

Annual Environmental Compliance Report

2013-14 Marine Produce Australia Fish Farms Pty Ltd

May 2014



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This Annual Environmental Compliance Report dated May 2014 is endorsed and approved for release by the managing director of MPA Fish Farms Pty Ltd.

Approval for release:

Justin Clarke
Managing Director
MPA Fish Farms

30/5/2014

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1. INTRODUCTION

Marine Produce Australia Fish Farms Pty Ltd (MPAFF) holds the Western Australian Department of Fisheries (DoF) Aquaculture Licence No 1465 for commercial culture of Barramundi (*Lates calcarifer*) at Cone Bay, in the Buccaneer Archipelago of the Western Australian Kimberly region. MPA Fish Farms (MPAFF) operates the Aquaculture Site producing premium quality Barramundi for sale in the Australian domestic market, and is responsible for conducting and managing all operational activities at Cone Bay including all environmental monitoring and reporting. MPAFF is committed to ensuring the operation is compliant with all relevant state and federal environmental guidelines and statutes, and with conditions outlined in the Environmental Protection Authority (EPA) Ministerial Statement 885.

MPAFF currently conducts all environmental monitoring and management activities in accordance with an EPA approved EMMP, pursuant to Ministerial Statement 885. This environmental compliance report has been prepared by MPAFF in response to the proponent's commitment under Section 4 of Ministerial Statement 885 and is designed to address each element of an audit program approved by the EPA.

4-6 The proponent shall submit to the CEO the first compliance assessment report 15 months from the date of issue of this statement addressing the 12 month period from the date of issue of this statement.

The reporting time frame for annual compliance reports relating to Ministerial Statement 885 was agreed to as part the audit program approved 20/2/2013. This report relates to compliance and operational activities for the period of February 2013 through March 2014 (2 additional wet season months to finalise monitoring under Statement 885).

2. CURRENT STATUS

Proposal Implementation Status

The proponent has substantially commenced implementation of the proposal. Production for the assessment period calendar year was determined to be 800 tonnes. To achieve this production level, and to make provisions for future increases in production, the company fed out 1400 tonnes of fish feed during this period. A summary of proposal characteristics as detailed in schedule 1 of Ministerial Statement 885 is listed in Table 2, including a report on the status of each listed characteristic.

The company has deployed as of the end of the reporting period, 18 HDPE Grow-out cages and 8 HDPE nursery tanks on the Cone Bay Aquaculture Site.

Table 1: Proposal Characteristics and status

Element	Description	Status
Location	<ul style="list-style-type: none"> Aquaculture Licence Site 1465, Cone Bay, Yampi Sound, Western Australia, ~215 km NNE of Broome 	<ul style="list-style-type: none"> All production carried out on Aquaculture site 1465
Species cultured	<ul style="list-style-type: none"> Barramundi (<i>Lates calcarifer</i>) 	<ul style="list-style-type: none"> Species Cultured – Barramundi only
Total Maximum Barramundi production	<ul style="list-style-type: none"> 2000 tonnes/annum 	<ul style="list-style-type: none"> Production for 12 month period – 800 tonnes
Feed input	<ul style="list-style-type: none"> Maximum of 4,000 tonnes annually 	Annual Feed Usage: <ul style="list-style-type: none"> 1400 tonnes

3. COMPLIANCE

The proponent informed the CEO of the OEPA in writing on 21 December 2012 as per condition 6-3 of Ministerial Statement 885, that the company had exceeded the EQG for sediment phosphorous levels in the MEPA.

6-3 In the event that monitoring required by Cone Bay Barramundi Aquaculture EMMP ...indicates that the levels of ecological protection, EQG or EQS are not being met: the proponent shall report such findings to the CEO...

The proponent addressed this exceedance by moving to the EQS for Total Phosphorous, and reporting the findings to the OEPA Compliance Branch. Given the resultant findings of no detectable impact on infauna, no reduction in oxygen saturation, and no development of bacterial mats under cages, the proponent has requested that the phosphorus EQG trigger level be reconsidered as it is the proponent's view that the trigger value is not indicative of a likely impact on the Cone Bay environment.

A copy of the updated annual audit table is included in Section 5. The proponent has complied with all conditions outlined in the audit program.

4. ENVIRONMENTAL MONITORING

The Proponent, at Cone Bay, originally operated under a Department of Fisheries (DoF) approved EMMP relating to Aquaculture Licence number 1465. Monitoring results relating to the EMMP were reported to DoF on a three monthly basis, with a major environmental report provided annually before 1 March. The 2010 and 2011 compliance reports, including the approved audit tables and environmental reports, were submitted to DEC/OEPA. The current environmental monitoring plan is as described in the EPA approved “Marine Produce Australia: Cone Bay Aquaculture Environmental Monitoring and Management Plan”.

5. ANNUAL AUDIT TABLE

Audit Code	Subject	Requirement	How	Evidence	Phase	Timeframe	Status	Further Information
885:M1.1	Proposal Implementation	The proponent shall implement the proposal as documented and described in schedule 1 of this statement subject to the conditions and procedures of this statement	Project will be implemented in accordance with the conditions and schedules of this statement	Compliance Assessment Report	Overall	Life of Proposal - Yearly	Completed	
885:M2.1	Proponent Nomination and Contact Details	The proponent for the time being nominated by the Minister for Environment under sections 38(6) or 38(7) of the <i>Environmental Protection Act 1986</i> is responsible for the implementation of the proposal.	The proponent has authorized Marine Produce Australia Pty Ltd to implement the proposal	Compliance Assessment Report	Overall	Life of Proposal - Yearly	Compliant	
885:M2.2	Proponent Nomination and Contact Details	The proponent shall notify the Chief Executive Officer of the Office of the Environmental Protection Authority (CEO) of any change of the name and address of the proponent for the serving of notices or other correspondence within 30 days of such change.	Notify the CEO of any change to contact name and or address	Written advice to CEO of OEPA of change of contact name and address	Overall	Within 30 days of any change	Compliant	
885:M3.1	Time Limit of Authorization	The authorization to implement the proposal provided for in this statement shall lapse and be void five years after the date of this statement if the proposal to which this statement relates is not substantially commenced.	Provide written advice to CEO demonstrating the commencement of the Proposal within five years after the date of this statement	Compliance Assessment Report	Overall	On or before the expiration of five years from the date of this statement	Compliant	
885:M3.2	Time Limit of Authorization	The proponent shall provide the CEO with written evidence which demonstrates that the proposal has substantially commenced on or before the expiration of five years from the date of this statement	Provide written advice to CEO demonstrating the commencement of the Proposal within five years after the date of this statement	Compliance Assessment Report	Overall	On or before the expiration of five years from the date of this statement	Completed	
885:M4.1	Compliance Reporting	The proponent shall prepare and maintain a compliance assessment plan to the satisfaction of the CEO	Submit Compliance Assessment Plan to the CEO of OEPA	Compliance Assessment Plan	Overall	Life of Proposal	Compliant	

