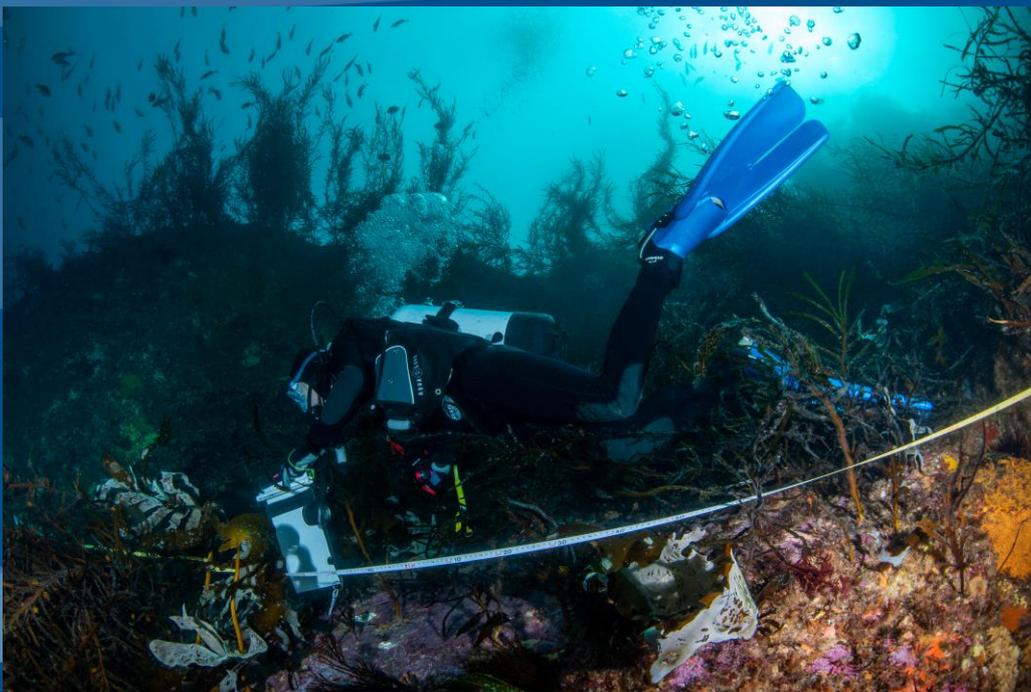


GUIDELINES FOR NATURAL VALUES SURVEYS - ESTUARINE & MARINE DEVELOPMENT PROPOSALS



CONTENTS

1. INTRODUCTION	5
2. PURPOSE OF THE GUIDELINES	6
3. ASSESSMENTS FOR NATURAL VALUES	6
Currency of surveys.....	6
Personnel and preparation	6
Survey area and context	7
Survey timing and method.....	7
Survey requirements.....	8
Introduced Marine Species	8
Geoconservation and Geomorphic Features	9
Additional or follow up (targeted) surveys	9
4. SURVEY DATA	9
5. MITIGATION AND OFFSETS	10
6. REPORTING	11
7. APPENDICES	12
APPENDIX 1: ADDITIONAL SURVEY DETAIL.....	12
DESKTOP ASSESSMENT	12
SITE AND VALUES CHARACTERISATION	12
UNDERWATER VIDEO SURVEY	13
SEABED CHARACTERISTICS AND HABITAT PROFILE	14
APPENDIX 2A: BIOLOGICAL INFORMATION ON MARINE/ESTUARINE THREATENED SPECIES.....	16
Live-bearing Seastar (<i>Parvulastra vivipara</i>)	16
Derwent River Seastar (<i>Patiriella littoralis</i>).....	16
Bruny Island Seastar (<i>Smilasterias tasmaniae</i>).....	17
Spotted Handfish (<i>Brachionichthys hirsutus</i>)	17
Red Handfish (<i>Thymichthys politus</i>)	17
Ziebell's Handfish (<i>Brachiopsilus siebelli</i>).....	17
Gunn's screwshell (<i>Gazameda gunnii</i>)	18
Brown Alga (<i>Sirophysalis trinodis</i>)	18
Large-Fruit Seatassel (<i>Ruppia megacarpa</i>)	19
Tuberous Seatassel (<i>Ruppia tuberosa</i>)	19
Listed marine mammals, sharks and birds.....	20
APPENDIX 2B: SPECIES-SPECIFIC SURVEY METHODS.....	21
Threatened Seastars (Live-Bearing Seastar, Derwent River Seastar and Bruny Island Seastar)	21
Gunn's Screwshell (<i>Gazameda gunnii</i>)	22
Brown Alga (<i>Sirophysalis trinodis</i>)	22

Large-Fruit Seatassel (<i>Ruppia megacarpa</i>) and Tuberous Seatassel (<i>Ruppia tuberosa</i>)	23
Spotted Handfish (<i>Brachionichthys hirsutus</i>)	23
Red Handfish (<i>Thymichthys politus</i>) and Ziebell's Handfish (<i>Brachiopsilus siebelli</i>).....	28
APPENDIX 3: ACID SULFATE SOILS AND OTHER SEDIMENT SAMPLING PROTOCOLS	31
APPENDIX 4: RESOURCES.....	32
APPENDIX 5: COMPLETED SURVEY CHECKLIST	34
APPENDIX 6: SUGGESTED SURVEY REPORT CONTENT	35
APPENDIX 7: GENERAL OFFSET PRINCIPLES.....	37
APPENDIX 8: REFERENCES.....	43

Abbreviations and Acronyms

Cwlth	Commonwealth
DPIPWE	Department of Primary Industries, Parks, Water and Environment
EPBCA	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)</i>
GPS	Global Positioning System
LISTmap	Land Information System Tasmania map
NCA	<i>Nature Conservation Act 2002</i>
NCH	Natural and Cultural Heritage Division, DPIPWE
NVA	Natural Values Atlas
PASS	Potential Acid Sulfate Soils
PARS	Policy Advice and Regulatory Services Branch, NCH, DPIPWE
ROV	Remotely Operated Vehicle
RMPS	Resource Management and Planning System
TSPA	<i>Threatened Species Protection Act 1995</i>

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1. INTRODUCTION

These guidelines have been prepared for proponents and consultants who are required to survey and report on the potential impacts of proposed developments and activities on natural values in estuarine and marine environments (hereafter called 'marine') in Tasmania.

They outline the minimum standard for undertaking natural values surveys in marine environments and include survey methodologies that may be applied to particular species. Note these guidelines do not cover surveying in freshwater environments, which require different survey techniques¹

This is a guidance document, and it is recommended that a proponent or consultant intending to use these guidelines contact the relevant regulator (e.g. the Environment Protection Authority, the Parks and Wildlife Service, or Council) to determine which surveys they require to be undertaken.

