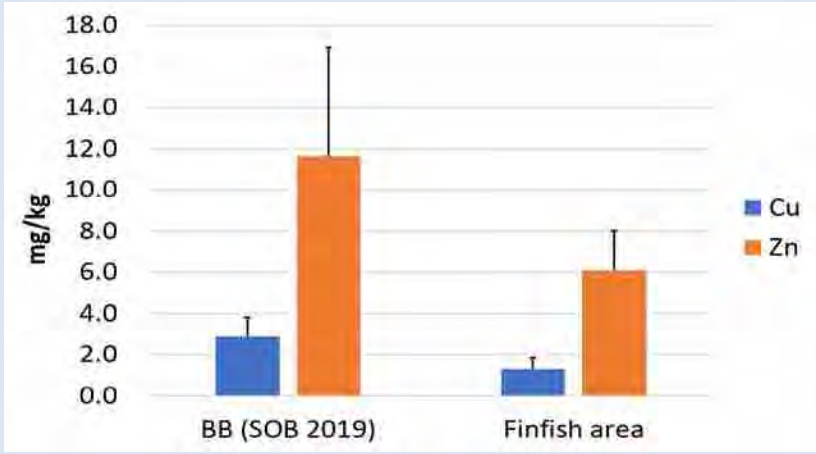
Trace Metals

- Cu and Zn baseline concentrations were significantly below their stipulated ERL threshold levels (DAFF 2018; Cu – 34 $mg.kg^{-1}$, Zn – 150 $mg.kg^{-1}$).
- Average sediment Cu and Zn concentrations in ADZ samples were less than those recorded in SOB 2019 samples.
- Currently there is no finfish aquaculture – and therefore no evidence of input of Cu (antifoulant) or Zn (health additive to feed).
- Molapong have indicated they do not intend to use antifoulant on cage infrastructure.

Metal concentrations at the finfish site



Average metal concentrations at the finfish site compared to SOB 2019 data

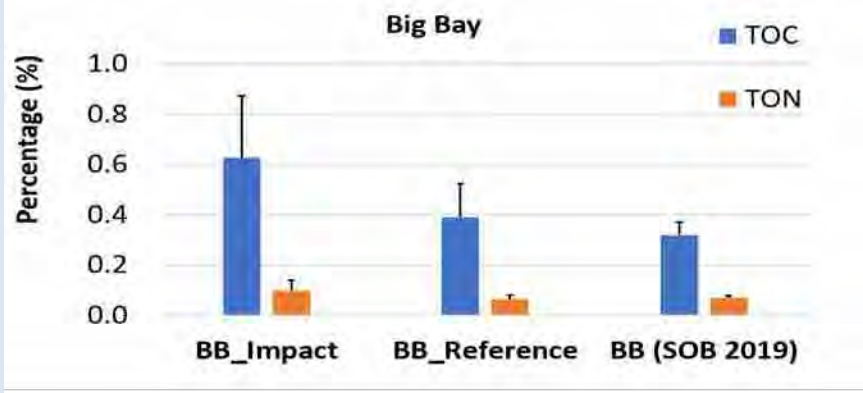


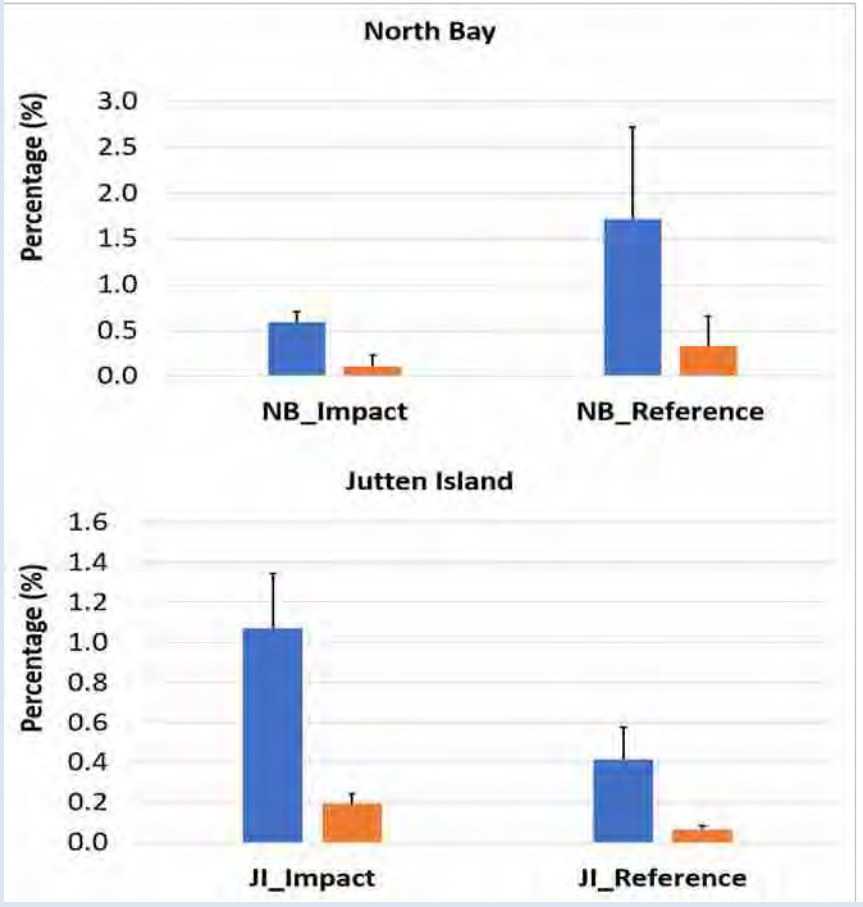
Results and Discussion:

<u>Sediment physico-chemical properties</u>

Total Organic Carbon (TOC) and Nitrogen (TON)

- TOC/TON levels for Big Bay and Jutten Island (no active mariculture) precincts were greater at the impact sites in comparison to reference sites, but these differences were not significant.
- No difference was found between the impact and reference sites in the North Bay.
- Data recorded in Big Bay at both the impact and reference sites are similar to levels recorded from SOB 2019.





