GUIDELINES FOR NATURAL VALUES SURVEYS - ESTUARINE & MARINE DEVELOPMENT PROPOSALS
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### Abbreviations and Acronyms

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DPIPWE</td>
<td>Department of Primary Industries, Parks, Water and Environment</td>
</tr>
<tr>
<td>EPBCA</td>
<td>Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)</td>
</tr>
<tr>
<td>GPS</td>
<td>Global Positioning System</td>
</tr>
<tr>
<td>LISTmap</td>
<td>Land Information System Tasmania map</td>
</tr>
<tr>
<td>LMRMA</td>
<td>Living Marine Resources Management Act 1995</td>
</tr>
<tr>
<td>NCA</td>
<td>Nature Conservation Act 2002</td>
</tr>
<tr>
<td>NCH</td>
<td>Natural and Cultural Heritage Division, DPIPWE</td>
</tr>
<tr>
<td>NVA</td>
<td>Natural Values Atlas</td>
</tr>
<tr>
<td>PASS</td>
<td>Potential acid sulfate soils</td>
</tr>
<tr>
<td>PCAB</td>
<td>Policy and Conservation Advice Branch, NCH, DPIPWE</td>
</tr>
<tr>
<td>RMPS</td>
<td>Resource Management and Planning System</td>
</tr>
<tr>
<td>TSPA</td>
<td>Threatened Species Protection Act 1995</td>
</tr>
<tr>
<td>TVMMP</td>
<td>Tasmanian Vegetation Monitoring and Mapping Program, DPIPWE</td>
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Version 1.1 – 30 April 2019 (Spotted handfish breeding season updated)

Cite as:
1. INTRODUCTION

These guidelines have been prepared by the Natural and Cultural Heritage Division (NCH), Department of Primary Industries, Parks, Water and Environment (DPIPWE) for proponents and consultants who are required to survey and report on the impact of proposed developments on terrestrial natural values within Tasmania (for terrestrial natural values refer to the companion document titled Guidelines for Natural Values Surveys - Terrestrial Development Proposals).

In Tasmania, an assessment of the potential impact of a development proposal on natural values may be required as part of a planning and development approval process under State legislation. These guidelines have been prepared for consultants who may be engaged by proponents to survey, assess and report on the potential impact of proposed developments on natural values within estuarine and marine environments (hereafter referred to as marine). Note these guidelines do not cover surveying in freshwater environments which require different survey techniques.¹

In relation to marine farming, these survey guidelines apply to shore based infrastructure, however they do not apply to marine farming activities where standard surveying protocols already exist. Survey requirements for marine farms are set by DPIPWE's Marine Farming Branch and they should be contacted if needed.

Many developments overlap both the terrestrial and aquatic environments (for instance a marina development with associated land-based infrastructure), furthermore, some aquatic developments can have impacts to terrestrial values (for instance sub-tidal blasting for a pipeline that may create a disturbance to a nearby wedge-tailed eagle nest). In situations where an impact to terrestrial values is known or likely, it is important to read these guidelines in conjunction with the Guidelines for Natural Values Surveys - Terrestrial Development Proposals.

Matters of National Environmental Significance as listed under the Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) (EPBCA) must also be considered to determine if the proposal will need to be assessed under that Act. Requirements under the EPBCA are not considered further in this document, and proponents and consultants are encouraged to make themselves aware of their responsibilities under Australian legislation. Further information is provided at http://www.environment.gov.au/epbc.

¹ NCH does not have current guidelines for surveying in freshwater environments in relation to developments assessments. If unsure consult with the Policy & Conservation Advice Branch (PCAB) in advance for advice on survey requirements.
2. PURPOSE OF THE GUIDELINES

The primary goal of these guidelines is to assist proponents and their representatives to meet the needs of regulators assessing the impacts of proposed developments on natural values. Use of the guidelines will help to ensure that surveys and reports are completed to a standard that enables regulators to perform their roles efficiently and achieve the conservation objectives under relevant legislation. It is recommended that the guidelines are referred to and the suggested approaches are adopted as a minimum standard.

Where species-specific survey guidelines exist, these must be used, unless an alternative methodology has been agreed in writing by the Policy and Conservation Advice Branch (PCAB) of NCH.

This document and any related methodologies are subject to regular review by NCH. Updates and additional information will be provided on the DPIPWE website as they become available. Consultants, development proponents and their representatives are advised to check the site regularly for new material that may have a bearing on their proposals.

3. ASSESSMENTS FOR NATURAL VALUES

The scale, location and nature of the proposed development will all influence its impact and therefore the information needed to assess it. This section outlines some of the factors relevant to planning, timing and selection of personnel to undertake natural values survey/s.

‘Natural values’ in this case refers to biological and geodiversity values of conservation significance, being those species, communities and other values that have significance and/or statutory protection under the Tasmanian Threatened Species Protection Act 1995 (TSPA), Nature Conservation Act 2002 (NCA) and the Living Marine Resources Management Act 1995 (LMRMA) and other relevant policies and regulations.

Currency of surveys

Survey reports are generally regarded as current for up to two years from the date of the field survey provided no significant changes have occurred on or around the survey area and no new, relevant information has become available. Beyond two years, the information provided may be out of date and may need to be re-verified on the site.

Personnel and preparation

The proponent or their representative must ensure that the personnel undertaking survey and preparing reports have appropriate skills, qualifications and experience in identification and documentation of all natural values of interest, including a knowledge of Tasmanian species, their habitat and other ecological requirements, and vegetation communities.
In addition, consultants undertaking surveys should ensure they have the necessary equipment on hand and that sufficient time has been allocated to identify and document all the natural values that are likely to be encountered at the site. The surveyor must also ensure that any necessary permits to ‘take’ listed species for identification purposes, and access authorisations, have been obtained prior to going on site. Appropriate biosecurity procedures need to be implemented as required.


Survey area and context
The survey area must be of an appropriate size to identify all the relevant natural values that may be impacted, as well as provide some local context for those impacts.

The survey area should include:

- The ‘development footprint’ which will include those areas where the proposed development, activity or action will be directly located, as well as other associated components such as access roads and tracks (or in some situations vessel navigation routes), parking and material storage areas. The development footprint will need to be well defined by the proponent in order for the consultant to accurately determine the extent of potential impacts. If the footprint is not defined further studies may be necessary to cover any areas missed. It is therefore important to overestimate rather than underestimate the footprint.

- For some developments and activities, potential impacts to threatened species and natural values will extend beyond the development footprint. For instance, pile driving can create significant noise disturbance (noise travels faster and further in water compared with air), and dredging and marine construction can result in sediment disturbance which may impact beyond the development footprint).