These guidelines may apply to foreshore infrastructure for marine farms. However, they do not apply to marine farming activities that take place away from the shore. Survey requirements for marine farms are set by DPIPWE's Marine Farming Branch and/or the EPA who should be contacted as relevant.

Where a development proposal overlaps the terrestrial and aquatic environments (for instance a marina development with land-based infrastructure or where sub-tidal blasting may cause noise/vibration impacts on land), it is important to read these guidelines in conjunction with the Guidelines for Natural Values Surveys - Terrestrial Development Proposals available on the DPIPWE website.

This document is subject to periodic review, and updates and additional information will be provided on the DPIPWE website. Consultants, development proponents and their representatives are advised to check the DPIPWE website regularly for new material that may have a bearing on their proposals.

Matters of National Environmental Significance as listed under *the Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBCA) should also be considered. 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 that legislation. Further information is provided on the Australian Government, Department of Agriculture, Water and the Environment website (<http://www.environment.gov.au/epbc>).

¹ NCH does not have guidelines for surveying in freshwater environments in relation to development assessments. If unsure, consult with the Policy Advice and Regulatory Services Branch (PARS) in advance for advice on survey requirements.

2. PURPOSE OF THE GUIDELINES

The primary goal of these guidelines is to help proponents and their representatives meet the needs of regulators assessing the impacts of proposed developments on natural values.

It is recommended that before planning a natural values survey, proponents consult with the regulator of the proposed activity to seek advice on whether a survey is required.

If a survey is required, use of these guidelines will help to ensure that marine surveys and reports are completed to a standard that enables regulators to perform their roles efficiently and meet conservation objectives under the legislation that they administer.

It is recommended that the suggested approaches (including species-specific survey methods as detailed in Appendix 2) are adopted as a minimum standard unless an alternative methodology has been agreed with the relevant regulator.

3. ASSESSMENTS FOR NATURAL VALUES

This section outlines some of the factors relevant to planning, timing and selection of personnel to undertake natural values surveys, including scale, timing, location and nature of proposed developments.

'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 other relevant policies and regulations.

Currency of surveys

Field surveys are generally regarded as current for up to two years from the date of the 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 new surveys may be required by the regulator of the activity to enable the assessment of natural values that may be present.

Personnel and preparation

The proponent or their representative should ensure that the person undertaking the survey and preparing reports has appropriate skills, qualifications and experience in survey planning and in the identification and documentation of all the natural values of interest, including knowledge of Tasmanian species and their habitat.

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.

The surveyor must ensure that any necessary permits to 'take' listed species for identification purposes, and access authorisations have been obtained prior to going on site. Further information on permits is available on the DPIPWE website: <https://dpiipwe.tas.gov.au/conservation/development-planning-conservation-assessment>.

Appropriate biosecurity procedures also need to be considered and implemented.

Survey area and context

The survey area must be large enough to identify all the relevant natural values that may be impacted by the proposed development, as well as to provide some local context for those impacts.

The survey area should include those areas where the proposed development or activity will be directly located, as well as associated components such as access roads, tracks, vessel navigation routes, parking and material storage areas.

The development footprint will need to be well defined to accurately determine the extent of potential impacts, including during construction and operational phases. If the footprint is not defined, further studies may be necessary to cover any areas missed. It is therefore recommended to overestimate rather than underestimate the development footprint.

For some developments and activities, potential impacts to 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 beyond the development footprint.

In situations where the impact of the activity is likely to exceed the development footprint, it may be appropriate to include an additional survey or buffer zone. The size of this zone will depend on the types of impacts and the species or values that may be impacted. If it is unclear whether additional surveys or a buffer zone may be required, or what size they should be, it is recommended to contact the Natural and Cultural Heritage Division.

Survey timing and method

These guidelines outline a minimum recommended level of surveying. A preliminary assessment and characterisation of the site is used to assess the likelihood of species occurring within or near the site and the potential for them to be impacted by the development.

Many marine species can be surveyed at any time of the year. However, migratory species only occur seasonally within a particular area.

For some marine species, specific survey guidelines have been developed (see Appendix 2b). Species-specific surveys should be conducted if the preliminary assessment and site 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 on the minimum requirements for surveys. Additional information regarding methodology etc. is provided in Appendix 1. A survey checklist is provided at Appendix 5.

When surveying for natural values, the following minimum general information should 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
- Site conditions at time of survey (i.e. visibility, swell, etc.)
- 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)
- Acid sulfate soils and other sediment sampling protocols (Appendix 3)

Introduced Marine Species

There are a number of recognised marine pests in Tasmania including the Northern Pacific Sea Star (*Asterias amurensis*), Wakame - Japanese Kelp (*Undaria pinnatifida*) and the European Green Crab (*Carcinus maenas*).

More information on the distribution and biology of these species can be found on the DPIPWE website.

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, this should be reported to DPIPW (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.

Geoconservation and Geomorphic Features

The surveyor will generally be alerted to the possibility of a geoconservation site being present within a development proposal area by a desktop assessment of the area through the NVA or LISTmap.

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.

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.

Additional or follow up (targeted) surveys

Additional or follow up surveys may be required if initial survey work highlights the need for more information. For example, the initial survey may identify threatened fauna habitat, which may then require a targeted threatened fauna survey to be undertaken, depending on likely impacts.

4. SURVEY DATA

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. NVA datasheets (which include a number of mandatory fields) can be downloaded from the NVA website (<https://www.naturalvaluesatlas.tas.gov.au/>). This assists to maintain the currency of publicly available datasets and mapping products and improves the accuracy of assessments.

For new users of the NVA, consultants will first need to apply to DPIPW for access via the NVA website and will then need to request the creation of a project under which to lodge their data. It is a condition of permits issued to consultants that survey data are submitted to the NVA.

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, as appropriate, 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 by remedying 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 demonstrate a conservation benefit for a particular natural value that compensates at some level for the impact.

Offsets are less frequently used in the marine context than the terrestrial. Nevertheless, proponents undertaking marine developments should be aware that offsets may be required by regulators. DPIPWE's General Offset Principles provide guidance on when an offset may be required (see Appendix 7).

6. REPORTING

Reports for assessment purposes should be concise and contain sufficient information (such as tables, maps, photographs, video footage etc.) to clearly describe the natural values and communicate any impacts of the proposal on them, as well as actions that would be 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.

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

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

An example report template using these headings is provided at Appendix 6.