Results and Discussion:

Baseline Macrofauna

Shannon-Wiener diversity index (H')

- In all cases the average H' for each ADZ precinct was significantly lower than the prescribed threshold of H' = 3, placing them in the Hypoxic B category or lower.
- No differences were detected between impact and reference sites in all three ADZ precincts.
- At Jutten Island (JI) there is currently no aquaculture, indicating the H' seen at the impact sites is typical of this area and not a reflection of aquaculture impacts.
- In addition, data from SOB 2019 indicates that no sites throughout Saldanha Bay or Langebaan exceeded a H' of 2.8.
- This suggests that Saldanha Bay naturally has a lower H' than the prescribed threshold.
- The threshold H' should be reduced to a value more reflective of the natural state in Saldanha Bay.

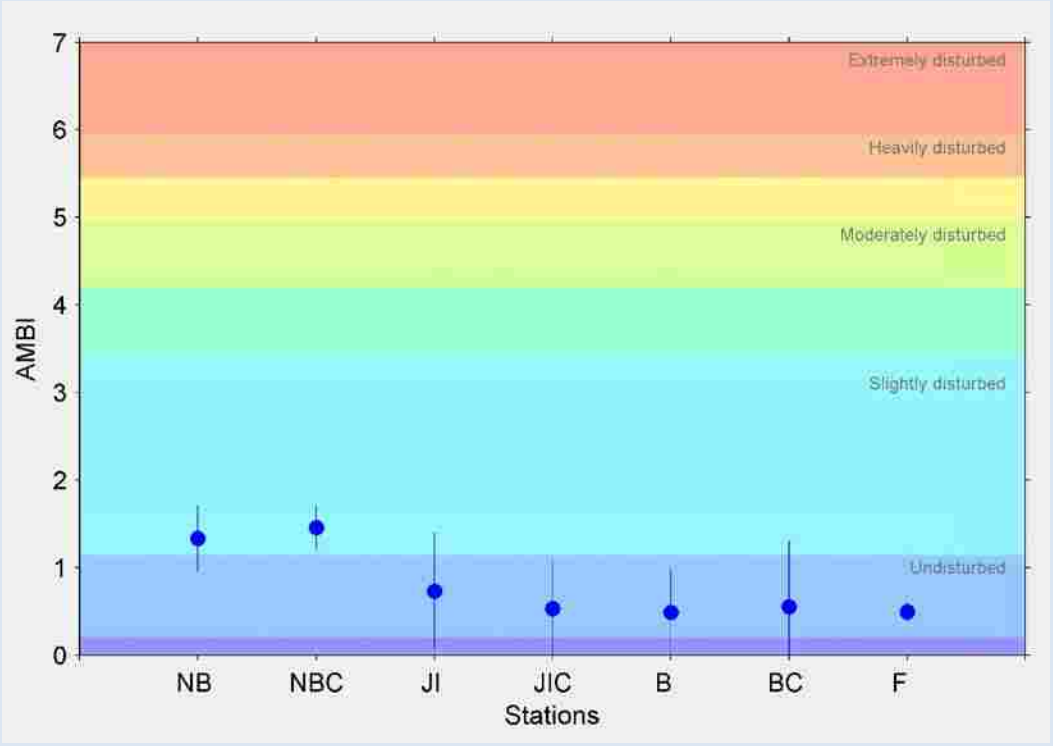
Area	Site	Shannon-Wiener diversity index (H')
Threshold		**≥ 3**
Big Bay	B 1	2.41
	B 2	2.02
	B 3	2.22
	B 4	1.51
	B 5	0.79
	B 6	0.83
	B 7	-
	B 8	-
	BC 1	1.64
	BC 2	2.52
	BC 3	1.40
	FF 1	2.05
	FF 2	-
	FF 3	2.00
North Bay	NB 1	2.12
	NB 2	2.21
	NB 3	2.69
	NB 4	2.64
	NB C 1	2.39
	NB C 2	1.85
	NB C 3	2.71
Jutten Island	JI 1	2.00
	JI 2	1.51
	JI 3	1.10
	JI C 1	2.53
	JI C 2	2.76
	JI C 3	0.67

Results and Discussion:

Macrofauna

AZTI organisation's Marine Biotic Index (AMBI)

- The AMBI score for each precinct was significantly lower than the prescribed threshold of AMBI = 3.3, placing them in the Oxic B category or higher.
- No differences between AMBI scores for impact sites and reference sites were detected in any of the ADZ precincts.
- The average AMBI scores indicate that Big Bay impact and reference, and Jutten Island impact and reference areas can be considered "Undisturbed" while both areas in North Bay are "Slightly disturbed".



Results and Discussion:

Macrofauna

Infaunal Trophic Index (ITI)

- In all cases the ITI for each ADZ precinct was above the prescribed threshold of >25, placing them in the Oxic B category or higher.
- No difference between the ITI at impact and reference sites within any of the three ADZ precincts.
- Based on the ITI the macrofaunal communities at the majority of sites were normal, or experiencing little anthropogenic impact.

- These biological indices provide a baseline condition for future monitoring to be compared to and indicate that the limited aquaculture operations at the time of sampling are having a negligible effect on benthic macrofauna present in these three ADZ precincts.