In situations where the impact of the activity is likely to exceed the development footprint then it may be appropriate to include an additional survey or buffer zone. The precise size of this zone will depend on the types of disturbances or impacts generated and the kinds of listed species or values that may be impacted. If it is unclear whether an additional survey or buffer zone may be required, or what size they should be, then it is recommended to contact PCAB.

Survey timing and method
Many marine species can be surveyed at any time of the year, however migratory species only occur within a particular area seasonally. DPIPWE’s Threatened Species Link ([http://www.threatenedspecieslink.tas.gov.au](http://www.threatenedspecieslink.tas.gov.au)) provides information on the best time(s) of year to survey for many threatened species.
These guidelines outline a minimum level of surveying. This preliminary assessment and characterisation of the site will inform as to the likelihood of species occurring within or near the site and their potential to be impacted by the development.

For some marine species, specific survey guidelines have been developed (see Appendix 2b) and species-specific surveys must be conducted if the preliminary assessment and characterisation indicates there is a medium to high likelihood of the species occurring in the local area, or as outlined in the species specific surveys (for instance the species specific survey for spotted handfish specifies when a targeted survey should be conducted).

Survey requirements

This section provides guidance regarding minimum requirements for surveys. Additional information regarding methodology etc. is provided in Appendix 1. A survey checklist is provided at Appendix 7.

When surveying for natural values, the following minimum general information must be recorded and reported. It is also expected that maps and photos will be provided, as appropriate.

- Site details including location and tenure
- Surveyor(s) name, contact details and the date and time of the survey/s
- Description of the survey methods used
- Description of the survey area including a GPS track-log and/or map/s
- Description of the bathymetry and bottom type
- Description of all natural values as well as a full species list, including non-threatened species, threatened species and introduced species
- Any potential opportunities for avoiding, reducing or mitigating impacts to the extent known at the time of survey
- Potential offset sites/areas (if likely to be required); and
- Any other information or data considered relevant

Specific survey information will be required for the following attributes of a site. Appendix references are provided for additional detail regarding methodology.

- Site and values characterisation (see Appendix 1)
- Threatened species (see Appendix 2A and 2B)
- Sediment sampling (Appendix 3)
- Introduced marine species (Appendix 4)
- Geoconservation and geomorphic features (Appendix 5).
4. KNOWLEDGE MANAGEMENT

All records of threatened species, and marine pests which are compiled during the field survey/s should be submitted to the Natural Values Atlas (NVA) within three months of survey using the online standard proforma and data entry facility. This assists to maintain the currency of publicly available datasets and mapping products, and improves the accuracy of assessments.

Consultants will first need to apply to DPIPWE for access via the NVA website and will then need to request the creation of a project to lodge their data under.

5. MITIGATION AND OFFSETS

Actions that may be required based on the outcomes of surveys include ‘no action’, ‘avoidance’, ‘mitigation’ and/or ‘offset’. It is important that, when required, the survey report includes due consideration of avoidance and mitigation measures to reduce the potential impacts of a proposal (on natural values) as much as practicable. This information will assist the regulator/s to assess the risks and to determine if these risks are acceptable.

Offsets operate within a mitigation hierarchy, where the first consideration is whether the likely impacts can be avoided or minimised, followed byremedying impacts on site, followed by mitigation options within the footprint area of the development, followed by offsetting some or all of the residual impacts.

Mitigation measures are intended to reduce the impact of a proposed development on natural values. Various approaches can be applied depending on the proposal.

When avoidance is not practicable and there is likely to be a residual impact/s on natural values after mitigation measures are put in place, an offset/s may be required. Offsets are actions that contribute to the conservation of natural values outside the development footprint, and are actions that demonstrate a conservation benefit for a particular natural value.

Offsets are less frequently used in the marine context than the terrestrial. Nevertheless, developers/consultants undertaking marine developments should be aware that offsets may apply. DPIPWE’s General Offset Principles provide a guide when an offset may be required (http://dpipwe.tas.gov.au/Documents/General-Offset-Principles.pdf).
6. REPORTING

Survey reports must include information regarding timing of surveys, survey method and effort/intensity.

Reports for assessment purposes should be concise and contain sufficient information (such as tables, maps, photographs etc.) to clearly describe the natural values and communicate the impact of the proposal on them, as well as actions taken and options available to avoid or mitigate negative impacts. Consistency with these suggested reporting formats and standards will assist regulators and assessment officers to process applications efficiently.

All maps should be presented in colour and geo-referenced to GDA94 using GIS software. Photos should be presented in colour and captioned (description, location, date and aspect/direction). The report should be provided as either a searchable PDF or an MS Word document. Where possible, shapefiles of mapping should also be provided.

The report should follow a standard scientific reporting format such as:

- Executive Summary
- Introduction
- Methods
- Results
- Discussion and Recommendations
- References
- Appendices

Suggested report content using these headings is at Appendix 8 as a guide.
7. APPENDICES

APPENDIX 1: ADDITIONAL SURVEY DETAIL

DESKTOP ASSESSMENT

A desktop assessment must be undertaken to determine which threatened and other natural values are likely to occur in the area. An NVA report (using buffers of 500 m and 5 km around the study area) must be generated and other relevant desktop tools interrogated (e.g., listing statements, Threatened Species Link etc.). Additional resources to assist the desktop assessment are at Appendix 6. Additional information on known biology and distribution for key threatened marine species is contained at Appendix 2A.

For each species listed on the NVA report, a brief qualitative risk assessment should be undertaken as to the likelihood of the species occurring in the local area and being impacted by the proposed development. The species-specific survey guidelines (Appendix 2B) should then be consulted to determine whether any species-specific searches need to be undertaken as part of the field assessment.

Where relevant, information on tidal and storm surge ranges, and estimates of wave and current climates should be considered as part of the desktop assessment.

SITE AND VALUES CHARACTERISATION

In most situations, a field survey is required to ground-truth the findings of the desktop assessment. At its most basic, a site and values characterisation should include collecting information on:

- Underwater video survey
- The bathymetric profile across the site
- Seabed characteristics and habitat profile

This basic site characterisation, may need to be undertaken in conjunction with species-specific surveying if the desktop assessment has indicated that these are required.