885:M4.2	Compliance Reporting	The proponent shall submit to the CEO the compliance assessment plan required by condition 4-1 at least six months prior to the first compliance assessment report required by condition 4-6. The compliance assessment plan shall indicate: 1. the frequency of compliance reporting; 2. the approach and timing of compliance assessments; 3. the retention of compliance assessments; 4. the method of reporting of potential non-compliances and corrective actions taken; 5. the table of contents of compliance assessment reports; and 6. public availability of compliance assessment reports.	Submit Compliance Assessment Plan to CEO for approval	Compliance Assessment Plan	Overall	5 October 2012	Completed	
885:M4.3	Compliance Reporting	The proponent shall assess compliance with conditions in accordance with the compliance assessment plan required by condition 4-1.	Assess compliance in accordance with the compliance assessment plan	Compliance Assessment Plan	Overall	Annually	Completed	
885:M4.4	Compliance Reporting	The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the CEO.	Retain digital copies of Compliance Assessment Reports	CARs available from MPA website	Overall	Annually and continued	Compliant	
885:M4.5	Compliance Reporting	The proponent shall advise the CEO of any potential non-compliance within seven days of that non-compliance being known.	Notify CEO (and compliance branch of OEPA) by email of potential non-compliance	Notification and yearly CAR	Overall	Within seven days of a non-compliance being known	Compliant	

885:M4.6	Compliance Reporting	The proponent shall submit to the CEO the first compliance assessment report 15 months from the date of issue of this statement addressing the 12 month period from the date of issue of this statement and then annually from the date of submission of the first compliance assessment report. The compliance assessment report shall: 1. be endorsed by the proponent’s Managing Director or a person delegated to sign on the Managing Director’s behalf; 2. include a statement as to whether the proponent has complied with the conditions of this statement; 3. identify all potential non-compliances and describe corrective and preventative actions taken; 4. be made publicly available in accordance with the approved compliance assessment plan; and 5. indicate any proposed changes to the compliance assessment plan required by condition 4-1.	Submit CAR to CEO annually	Annual Compliance Assessment Reports	Overall	First by April, 2013, subsequent yearly	Completed	
885:M5.1	Public Availability of Data	Subject to condition 5-2, within a reasonable time period approved by the CEO from the issue of this statement and for the remainder of the life of the proposal the proponent shall make publicly available, in a manner approved by the CEO, all validated environmental data (including sampling design, sampling methodologies, empirical data and derived information products (e.g. maps)) relevant to the assessment of this proposal and implementation of this statement.	Make data publically available	Yearly CARs posted on MPA website	Overall	Within the reasonable time period approved by the CEO	Compliant	
885:M5.2	Public Availability of Data	If any data referred to in condition 5-1 contains particulars of: i. a secret formula or process; or ii. confidential commercially sensitive information, the proponent may submit a request for approval from the CEO to not make this data publically available. In making such a request the proponent shall provide the CEO with an explanation and reasons why the data should not be made publically available.	Submit request to CEO	Submitted request to CEO with explanation	Overall	As required	Currently not applicable	

885:M6.1	Environmental Monitoring and Management Plan	The proponent shall ensure that operation of the proposal achieves the levels of ecological protection set out in <i>Cone Bay Barramundi Aquaculture Environmental Monitoring and Management Plan (Rev 7, Report No. 864_01_001/1, December 2011)</i> or subsequent approved revisions and shown in Figure 2, schedule 1 of this statement.	Assess compliance in accordance with EMMP	Compliance Assessment Report	Overall	Annually	In Progress	
885:M6.2	Environmental Monitoring and Management Plan	The proponent shall implement the <i>Cone Bay Barramundi Aquaculture Environmental Monitoring and Management Plan (Rev 7, Report No. 864_01_001/1, December 2011)</i> , or subsequent approved revisions, during operation of the proposal to the satisfaction of the CEO.	Implement EMMP	Compliance Assessment Report	Overall	Annually	Compliant	
885:M6.3	Environmental Monitoring and Management Plan	In the event that monitoring required by <i>Cone Bay Barramundi Aquaculture Environmental Monitoring and Management Plan (Rev 7, Report No. 864_01_001/1, December 2011)</i> or subsequent approved revisions indicates the levels of ecological protection, environmental quality guidelines or environmental quality standards are not being met: 1. the proponent shall report such findings to the CEO, with proposed actions to be taken to address the exceedance, within seven days of the exceedance being identified; 2. the proponent shall provide evidence which allows determination of the cause of the exceedance; 3. unless determined by the CEO that the exceedance is not a result of activities undertaken in implementing the proposal, the proponent shall implement the proposed actions to address the exceedance within 14 days of the exceedance being identified; and 4. the proponent shall continue to implement the actions to address the exceedance until such time the CEO determines that the actions may cease.	Report such findings to the CEO; provide evidence which allows determination of the cause of the exceedance; implement the proposed actions to address the exceedance.	Reported potential non-compliance; Annual CAR	Overall	Within seven days of the exceedance being identified; Within 14 days of the exceedance being identified; Continual.	Compliant	

885:M6.4	Environmental Monitoring and Management Plan	The proponent shall submit annually the results of monitoring required by <i>Cone Bay Barramundi Aquaculture Environmental Monitoring and Management Plan (Rev 7, Report No. 864_01_001/1, December 2011)</i> or subsequent approved revisions including an assessment of the effectiveness of the management and contingency measures implemented to ensure compliance with the requirements of conditions 6-1 and 6-2 to the CEO as part of the compliance assessment report required by condition 4-6.	Submit monitoring results	Compliance Assessment Report	Overall	Annually	Completed	
885:M7.1	Feed Source	The proponent shall ensure that any commercial fish feed used in the operation of this proposal shall be certified to the following standards or any subsequent revisions: HACCP (Hazard Analysis and Critical Control Points) as defined by CAC/RCP 1-1969 (Rev.4-2003); AS/NZS ISO 9001:2000 for manufacturing extruded fish food; and Australian Quarantine and Inspection Service (if imported).	Buy feed through certified dealers	Feed purchase receipts	Overall	Continual	Compliant	