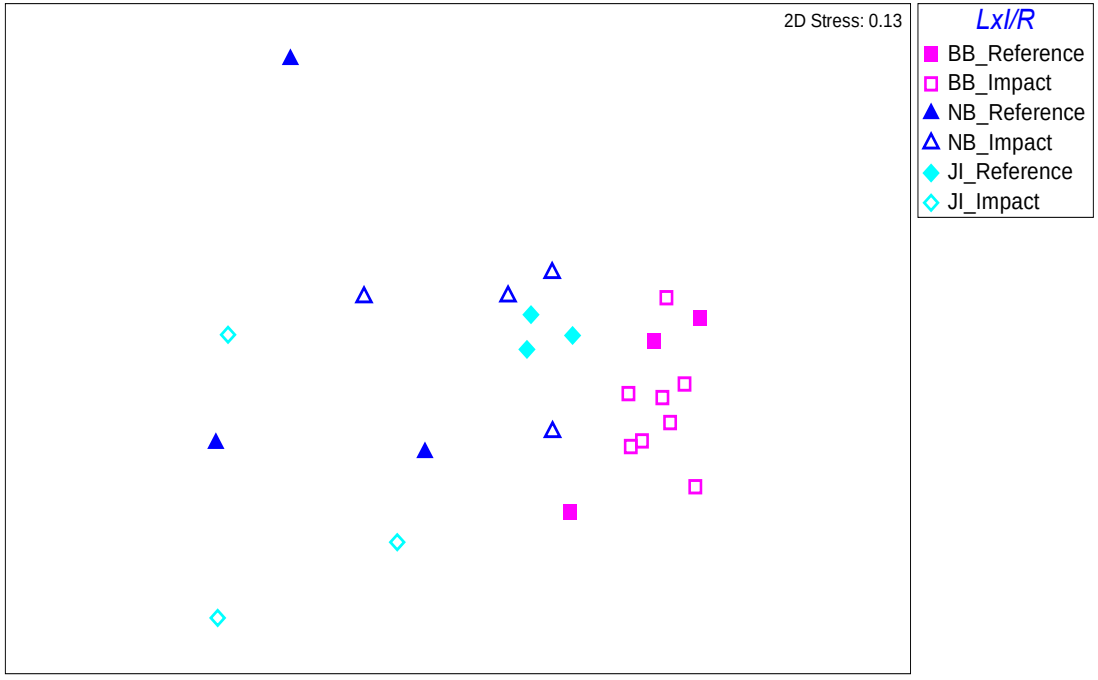
Area	Site	Infaunal Trophic Index (ITI)	ITI community description
Threshold		**≥ 25**	
Big Bay	B 1	67.3	Normal
	B 2	57.2	Normal
	B 3	66.1	Normal
	B 4	99.2	Normal
	B 5	99.7	Normal
	B 6	99.0	Normal
	B 7	-	
	B 8	-	
	BC 1	98.4	Normal
	BC 2	63.2	Normal
	BC 3	98.4	Normal
	FF 1	86.5	Normal
	FF 2	-	
	FF 3	90.3	Normal
North Bay	NB 1	65.5	Normal
	NB 2	78.9	Normal
	NB 3	46.9	Changed
	NB 4	74.5	Normal
	NB C 1	53.9	Changed
	NB C 2	87.5	Normal
	NB C 3	51.6	Changed
Jutten Island	JI 1	46.0	Changed
	JI 2	65.8	Normal
	JI 3	71.1	Normal
	JI C 1	87.7	Normal
	JI C 2	52.9	Changed
	JI C 3	97.7	Normal

Results and Discussion:

Macrofauna

Multivariate analysis

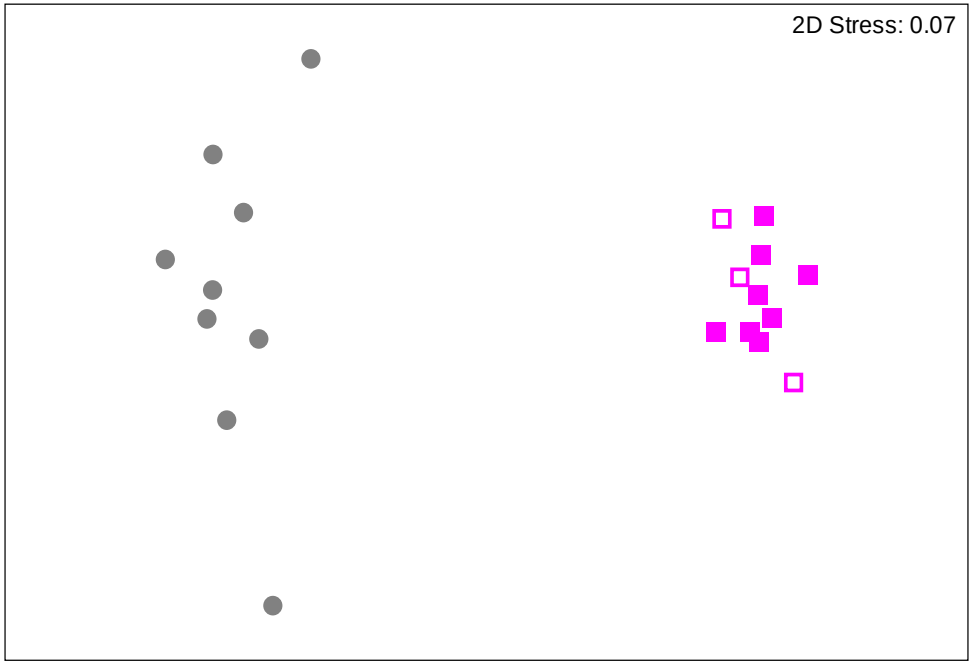
- MDS plot indicates macrofaunal communities present at the BB sites are clearly different to those at JI and NB.
- Both the reference and Impact sites in BB show a degree of similarity forming a distinct cluster with no obvious distinction between impact and reference sites.
- JI and NB share a degree of similarity with sites positioned in the same general area of the MDS.
- JI and NB - greater spacing between individual sites indicates a higher degree of within area variability.
- In the absence of aquaculture related impacts (e.g. JI), differences are likely to be linked to variability in physical and environmental parameters i.e. currents, wave exposure, water quality, sediment granulometry and depth.