UNDERWATER VIDEO SURVEY

The underwater video survey is designed to provide visual reference to the benthic habitat types within the development footprint and surrounding environs. It is preferred that this is done through linear transects, however in some situations it may be more appropriate to undertake camera drops or timed swims. The main objective is to ensure that habitat is appropriately characterised throughout the study area.
The number and length of transects must be appropriate to the size and shape of the study area (note that a guide to the numbers of transects related to the size of the study area are provided in Table 1).

Where the development includes an extension of infrastructure, or the foreshore, the video survey must be conducted, perpendicular to the shoreline, beginning at the shore, and progressing offshore. It is also recommended that supra-littoral and inter-tidal habitats likely to be impacted by the development are filmed. GDA co-ordinates of each transect must be recorded.

Table 1 Recommended number of transects required for different sized development survey areas.

<table>
<thead>
<tr>
<th>Area to be impacted (ha)</th>
<th>Number of transect dives</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 - 0.5</td>
<td>1</td>
</tr>
<tr>
<td>0.5 - 1.0</td>
<td>2</td>
</tr>
<tr>
<td>1.0 - 5.0</td>
<td>4</td>
</tr>
<tr>
<td>5.0 - 20.0</td>
<td>8</td>
</tr>
<tr>
<td>&gt; 20.0</td>
<td>8 (+ 1 for every additional 10 ha)</td>
</tr>
</tbody>
</table>

Filming procedure
Filming should be conducted slowly to ensure clear images of the seabed along the transect line are captured. Footage should show a minimum of 3 minutes of clear image and 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 should also be disturbed at regular intervals to provide an indication of likely sediment coarseness and information on potential re-suspension rates and likelihoods.

Where relevant, filming is to be conducted with the transect line in view. Each transect must be identified on the film with the appropriate transect number e.g. T1, T2 etc. Transect lines shall consist of a weighted line of known diameter with clearly marked tags 5m apart. Filming should be conducted slowly along the transect line to ensure that clear images of the transect line and seabed are recorded. For example, if a 40 m transect is required, stationary video footage should be obtained at a minimum of three points, specified, 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.

Equipment
All video footage is to be in colour and in a standard digital format (or equivalent), to allow for computerised image analysis to be conducted by DPIPWE. Clear, well lit images on high quality discs are required.
Electronic copies of the underwater footage should be submitted in conjunction with the report. The report should include comments on the following with respect to information obtained from the video transect survey:

- Dominant subtidal habitats (see Section Seabed characteristics and habitat profile)
- Sediment colour (e.g. from brown/grey to black),
- Texture of sediments (e.g. sand, silt mud)
- Seaweed/seagrass cover
- A list of the species observed
- Presence of bacterial mats (e.g. Beggiatoa spp.)
- Any other relevant features

**BATHYMETRIC PROFILE**

The bathymetry of the survey area should be obtained either directly using specific depth measurement devices, or from existing chart datum from reliable sources. Depths recorded accurately to within 0.5 m are to be measured across the development footprint and include the area extending to a buffer of 10% by area beyond the boundaries of this footprint.

Where practicable, depth measurements should be made by a boat with echo-sounder and differential GPS (or log measuring distance). Extrapolation from other depth measuring devices (e.g. dive computers) is also considered adequate, particularly for developments in shallow environments. The approximate position of depth contours are to be presented on a map of the survey area.

**SEABED CHARACTERISTICS AND HABITAT PROFILE**

Location of major habitat type(s) must be detailed on a map of the development 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 development area. Habitats are to be described using similar methodology to Table 2 (adopted from SEAMAP Tasmania).
Table 2. Descriptive classifiers used to assess and quantify the benthic habitat type within the survey area for a given development (definitions adopted from SEAMAP Tasmania (http://seamap.imas.utas.edu.au/uploads/file/SEAMAP_Classification_2006.pdf)).

<table>
<thead>
<tr>
<th>Geomorphic Type</th>
<th>Bio-geomorphic Type</th>
<th>Unconsolidated Substrate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidated Substrate</td>
<td>Rocky Reef</td>
<td>Vegetated Unconsolidated</td>
</tr>
<tr>
<td></td>
<td>Unvegetated Unconsolidated Substrate</td>
<td></td>
</tr>
<tr>
<td>Substratum/ Ecotype</td>
<td>High Profile Reef</td>
<td>Seagrasses</td>
</tr>
<tr>
<td></td>
<td>Medium Profile Reef</td>
<td>Algal Beds</td>
</tr>
<tr>
<td>Low Profile Reef</td>
<td>Gravel Sand Silt Cobble</td>
<td>Aquatic Macrophytes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modifiers</td>
<td>Attached Epifaunal Groups</td>
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<td></td>
<td>Sponges</td>
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</tr>
<tr>
<td>Structure</td>
<td>Continuous Patchy Guttered Bommies</td>
<td></td>
</tr>
<tr>
<td>Relief</td>
<td>Hills Flat Ripples</td>
<td></td>
</tr>
<tr>
<td>Substratum Texture</td>
<td>Solid Cobble Boulder</td>
<td></td>
</tr>
<tr>
<td>Rock Type</td>
<td>Dolerite Granite Sandstone Limestone Basalt</td>
<td></td>
</tr>
<tr>
<td>Biota</td>
<td>Macroalgae Example: Ecklonia radiata Seagrass Example: Amphitobilis Antarctica Sponge</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX 2A: BIOLOGICAL INFORMATION ON MARINE/ESTUARINE THREATENED SPECIES

This appendix contains a summary of the biology of some of the species most likely to require targeted surveying. It is provided because for many marine threatened species there is very little publicly available information. This information has been reviewed by experts and was current when these guidelines were written, however notesheets and other available information should still be consulted.

LIVE-BEARING SEASTAR (PARVULAstra vivipara) - VULNERABLE (TSPA), VULNERABLE (EPBCA)

*Parvulastra vivipara* is a very small orange-yellow seastar endemic to Tasmania, with adults only reaching up to 13 mm in diameter. *Parvulastra vivipara* obtains its name through the seastar’s ability to produce live young in place of eggs. *Parvulastra vivipara* was first described from the Pittwater area by A.J. Dartnall in 1968.

The seastar is only known to have been recorded in a handful of locations in Tasmania. These are: Southport Lagoon; and Roches Beach, Pipeclay Lagoon and Pittwater Lagoon in Frederick Henry Bay; and Tessellated Pavement and Fortescue Bay on the Tasman Peninsula. There are also reports of the species from the D’Entrecasteaux Channel, although these remain unconfirmed. Known populations are small in size and area and the species is restricted to shallow rocky reefs within the tidal zone, with a general preference to occupy the undersides of rocks near the high tide mark.

