

BASELINE ENVIRONMENTAL SURVEY SPECIFICATIONS, JULY 2018

LEASE NO. 117 – GREEN HEAD – TASMAN PENINSULA AND NORFOLK BAY MFD

In this schedule, 'Director' means the Director, Environment Protection Authority as defined in Section 3 of the *Environmental Management and Pollution Control Act 1994*.

1. Outline of Requirements

A baseline environmental survey in accordance with these requirements is to be undertaken at Marine Farming Lease No. 117 **prior to the commencement of marine farming operations in the lease**

Upon completion, baseline survey reports outlining the findings of the survey are to be submitted to the Director in accordance with section 2.7 of this schedule. **Establishment of moorings in relation to this lease is not to commence until the interim report has been submitted and endorsed by the Director. Stocking of the lease is not to commence until an Environmental Licence has been issued by the Director.**

Surveys are to be conducted at each of the sites shown on the enclosed sampling plan (see section 3). All survey sites are to be located and recorded consistent with GDA 94 MGA Zone 55 coordinates using differential GPS (DGPS). Minor variations of sampling locations are acceptable, if they are required due to compelling practical reasons or to improve representativeness of the resulting information. Any variations of the sampling plan must be explained and appropriate justification be provided in the baseline survey report. All sample collection and filming is to be conducted on the same day if practical, but within a period of 2 weeks as a maximum.

The person(s) undertaking the monitoring must be covered by appropriate permit(s) specific to the work. Permits include:

1. Living Marine Resources Management Act 1995 (LMRMA): Pursuant to s12 LMRMA, any person undertaking environmental monitoring in State waters must obtain a permit to do so insofar as such monitoring involves a breach of that Act.
2. Threatened Species Protection Act 1995 (TSPA): Any person knowingly collecting any specimen of a listed taxon of flora or fauna can only do so if covered by a permit issued pursuant to s51 of the TSPA. Further details can be obtained from threatened.species@dpiw.tas.gov.au.

Unless otherwise agreed by the Director, the baseline survey must include the following components, as detailed further in section 2 of these specifications:

- 2.1 Hydrodynamic investigations
- 2.2 Bathymetric profile
- 2.3 Seabed characteristics/habitat type profile
- 2.4 Underwater video survey
- 2.5 Sediment chemistry - redox, sulphide, particle size analysis, organic content, metals analysis
- 2.6 Biological analysis - benthic fauna, Spotted Handfish, seagrass and *Gazameda gunnii*
- 2.7 Reporting of results

Where reliable and accurate information from past surveys or external sources exists which is suitable to address these requirements, such information can be used in place of new surveys being conducted. All relevant information must be included in the reports required under section 2.7 of this schedule. Failure to address the information requirements in this schedule to a significant degree may result in the Director's decision not to endorse the reports submitted.

2. Environmental Baseline Survey Specifications

2.1 Hydrodynamic investigations

Current speed and direction are to be measured with an Acoustic Doppler Current Profiler (ADCP) at a site within the lease area likely to be typical of flow conditions within the lease area. Measurements are to be taken continuously over a 6-week period, at intervals not exceeding 30 minutes. Other existing verified flow data can be used to supplement these ADCP readings.

The information provided must include the following and be presented graphically in accordance with the following:

- A description of the current monitoring equipment, deployment location (defined by GDA 94 MGA ZONE 55 co-ordinates) and deployment periods;
- A description of key measurement parameters, e.g. bed depth, cell width, blanking distance, bed to head distance & reporting bin width;
- The data must be accompanied by appropriate interpretation and analysis including:
 - Current rose plots presented separately for all relevant depth layers;
 - Current rose plots to show flow velocity (cm/sec), direction and associated frequency;
 - Where significant seasonal or other variations have been identified, these must be illustrated with relevant plots;
 - Current rose plots must also note the direction of flow, *i.e.* into the centre or out from the centre of the plots and the date range illustrated in each plot;
 - Where practical, the scale on each axis of plots or current roses should be the same to allow visual comparison of plots.