Results and Discussion:

Macrofauna

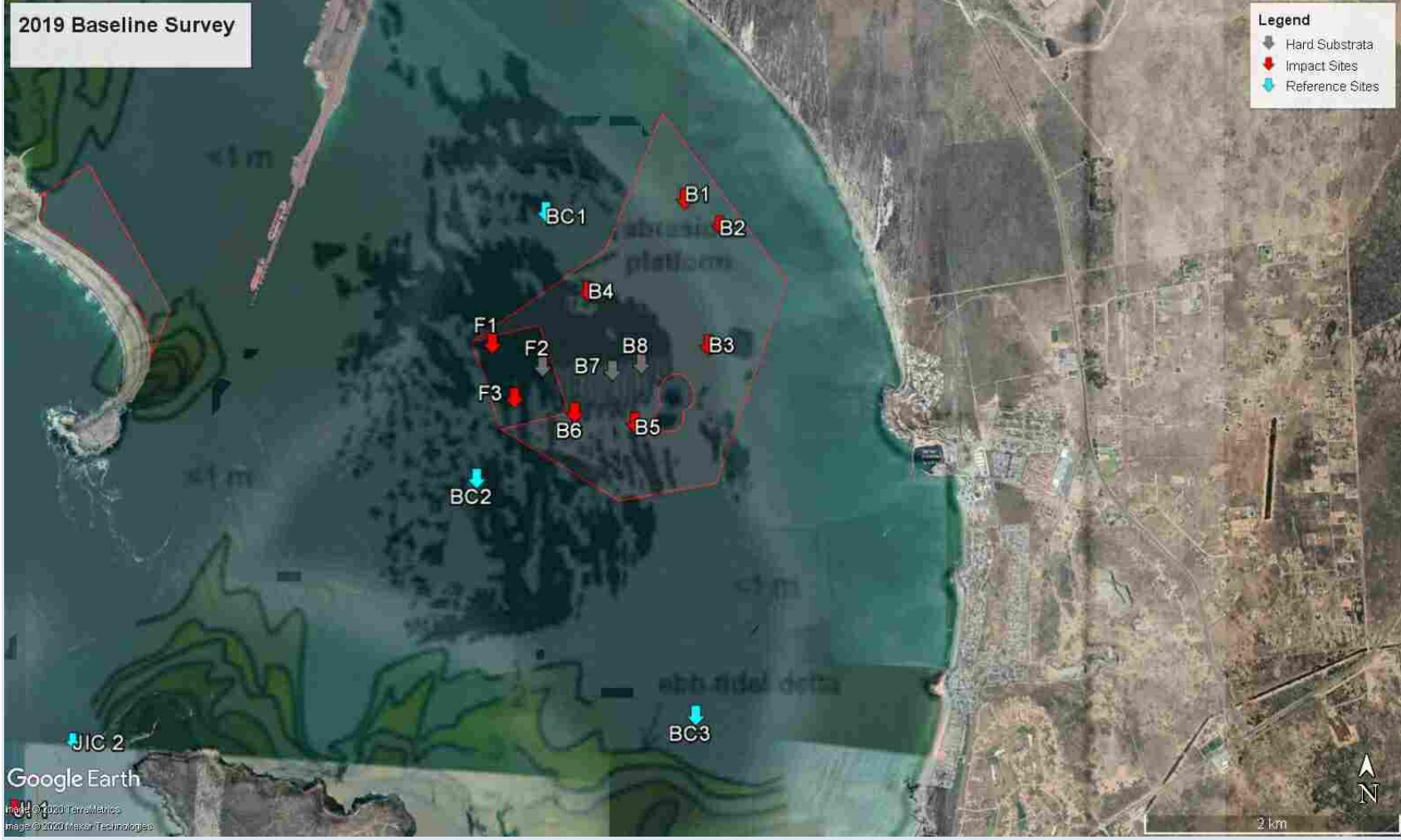
- Differences in macrofauna between the ADZ baseline study and SOB 2019 samples are attributed to sampling location with the SOB 2019 samples located on the perimeter of the Bay in sandy substrate, whilst ADZ Baseline samples are in the centre of the Bay in an area where an extensive abrasion platform with rock projecting above the soft sediment which may form reef.
- In summary, the univariate and multivariate analyses suggest that the aquaculture operations are currently having a negligible effect on **soft sediment** benthic macrofauna present in these ADZ lease areas.



Results and Discussion:

Presence of hard substrata/reef in Big Bay

- The marine specialist report for the Saldanha ADZ EIA considered subtidal reef habitat to be scarce in Saldanha Bay(Pulfrich 2018).
- Only identified Lynch blinder and North Bay blinder as important reef areas.
- Reports from divers during this assessment revealed the presence of calcrete rock at several sampling sites during the baseline survey (Capfish 2019).
- Difficulties in obtaining grab samples at several stations in Big Bay during 2020 (AR&M) sediment surveys also suggests that rock which may form reef is more widespread in Big Bay than originally suspected.
- Observations by ARM divers deploying water quality monitoring instruments during April 2020, also indicated reef in several areas of the Big Bay ADZ precinct.
- Subsequent literature review revealed the existence of an extensive abrasion platform (areas of exposed calcretre rock) throughout much of Big Bay (Flemming 2015).
- The distribution of the abrasion platform is overlaid on a map of Big Bay and the ADZ boundaries as well as the sampling sites on the following slide.