7. APPENDICES

APPENDIX 1: ADDITIONAL SURVEY DETAIL

DESKTOP ASSESSMENT

A desktop assessment should be undertaken to determine which threatened and other natural values are likely to occur in the area. It should be noted that there are a limited number of records available on the NVA for marine species. As such, its usefulness is mostly limited to determining the potential for threatened species to occur at particular locations (based on range boundaries).

An NVA report (using buffers of 500 m and 5 km around the study area) should be generated and other relevant desktop tools interrogated (e.g. listing statements, LISTmap, etc.). Additional resources to assist the desktop assessment are at Appendix 4. 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:

- An underwater video survey
- Mapping of the bathymetric profile across the site
- Identification of 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. GPS co-ordinates of each transect must be recorded.

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

Area to be impacted (ha)	Number of transect dives
0.0 - 0.5	1
0.5 - 1.0	2
1.0 - 5.0	4
5.0 - 20.0	8
> 20.0	8 (+ 1 for every additional 10 ha)

Filming procedure

Filming should 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.

It is accepted practice now for surveys to be conducted using GPS points instead of transect lines, however, if it is preferred by the consultant to use transect lines, filming is to be conducted with the transect line in view. Each transect must be identified on the video with the appropriate transect number e.g. T1, T2 etc. GPS points must be provided for the start and end of each transect.

Filming should be conducted slowly along the GPS transect (or line) to ensure that clear images of the 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. The sediment must be disturbed and filmed at each specified site along each transect.

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 and/or video footage 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 echosounder 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 is to be presented on a map of the survey area.

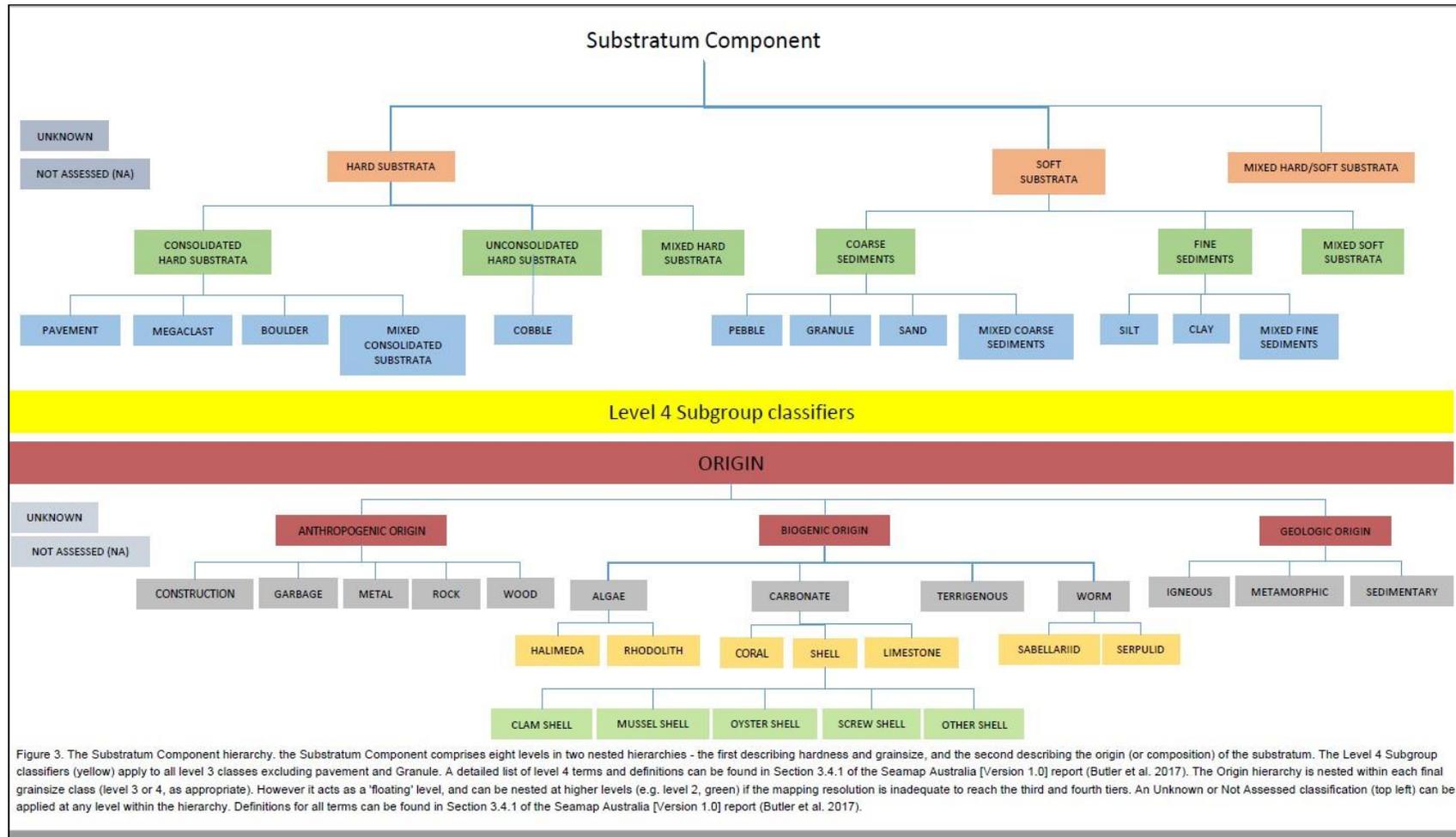
SEABED CHARACTERISTICS AND HABITAT PROFILE

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 Figure 1 (adopted from SEAMAP Tasmania).

Figure 1. Descriptive classifiers used to assess and quantify the benthic habitat type (definitions adopted from SEAMAP Tasmania)

https://seamapaustralia.org/wp-content/uploads/2017/11/Classification_Hierarchy_20170907.pdf



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, recovery plans, 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 reaching a maximum size of 13 mm in diameter. The seastar usually has five arms, although specimens with two, four and six arms have been identified in small numbers (Prestedge, 1998). *Parvulastra vivipara* obtains its name through the seastar's ability to produce live young in place of eggs.

The seastar is only known to have been recorded at a small number 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 (*PATIRIELLA LITTORALIS*) – ENDANGERED (TSPA), CRITICALLY ENDANGERED (EPBCA)

Patiriella littoralis is a small seastar up to 17 mm in diameter which 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 Pavilion Point, Granville Avenue, Risdon and Paloona Street, Lindisfarne. The species has not been observed in its natural state since the early 1990's.

Patiriella littoralis 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).