6. Annual Environmental Report

**Cone Bay Ocean Cage Aquaculture
Annual Environmental Report –
2013/14**

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Figure Key (4.4 – 4.11): M = sample month (1-6) within each of the 2 seasons

Median 4 month* = the median value of each season's sampling (Note that this is a 6 month median in the wet season, and a 4 month median in the dry season)

EQG = environmental quality guideline for the particular parameter measured

1. INTRODUCTION

MPA Fish Farms Pty Ltd (MPAFF) is a small company incorporated in 2003 and is a wholly owned subsidiary of Marine Produce Australia Ltd. MPAFF operate a sea cage marine farm in Cone Bay,

Western Australia (under Department of Fisheries Licence No. 1465) which is solely utilised for the production of Barramundi (*Lates calcarifer*).

This report has been prepared by MPAFF to comply with licence conditions. It contains monitoring data obtained as specified in the Ministerial Statement 885, and MPA: Cone Bay Barramundi Aquaculture Environmental Monitoring and Management Plan (EMMP) approved in December 2011. In addition the report provides an explanation of the monitoring results with respect to the EQG and EQS limits, and any environmental impacts of the project.

2. SITE LOCATION

The existing aquaculture site (Licence no. 1465) is approximately 700 hectares and is located in Cone Bay, Yampi Sound, Western Australia (see Figure 4.1). Cone Bay is located approximately 215 km NNE of Broome in the north-west of Western Australia. The bay is approximately 20 km long and 6.5 km wide near its west-facing opening and fringed by sandstone cliffs on the northern and southern sides. The aquaculture site is situated in the southern section of the bay and encompasses Turtle Island where infrastructure exists for aquaculture activities. Figure 4.2 represents Licence No. 1465 and the boundary coordinates which are stated in Datum GDA94 (approximates WGS84) and are as follows:

Point	Latitude	Longitude
A	16° 27.9388' S	123° 29.3366' E
B	16° 29.6918' S	123° 32.8253' E
C	16° 30.1729' S	123° 32.5657' E
D	16° 28.4194' S	123° 29.0771' E

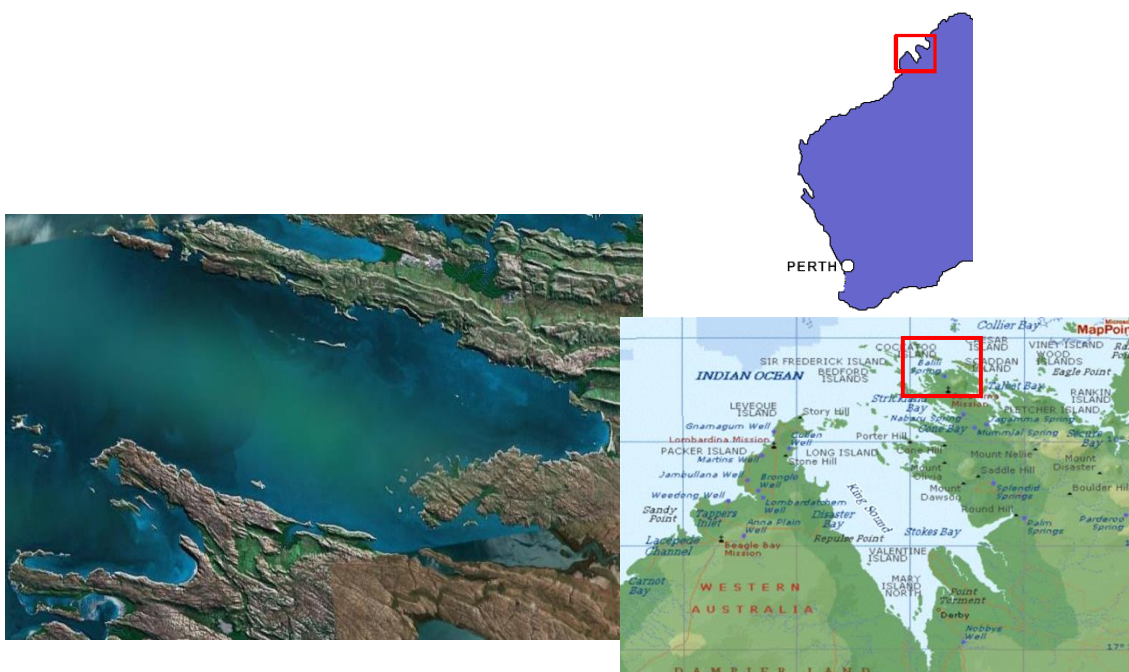


Figure 4.1 Cone Bay location, Yampi Sound, Western Australia.