Unless otherwise approved by the Director, all raw data must be submitted with the final baseline report, in Excel format, and must be accompanied by summary statistics (e.g. min / max / average velocity values & zero velocity counts)

2.2 Bathymetric profile

Depths (m) accurate to 0.5m are to be measured across the lease area and for an area extending 50m beyond the boundaries of the lease area. Measurements must be made by a boat with echosounder and by differential GPS (or log measuring distance). The records of depth should be made by soundings every 100m.

The approximate position of depth contours are to be presented on a map of the lease area.

2.3 Seabed Characteristics and habitat profile

Location of major habitat type(s) must be detailed on a map of the lease area. The map of significant seabed features is required as an overlay for the bathymetric map. The data for the sketch map can be collected by echo or side-scan sonar, diving, or underwater video to classify the major habitat types on the seabed in the lease area. These may include, but are not limited to:

- hard bottom - rock, limestone reef, boulders, rubble etc.;
- soft bottom - sand, mud/silt etc.;
- marine plants - composition of dominant species present.

2.4 Underwater Video Survey

The survey is to include an underwater video survey, made using external and internal spot dives. An internal spot dive is one made within the lease area and an external spot dive is one made outside the lease area.

External spot dives:

External spot dives are to be conducted at compliance and control sites. The locations of required spot dives are shown on the attached sampling plan.

Eight compliance sites are to be surveyed for the lease. Each site is to consist of a set of 3 spot dives at least 20m apart parallel to the lease boundary at a distance of 35m from the lease boundary. Each spot dive must record a minimum of 3 minutes of video footage. GDA 94 MGA ZONE 55 coordinates of each spot dive must be recorded.

In addition, three control sites are to be surveyed. Each site is to consist of a minimum of 3 spot dives at least 20m apart. Control sites must have sediment particle size similar to that found at the 35m compliance points. Where predetermined locations as shown in the attached sampling plan do not meet this requirement, they can be varied to improve representativeness of the resulting information.

Where a transect line is used it shall consist of a weighted line of known diameter with clearly marked tags 5m apart.

Internal spot dives:

In addition to the external dives, spot dives must also be performed inside the lease area to characterise existing habitat within the lease area. GDA 94 MGA ZONE 55 co-ordinates of each within lease spot dive must be recorded. The number of habitat dives for each lease block required for this survey is six, consistent with the table below:

Lease area to be surveyed (Ha)	Number of habitat dives
0-5	2
6-10	4
11-20	6
21-40	8
41-100	10

The location of internal spot dives should be determined in the field with consideration of observed hydrodynamic patterns and covering a range of different habitat and sediment types. The internal dives must include at least two dives in the locations that the pens will be established.

2.4.1 Filming Procedure

Spot dives:

Filming must be conducted slowly to ensure clear images of the seabed in the vicinity of the anchor marking the spot dive are recorded. Each spot dive site must be clearly identified on the video footage. Footage must show a minimum of 3 minutes of clear footage. Filming is to include sufficient coverage of the sediments in the vicinity of the dive site together with some stationary footage recorded with the camera lens pointing vertically down. The sediment must be disturbed and video footage recorded to assess presence of outgassing (i.e. sediment is to be disturbed and camera tilted up to the vertical so that any ascending bubbles can be seen)

If an ROV is used and tethered to a shot line the operator must ensure that if sediments are stirred up, the ROV can move to clear water showing undisturbed sediments and providing optimal visibility before filming commences.

Where relevant, filming is to be conducted with the transect line in view or bearing information and distance on the ROV display. Each transect must be identified on the film with the appropriate transect number e.g. T1, T2 etc. Filming must be conducted slowly along the transect line to ensure that clear images of the transect line and seabed are recorded. For a standard 40m transect, stationary video footage must be obtained at three points specified on the survey map with the camera lens pointing vertically downward with the transect line in view. The sediment must be disturbed and filmed at each specified site along the transect including vertical footage to check for the presence of outgassing on disturbance.