BRUNY ISLAND SEASTAR (*SMILASTERIAS TASMANIAE*) – RARE (TSPA)

Smilasterias tasmaniae is a five-armed seastar of dark grey-brown/tan colouration, growing to a maximum size of 40 mm in diameter. The species most commonly occurs in marine rocky intertidal habitats but has also been recorded at depths of up to 8 m. The seastar is found underneath rocks and there is some anecdotal evidence that it prefers rocks with the coral worm *Galeolaria aespitose* growing on their underside, although there have not been enough surveys to know this for sure (draft listing statement, 2019).

Smilasterias tasmaniae is extremely rare, occupying only a small number of localities on the western side of Bruny Island, and one site at Recherche Bay. There are currently no population data for the seastar and all surveys have recorded less than 10 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 ecology of this species or the factors affecting its distribution and abundance, which makes designing appropriate survey methods difficult.

SPOTTED HANDFISH (*BRACHIONICHTHYS HIRSUTUS*) - ENDANGERED (TSPA), CRITICALLY ENDANGERED (EPBCA)

RED HANDFISH (*THYMICHTHYS POLITUS*) - ENDANGERED (TSPA), CRITICALLY ENDANGERED (EPBCA)

ZIEBELL'S HANDFISH (*BRACHIOPSILUS SIEBELLI*) - ENDANGERED (TSPA), VULNERABLE (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 (*Thymichthys politus*) and Ziebell's Handfish (*Brachiopsilus siebelli*) are all listed under the TSPA and the EPBCA.

The survey requirements for Spotted Handfish are different from those for Red Handfish and Ziebell's Handfish as they live in different habitats.

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 2-45 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 250 eggs to small upright structures on the seabed (preferably a stalked ascidian or seaweed, however they will also readily attach egg masses to artificial substrates).

Red Handfish inhabit shallow rocky reefs (depths from 1–20 m), occupying sites on top of rocks, amongst macro-algae and in sandy areas between rocks and the reef-sand interface (Bruce et al., 1997). The breeding season is yet to be confirmed, but egg masses with their attendant guarding female have been observed in October and early November. Given the extremely limited distribution of the species, all areas in which the Red Handfish are found represent habitat critical to the survival of the species (*Recovery Plan for Three Handfish Species*, Commonwealth of Australia 2015).

Ziebell's Handfish were once recorded from a number of disjunct populations in eastern and southern Tasmania but have not been observed for many years. Its current distribution is not known. The species appears to prefer soft bottomed habitat, with patches of rock that support sponge and algae communities, but has also been found at the edge of giant kelp forests, on rocky substrate, and on or in cracks within rock ledges. The species depth distribution is 3–40 m, but has most commonly been observed at depths of 10–20 m. The breeding strategy of the species is similar to that of the Spotted Handfish and Red Handfish (*Recovery Plan for Three Handfish Species*, Commonwealth of Australia 2015).

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

Gazameda gunnii is a small gastropod sea snail from the family Turritellidae, 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 of approximately 8 m 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 (Beechey, 2004).

BROWN ALGA (ALSO KNOWN AS THREE-NODE SEAWEED) (*SIROPHYSALIS TRINODIS*) – RARE (TSPA)

Sirophysalis trinodis is the only brown algae listed under the TSPA. The species exhibits several stipes between 1–4 cm in length, 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 (Sanderson, 2000).

This species has a widespread distribution and is found in northern and southern Australia and the Indian Ocean tropics and subtropics. In Tasmania, it has only been recorded in Blackman Bay near Dunalley, with an unconfirmed observation from 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 (Wormersley, 1987, Sanderson, 2000).

LARGE-FRUIT SEATASSEL (*RUPPIA MEGACARPA*) – RARE (TSPA)

Ruppia megacarpa is a perennial aquatic herb with rhizomes 0.6 to 1 mm in diameter. The stems are 20 to 30 cm long and are often zigzag in form. The leaves are dark green, alternately arranged along the stems and stalkless, and are up to 25 cm long by 0.3 to 0.5 mm wide, with notched tips. Each flower produces 2 to 4 (to 6) fruiting bodies (carpels) that are 3.5 to 4 mm long; these are held at the ends of stalks that elongate to several times the length of the carpels, unlike the other listed *Ruppia* species, *R. tuberosa* which has stalks shorter than the carpels. Mature fruit are pearshaped and have a short beak. Flowering may occur from November to March.

In Tasmania it is found growing in estuaries and lagoons along the east and southeast coasts, and brackish lagoons in the Midlands; there is also an historic record from the Tamar estuary in the States' north. Key sites for *Ruppia megacarpa* include Derwent Estuary, Freshwater Lagoon, Hermitage Lagoon, Moulting Lagoon, Porters Bay, Sloping Lagoon, Sloop Lagoon and Township Lagoon (DPIPWE, 2013).

TUBEROUS SEATASSEL (*RUPPIA TUBEROSA*) – RARE (TSPA)

Ruppia tuberosa is an annual or short-lived perennial aquatic herb, with 0.4 to 0.6 mm diameter rhizomes. The stems are up to 2 cm long. Leaves are thread-like, 5 to 10 cm long and 0.1 to 0.3 mm wide, with rounded or pointed tips; ligule absent. Flowers consist of two-flowered spikes held at the end of a stalk up to 30 cm long. Each flower may produce 4 to 16 fruiting bodies (carpels), which are sessile or subsessile. Mature fruit are about 2 mm long, compressed and oval in shape, with a short, broad beak. Flowering may occur from September to November.

In Tasmania the species has been recorded from the State's southeast at Ralphs Bay, Blackman Bay and Marion Bay, where it occurs in holes and channels in salt marsh. Key sites for *Ruppia tuberosa* are Lauderdale, Boomer Marsh and Marion Bay (DPIPWE, 2017).

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 and are at risk of being disoriented by artificial light, particularly at night.

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, information around proposed mitigation, may suffice. If the risk is likely to be high, additional consideration or surveying may be required. If uncertain contact the Conservation Assessment and Wildlife Management Section to discuss.

APPENDIX 2B: SPECIES-SPECIFIC SURVEY METHODS

THREATENED SEASTARS (LIVE-BEARING SEASTAR, DERWENT RIVER SEASTAR AND BRUNY ISLAND SEASTAR)

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 each 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 each 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 relation specifically to the Bruny Island Seastar; there is one record of the Bruny Island Seastar recorded from the subtidal zone at 8 m depth, while all other observations have been in the low intertidal zone. Due to ease of access for conducting searches, it is recommended that surveys of this species should focus initially on the intertidal zone. Subsequent surveys of the subtidal zone should be undertaken if this area is within the impact zone for the proposed development and the initial intertidal survey has recorded individuals of the seastar.