DERWENT RIVER SEASTAR (MARGINASTER LITTORALIS) – ENDANGERED (TSPA), CRITICALLY ENDANGERED (EPBCA)

The Derwent River seastar is a small seastar up to 17 mm in diameter and usually possesses five radial arms in a rounded pentagonal shape. It is bluish-greenish-brown on the upper (dorsal) surface, bordered by off-white around the outer edge. The under (ventral) surfaces are off-white. The species is endemic to Tasmania, known only from five locations in the Derwent River, predominately north of the Tasman Bridge (Materia 1994):

- Cornelian Bay Point
- Powder Jetty (Type locality)
- Botanical Gardens near Pavillion Point
- Granville Avenue, Risdon
- Paloona Street, Lindisfarne

The Derwent River seastar has only been observed occupying rocky, shallow waters in the Derwent River (Bryant & Jackson 1999b; Dartnall 1970) in the mid-littoral zone in waters between 0–1.5 m depth (Materia 1994).
NOTE: This species has not been observed in the wild since the early 1990’s. If undertaking survey work for a project proposal that occurs in one of the areas outlined above, and the development proposal is likely to impact the Derwent River seastar, it is recommended that PCAB is contacted in advance to discuss surveying requirements for this species.

SEASTAR (SMILASTERIAS TASMANIAE) – RARE (TSPA)

Smilasterias tasmaniae is chocolate brown with fawn tips, growing to a maximum size of 40 mm in diameter. The species occupies intertidal regions, preferring habitats at, or just below, the low tide mark.

Smilasterias tasmaniae is extremely rare, occupying only five localities on the western side of Bruny Island, and one site at Recherche Bay. Each site probably contains less than 30 individuals. The species was described in 1990 from museum specimens collected at Recherche Bay, Catamaran in 1929 and from specimens collected at Lighthouse Bay, Bruny Island in 1977. Little is known about the biology and behaviour of this species, which makes designing appropriate survey methods difficult.

SPOTTED HANDFISH (BRACHIONICHTHYS HIRSUTUS) – ENDANGERED (TSPA), CRITICALLY ENDANGERED (EPBCA)

Handfish are small slow-moving, benthic fish that prefer to ‘walk’ on their pectoral and pelvic fins rather than swim. The pectoral or side fins are leg-like with their extremities resembling a human hand (hence their common name).

The spotted handfish (Brachionichthys hirsutus), red handfish and ziebells/waterfall bay handfish are all listed under the TSPA and the EPBCA.

Currently, Tasmania only has species-specific survey guidelines for the spotted handfish. The survey requirements for spotted handfish, red handfish and ziebells/waterfall bay handfish may be different as they live in different habitats. For survey guidelines for the red handfish and ziebells/waterfall bay handfish please refer to the survey guidelines for Australia’s threatened fish, Australian Government Department of Environment (http://www.environment.gov.au/epbc/publications/pubs/survey-guidelines-fish.pdf).

Spotted handfish primarily inhabit unconsolidated substrata ranging from well sorted coarse sand and shell grit, to areas of fine sand and silt. They are often observed in shallow depressions or near rocks of low relief projecting from the substrate. They have been recorded from depths between 2-30 m but may occur deeper, potentially up to 60 m (Green et al., 1998).

The breeding season for spotted handfish is from mid-July to mid-November inclusive. During this time adults may be courting, breeding, spawning or guarding egg masses and are therefore more sensitive to disturbance. Spawning females attach an egg mass of up to 200 eggs to an appropriate...
object (preferably a stalked ascidian or seaweed, however they will also readily attach egg masses to artificial substrates).

**GUNN’S SCREWSHELL (GAZAMEDA GUNNII) – VULNERABLE (TSPA)**

Gunn’s screwshell is a small turritelid gastropod, endemic to Australia, occupying various habitats from Cape Moreton in Queensland, to northern and eastern parts of Tasmania. The species can attain lengths of up to 69 mm in length although most specimens range between 30-40 mm. They have been recorded from shallow depths to at least 140 m in depth and occupy sandy mud, and muddy and gravelly sand, although they are more prevalent in coarser grained substrata. The colour of shells can be variable, ranging from mottled purple through to white, depending upon the age and level of bioerosion.

**BROWN ALGA (CYSTOSEIRA TRINODIS) – RARE (TSPA)**

The only brown algae listed under the TSPA. The species exhibits several stipes between 1-4 cm long arising from a single holdfast. The stipes bear a few, to numerous primary branches (between 20-50 cm long) which are usually formed and lost seasonally. Branchlets are borne on the primary branches which bear air bladders, egg-holding structures and male gametes. In summer the plant sends up fertile fronds, which float on top of the water at low tide and are easily visible. In late summer these disappear, leaving the basal holdfast (description from Sanderson 2000).

This species has a wide-spread distribution and is found in northern Australia and the Indian Ocean tropics and subtropics. In Tasmania it has been recorded in Blackman Bay near Dunalley, and may also occur in the Derwent River estuary, in south east Tasmania. In Tasmania, the species inhabits sheltered water between 0.5 and 1.5 m depth.

Important populations are located near sand/reef interfaces although in South Australia, the species has been observed in segregated reef rock pools (Sanderson 2000, Wormersley 1987).

**LISTED MARINE MAMMALS, SHARKS AND BIRDS**

A number of cetaceans, pinnipeds, sharks and avifauna are listed under State legislation. Key risks to listed marine mammal and shark species can include acoustic disturbance (for instance pile driving or seismic surveys) and entanglement with gear and infrastructure. Listed bird species can also become entangled with gear and infrastructure.

Devising a sampling protocol for many of these species can be logistically difficult, and depending on the nature of the development proposal a desktop assessment showing which of these species are likely to occur within the area and, where necessary some information around proposed mitigation, may
suffice. If the risk is likely to be high, additional consideration or surveying may be required. If uncertain contact PCAB to discuss.

APPENDIX 2B: SPECIES-SPECIFIC SURVEY METHODS

THREATENED SEASTARS

Where the desktop assessment has concluded that one or more listed threatened seastar species may occur within the impact area then the following survey should be conducted.

Surveying should be undertaken by running a series of transects parallel with the shore. It is recommended that transects be placed along the mean high tide and mean low tide marks, and at 0.5 and 1 m below the mean low tide mark. The length of the transect should be determined by the ‘width’ of the survey area (specified by the width of the footprint + 10% buffer either side). A quadrat should be placed every 5 m along the transect. Boulder and cobble within each quadrat must be turned over to reveal the underside.