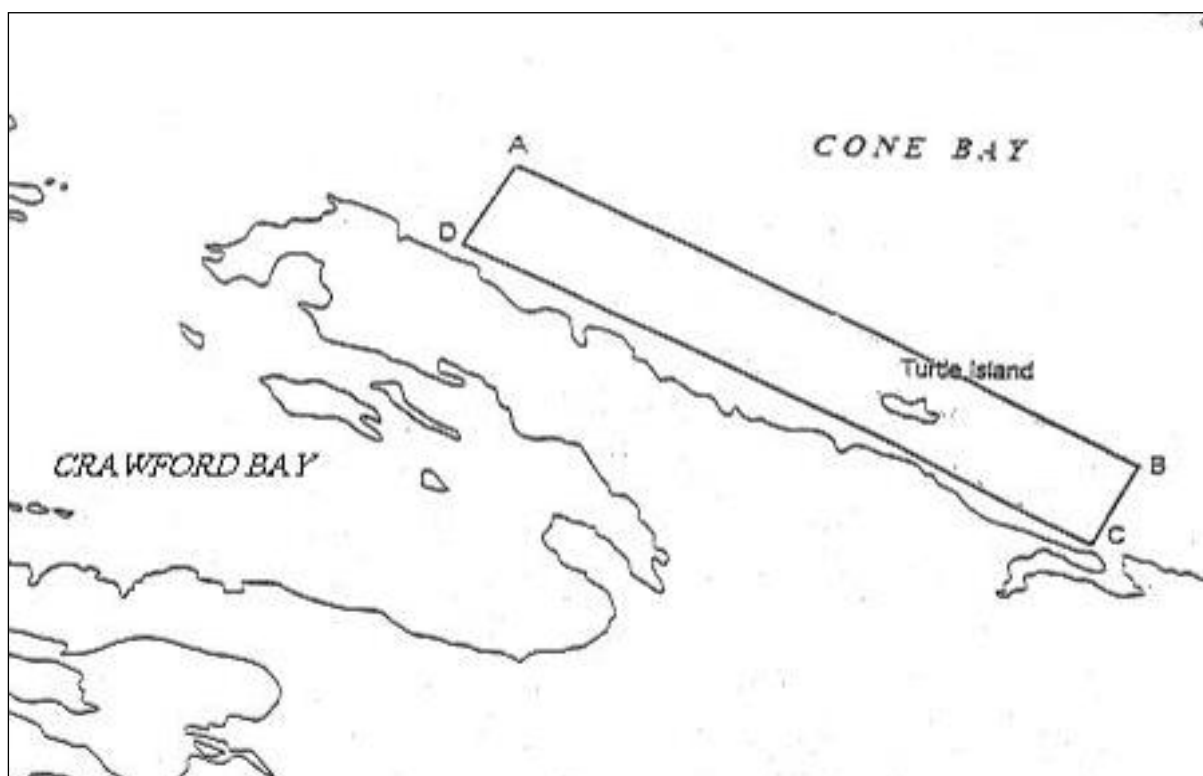


Figure 4.2 Location of boundary points of aquaculture licence number 1465, Cone Bay.

3. HYDROLOGY

Licence site 1465 is situated on the southern side of Cone Bay and encompasses Turtle Island. The depth within the site varies greatly (3-25m) as it does in the rest of Cone Bay (3-36m). The main hydrological influences on the Cone Bay water body is the 9 to 11 metre tidal range, high velocity currents and the large amount of run-off from the steep coastline that can occur during the wet season from heavy rainfall.

Previous hydrodynamic modelling studies of Cone Bay have demonstrated that current speeds range between 0.5 ms^{-1} and 2.0 ms^{-1} (dependent on neap or spring tide conditions). The modelling also demonstrated that Cone Bay, including the aquaculture licence area has a very rapid flushing rate, with 95% of the water flushed within 2 hours during a spring tide and completely flushed within 2 days (Brown & Root, 2000; APASA, 2006). Additional modelling has been completed under the Department of Fisheries Kimberley Aquaculture Zones project, and will be used to inform future environmental monitoring and management plans.

4. ENVIRONMENTAL MONITORING AND MANAGEMENT PLAN (EMMP)

4.1 Introduction

The Environmental Monitoring and Management Plan (EMMP) relates to the proposal by MPA to culture Barramundi (*Lates calcarifer*) in Cone Bay, Western Australia. The objective of the EMMP is to ensure the proposal is managed to achieve the relevant Environmental Values (EV) and Environmental Quality Objectives (EQO), as outlined by the Government of Western Australia (2003, 2004) and the EPA (2000, 2005a, 2005b). By implementing the EMMP, the proposal will be managed to ensure the marine environment is protected and that any adverse effects (should they arise at all) are rapidly detected. To that end, MPA has committed to an extensive program of environmental monitoring.

4.2 Monitoring Against Trigger Values

To evaluate any potential impact the farming operation may have on the marine environment, indicative (water and benthic) variables have been measured and compared to trigger values also known as Environmental Quality Guidelines (EQG). The indicative variables for water and benthic quality provide early warning of possible impacts. For the EMMP, EQG have been developed according to the approach defined in EPA (2005a) such that exceedance of an EQG is a 'trigger' for further investigation against the corresponding interim EQS. Interim EQS have been developed according to the risk based approach also defined in EPA (2005a). If an EQS is exceeded, it is considered that there is a potential risk that the associated EQO has not been achieved, investigation of the cause is needed and an adaptive management response is triggered if the exceedance continues. These EQG values are not absolute, and are meant to be informed by the local results and re-evaluated after two years' of monitoring under the current EMMP.

The percentile based calculations specified in the EMMP works under the premise that the median of the compliance site measurements must lie between a specified percentile of the natural distribution of the reference sites for a biological parameter where:

- A median is the middle value of a sequence of numbers. Half the values are numerically smaller and half are numerically larger (also known as the 50th percentile); and
- A percentile is the division of a frequency distribution of data into one hundredths. The p^{th} percentile of a distribution of data is the value that is greater than or equal to the $p\%$ of all values of the distribution. For example, the 80th percentile is greater than or equal to 80% of all values or 80% of all values are less than or equal to the 80th percentile.

As per the EMMP, monitoring against the EQG will proceed on an annual basis. Monitoring associated with the EQS will proceed only upon exceedance of the EQG.

4.3 Reference and compliance sample sites

The Cone Bay site experiences two major climatic cycles: the November-March ‘wet’ season and the April-October ‘dry’ season. The winter dry season is characterised by extended periods of dry sunny weather, while the summer wet season is characterised by frequent rain and periodic cyclone events. Water and sediment quality sampling was conducted once per month for four months in each of the dry (June – September) and the wet (December – March) seasons.

On each of the ten (6 wet, 4 dry) sampling occasions, water and sediment samples were collected at 16 compliance sites (8 sites at the MEPA, and 4 sites in both the HEPA and MaxEpa) and 8 reference sites. MEPA site samples were collected along a drogue transect on the incoming tide at 0-200m from a single cage.