Intertidal surveys should be conducted of the low-intertidal zone during low tide conditions, with searching conducted beneath and on the undersides of rocks. Uprturned rocks should be returned to their original position once searched to reduce disturbance to intertidal habitat. Quantitative intertidal survey approaches using transect lines and quadrats may be applied, however as the Bruny Island Seastar can occur at very low densities in the intertidal zone, generic searches across as much suitable low-tidal habitat as possible will be most effective for detection (draft listing statement, 2019).

There may be situations where it is necessary to collect specimens to confirm species identification. Please note that this will require a permit issued under the TSPA, which can be applied for through PARS.

GUNN'S SCREWSHELL (*GAZAMEDA GUNNII*)

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 Tarooma; the Huon River upstream of Police Point; the Tamar River upstream of the Batman Bridge; and Macquarie Harbour).

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 sample 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 2. Number of benthic samples per area of relevant habitat for *G. gunnii*

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

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

BROWN ALGA (ALSO KNOWN AS THREE-NODE SEAWEED) (*SIROPHYSALIS TRINODIS*)

Targeted surveys for *Sirophysalis trinodis* are currently only required for developments within Blackman Bay on the SE coast near Dunalley. Surveys 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 each transect, and the number and density (or surface area) of *Sirophysalis trinodis* recorded.

Suspected *Sirophysalis 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.

LARGE-FRUIT SEATASSEL (*RUPPIA MEGACARPA*) AND TUBEROUS SEATASSEL (*RUPPIA TUBEROSA*)

Targeted surveys for *Ruppia tuberosa* are currently only required for Ralphs Bay, Blackman Bay and Marion Bay, where there are developments proposed that are likely to impact on its salt marsh habitat.

Ruppia megacarpa has a wider distribution and habitat preference, along the east and southeast coasts of Tasmania. Currently targeted surveys for *Ruppia megacarpa* are required for developments that are likely to impact the estuarine environment of Derwent Estuary, and lagoon habitats of the east and southeast coast including Freshwater Lagoon, Hermitage Lagoon, Moulting Lagoon, Porters Bay, Sloping Lagoon, Sloop Lagoon and Township Lagoon.

Surveys should be conducted as transects laid parallel with the shore at depths of up to 1.5 m depth within the study area. Quadrats (1 m) must be placed every 5 m along each transect, and the number and density (or surface area) of *Ruppia megacarpa* and/or *Ruppia tuberosa* recorded.

Suspected *Ruppia* specimens should be photographed and the identity of the species confirmed by qualified personnel.

SPOTTED HANDFISH (*BRACHIONICHTHYS HIRSUTUS*)

Desktop assessment

A LISTmap search and a 'Natural Values Report' generated through the Natural Values Atlas (NVA) 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, as determined by the NVA and previous surveys of the location. Once this has been determined the following procedure should be followed with regard to surveying and assessment:

Known to occur (within the known range of the species) – field surveying should be conducted following the protocols outlined in this document.

Likely to occur (within the potential range) – within the potential habitat and depth range of the species (2-45 m). Additional consideration required (see Field Survey section below for characterisation of habitat).

May occur – within the potential habitat range of the species but currently outside of the known depth for the species (>45 m). This likelihood of occurrence should be stated as part of the desktop assessment in the report. No additional surveying is required.

Field survey

Habitat Assessment

A field survey is conducted to classify habitat within the development footprint and determine its suitability to support Spotted Handfish. This habitat assessment can be undertaken through video surveying conducted as part of the site and values characterisation (see Appendix 1 and Wong et al 2018, which provides further micro-habitat characterisation). Part of this characterisation should include whether the area contains suitable substrate structure/complexity for attachment of handfish egg masses.

Spotted Handfish utilise a range of different habitats. Preliminary video footage should be reviewed by a suitably qualified ecologist to refine search parameters within and adjacent to the proposal for additional surveys.

Survey Design

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 considered small to medium (5 ha or less) and the depth is relatively shallow (< 12 m).

Survey Design 2 is an ROV survey design and is considered to be suitable for development footprints that are large (>5 ha) and/or 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 for small proposals (<0.5 ha) it is expected that the entire footprint is surveyed. The intensity of surveying is less for Survey Design 2 in recognition of the fact that it is not practicable to intensively survey large development 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; this should be done in consultation with the Natural and Cultural Heritage Division².

Table 3. Summary of field survey requirements for Spotted handfish

Species	Survey method	Water depth	Development size	Survey requirements
Spotted handfish	Diver based	Shallow (<12m)	Small to medium (≤5ha)	<0.5ha footprint: survey entire site 0.5ha – 5ha footprint: do 10x 12m transects
	ROV	Deep (>12m)	Large (>5ha)	5-25ha footprint: 10 x 250m transects >25ha footprint, transects double per 25ha, increase at a rate of 10x 250m transects/25ha. For example, 50ha footprint: 20x 250m transects

² 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 survey area

Surveys for handfish should include a buffer zone which extends beyond the boundary of the proposed development footprint. The distance of the buffer zone from the development footprint 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 (e.g. for developments involving the movement of sediments, current/drift should be taken into consideration). The consultant should determine an appropriate buffer and provide justification for its design.

Survey design – small proposals

For small proposals (<0.5 ha), in relatively shallow water (<12 m), e.g. for jetty constructions or extensions, diver-based surveys for Spotted Handfish should be undertaken and be conducted across the entire footprint of the proposal. For proposals involving construction of jetties or other mooring structures, surveys must include an extended area beyond the boundary of the development footprint to take into consideration areas likely to be disturbed by vessel use, including vessel mooring.

Survey design – medium-sized proposals

For medium-sized proposals (0.5-5 ha), surveys for Spotted Handfish should be conducted as transects. The transects should be perpendicular to the shore line, commencing either at the shallowest extent of the buffer zone or (for shore based developments such as jetties) at a minimum depth of 1 m and extending to the lesser of the 12 m depth contour or to the deepest extent of the buffer boundary.

Transects should be planned or mapped out within the study area and be perpendicular to the shore, but need not necessarily be straight, providing they are mapped using GPS tracking. For example, it is acceptable to have a series of randomly swum transects which appear as shown in Figure 2.

For proposals 0.5-5 ha, 10 transects are recommended as the minimum search effort. The length of each transect is dependent on the length of the proposal, taking into consideration the buffer zone determined by the consultant.