2.4.2 Equipment

All video footage is to be colour and in a standard digital format (or equivalent), to allow for computerised image analysis that will be conducted by the EPA. Clear, well lit images on high quality discs are required. The camera / ROV must be capable of operating at a minimum of 3 lux. A record of the date, time and type of filming (control/transect/farm dive, etc.) must be provided at the start of each filming sequence. Note that GoPro footage is required in addition to ROV footage.

Underwater housing to suit the camera must be used and fitted with a minimum of 2 x 50W lights or equivalent in LED's.

Electronic copies of the underwater footage must be submitted with the report.

The report must include comments on the following:

- Sediment colour (e.g. from brown/ grey to black);
- Texture of sediments (e.g. sand, silt mud);
- Seaweed/seagrass cover;
- Variety and density of animals living on and in the seabed;
- Presence of bacterial mats (e.g. *Beggiatoa* spp.);
- Outgassing from the sediment (including any outgassing upon disturbance);
- Presence of finfish faeces and/or feed pellets;
- Any other relevant features.

2.5 Sediment chemistry

2.5.1 Visual assessment, redox and sulphide

One undisturbed sediment core is to be taken using a perspex corer with an internal diameter of at least 50 mm at each sample site specified in the survey. A written description of each core recording the following parameters is required along with a digital image of each set of triplicates:

- length of core measured in millimetres with a ruler;
- sediment colour, from the surface to deeper layers;
- visible animal and plant life;
- gas vesicles if present and the size and position of the vesicles in the sediment;
- any sediment smell indicating for example, the presence/absence of hydrogen sulphide.

2.5.2 Redox and sulphide

The following protocols for redox and sulphide measurement have been drawn from Macleod *et al.* (2004). Redox potential and sulphide concentration measurements are to be taken from each sediment core. Both redox and sulphide should be measured at 3cm depth. There are a variety of redox probes available; single cell and combination electrodes. For ease of sampling, the combination electrodes are recommended. Prior to each set of measurements being taken the probe should be calibrated. Pre-packaged calibration solutions can be purchased. As calibration

is sensitive to temperature, it is important to note the temperature of both the calibration solution and the sample at the time of sampling. It is best if these temperatures are comparable.

To obtain a redox measurement, the probe is inserted into a port in the side of the core tube. This port must be positioned at 3cm below the sediment water interface. Redox potential values should be allowed to stabilise prior to recording. Depending on the sediment condition, the measurement may settle quickly or it may take a few minutes. Redox measures the oxidation/reduction potential of the sediments by determining the availability of free hydroxyl ions. Measurement will itself affect this level and therefore the reading on the meter will continue to decline (albeit slowly) whilst the measurement is being made. Consequently it is not necessary for the probe to stabilise completely before taking a reading, simply ensure that the rate of decline has steadied. Note: that an error level of +/- 10-20mV in the final reading is acceptable. Corrected redox results and raw data are to be reported in millivolts at 3cm depth.

There are a variety of different probes available for the measurement of sulphide concentration, but again a combination electrode is recommended. Each manufacturer will have slightly different specifications regarding use, sensitivity and calibration and these should be followed carefully. Prior to each sampling occasion, a Sulphide Anti-Oxidant Buffer (SAOB) must be prepared (see technique below) and standard curves should be established for calibration.

A sediment sub-sample (2ml) is extracted from the port in the side of the core tube using a 5ml syringe, and placed in a glass vial. SAOB (2ml) is added to each jar and sulphide concentration measured (mV) by placing the probe into the jar, and slowly stirring the sediment/buffer mix until the reading stabilises. The mV readings can be converted to sulphide concentration using the calibration curve. Samples should be collected and converted sulphide results (μM) and raw data (mV) are to be reported for 3cm depth. (TAFI, 2004).

Preparation of Sulphide Anti-Oxidant Buffer Solution (SAOB):

The SAOB solution can be purchased or it can be prepared by adding 20.0g of NaOH (Sodium Hydroxide pellets) and 17.9g of EDTA (Ethylenediaminetetra-acetic acid) in a 250ml volumetric flask and diluting to volume with distilled water. This solution should be refrigerated until required. Just prior to use add 8.75g of ascorbic acid for every 250ml of solution required. Once ascorbic acid has been added, the solution will only remain viable for 3 hours.