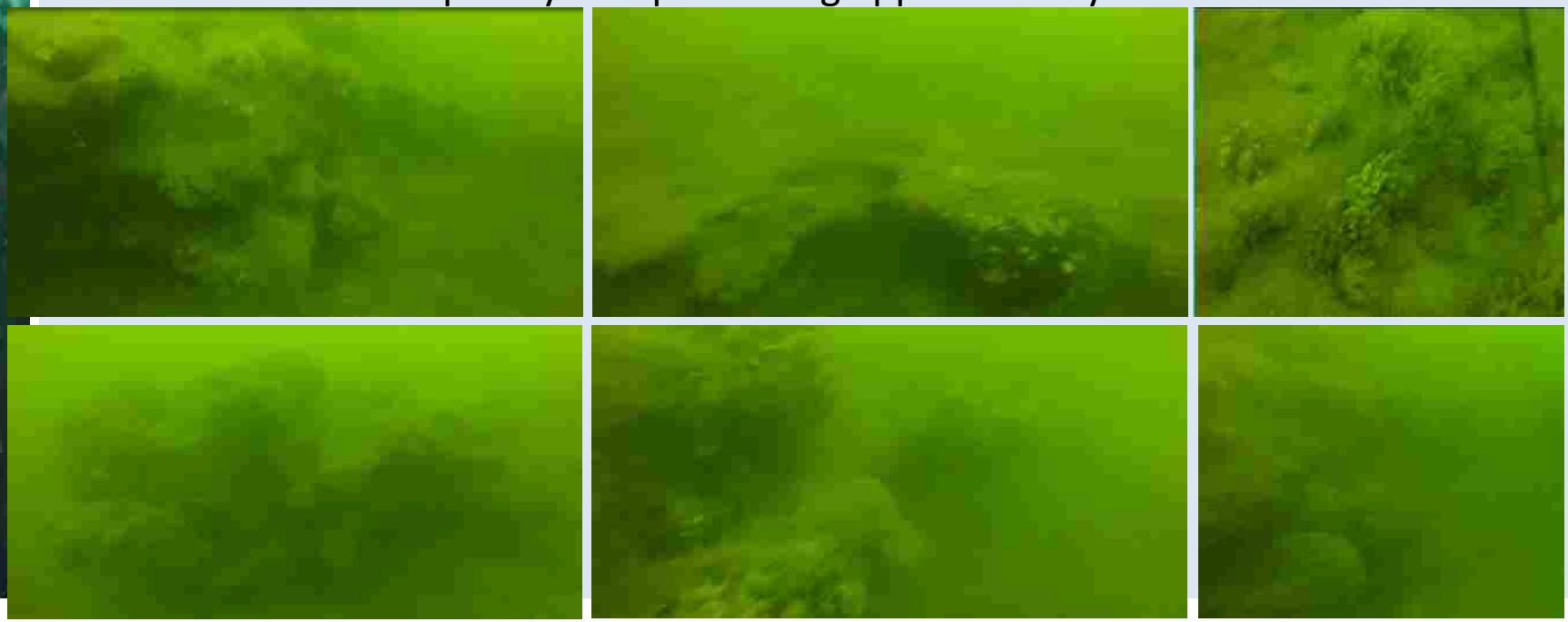


- It must be noted that Flemming's (2015) map is a rough overlay on a google earth image and the exact locations of the features depicted may not be accurate.
- The map indicating the extent of the abrasion platform dates from 1977, prior to the construction of the multipurpose terminal, which may have altered sediment deposition in BB, possibly altering the extent of the platform.

Results and Discussion:

Presence of hard substrata/reef in Big Bay

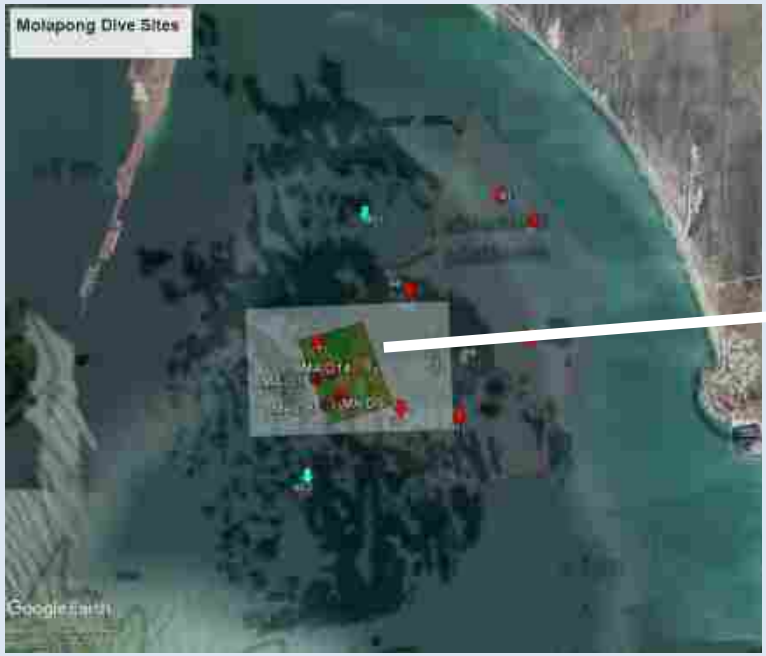
- The true extent of the abrasion platform is not known and nor are the biotic communities associated with it, as it is a largely unstudied habitat within Saldanha Bay.
- Underwater video footage obtained from one of the BB finfish lease holders (Molapong) revealed that the depth of sediment varied considerably within their lease area, and was frequently less than 50 cm.
- Videos of a small proportion of the lease area – dive sites 1 -15 (next slide).
- Visual evidence of patchy reef protruding approximately 1 m into water column.



Results and Discussion:

Presence of hard substrata/reef in Big Bay

- Molapong's bathymetry map of their lease area indicates extensive low-profile reef throughout the site (indicated by orange shading, approximately 13.2 – 14.8 m in depth).
- The green shading within the lease area (approximately 15.0 – 16.0 m in depth) indicates areas where soft sandy or muddy sediments would accumulate.
- The bathymetry shows a low-profile reef that is mostly < 1m in height from the sea floor; however, outcrops greater than 1 m may be present.