Where a seastar is collected that may be one of the listed seastar species, then the specimen should be photographed on-site and returned immediately to its location (i.e. placed back under the rock or rubble from which it was collected).

In some situations it may be necessary to collect specimens to confirm species identification. Please note that this will require a permit issued under the TSPA and should only be done in consultation with DPIPWE experts.

GUNN’S SCREWSHELL

Habitat

Sampling should be undertaken within benthic habitats occurring in depths of 3 to 80 m and where the average sediment size is expected to exceed 0.125 mm. 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).

Number of Samples

Table 3 indicates the number of benthic grabs/cores (e.g. Van Veen grab, 15 cm diameter corer) that should be taken within relevant habitat in a development proposal area. If dead Gazameda spp. shells occur in any of the initial samples then the number of samples collected should be doubled. Sampling should aim to cover the full depth range of suitable habitat but otherwise be randomly located. It should be noted that samples numbers below are a minimum standard. In certain situations it may be desirable to undertake more intensive sampling (discuss with relevant regulator if it is thought that additional sampling may be necessary).

Table 3. Number of benthic samples per area of relevant habitat for G.gunnii
GUIDELINES FOR NATURAL VALUES SURVEYS - ESTUARINE & MARINE DEVELOPMENT PROPOSALS

Area of relevant habitat (ha) | Initial no. of samples | Total no. of samples if dead Gazamera spp. in initial samples |
--- | --- | --- |
<1 | 3 | 6 |
1 - 5 | 5 | 10 |
6 - 20 | 10 | 20 |
21 - 100 | 15 | 30 |
101 - 1000 | 20 | 40 |

Processing samples
- Benthic samples should be sorted through a maximum sieve size of 2 mm.
- Dead shells should be confirmed as G. gunnii by suitably qualified personnel.
- Any live G. gunnii should be photographed with a good quality macro-camera.

BROWN ALGAE - CYSTOSEIRA TRINODIS

Targeted surveys for Cystoseira trinodis are only required for developments within Blackman Bay on the SE coast. The survey(s) should be conducted as transects laid parallel with the shore between 0.5 and 1.5 m depth within the study area. Quadrats (1 m) must be placed every 5 m along the transect(s), and the number and density (or surface area) of Cystoseira trinodis recorded.

Suspected Cystoseira trinodis specimens should be photographed and the identity of the species confirmed by qualified personnel. It is reasonable to use reconnaissance dives and/or video transects as a substitute for specific dives/transects to search for this species. However, this is only to be undertaken provided the visibility of video footage is adequate to accurately identify individuals of the species.

SPOTTED HANDFISH

Desktop assessment
A LIST search and ‘Natural Values Report’ should be completed to determine whether the proposal occurs within habitat where the spotted handfish is known to occur, likely to occur or may occur. Once this has been determined then the following procedure should be followed with regard to surveying and assessment:

**Known to occur** - surveying should be conducted following the protocols outlined in this document.

**Likely to occur** – additional consideration required. The first step is to assess the habitat within the proposed development footprint to confirm that it is suitable for spotted handfish. This habitat assessment could be undertaken through video surveying conducted as part of the site and values characterisation (see Appendix 1). Part of this characterisation should include whether the area contains suitable substrate structure/complexity for attachment of handfish egg masses.

If the habitat assessment concludes that there is suitable habitat then surveying should be conducted following the protocols outlined below. If you are unclear as to what constitutes suitable habitat then consult with PCAB.

**May occur** – This should be stated as part of the desktop assessment in the report. No additional surveying requirements.

**Field survey**

Two general survey techniques have been outlined below. Survey Design 1 is an intensive diver based survey and is more suitable for development assessments where the impact footprint is relatively small (approximately 5 ha or less) and the depth is relatively shallow (< 12 m).

Survey Design 2 is a ROV survey design and is considered to be suitable for development footprints that are large (> 5 ha) and in relatively deep waters, that is depths greater than 12 m (in depths > 12 m dive-based surveys become increasingly constrained by time and safety issues).

Both survey designs are transect based, however the intensity of surveying is less for Survey Design 2 in recognition of the fact that it is not possible to intensively survey large impact footprints. If it is considered that these survey techniques do not adequately fit a particular situation then it may be appropriate to modify the survey design, however this should done in consultation with PCAB.

Regardless of which survey design is used, it is recommended that a stratified survey design be employed with respect to habitat and depth to maximise detection probability.

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2 Please note maps not yet publicly available. In the interim please contact PCAB to determine if a targeted spotted handfish survey may be required for a particular development.

3 For linear infrastructure the impact footprint will be long and narrow. It should be possible to fit the survey designs outlined below into a footprint of this nature, however it may also be reasonable to modify some aspects of the survey design.
Survey Design 1 - Diver based survey

Determining the study area

Surveys for handfish should extend beyond the boundary of the proposed construction footprint. The distance of the buffer zone is dependent on the nature of the impact and the distance to which it has the potential to cause a significant impact to spotted handfish. The consultant should determine an appropriate buffer and provide justification as to why this figure was chosen.

Survey method

Surveys for spotted handfish should be conducted as transects. The transects should be laid perpendicular to the shore line, commence in a minimum depth of 2 m and extend to the lesser of the 12 m depth contour or to the deepest extent of the buffer boundary. An area of 2 m either side of the transect(s) must be surveyed. Paired divers should swim either side of the transect(s) and collect the following information:

- The presence, number and density of spotted handfish individuals, including information on the size, position along the transect and the time of identification.

- 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, along with information on the position of each ascidian. In the case of seagrass or Caulerpa spp., dense beds can be assessed using a 0.25 m quadrat and quantified as percentage cover. The location of seagrass and/or Caulerpa spp. along the transect must also be recorded.

- The presence, number and density of spotted handfish egg masses (during the breeding season), including information on the size, position along the transect and the time of identification.

- The presence, number and density of Northern Pacific seastars (Asterias amurensis), including information on the size, position along the transect and the time of identification.

Survey design – number and selection of transects

Transects should be planned, or mapped out within the study area and perpendicular to the shore, at distances 25 m apart. Fifty percent of these transects must be then selected at random and a survey conducted along each of the randomly selected transect paths.

For example, a proposed marina 100 x 100 m in size, located entirely on suitable habitat and where it is determined to use a 100 m buffer will have a study area of 300 m wide along the shore, and extending 200 m offshore (or to the 12 m contour if it is closer to the shore). Within this study area, 12 transects will be mapped out within the study area and 6 of these will be selected at random and become the survey transects.
Survey Design 2 – ROV based survey

This survey is designed to detect (with a known detection probability) a small population of spotted handfish within a large impact footprint (for instance some development proposals which have the potential to impact spotted handfish have impact footprints in the hundreds of hectares).