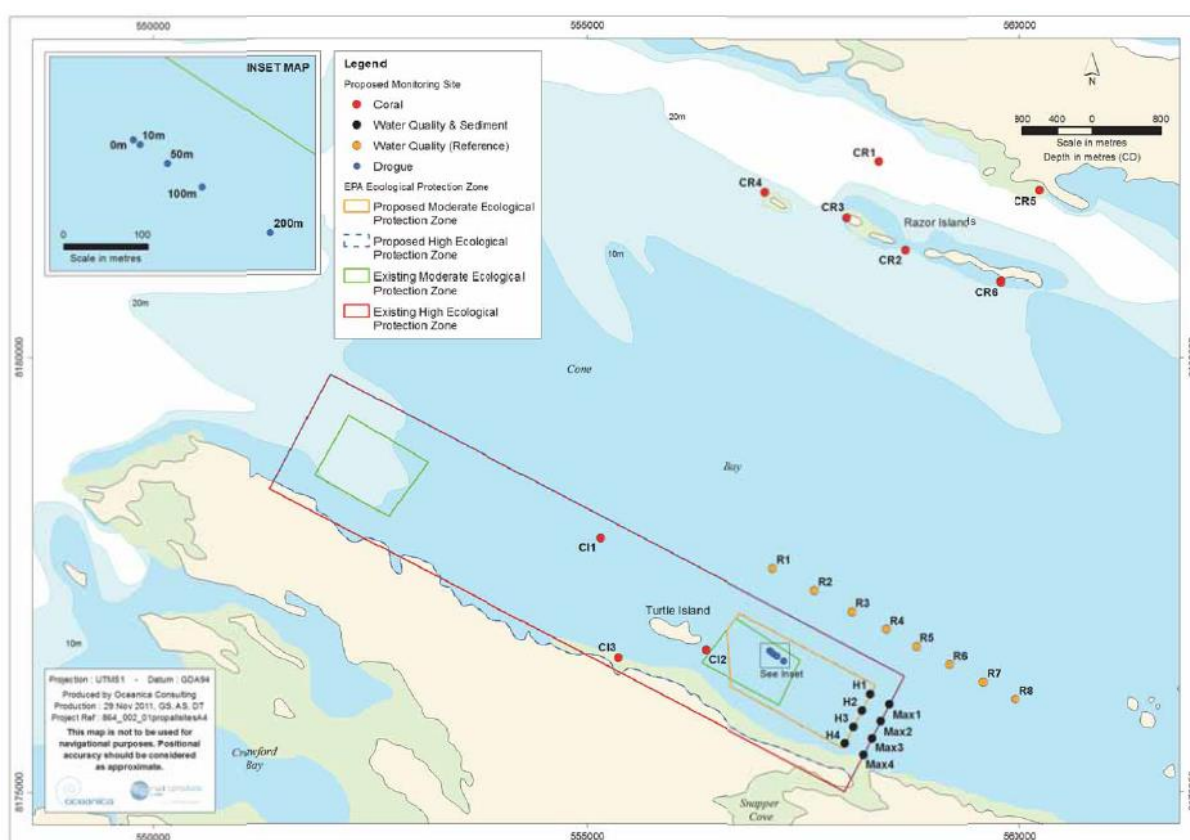


Figure 4.3 Reference and compliance sample sites

4.4 Results and Discussion

4.4.1 Water Analysis

The objective of the water quality monitoring component is to assess whether the EQG have been met in each of the Moderate (MEPA), High (HEPA) and Maximum (MaxEpa) Ecological Protection Areas. The water quality EQG are designed to provide information on the potential for increased shading or smothering, increased phytoplankton or algal growth, and increased water toxicity, that

may potentially result from fish farm activity. In accordance with MPA EMMP, the water quality monitoring program will measure the following water quality parameters: Total Suspended Solids (TSS), Light attenuation, Dissolved Oxygen, Ammonia, and Chlorophyll-a. It will also measure Dissolved Inorganic Nitrogen (DIN) for contextual purposes.

Total Suspended Solids (TSS)

The level of total suspended solids in the water samples was within the EQG levels at all three compliance monitoring sites, on all sample occasions. The variation seen in TSS measures was spread across all sample sites, with no evidence of increased TSS in the vicinity of ocean cages. Heavy rains and King Tides resulted in a bay-wide spike in turbidity and TSS in March 2014 (M6). The organic fraction of TSS was mostly consistent across sample locations.