Calibration of the Sulphide Probe

Macleod *et al.* (2004) provides information on calibration procedures for a Cole-Parmer 27502-40 silver/sulphide electrode. If an alternative probe is to be used, it is recommended that manufacturer guidelines are referred to for specific details.

2.5.3 Particle size Analysis

A subsample of sediment from the top 100mm of each core should be placed in container of known volume (fill to top). Gently wet sieve each sample through a sieve stack of 4, 2, 1 mm, 500 μm , 250 μm , 125 μm , 63 μm either by hand or using a sieve shaker. The less than 63 μm fraction is allowed to drain away, i.e. not collected. The material remaining on each sieve is carefully removed and placed in a graduated cylinder. A known volume of water is added (this volume should remain consistent throughout the procedure). The volume of sediment from this fraction is measured as the displaced volume. This process should be repeated for all sieve fractions.

The sum of all sieve fractions subtracted from the initial volume will give the less than 63 μm fraction. The data is to be provided in an Excel spreadsheet and graphed as cumulative percentages.

2.5.4 Organic Content

A single undisturbed sediment core is to be taken using a perspex corer with an internal diameter of at least 50 mm at each sample site specified in the survey for the purposes of organic content analysis. The top 3 cm of each core is to be oven dried at 60°C prior to analysis of total organic carbon (loss on ignition at 450°C in a muffle furnace for 4 hours).

2.5.5 Metal Analysis

A single undisturbed sediment core is to be taken using a perspex corer with an internal diameter of at least 50 mm at each sample site specified in the survey for the purposes of heavy metal analysis. The top 3cm of sediment within the core is to be transferred to an acid washed glass jar and stored at a constant, cool temperature whilst conducting the survey. Samples are to be submitted to and processed by a NATA accredited laboratory. Analysis is to include the following metals As, Cd, Co, Cr, Cu, Mn, Ni, Pb, Zn. Results of all metal analyses are to be presented in the baseline report.

2.6 Biological analysis

2.6.1 Benthic faunal analysis:

Single Van Veen grabs or diver collected wide-diameter core samples (150mm diameter x depth 100mm) are to be taken at each of the sample sites identified in the attached sampling plan. Each benthic sample should be sieved through a 1 mm sieve and all fauna identified to family level and counted. It will be necessary however, to take the identification of several taxa down to species level. These groups currently include (but are not limited to) the Family Capitellidae, Family Turitellidae (See Annexure II for sampling protocols) and all introduced marine species.

Each benthic sample should be processed separately and identically.

2.6.1.1 Preservation/Retention of Samples:

All fauna collected must be preserved in formaldehyde solution. After identification and enumeration of the organisms, they are to be transferred to 70 % alcohol for long-term storage. Storage jars must be labelled (inside and outside) with details of date of collection, site location, collection method, and collectors' and identifiers' name. The jars are to be stored for at least 5 years in a readily accessible place so that confirmation of identification can be investigated at a later date if required.

2.6.2 Spotted Handfish (*Brachionichthys hirsutus*)

The results of the survey are to be documented in the interim baseline survey report.

This survey is designed to detect (with a known detection probability) a small population of Spotted Handfish within a large impact footprint. The survey design utilises a two stage survey approach. The first stage is a presence/absence survey. If any spotted handfish are detected during the first survey then the second stage survey is triggered. The intent of this survey is to provide a more detailed assessment of the size and extent of the population.

Survey method

ROV based surveys for Spotted Handfish should be conducted as transects. A standardised transect length of 100 m is desirable, however there may be reasons why a different transect length is suitable in some situations. The transect may be dived as 3 x 30 m ROV runs along the bearing set in the specifications where the bearing and distance are visible on the ROV display.

Where a transect line will not be deployed and the ROV run along the bearing line, then GPS fixes at start and end of dive together with fixes of approximate handfish locations, if identified during filming, must be reported.