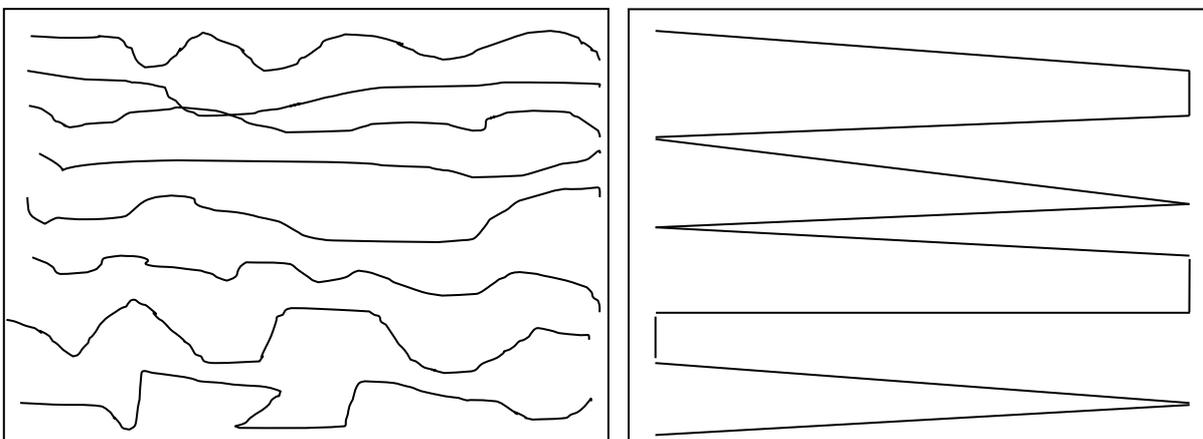


Figure 2. Examples of acceptable survey design for Spotted Handfish transects

Survey method

Geolocation by a diver-attached tow float containing a GPS is recommended, with a time stamped underwater photo. An area of 2 m either side of the transects must be surveyed. Paired divers should swim either side of the transects and collect the following information:

- The number and photos of Spotted Handfish individuals, including information on the size, position along the transect and the time of observation.
- The presence of vertical structures that could provide potential substratum appropriate for attachment of handfish eggs. In the case of stalked ascidians, this is a direct 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 should also be recorded.
- During the breeding season; the number and density of Spotted Handfish egg masses, including information on the size, position along the transect and the time of observation.
- The number of Northern Pacific Seastars (*Asterias amurensis*), including information on the size, position along the transect and the time of observation.

Survey Design 2 – ROV based survey

This survey is designed for large developments (>5 ha), or small to medium developments in deeper water (>12 m).

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 survey area

See determining the survey area for Survey Design 1. Although it is not practical to survey the entire development impact footprint for proposals larger than 5 ha, it is important to ensure that the area surveyed provides adequate coverage of the development impact footprint and is a representative sample of the overall development impact footprint.

Survey design – number and selection of transects

For proposals of 5-25 ha, a minimum of 10 transects of 250 m length are recommended as the minimum search effort. For proposals larger than 25 ha, the number of transects should increase proportionally. For example, for areas larger than 1 km x 500 m (50 ha), the number of transects required would double.

Survey method

ROV based surveys for Spotted Handfish should be conducted as transects. Depending on the proposal, a standardised transect length of a minimum of 250 m x 3 m is preferred; however, there may be reasons why a different transect length is suitable in some situations.

It is preferable that a transect be established using GPS positioning and the ROV run along the transect, (this method should include GPS fixes at start and end of dive together with fixes of approximate handfish locations if identified during filming). Ideally, the transect should start outside the buffer zone on one side of the development footprint; continue through the development footprint and finish in the buffer zone on the opposite side of the development footprint, however, it is recognised that the large size of some proposals needs to be considered.

Scaling bars should 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 number of Spotted Handfish individuals, and an estimate of their length. Where a Spotted Handfish is detected then either its GPS position and/or its position along the transect line should be recorded.
- 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.
- During the breeding season, the number and density of Spotted Handfish egg masses and position along the transect.
- The number and density of Northern Pacific Seastars (*Asterias amurensis*), position along the transect, and the time of identification.

In the event that Spotted Handfish are observed during the survey, the predicted abundance of handfish for the survey area can be extrapolated. Once the number of handfish has been determined for the survey area, this figure can be extrapolated to estimate the abundance of handfish over the entire development impact footprint³.

³ Further information about the use of density calculations to determine the mean density of fish within survey areas (expressed as number of fishes per hectare) can be found in Wong et al 2018.

RED HANDFISH (*THYMICHTHYS POLITUS*) AND ZIEBELL'S HANDFISH (*BRACHIOPSISILUS SIEBELLI*)

Desktop assessment

The procedure for determining whether the proposal occurs within habitat where these handfish are known to occur, likely to occur or may occur is similar to that described for the Spotted Handfish above. A LISTmap search and 'Natural Values Report' should be completed to determine whether the proposal occurs within habitat where the Red and/or Ziebell's Handfish are known to occur or likely to occur, as determined by the NVA and previous surveys of the location. Once this has been determined then the following procedure should be followed with regard to surveying and assessment:

Known to occur – this habitat is critical to the survival of these species and should not be disturbed. No surveying should be conducted for these species at known locations without seeking advice from the Conservation Assessment and Wildlife Management Section.

Likely to occur – within the potential habitat and depth range of the species (1-20 m for Red Handfish and 3-40 m for Ziebell's Handfish) - additional consideration required.

For the Red Handfish, the current areas requiring surveys are limited to Fredrick Henry Bay (within 5km of the shore from Dodges Ferry to Primrose Sands) and the entirety of Norfolk Bay.

For Ziebell's Handfish the survey area is on the eastern side of the Tasman Peninsula, from The Sisters Rocks (off Sisters Bay) south to Tasman Island, and within 2 km of the Actaeon Islands, southwest of Bruny Island, off Recherche Bay.

Field survey

A field survey is conducted to classify habitat within the development footprint and determine its suitability to support Red and/or Ziebell's Handfish. This habitat assessment can be undertaken through video surveying conducted as part of the site and values characterisation (see Appendix 1).

It is recommended that fieldwork to survey for Red and Ziebell's Handfish is only undertaken by suitably qualified and experienced consultants⁴.

⁴ For example, this could include undertaking training by the Reef Life Survey Program. More information about Reef Life Survey can be found on the following website: <https://reeflifesurvey.com/>

Table 4. Summary of field survey requirements for Red handfish and Ziebell's handfish

Species	Survey method	Water depth	Development size	Survey requirements
Red handfish and Ziebell's handfish	Diver	Shallow	Small (reef of ≤500m)	Survey entire site
			Large (>500m)	2x 50m transects / 2000m ² area; spaced 10m apart

Survey Design – Diver-based survey

Determining the survey area

As for Spotted Handfish, surveys for Red and Ziebell's Handfish should include a buffer which extends beyond the boundary of the proposed development footprint. The distance of the buffer zone from the development footprint is dependent on the nature of the impact and the distance to which it has the potential to cause a significant impact to handfish. The consultant should determine an appropriate buffer and provide justification for the survey design.