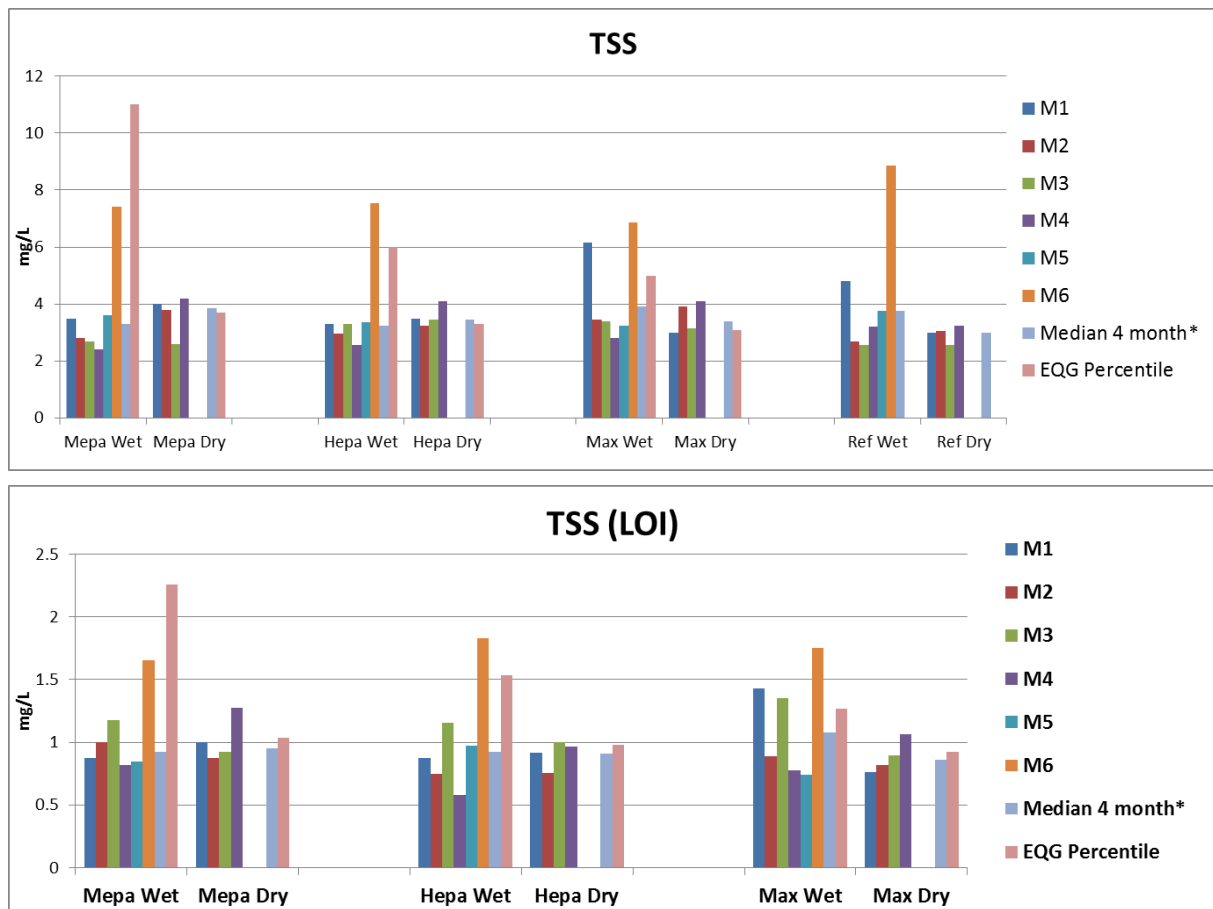


Figure 4.4 Total suspended solids EQG percentiles, and monthly compliance site median values

Dissolved Oxygen

Dissolved oxygen (DO) levels varied little between sites and were above 80% or 90% saturation at all sample times and locations (except February 2013). In February 2013 the sample probe started giving odd results (see M1 Max Wet and Ref Wet results), and then stopped working completely, at which time it was sent away for repair (hence no DO readings in March 2013).

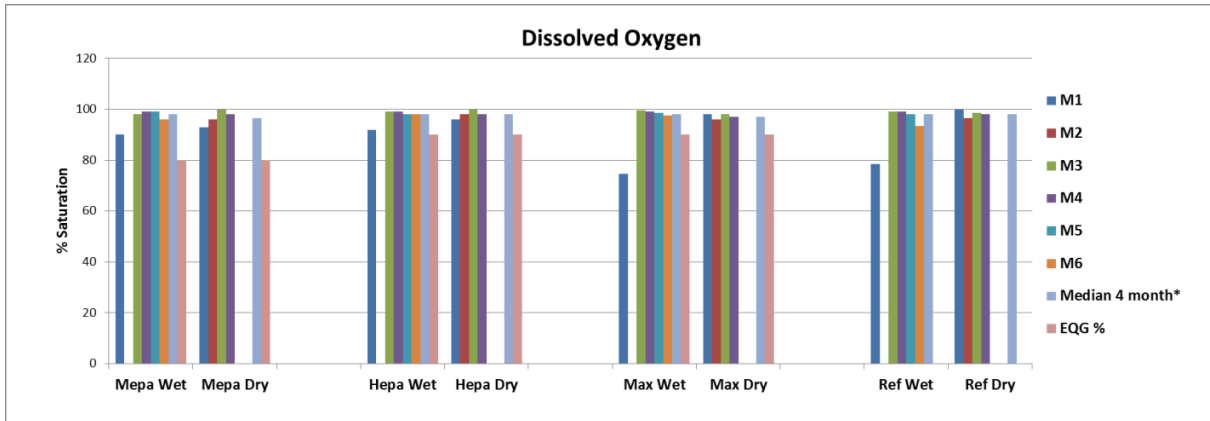


Figure 4.5 Dissolved oxygen EQG % saturation and monthly reference and compliance site medians

Ammonia

Median ammonia levels in all three compliance zones were well below their respective EQG compliance zone percentiles. There does appear to be a slight gradient in ammonia median levels from Mepa down to MaxEpa, which may suggest some influence of fish farm activity, but all levels are well within the lower range of normal levels detected at the compliance sites. Also the main variation in ammonia levels appears to be due to sample date, not location. Note: the EMMP has EQG trigger levels set as 1200ug, 500ug, and 250ug for the Mepa, Hepa and MaxEpa respectively. However, for clarity of display in the figure below I have reduced those tenfold, and show EQGs as 120ug, 50ug, and 25ug respectively.

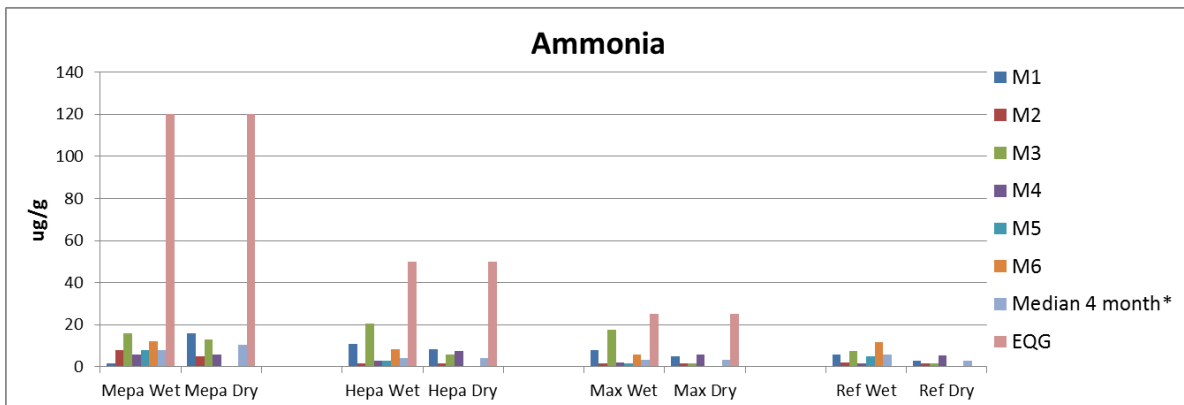


Figure 4.6 Ammonia EQG values and monthly reference and compliance site medians

Chlorophyll-a

Levels of chlorophyll-a were measured in the Hepa and MaxEpa sites in compliance with the EMMP. Levels of chlorophyll-a were similar across the Hepa and MaxEpa. The median values of the combined Hepa and combined MaxEpa sites in each month were well below the EQG trigger levels of 3x and 2x the 50th percentile respectively of the reference site data. Note that there was a higher level of Chlorophyll-a throughout the entire bay in month 4 of the dry season, and as such the EQG trigger values for the HEPA and MaxEPA in that month were 3.75ug/L and 2.5ug/L respectively.