Results and Discussion:

Presence of hard substrata/reef in Big Bay

- Pictures of the rock/reef type habitat found in the finfish area were taken during instrument servicing in the finfish area on the 29th of June 2020.
- These images were taken in extremely poor visibility but indicate the presence of basket stars (Phylum Echinodermata), sponges (Phylum Porifera) and possibly Bryozoans. Before conclusions can drawn about the nature of the communities, specimens would need to be collected and identified.

Results and Discussion:

Presence of hard substrata/reef in Big Bay

- The Molapong diver video footage reveals that the visibility at the time (November 2019) was considerably better than that at the time of instrument servicing during (June 2020).
- West Coast Rock Lobster (*Jasus lalandi*) are evident in the video footage recorded from the Molapong dives was and were noted by AR&M divers deploying instruments.
- While Rock Lobster would benefit from increased organic matter originating from the aquaculture as a food source, their habitat may ultimately become smothered by fall off biofouling and culture animals.

Results and Discussion:

Presence of hard substrata/reef in Big Bay

- The initial marine ecology specialist study (SRK BAR 2017, appendix D2) and impact assessment (SRK BAR 2017, appendix F) of the Basic Assessment Report for the Saldanha Bay ADZ assessed impacts of the benthic environment assuming that soft sediment was present throughout the Big Bay ADZ precinct.
- The BAR identified Lynch Blinder in Big Bay as sensitive habitat and recommended a 100 m buffer zone.
- No further consideration was given to the presence of possible low-level reef being present in the ADZ.
- The marine ecology specialist study recommended a bathymetry survey should be undertaken and a bathymetric map should be submitted along with a sketch of the important habitats in the lease area as well as adjacent potentially sensitive and valuable habitats (conservation areas, biogenic habitats and reefs) (SRK BAR 2017, appendix D2, Pg. 82).

Results and Discussion:

Presence of hard substrata/reef in Big Bay
Recommendations

- Given the presence of low-lying reef detected during the baseline surveys and instrument deployments in the finfish area in Big Bay, it is recommended that a side scan sonar survey be undertaken across the whole of Big Bay to establish the actual extent of this reef and that reef biota be surveyed.
- Once the extent and nature of the reef and associated benthic communities have been assessed and quantified, the management measures, mitigation measures and monitoring measures should be reassessed.

Conclusions:

Sediment physico-chemical properties

- Aquaculture at current production levels in Big Bay and North Bay is having a negligible effect of sediment physico-chemical properties.
- Data collected at Jutten Island forms a good baseline for these properties prior to aquaculture development in this precinct.
- Trace metal levels for the finfish lease area in Big Bay also represent baseline data as no finfish aquaculture is currently operational on this site.

Macrofauna

Biological indices:

- The Shannon-Wiener diversity index (H') in Saldanha Bay is naturally lower than the prescribed threshold of H' = 3.
- This threshold should be adjusted to a more applicable value for future surveys.
- The ITI for each precinct was significantly above the prescribed threshold of >25.
- The AMBI score for each precinct was significantly lower than the prescribed threshold of AMBI = 3.3.
- Both the ITI and AMBI place all the stations in either the Oxic A or B categories.
- Generally, these data indicate that the aquaculture operations are having a negligible effect on benthic macrofauna present in these three ADZ precincts

Conclusions:

Macrofauna

Multivariate analyses

- Macrofaunal communities present at the BB sites are clearly different to those at JI and NB.
- Likely to be linked with differences in the physical and environmental parameters i.e. currents, wave exposure, water quality, sediment granulometry and depth.
- Both the reference and Impact sites in BB show a degree of similarity forming a distinct cluster with no obvious distinction between impact and reference sites.
- The Outer Bay precincts (NB and JI) exhibit greater macrofaunal assemblage variability.

Overall, the univariate and multivariate analyses presented here suggest that the aquaculture operations are currently having a negligible effect on soft sediment benthic macrofauna present in these lease areas. Ongoing monitoring will ascertain if this remains the case at future production levels.

These findings notwithstanding, it is important to note that change in sediment physico-chemical properties and benthic infauna are not appropriate indicators of impacts on rocky habitat (as sediment is absent), which seems to be widespread in Big Bay.

Conclusions:

Presence of hard substrata and reef in the big bay precinct:

- The presence of hard substrata and low lying reef (besides that identified at Lynch Blinder) within the Big Bay ADZ precinct has been highlighted for the first time.
- The reef appears to be low-profile that is mostly < 1m in height, although some outcrops greater than 1 m in height are present.
- The extent and nature of the reef needs to be quantified throughout Big Bay which is frequently impacted by scouring and sand deposition.
- The nature of the macrofaunal/epifaunal assemblages associated with the reef needs to be quantified.
- Once the above aspects are completed, the impacts of aquaculture in the Big Bay precinct in light of there being reef present should be re-assessed.

Thank you

References:

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SALDANHA BAY SEA BASED AQUACULTURE DEVELOPMENT ZONE ANNUAL BENTHIC REDOX SURVEY INCLUDING THE ONCE OFF SURVEY OF SMALL BAY		
	Findings by Anchor Research and Monitoring	**Preliminary way forward with regards to the scientific findings to be undertaken forward by the DEFF: Fisheries Management**
1.	Sulphide concentrations in sediments were not measured during these surveys due to the lack of an appropriate instrument for measuring these data but. It is acknowledged that this is a critical tool in assessing the impacts of aquaculture on the benthic environment in all the ADZ precincts including Small Bay.	The Terms of Reference (ToR) for the appointment of Anchor Research and Monitoring included a once-off chemical transect survey of sulphide (S2-) to establish the oxic status of the lease areas in Small Bay. The ToR indicated that the DEFF would provide a Sulphide probe for this analysis. The DEFF procured a sulphide probe for the measurement of sulphides, however following delivery which was held up at customs during the initiation of the national lockdown, it was discovered that the instrument was not suitable for field measurements of sulphides as envisaged and that field-based equipment is not available at all- only laboratory-based analytical equipment, thereby precluding their measurement in the field as per the ToR. Redox measurements were taken to substitute the measures of sulphide. Sulphide measurements will be undertaken during the next survey following familiarisation of the new instrument purchased by DEFF and of the operation of the instrument. These measurements will be undertaken by a new service provider to be appointed in October/November 2020.
2.	Redox values were used as proxy for sulphide concentrations, but again it is acknowledged that measuring sulphide concentrations would provide additional valuable information on the state of the benthic environment and allow for the validation of redox measurements taken to date.	The new service provider will be required to undertake the once-off chemical transect survey of sulphides in Small Bay as originally intended.
3.	Redox measurements yielded highly variable readings among sites. Several factors (e.g. sediment granulometry and organic content) may influence redox values in sediment and, as an additional measure, these should be analysed in the future. These sediment characteristics (granulometry and organic content) can also be used to monitor potential impacts of ADZ development and will allow better use to be made of the sediment samples collected in future.	Granulometry and organic content collected in the Redox (chemical) survey was not a requirement of the original Sampling Plan but will be considered as part of Chemical surveys going forward. The frozen 2020 sediment samples may be considered for analysis for granulometry and organic content in future monitoring

		appointments.. These measurements are part of the monitoring requirements for the survey in 2021 as per the Sampling Plan. The Baseline survey also measured these parameters. (
4.	The presence of the abrasion platform in Big Bay prevented the collection of sediment samples at certain sites and may cause the concentration of organic matter in depressions at others. Determining the extent and nature of platform would help in interpreting findings from future surveys and in the assessment of impacts of aquaculture development in Saldanha Bay as a whole.	Follow up research will be done on the extent and nature of abrasives platform. The Sampling Plan methodology will be revised for the Big Bay precinct and will detail an appropriate sampling methodology that includes rock substrate going forward.
5.	In instances where farming structures fall over hard substrata, redox and sulphide measurements are not considered suitable tools for monitoring the health of the benthic environment as sediment cannot be collected and these analyses require sediment. Alternative means for monitoring the health of the benthic environment in these areas (e.g. assessment of visual or photo-quadrats) needs to be identified and implemented in the future.	Alternative methodologies will be investigated for monitoring the health of the benthic environment on hard substrata and the Sampling Plan will be revised accordingly.
6.	The two reference stations in Small bay SB C1 and SB C3 are not at a comparable depth to the impact sites. Reference sites located at a similar depth to the impact sites would provide a more accurate reference to measure redox and sulphide impacts against.	New and or additional reference sites will be located in Small Bay at depths similar to the impact sites. Proposed sites were included in the redox survey report and these will be included in the next survey.
Management recommendations are based primarily on the statistical analyses of the data collected during the 2020 survey		
1.	The majority of the impact sites surveyed within the four ADZ precincts in Saldanha Bay (Big Bay, Outer Bay North, Outer Bay South and Small Bay) fall within the stipulated thresholds, and it is recommended that these sites be surveyed again in April 2021 in accordance with the ADZ sampling Plan requirements.	A repeat Redox survey will be commissioned in April/May 2021 this survey will be more detailed as per the requirements stipulated in the Sampling Plan which will include sampling of the macrobenthos and other parameters. The Sampling Plan recommends that if thresholds are exceeded, further sampling is undertaken. However, these thresholds are being exceeded in areas that do not have aquaculture thereby demonstrating the value of the baseline assessment and raising the possibility that the thresholds are too low to be of use in this context and may need to be revised. The next survey in April/May 2021 will give more information in terms of macrobenthos.
2.	The same applies to the sites in Big Bay (B4) and Outer Bay North (NB1) where, in 2020, measured redox values exceeded stipulated thresholds and were significantly different to their respective reference stations, but no aquaculture activity was present in the immediate vicinity.	
3.	Similarly, while the redox values recorded at SB2 in Small Bay exceeded the stipulated threshold, measured values were not significantly different from the two reference stations in this area, and thus should not trigger any management action. This precinct should be surveyed again along with the new	

	recommended reference stations during the 2021 annual redox and sulphide survey.	

SALDANHA BAY SEA BASED AQUACULTURE DEVELOPMENT ZONE BASELINE BENTHIC SURVEY REPORT		
1.	Due to the presence of hard substrata, the number of sites sampled does not meet the required amount stipulated in the sample plan. Monitoring macrofauna at the replacement sites surveyed during the 2020 chemical survey (Appendix 1), where known soft substrata is present would increase the number of impact sites to required amount. The timing of future chemical, sediment and macrofauna surveys to coincide with the SOB sampling (Autumn) would facilitate comparisons between sediment chemical characteristics and macrofauna communities without seasonal effects.	The number of sampling sites will be increased. In future sampling will coincide with the State of the Bay sampling.
2.	Access to the invertebrate taxonomic reference collections from previous surveys would facilitate refinement of the overall species list for the area, resolving ambiguous species definitions among service providers. A macrofauna reference collection of the specimens collected from the ADZ would be invaluable.	Invertebrate taxonomic reference collections will be created to allow of comparison of results and conclusions between service providers. Development of this reference collection will be included in the new service provider's Terms of Reference to be appointed in October/November 2020.
3.	Despite high abundance and species richness in Saldanha Bay, the natural occurrence of certain dominant species causes the Shannon-Weiner Diversity index to fall below the stipulated threshold of H' = 3 throughout the three ADZ precincts. A revised H statistic threshold calculated from reference or baseline sites would be a more locally applicable threshold value.	A revised H statistic threshold will be calculated for the baseline sites for a local threshold value. This highlights the importance of reference stations for comparison with non-impacted sites. In addition, the next surveys will measure whether the index has changed significantly to measure impact over time and compare with the baseline.
4.	Cumulative abundance-biomass plots (ABC curves) of macrobenthic communities (Warwick 1993), also called k-dominance curves, would be additional useful tools in the analysis of macrobenthic invertebrate data.	This recommendation will be considered for the next survey and the Sampling Plan will be amended accordingly.
5.	Infaunal Trophic Index (ITI) and AZTI Marine Biotic Index (AMBI) are more suited to analysing Northern Hemisphere macrofaunal communities, while the locally developed Biological Traits Analysis (BTA) with Fuzzy logic may be more suitable for future macrobenthos surveys in Saldanha Bay.	This recommendation will be considered for the next survey and the Sampling Plan will be amended accordingly.