An ROV based survey should collect the following information:

- The presence, number and density of Spotted Handfish individuals, and an estimate of length. Where a Spotted Handfish is detected then either its position along the transect line should be recorded and/or its GPS position.
- The presence of vertical structures that could provide potential substratum appropriate for attachment of handfish eggs. In the case of stalked ascidians, this can be a direct quantitative count. In the case of seagrass or *Caulerpa* sp., dense beds can be quantified using an estimate of percentage cover over the length of the transect.
- The presence, number and density of Spotted Handfish egg masses (during the breeding season) and position along the transect.
- The presence, number and density of northern Pacific Seastars (*Asterias amurensis*), position along the transect, and the time of identification.

Important: The efficacy of an ROV based survey is strongly dependent upon the quality of the footage. As a cryptic and relatively small species, the Spotted Handfish is hard to detect and it is therefore essential that high quality footage is provided. It is recommended that surveys be conducted by experienced operators in good conditions and visibility. Poor quality footage may not be accepted.

Video footage taken at all specified sampling sites must be analysed by suitably qualified personnel to determine the presence of specimens of *Spotted Handfish*

Survey design

Stage 1 Presence/absence survey

Six 100m transects (or as 3 x 30 m for each 100 m transect between these points) are required within the survey area at the locations specified in the following table.

TRANSECT	START		FINISH	
	EASTING	NORTHING	EASTING	NORTHING
H1	556829	5245867	556899	5245939
H2	556910	5246026	556980	5246098
H3	556725	5245978	556795	5246050
H4	556784	5246166	556854	5246238
H5	556585	5246123	556655	5246195
H6	556660	5246288	556730	5246360

Stage 2 Population survey

In the event that Spotted Handfish presence is detected through Stage 1 surveying then further surveying is likely to be required to provide information around population size and characteristics. If a Stage 2 survey is required the EPA must be contacted to discuss Stage 2 survey requirements.

2.6.3 Seagrass

Seagrass surveys are to be undertaken, as a minimum, along transects (or as 3 x 30m ROV dives) in the proximity of the locations identified in the sampling plan. Surveys are to consist of dive or remote video recordings and an assessment of epiphyte cover along transects.

2.7 Reporting of Results

An interim report must be submitted with the Environmental Licence application. This report must include video survey results and interpretation, threatened species report and a bathymetry map.

The final baseline report is to be a complete record of all work undertaken, including an analysis of benthic sampling and hydrodynamic investigations undertaken. The final baseline report is to

be submitted no later than six weeks after the baseline survey was conducted, unless otherwise approved in writing by the Director.

Detailed reporting requirements for the interim and final baseline report are outlined in the attached 'Reporting Schedule – Baseline Environmental Survey'.

The reports are to be submitted to EPA Tasmania, Salmon Environmental Management Section (email to: SalmonRegulation@epa.tas.gov.au). The interim and final baseline report, once endorsed by the Director, are to be made publicly available.

The raw data must be provided as hard copy and electronically in the formats specified in Annexure 1 to this Schedule or as otherwise agreed by the Director. A concise interpretation of the data should be provided for each parameter in the report. The report should comply with the requirements of Annexure 1.

All documents lodged are to be approved by and submitted in full by the lease holder / licensee.

3. Sampling plan

Sampling is to be undertaken in accordance with attached sampling plan.

References

Macleod, C., Forbes, S., Bisset, A., Burke, C., Crawford, C., Holdsworth, D., Nichols, P., Revill, A., and Volkman, J. (2004) Guide to the assessment of sediment condition at marine finfish farms. Aquafin CRC Project 4.1 Extension report to FRDC. Tasmanian Aquaculture & Fisheries Institute.

Annexure 1

ENVIRONMENTAL ASSESSMENT OF LEASE AREA #117

Marine Farming Lease No.: 117

Applicant's name: Huon Aquaculture Company Pty Ltd

Name of Person(s) / organisation conducting environmental assessment:

Introduction: Preamble to the report indicating any previous work done relevant to this report and work done at the lease area.

Methods and results: The methods used for the assessment of each parameter and the results are to be presented in the same order as in this Schedule. Data must be summarised in tables and graphs and the raw data attached as appendices.