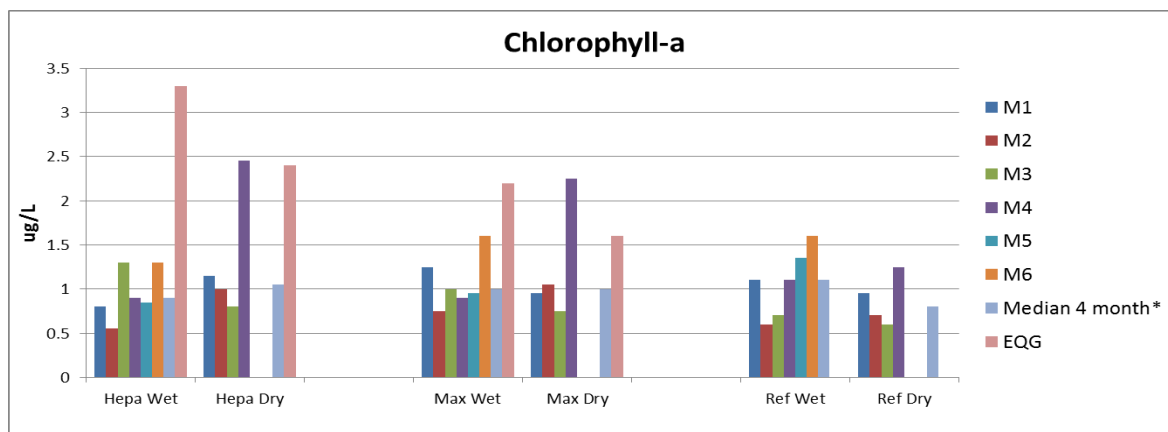


Figure 4.7 Chlorophyll-a EQG values and monthly reference and compliance site medians

Dissolved Inorganic Nitrogen

Concentrations of dissolved inorganic nitrogen (DIN) were collected for contextual purposes in the Mepa, Hepa, MaxEpa and reference sites. DIN is the total dissolved nitrogen in the form of ammonia, NO₃ and NO₂. The pattern of DIN is very similar to that of ammonia as it forms the largest part of the total. There is no clear or predictable pattern of DIN values within or across the sample areas or sample periods.

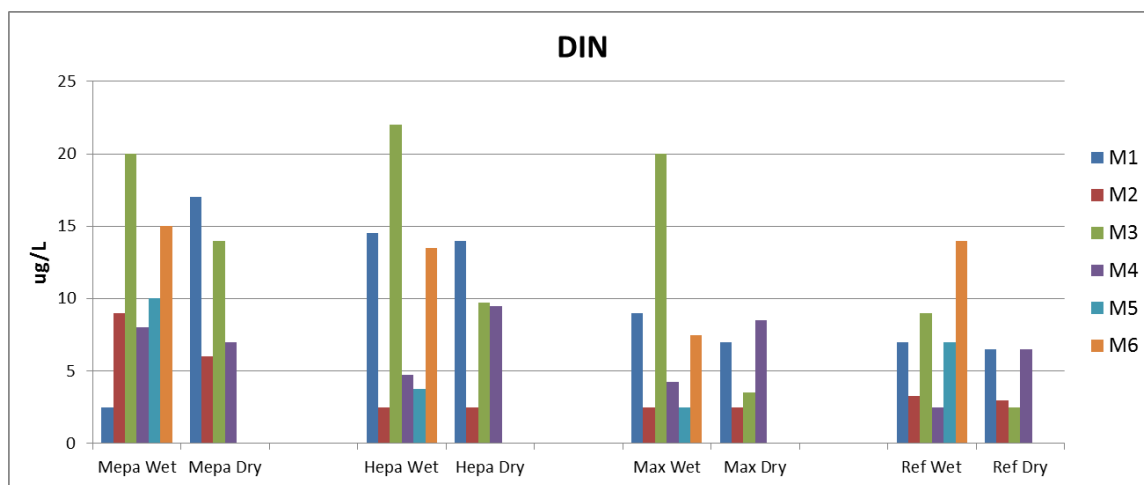


Figure 4.8 Dissolved Inorganic Nitrogen

4.4.2 Sediment Analysis

The objective of the sediment quality monitoring component is to assess whether the EQG have been met in each of the Moderate (MEPA), High (HEPA) and Maximum (MaxEpa) Ecological Protection Areas. Sediment EQGs have been developed to provide early warning of the potential for adverse effects relating to sediment nutrients and organic enrichment. In accordance with MPA EMMP the sediment quality monitoring program will measure the following sediment quality parameters: Total

Kjeldahl Nitrogen (TKN), Total phosphorous, Total Organic Carbon (TOC), and the presence of a Redox Discontinuity Layer.

Total Kjeldahl Nitrogen

Total Kjeldahl Nitrogen (TKN) measures the sum of organic nitrogen, ammonia and ammonium in the sediment, and is an indicator of sediment quality as high levels of TKN can be toxic to aquatic life. The median TKN value in the Mepa compliance zone was substantially lower than the EQG trigger percentile of the combined reference sites, suggesting that fish farm activities are not substantially impacting the nitrogen content of sediment in the vicinity of cages. Interestingly, and as yet inexplicably, the TKN levels in the Mepa are substantially lower than that in the Hepa, MaxEpa, and in the Reference sites.