6.	The extent of the abrasion platform present in Big Bay is currently un quantified The proportion of this habitat type impacted by current and future mariculture activities is unknown, (especially in view of the fact that the dispersion model shows strong scouring here. A full detailed bathymetry survey using side scan sonar or multibeam echosounder of the ADZ precinct and historical extent of the abrasion platform would map the current extent of the abrasion platform in Big Bay.	. Historic State of the Bay monitoring sites do not coincide with the new sampling sites and so did not detect these rocky outcrops. The Environmental Authorisation condition 46 indicates that benthic sampling needs to be undertaken prior to new operators starting operations which was undertaken with the baseline sampling. Further research will be undertake to determine the extent, the patchiness and species diversity and composition on rock outcrops to inform management measures within the ADZ. A study will be commissioned with the new service provider to investigate the Big Bay precinct area. Based on the findings of this investigation a further study will be commissioned to determine the species community in the area on rocky outcrops.
7.	The video footage and bathymetry provided by Molapong as well as the photographs taken by AR&M divers shows patches of exposed reef present in the finfish lease area. The reef appears to be mostly low profile <1m in height which may be periodically inundated with sand, however, outcrops of reef >1m in height were evident. This is a poorly/unstudied habitat type within Saldanha Bay and there is a dearth of information on its extent, and the nature and type of biotic communities present. The ADZ monitoring programme should be updated to include suitable methods for monitoring potential aquaculture impacts on this habitat type.	The Sampling Plan will be revised to take into account the presence of the abrasion platform so that the impacts of the farming can be monitored on hard bottom substrate as well as sandy bottom. The sediment and chemical dynamics of the platform will be the subject of additional research since the dispersion model did not suggest that there will be significant accumulations of wastes or organic compounds on the seabed in Big Bay due to the existing wave regime.
8.	Suitable reef impact sites (n=3) in the finfish area and suitable reference sites (n=3) should be surveyed by scientific divers using transect or quadrat surveys to quantify key biotic components of this reef habitat. An alternative approach could be the use of underwater visual survey by means of divers with cameras, drop cameras or a Remote Operated Vehicle (ROV). All methods of surveying this habitat will rely on acceptable underwater visibility which is not common in Big Bay. In situ benthic surveys by divers, however, may be more easily undertaken than underwater video surveys in conditions of reduced visibility, but all options should be considered. It is critical that whichever survey method is employed, it must be repeatable for ongoing future monitoring. Ideally this monitoring should (as per the soft sediment	An investigation of the Big Bay precinct will be undertaken to quantify the biotic components of the abrasion platform and low lying reef areas as detailed above.

	monitoring programme) follow a BACI design, although it may not be practically feasible to complete a survey prior to installation of fish cages on the site.	
9.	Analysis and interpretation of the results of the bathymetric and underwater reef habitat surveys must provide practical advice to support the ongoing adaptive management of the Big Bay ADZ precinct.	Ongoing monitoring will inform the management of the ADZ.

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2 October 2020

Ms Milicent Solomons
Department of Environmental Affairs

The sailing and motor schools which I speak on behalf of have been battling with the coordinates and charts that are extremely poorly updated. This is due to different departments like yourselves, Department of Forestry and Fisheries (DAFF) and the ADZ not giving the Hydrographer Captain Timothy Stokes (hydrosan@iafrica.com) correct and updated information. It has resulted in vessels getting damaged in buoyage and lines and having to replace their shafts and props. This was North of the latest indicated aquaculture area in Small Bay. The aquaculture areas in Outer Bay are also not stuck to and buoys are seen outside the demarcated area.

My recommendation would be to get someone on the water to check the coordinates annually and take responsibility to feed updated information to the hydrographer for instance the aquaculture area South of Mykonos has been agreed that this will no longer be used for aquaculture yet it is still indicated on the chart incorrectly.

I hope this information will help the ADZ communicate better with the hydrographer so that the Port, Harbour authorities, commercial vessels and recreational vessels can all make use of the densely used waters safely.

Kind regards

Adrian Ceruti
Principal/Director

Appendix 1

PARADISE BEACH
HOMEOWNERS ASSOCIATION

(a Body Corporate established i.t.o. Section 29 of the Land Use Planning Ordinance No 15 of 1985)

RESOLUTION OF THE PARADISE BEACH HOMEOWNERS ASSOCIATION

1. PREAMBLE

1.1. The trustees vote in favour of the resolution below;
1.2. The trustees have decided to resolve by way of Round Robin.

2. RESOLUTION

It was resolved to:

2.1. Appeal against the amendment of the environmental authorisation issued on 8 January 2018 DEA Ref 14/12/16/3/3/1/1728/am2 and that Paul Desmond Butler in his capacity as trustee is duly authorised to sign and submit the necessary appeal documents on behalf of the association.

Paul du Plessis (Chairperson)
On behalf of PBHOA

Date: 12 October 2020

TRUSTEES:	P. du Plessis (Chair), P. Meijer (Vice-Chair), M. Brink; H.Nigrini, P.Butler, F. Hofmeyr		
MANAGEMENT:	Johan Coetzee	manager@paradisebeachhoa.co.za	079 783 8684
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APPENDIX 2