Interpretation: An interpretation of the data providing an integrated understanding of the results must be included in the report. Any unusual results should be highlighted.

Data: Original, raw data shall be provided as hard copy and in electronic form (either on disc, hard drive or via email) to **EPA Tasmania, Salmon Environmental Management Section (email to: SalmonRegulation@epa.tas.gov.au)**. Results are to be provided electronically in Excel spreadsheets (data templates to be provided upon request) and appropriate digital footage is to accompany the report.

The following is to be included:

- date, time, weather conditions of the sampling day;
- Unless otherwise specified, DGPS files DXF (Drawing Exchange Format)/ESRI (Environmental Systems Research Institute) shape file format providing position fixes and at least one spm (State permanent mark) reference fix. Data files are to include date and time attributes;
- current meter/ ADCP results and interpretation* - electronic data must be supplied;
- an interpretation of video footage (using the Microsoft Excel template file provided and employing assessment techniques identified in section 7.1, Macleod and Forbes 2004);
- description and interpretation of core profiles;
- interpretation (written and graphical) of redox results recorded from cores;
- interpretation (written and graphical) of sulphide results recorded from cores;
- interpretation (written and graphical) of sediment particle size analysis;
- interpretation (written and graphical) of heavy metal analysis; and
- where relevant, an interpretation of results (written and graphical) from the benthic organisms from grab/core samples*

* Note that where hydrodynamic investigations and/or benthic infaunal assessment are required as part of the baseline survey, an interim report covering all other parameters must be submitted within one month of the survey. Relevant data, analysis and interpretation of biological/hydrodynamic information is to be provided within four months of the survey date and the reporting of this information is to be consistent with the format detailed above.

Annexure II

Given the limited information on the distribution and ecology of *Gazameda gunnii* and based on advice from a number of recognised Tasmanian marine mollusc experts regarding appropriate sampling strategies for this species, the following sampling protocol is to be implemented:

□ **Habitat**

Sampling is to be undertaken within areas of coarse sand (*i.e.* > 1mm particle size), shell-grit and fine gravel occurring in depths of 3 to 80 m within development proposals (Note: Departmental and TAFI data shows *G. gunnii* occurring within fine sand, particle size >0.125 mm).

Note: Sampling is not required within estuaries (including the Derwent River upstream from Taroona; the Huon River upstream of Police Point; the Tamar River upstream of the Batman Bridge; and Macquarie Harbour).

□ **Sample number**

The below table indicates the number of benthic grabs/cores (*eg.* Van Veen grab, 15 cm diameter corer) that should be taken within relevant habitat in a development proposal area. **If dead *Gazameda sp.* shells occur in any of the initial samples then the number of samples is to be doubled.** Sampling is to cover the full depth range of suitable habitat but otherwise be randomly located.

Required number of benthic samples per area (**each block of lease**) of relevant habitat for *G. gunnii*

Area of relevant habitat (hectares)	Initial # of samples	Total # of samples if dead <i>G. gunnii</i> in initial samples
< 1	3	6
<5	5	10
<20	10	20
<100	15	30
<1000	20	40

□ **Processing samples**

Benthic samples are to be sorted through a maximum sieve size of 4 mm.

Dead shells are to be retained and confirmed as *G. gunnii* by a suitably qualified person.

Any live *G. gunnii* are to be photographed with a good quality macro-camera.

Collected individuals of *G. gunnii* are to be placed in a container of fresh seawater for relocation.

Individuals of *G. gunnii* are to be relocated to a location nearby that is outside of the proposed area identified for impact and that will provide similar habitat including water depth and substrate composition.

Numbers and location of individuals relocated are to be recorded.

The time taken for relocation must be kept to the minimum practically achievable.

A report detailing results of the survey including data occurrences of dead and relocated individuals of *G. gunnii* is to be provided to the Director in an electronic form suitable for entry into the Natural Values Atlas within 90 days of collection. Required data includes species name, location information including grid reference in GDA 94 and location variation in metres, observer name, observation date, number of individuals and/or approximate area occupied.