Survey design

Ziebell's and Red Handfish are cryptic and often camouflaged by the rocky reef substrate on which they are found.

The survey design for Red and Ziebell's Handfish has been developed based on the survey methods used by the Reef Life Survey program, 2019. *Standardised Survey Procedures for Monitoring Rocky and Coral Reef Ecological Communities*. For all development proposals, independent of size, the survey design is based on divers swimming transect lines along the development footprint (including the buffer zone).

For proposals involving construction of jetties or other mooring structures, surveys should include an extended area beyond the boundary of the construction footprint, taking into consideration areas likely to be disturbed by vessel use including sediment/substrate disturbance by vessel props and mooring or tying up to structures such as jetties, buoys and/or marinas. In such locations, Red Handfish also spread out into the seagrass to a limited extent (especially the juveniles) and also into areas where there are occasional sargassum plants within the seagrass.

For larger development proposals (e.g. large floating structures, moored to the seafloor), impacts on nearby known Red Handfish populations should be taken into consideration, including sedimentation, siltation and water quality changes. For these types of developments, consultants need to ensure the survey area is large enough to include known handfish habitat which may be indirectly impacted by the proposal.

While similar methodology for Ziebell's and Red Handfish may be used, Ziebell's Handfish can occur at depths slightly deeper than Red Handfish (up to 40m).

Thus the logistics for surveying for Ziebell's Handfish can be a major challenge. For proposals that may occur within or near the survey areas identified for Ziebell's Handfish it is recommended the proposal be discussed with the Conservation Assessment and Wildlife Management Section to determine the best options on a case by case basis.

Survey method

Areas of suitable habitat within the proposed development footprint should be surveyed for handfish. This involves two divers swimming transects of 2 x 1 m wide 'blocks', with a diver on either side of a 50 m transect line. The entire rocky substrate should be searched very carefully within each block, lifting aside individual seaweed fronds to search beneath the canopy.

For small proposals e.g. for jetty constructions or extensions (covering a reef distance of 200-500 m or less), a systematic search of the entire strip of coastal reef area covered by the development footprint is recommended.

If a large area needs to be searched, 2 x 50 m transects (=4 x 50 m² blocks = 200 m²) per 2000 m² area (i.e. 50 x 20 m) should be surveyed as an absolute minimum. Please note that this is only 1/10th of the reef surface covered, so if the handfish were evenly distributed you would expect to locate 1 in every 10. However, handfish are usually not evenly distributed, so spacing the 2 transects parallel 10 m apart is recommended, with one along the reef-sand edge, if possible. Geolocation by a diver-attached tow float containing a GPS is recommended, with a time stamped underwater photo. The following information is to be collected:

- The number and photos of Red or Ziebell's Handfish individuals, including information on the size, position along the transect and the time of identification.
- The presence 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 should also be recorded.
- During the breeding season; the number and density of handfish egg masses, including information on the size, position along the transect and the time of observation.
- The number and density of Northern Pacific seastars (*Asterias amurensis*) and echinoderms observed, including information on the size, position along the transect and the time of observation.

APPENDIX 3: ACID SULFATE SOILS AND OTHER SEDIMENT SAMPLING PROTOCOLS

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.

In the event that the initial desktop assessment reveals that ASS or Potential acid sulfate soils (PASS) are likely to be present and that more than 100 m² are likely to be disturbed, and possibly re-suspended or exposed to the air during construction, maintenance or day-to-day operations, PARS will recommend that an intensive PASS sampling protocol be adopted, in accordance with the Tasmanian Acid Sulfate Soil Management Guidelines (<https://dpiwwe.tas.gov.au/Documents/ASS-Guidelines-FINAL.pdf>).

The guidelines contain technical and procedural advice aimed at avoiding environmental harm from disturbance of (P)ASS. They also include sampling/analysis and guidance.

Other sediment surveys may include as required/appropriate:

- 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, the gathering of information on particle size may be important.
- Redox and Sulfide Assessments - 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. This may be significant where there is likely to be a significant increase in organic and nutrient loading as a result of a development (e.g. wastewater treatment plants, stormwater pipe installation).

BIOLOGICAL ANALYSIS OF BENTHIC INFAUNA

PARS may request an assessment of benthic infauna and epifauna, where a development is likely to significantly impact soft-sediment benthic habitats.

APPENDIX 4: 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 PARS 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 most 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.

www.naturalvaluesatlas.tas.gov.au

- The Land Information System Tasmania (LISTmap) 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 Aerial Photo layer or ESRI Imagery layer) can also be used to access the latest satellite imagery for the State.

<http://maps.thelist.tas.gov.au/listmap/app/list/map>

- 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. However, it should be noted that the information for some fauna species is no longer being maintained.

<http://www.threatenedspecieslink.tas.gov.au>

- 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. In general, 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:

- Threatened species listing statements, notesheets and recovery plans:
<https://dPIPWE.tas.gov.au/conservation/threatened-species-and-communities/lists-of-threatened-species/full-list-of-threatened-species>
- Biosecurity information (marine pests and diseases):
<https://dPIPWE.tas.gov.au/conservation/the-marine-environment/marine-pests-and-diseases>
- Potential acid sulfate soils information:
<https://dPIPWE.tas.gov.au/agriculture/land-management-and-soils/soil-management/acid-sulfate-soils>
- Seamap Australia, which is a marine habitat classification system that has mapped habitat type for Australian waters and includes a layer for Tasmania. Please note that this information can also be accessed via LISTmap.
<https://seamapaustralia.org/>

APPENDIX 5: 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 undertaken to help inform focus area and focus species/values for on-ground survey, utilising relevant databases, tools, recovery and management plans, literature review, etc.
- DPIPWE website visited to check latest versions of survey 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 PARS.
- 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.) and GPS coordinates 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 6: 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. Recommend any 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 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.

APPENDIX 7: GENERAL OFFSET PRINCIPLES

How do offsets apply under the Resource Management and Planning System?

An objective of the Resource Management and Planning System for Tasmania (RMPS) is to promote 'sustainable development of natural and physical resources and the maintenance of ecological processes and genetic diversity'. The RMPS definition of sustainable development includes 'avoiding, remedying or mitigating any adverse effects of activities on the environment'.

Offsets are one form of mitigation of the potential impacts of proposed activities on natural values. They are actions that contribute to the conservation of natural values outside of the development footprint, and can include reservation, active management, and other actions that demonstrate a conservation benefit for a particular natural value.