Due to the potentially large survey areas, Survey Design 2 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.

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.

Determining the study area

See determining the study area for Survey Design 1. Given the large survey areas involved, it may also be desirable to stratify sampling based on impacts if the proposal is likely to result in different levels of impacts to spotted handfish across the overall footprint.

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.

In general it is preferable that a transect line be deployed and the ROV run along the line, however in situations where this is not possible then an alternative is to run the ROV along a straight line between two GPS positions 100 m apart (this method should include GPS fixes at start and end of dive together with fixes of approximate handfish locations if identified during filming).

If the latter method is to be used then it is recommended that scaling bars be placed on the ROV to allow for an estimate of size should a spotted handfish be detected.

Scaling bars are also recommended as they provide a means of measuring the view width and hence allow for an estimate of the total area surveyed.

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.

Survey design – number and selection of transects

Stage 1 Presence/absence survey

The total number of transects to be conducted within an area is determined using a standard formula to detect threshold populations of benthic species (see Figure 1).

Figure 1. Formula for calculating the number of transects needed to conduct a presence/absence survey for Spotted Handfish.

\[ L = \frac{-\log_e(1 - s)}{\left(\frac{p}{a}\right) x e x A} \]

Where:

L = number of transects required.

s = survey sensitivity. PCAB has determined that this should be set at 0.8 (i.e. 80%).

e = effectively the probability of detecting the theoretical population. Given the endangered status of the Spotted Handfish this should preferably be set at 0.95, with 0.90 being reasonable if the amount of surveying at 0.95 is unfeasible.

A = sample method area. The area of a standard transect. For instance a 100 m ROV transect where is can be reasonably assumed that the survey width would be 2 m would have a sample method area of 200 m$^2$.

p = the size of the target species population to be detected*

a = area (m$^2$). The total area of suitable habitat to be surveyed*

*It is not feasible to design a survey capable of detecting an individual Spotted Handfish within a large impact footprint. Instead p should be set at a realistically small population size (for instance around 20 for a 5 ha impact footprint and up to 100 for a 300 ha impact footprint). The (p/a) function is effectively a calculation of the density of the theoretical population within the impact footprint. This should be checked to ensure it is biologically realistic.

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. A Stage 2 survey has not currently...
been developed. If consultants/developers find that they may need to conduct a Stage 2 survey then it is recommended that they discuss specifications with PCAB.
APPENDIX 3: METHODS FOR VARIOUS SEDIMENT SAMPLING PROCEDURES

PCAB may recommend a particular method of sediment sampling be undertaken where a development poses a specific threat to nearby natural values.

Information on sediment chemistry can assist in assessing the likely re-suspension of toxic or potentially dangerous substances, in addition to the potential for development activities to cause contamination of the development footprint and surrounds. Potential ‘contaminants’ can include Acid Sulfate Soils (ASS), heavy metals, anoxic sediments and toxic dinoflagellate cysts.

POTENTIAL ACID SULFATE SOILS (ASS)

In the event that the initial desktop assessment reveals that PASS are likely to be present and that more than 100m² are likely to be disturbed, and possibly re-suspended or exposed to the air during construction, maintenance or day-to-day operations, PCAB will request that an intensive ASS sampling protocol be adopted, in accordance with the Tasmanian Acid Sulfate Soil Management Guidelines (http://www.dpiw.tas.gov.au/inter.nsf/WebPages/SWEN-83NVBG?open#b).

The guidelines contain technical and procedural advice aimed at avoiding environmental harm from disturbance of acid sulfate soils. It also includes sampling/analysis and guidance.

See Table 4 for guidance on survey intensity.

PARTICLE SIZE ANALYSIS

Information on particle size provides some indication around the likelihood of toxic dinoflagellates and heavy metals occurring in the sediment. Where the activity is likely to cause a significant risk of remobilisation of dinoflagellate cysts or heavy metals DPIPWE may request that information on particle size be provided.

Cores for particle size analysis should consist of samples of sediments from the upper 100 mm of the benthic profile, and must be a minimum of 25 mm in diameter. Alternatively, a 100 mm subsample of sediment from cores collected for other analyses may also be used. However, the locations of cores should be randomly distributed throughout the survey area to ensure samples are unbiased and representative.

Sediment should be placed in a 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.

Each sediment core should be assessed independently. Sediment size data can be represented in various forms and it is recommended that proponents/consultants review (Folk 1981). As a minimum, the relative proportions of each of the sieve fractions should be represented as a cumulative distribution for each sediment size core collected.

See Table 4 for guidance on survey intensity.

HEAVY METAL ANALYSIS

The number of cores required for heavy metal analysis should be determined in consultation with Table 4.

Cores should be washed in acid and must have an internal diameter of at least 50 mm. The top 3 cm of sediment within the core must be transferred to an acid washed glass jar and stored at a constant, cool temperature whilst conducting the survey and chilled as soon as practicable. Samples must be submitted to and processed by a NATA accredited laboratory. Results of all metal analyses are to be presented in the report.

TOXIC DINOFLAGELLEATE ASSESSMENTS

Cores for identification of potentially toxic dinoflagellates (and resting life stages) should consist of samples of sediments from the upper 50 mm of the benthic profile, and must be a minimum of 25 mm in diameter. Alternatively, a 50 mm subsample of sediment from cores collected for other analyses may also be used. However, the locations of cores must be randomly distributed throughout the survey area to ensure samples are unbiased and representative. The number of cores to be undertaken should be calculated in consultation with Table 4.

Identification of potentially toxic dinoflagellate species (and resting life stages) must be undertaken by appropriately trained personnel, skilled in the identification of benthic microalgae.

VISUAL ASSESSMENT, REDOX AND SULFIDE

Analysis of sediment redox and sulfide are commonly used metrics that enable interpretation of increase in organic and bacterial loading of sediments, most typically associated with an increase in precipitation of nutrients and energy resources (which promotes the sequestration of carbon). PCAB is likely to request analysis of redox and sulfide only where there is likely to be a significant increase in organic and nutrient loading as a result of the development (e.g. wastewater treatment plants, stormwater pipe installation).
The number of cores required for redox and sulfide should be calculated with reference to Table 4, based on the survey area. Cores must be individual perspex cores with an internal diameter of at least 50 mm. A written description of each core recording the following parameters is required:

- Length of core measured in mm
- 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.