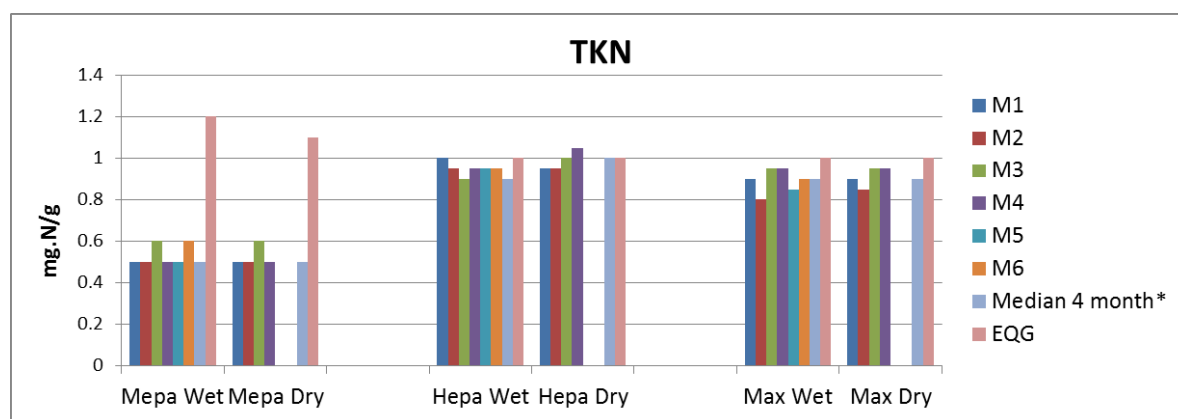


Figure 4.9 Sediment TKN EQG percentile and monthly compliance site median

Total Phosphorous

Total Phosphorous (TP) is a measure of phosphorous in all its forms (dissolved and particulate) within the benthic substrate. As previously reported to the OEPA (ongoing discussions throughout 2013), phosphorous levels in the Mepa continue to exceed the EQG in both the wet and dry season. The median Mepa wet and dry season levels of approximately 0.6 mg/g exceed their respective EQGs of approximately 0.46 and 0.42 mg/g. The highest median values of 0.65 and 0.66 mg/g measured in the Mepa wet and Mepa dry during this sampling year are lower than the highest values measured last year of 1.1 and 0.9 mg/g.

The Shaanning Pollution Index of sediment (Carroll et al, 2003) considers a phosphorous concentration of <0.5mg/g higher than background to represent no deviation from background, and a concentration between 0.5-2mg/g higher than background as representing a small deviation from background. By this standard the value of 0.6mg/g (only 0.14 and 0.18 mg/g greater than background) should be considered as no different from background.

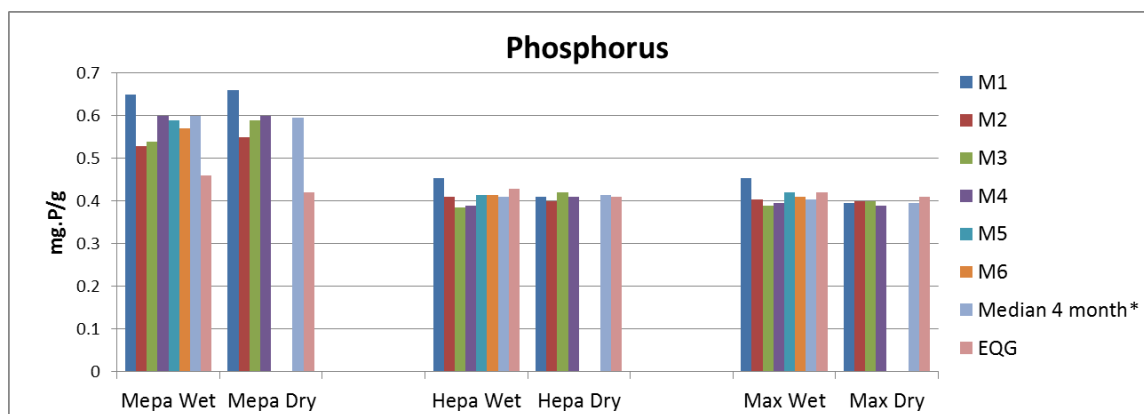


Figure 4.10 Sediment Total Phosphorous EQG percentile and monthly compliance site medians

Total Organic Carbon

The level of total organic carbon (TOC) in the sediment was significantly lower in the Mepa region than in the Hepa, Maxepa and reference site regions. The median over the 4 (or 6) month sample periods did not exceed the EQG in any of the sample regions.

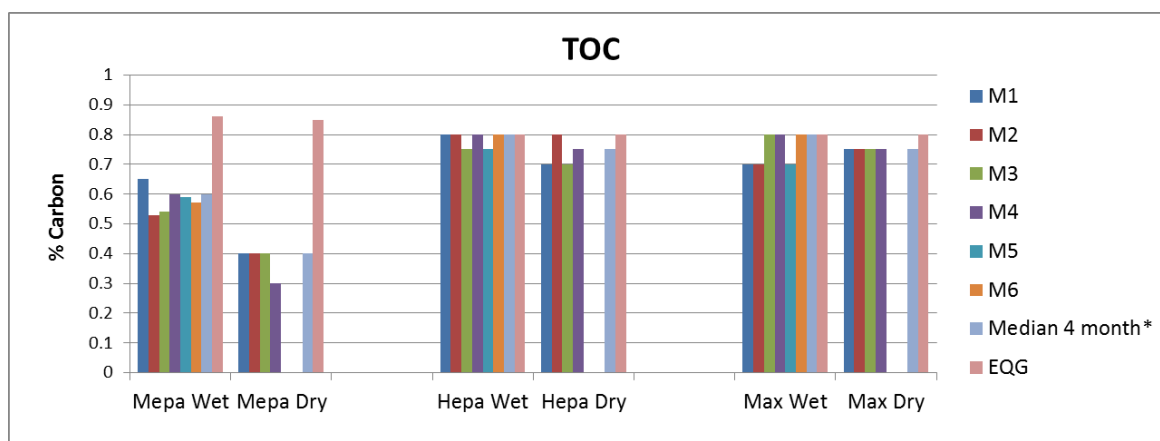


Figure 4.11 Sediment Total Organic Carbon EQG percentile and monthly compliance site medians

Core Characteristics and Redox Layer

The redox potential is driven by the dissolved oxygen concentration and the presence of organic matter. The decomposition of organic matter utilises dissolved oxygen and lowers redox potential: the transition layer between oxygen-rich and oxygen-poor layers is called the redox discontinuity layer. A redox discontinuity layer was not detected in any of the cores taken at any of the compliance and reference sites. Cores ranged from about 15-85 cm, with varied lengths within each sample site on different sample occasions.

Written descriptions of the cores included core length, sediment colour and stratification, visible animal or plant matter, presence of gas vesicles, and any sediment odour indicating hydrogen sulphide. Over the 8 months sampled, core lengths ranged from 15-85cm. In all locations and cores the colour was generally grey to dark grey, with occasional darker blackish streaks (mostly at Hepa sites). Shell grit was seen randomly in both compliance and reference sites..At no time were gas bubbles recorded.

5. References

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