**REDOX AND SULFIDE**

The following protocols for redox and sulfide measurement have been drawn from Macleod et al. (2004). Redox potential and sulfide concentration measurements are to be taken from each sediment core. Both redox and sulfide should be measured at 3 cm depth. There are a variety of redox probes available; single cell and combination electrodes. For ease of sampling the combination electrodes are recommended.

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 3 cm below the sediment water interface. Note: that an error level of +/- 10 - 20 mV in the final reading is acceptable. Corrected redox results and raw data are to be reported in millivolts at 3 cm depth.

There are a variety of different probes available for the measurement of sulfide concentration, but again a combination electrode is recommended. A sediment sub-sample (2 ml) is extracted from the port in the side of the core tube using a 5 ml syringe, and placed in a glass vial. SAOB (2 ml) is added to each jar and sulfide 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 sulfide concentration using the calibration curve. Samples should be collected and converted sulfide results (μM) and raw data (mV) are to be reported for 3 cm depth (TAFI 2004).
Table 4. Recommended number of cores required for each of the sediment chemistry assessment components

<table>
<thead>
<tr>
<th>Sediment chemistry assessment component</th>
<th>Area to be surveyed (ha)</th>
<th>Number of sediment cores required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential Acid Sulfate Soils (PASS)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0-1.0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>1.0-2.0</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2.0-3.0</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>3.0-4.0</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>&gt;4.0</td>
<td>2 cores / ha</td>
<td></td>
</tr>
<tr>
<td>Sediment size analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0-1.0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>1.0-2.0</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>2.0-3.0</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>3.0-4.0</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>&gt;4.0</td>
<td>4 cores / ha</td>
<td></td>
</tr>
<tr>
<td>Heavy metal analysis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0-0.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>0.5-1.0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1.0-5.0</td>
<td>4</td>
<td></td>
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<tr>
<td>5.0-20.0</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>&gt;20.0</td>
<td>8 (+ 1 for every additional 10 ha)</td>
<td></td>
</tr>
<tr>
<td>Toxic Dinoflagellate cysts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>&lt;5</td>
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<td>&lt;1000</td>
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<td></td>
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<tr>
<td>Redox and Sulfide</td>
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</tr>
<tr>
<td>0.0-0.5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>0.5-1.0</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>1.0-5.0</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>5.0-20.0</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>&gt;20.0</td>
<td>8 (+ 1 for every additional 10 ha)</td>
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</tbody>
</table>

BIOLOGICAL ANALYSIS OF BENTHIC INFAUNA

PCAB may request an assessment of benthic infauna and epifauna, where a development is likely to significantly impact soft-sediment benthic habitats.
APPENDIX 4: INTRODUCED MARINE SPECIES - SURVEY AND RISK ASSESSMENT

There are over 130 species of unknown origin found in Tasmanian coastal waters. These comprise of at least 62 non-indigenous species and at least 69 cryptogenic (unknown) marine species (SoE Report 2009).

Not all introduced species become pests and only seven marine species are formally listed as ‘noxious’ under the LMRMA. Of these, only four are currently recorded as being present in Tasmanian marine waters i.e. Northern Pacific seastar (*Asterias amurensis*), European shore crab (*Carcinus maenas*), wakame (*Undaria pinnatifida*), and the European fan worm (*Sabella spallanzanii*).


Sightings of introduced or cryptogenic species known to be already present in Tasmanian waters should be included in the consultant’s report. If any species are sighted that the consultant is unfamiliar with, or believes may be a new marine pest species then this must be reported to DPIPWE (Biosecurity Tasmania) immediately. Where possible, specimens, photographs or video of the suspect species (along with site location and description) should be collected as this will aid the Department in making a formal identification and taking timely action if appropriate. Any documentary information specific to observed pest species should be included in the assessment report.

Perhaps the most important risk in relation to new developments is the introduction of new pests during the construction and ongoing operation and management phases. Consideration should be given to what vessels are to be used for construction (e.g. pile driving barges, dredges etc.). Due to the nature of their movements these vessel types are considered high risk for carrying marine pests. PCAB would recommend that any barges/dredges be sourced locally where possible. If the barge is to be sourced from interstate or overseas then strict boat hygiene rules should apply consistent with the National Biofouling Management Guidance for non-trading vessels (http://www.marinepests.gov.au/non-trading-vessels/biofouling).
APPENDIX 5: SURVEY OF GEOCONSERVATION SITES AND GEOMORPHIC FEATURES AND PROCESSES

- The primary objective for surveying for geoconservation sites and geomorphic features and processes is to determine if any geoconservation sites or features and processes exist on or near to the proposal area, and if so, their extent, condition, and any potential direct or indirect impact from the proposal.

- A desktop assessment must be undertaken to determine if any listed geoconservation sites occur within 1 km of the proposal area. This can be done through the NVA or LISTmap. If any sites are recorded further information on threats that are likely to impact on these sites can be accessed using a ‘Geosite Search’ on the NVA. An assessment of the geology, geomorphology and soils of the site and surrounds should also be undertaken and reported on.

- An field survey may be required if there is a known geoconservation site/s and/or geomorphic features and processes onsite or within the vicinity of the site, which cannot be avoided and which might be impacted by the proposed works. Such surveys must only be undertaken by a suitably qualified and experienced person and it is recommended that PCAB be contacted for advice prior to any such surveys (of geoconservation sites) being undertaken.

- Based on the findings of the survey/s consideration should be given to potential avoidance and mitigation actions to minimise impact on geoconservation sites and/or geomorphic features and processes.
APPENDIX 6: RESOURCES

DPIPWE has a range of publicly available information that will assist consultants when planning to undertake a natural values survey. Some of the main information sources that should be consulted before undertaking a field survey are noted below, with some explanatory notes.

NCH may also need to be consulted for advice when planning a survey. If advice is required, it is requested that you contact PCAB in the first instance.

- The Natural Values Atlas (NVA) is the most authoritative repository of information on natural values in Tasmania. A Natural Values Report can be requested on the NVA website to obtain a map as well as lists of TASVEG vegetation communities, geoconservation sites listed on the Tasmanian Geoconservation Database, threatened flora and fauna species and species of conservation significance, for any site or area within the State. Whilst the NVA will not contain an exhaustive list of natural values with the potential to occur in a given area it will reflect the current level of knowledge of values and their distribution. It should be noted that the NVA contains little information for some marine species. Therefore it is important to consult the additional biological information at Appendix 2A and any other relevant information.

Note whilst the NVA is a valuable tool, care must be taken when interpreting information from the NVA (e.g. age of the record, accuracy level of the record, whether there has already been a take under permit at the site of the record, etc.); it is not sufficient to simply add up the number of records (etc.) that are in the NVA and use this as the sole justification to support (or otherwise) an action.


- The Land Information System Tasmania (LIST) is a web based repository of the State’s comprehensive spatial data resources including property and land title information, satellite imagery, topographic maps, geological maps and natural values data.

LISTmap (State Orthophoto basemap layer or Google Satellite basemap layer) can also be used to access the latest satellite imagery for the State.


- The Threatened Species Link website contains management and conservation advice on Tasmania’s threatened species, including species-specific information on survey periods, habitat, activities most likely to cause an impact, and links to DPIPWE notesheets and species recovery plans.


- The Department of Primary Industries, Parks, Water and Environment (DPIPWE) website contains links to biological and ecological information on many of the State’s threatened species as well as biosecurity and invasive species information. This information is contained in documents such as notesheets.
(for most threatened flora species), Listing Statements and Recovery Plans (for selected threatened flora and fauna species) and guidelines (for biosecurity management).

Note that many of the notesheets available on the DPIPWE website are now quite old, so care needs to be taken depending on what they are being referred to for. Generally it is recommended that the notesheets are not referred to as the only source of information; rather that they be referred to along with more updated information sources such as the NVA (species search), recent published papers and the Threatened Species Link.

Useful webpages include:

- The Water Information System of Tasmania website provides access to the Conservation of Freshwater Ecosystem Values Database which contains information on the conservation value of all the State’s freshwater and estuarine systems. [http://wrt.tas.gov.au/wist/ui?command=content&pageSequenceNo=3&click=0.HomeLink#fopt](http://wrt.tas.gov.au/wist/ui?command=content&pageSequenceNo=3&click=0.HomeLink#fopt)
- Seamap Tasmania, which is a marine habitat classification system that has mapped habitat type for much of Tasmania’s waters. [www.seamap.imas.utas.edu.au](http://www.seamap.imas.utas.edu.au)
APPENDIX 7: COMPLETED SURVEY CHECKLIST

- Thorough review of development proposal material that is available, so that a clear understanding of the size, scope and potential impacts may be formed.

- Thorough desktop survey (utilising relevant databases, tools, recovery and management plans, literature review, etc.) undertaken to help inform focus area and focus species/values for on-ground survey.

- DPIPWE website visited to check latest version of (consultants and species specific) guidelines are being used.

- Site and values characterisation undertaken as required.

- Appropriate survey boundary determined encompassing any areas which might be directly or indirectly impacted by the proposal.

- Potential biosecurity risks identified and appropriate control procedures developed for the survey/s.

- Valid permit/s held for on-ground survey(s), if required.

- Field surveys undertaken consistent with these guidelines or in consultation with PCAB.

- Standard survey methods used and all different habitats of the survey area were surveyed or sampled with survey intensity greatest in areas of known or potential habitat.

- Tracklogs and/or maps were taken of the survey route(s) and provided in the report.

- Report was written up following the general layout outlined in this document with adequate descriptions of the methods and results, appropriate mapping and photographs.

- Shapefiles (e.g. survey tracklogs, site boundaries etc.) provided with the report, where appropriate.

- Data on threatened and species and threats (pests and diseases) recorded during the on-ground survey(s) submitted to DPIPWE (via the NVA).
APPENDIX 8: SUGGESTED SURVEY REPORT CONTENT

EXECUTIVE SUMMARY

- Summarise the scope and findings of the survey and the key recommendations.

INTRODUCTION

- Introduce the survey report including where, why, when and for whom the survey is being conducted.
- Provide a location map and a description of the development proposal.
- Provide a site map showing the development footprint and any associated offsite impacts.
- State the aim of the survey.
- Provide the surveyor(s) name, contact details and the date and time of the survey.
- Provide details of any permits or authorisations issued to the surveyor e.g. for collection permits provide the permit number, date of expiry, and a statement of compliance with permit conditions.

METHODS

- Indicate the background research and information sources consulted prior to the on-ground survey.
- Describe the on-ground survey methods.

RESULTS

- Use tables, maps and photographs to summarise and illustrate the survey results. In addition to the written report format, provide any data in electronic format (e.g. shapefiles, spreadsheet, video footage etc.).
- Provide a broad characterisation of the site including bathymetry, habitat, exposure etc.
- For threatened species recorded during the survey, provide their location(s), local population size or extent (include confidence intervals when appropriate), and if possible the age structure and condition of the population and any unusual features observed. Where relevant indicate how much of the local population will be impacted by the development and how much will be retained.
- Include a description of the broader context around the site/habitats.
- Include detail of potential offsite impacts (e.g. acoustic disturbance, turbidity plumes, light etc.)
• For geoconservation sites, features and processes details on the type, size and significance of the site(s) or feature(s) should be provided. For large or complex sites, geology, soil and landform maps should be provided, or at a minimum a detailed description of these attributes. Describe the nature and extent of anticipated impacts to geoconservation values.

• Provide a list of all species (that could be identified) that were observed on the site.

• Provide sedimentological description of any core samples.

• Provide GPS tracklogs or map, where possible.

• Discuss any limitations of the survey (e.g. the timing of the survey, the methods used, the weather, poor visibility etc).

• State which geographic datum has been used when providing spatial data. It is recommended to use the currently accepted standard in Tasmania which is the GDA94 Zone 55 with coordinates expressed in eastings (6 digits) and northings (7 digits).

DISCUSSION AND RECOMMENDATIONS

• Discuss the quality and condition of the natural values that have been identified and the significance of the impact of the proposal on these values.

• Discuss the potential for the spread of introduced marine pests and diseases. Identify whether a hygiene plan is required. Recommend any other measures to prevent the spread of those pests and diseases either elsewhere on the site or to areas offsite and any mitigation strategies where contamination has occurred.

• Discuss the risk of erosion, ASS, heavy metal remobilisation or other issues and the potential for these to impact on natural values.

• Where relevant, identify the legislative implications of the proposal particularly with regard to the requirements for any permits or approvals.

• Discuss and detail the options for avoiding, minimising, or mitigating the impact(s) including the potential for offsetting any residual impacts (after all practicable avoidance and mitigation measures have been considered).

• Make recommendations in this regard and indicate whether these recommendations have been made in consultation with the client.

• If an offset is likely to be required, outline the location and details of the proposed offset/s.

REFERENCES

• Provide a list of references using a standard scientific reporting format.
8. REFERENCES