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

Where offsets are identified as being required for a particular proposal, the proponent should propose offsets that aim to meet the following policy principles. Proposed offsets should be assessed against these principles, and must meet these principles in order to be approved.

PRINCIPLES

Mitigation hierarchy

Offsets can act as a form of mitigation for the residual impacts of a development proposal on natural values. Alternatives and options to avoid, minimise and remedy the impacts of the proposal must be adequately addressed prior to the consideration of offsets.

Staged developments

For staged developments, such as a staged subdivision proposal, proponents should provide details of the whole proposal early in the process to allow for a single assessment wherever possible. This will normally provide better conservation outcomes and greater certainty for the proponent. Any offsets that are required can be implemented either up-front, or in a staged manner in accordance with approvals for each stage of the development.

Conservation outcomes

Proposed offsets should aim to maintain or improve conservation outcomes. Offsets should generally be for the same species, native vegetation community (in comparable condition), or other natural value that is to be adversely impacted by the proposal.

A greater magnitude of offset is generally required for impacts on natural values on sites that are protected or managed for nature conservation, including reserves and public lands that are managed for natural values. Impacts on these sites may decrease the protection or reservation status of those natural values. For impacts in public reserves, wherever possible the offset should provide outcomes within the reserve system.

LOCATION OF OFFSETS

On-property offsets

- Where offsets will occur on the same property as the development, overall conservation outcomes for natural values on the property may be considered in determining appropriate offsets, including existing reservation and formal management arrangements.
- Offsets should contribute to well-designed proposals and property management planning that takes account of impacts on natural values and the potential for achieving genuine conservation gains at a property or landscape level. This includes providing for the recognition of land management practices which provide positive environmental outcomes.
- In general, conservation actions (such as a covenant) that have received substantial funding from other sources will not be considered as an offset for a development proposal.

Off-site offsets

- Where it is not practical for offsets to be provided on the site or property where the impact will occur, consideration may be given to other proposed locations. Preference should be given to locating the offset where the greatest conservation gains can be made at a bioregional or State level.
- In cases where the proposed offset is not on land currently owned by the proponent, the proposal will need to demonstrate how the proponent intends to ensure that the offset is effectively implemented and maintained.
- Offsets can be used to reserve and manage sites of high conservation value, and provide opportunities to achieve genuine conservation gains in areas that are more viable than the impacted site or are identified as strategic priorities.
- For reservation of sites that are identified as a priority in a planning tool such as a recovery plan, the whole site should be reserved wherever possible. This is because assessments of viability and management are implicit in identifying these sites, and a smaller area is less likely to be viable in the long-term.

OFFSET MECHANISMS

- Offsets must be designed to meet conservation priorities or to address known threats for specific natural values. Flexibility will be incorporated into

the appropriate offset mechanism/s to the extent that the offset principles are met.

- A package of individual offsets may be approved where this will achieve conservation outcomes that are consistent with this principle.
- In general terms, offsets can include:
 - improved protection of a site, such as through conservation covenants, transfer of land to the Crown for reservation, Part 5 Agreements, or formal management agreements
 - management actions that aim to benefit specific natural values at an existing site
 - restoration or revegetation of sites to provide a direct conservation benefit, such as the creation of foraging habitat for a threatened species or actions facilitating the recovery of areas with the potential to revegetate naturally
 - where lack of knowledge is considered a threat to a specific natural value, or as part of an offset package, agreed actions to increase knowledge regarding that natural value may constitute an offset if the actions aim to increase protection or viability.

Reservation

- For offsets involving reservation, the size, condition, context and viability of the impacted site and the offset site should be compared. The assessment should consider the management requirements of the natural values involved and the expected outcomes of any management actions that form part of the offset.
- For threatened species and threatened native vegetation communities, the 'size' is the number of individuals in the population to be lost (or protected through an offset), or the area of habitat or native vegetation community that will be lost (or protected through an offset).
- Where reservation forms the major part of the offset, the offset site should protect natural values of a magnitude at least as large as that lost, and maintain or improve the condition and/or context of the site.
- Offsets should generally last for the duration of the impact. Where reservation is required as part of an offset, and the proposal results in the loss of the natural values in perpetuity, the offset must protect the site in perpetuity.
- Restoration and revegetation:
 - Revegetation of complex ecosystems or threatened species populations through planting or translocation are generally unsuitable as offsets, however there may be exceptions where a genuine conservation gain can be demonstrated and the level of risk associated with the success of the actions is considered to be acceptable.

- Where restoration and revegetation of complex ecosystems or threatened species populations through planting or translocation is accepted as an offset, it should be carried out in advance of the development where feasible to demonstrate success of the actions.
- Restoration or revegetation should include a performance-based measure.
- Where restoration or revegetation is used as an offset and there will be a significant time lag between the impacts of the proposal and the creation or improvement in condition of the site, the offsets should wherever possible include actions with short-term results.

Management actions

- Where specific management actions are likely to be required to ensure the viability of an offset site in the long-term, the offset should include the necessary management actions.
- Where appropriate, adaptive management can be agreed, with monitoring used to review the required management actions at appropriate intervals.
- Management actions that form part of a development approval should require reporting at appropriate intervals. The nature, frequency and responsibility for management actions and reporting should be clearly specified in the permit or other legal mechanism established as a condition of approval.
- Where a third party will be carrying out management actions as part of an offset, any required funding for management should be provided by the proponent up-front or at agreed intervals, as part of the offset.
- Knowledge-based actions:
 - Knowledge-based actions are appropriate for some threatened species, geodiversity and other natural values, where knowledge gaps are recognised as a conservation priority for those values.
 - Knowledge-based actions should only be used in conjunction with other actions as offsets for vegetation communities.
 - Actions for the purposes of increasing knowledge may include research that addresses conservation priorities for the natural values. Examples may include research that is identified as a priority in a recovery plan, or surveys to determine the likely extent of a value where there are significant knowledge gaps that lead to difficulties for the protection and management of that value.

Threatened species

- Where loss of threatened species populations is likely to be unavoidable and there are substantial residual impacts identified, the offset should,

where possible, include outcomes for threatened species populations, rather than for potential habitat only.

Threatened native vegetation communities

- Offsets for threatened native vegetation communities should be based on the reservation and management of threatened native vegetation communities elsewhere.
- The offset may include some regeneration of adjacent areas to be protected within the reserved area where it is likely that a viable extension to the native vegetation community will result (e.g. fencing to exclude grazing). This aims to account for the loss of extent of the native vegetation community due to the proposal.

RELATIONSHIP TO OTHER APPROVALS AND LEGAL MECHANISMS

Legal mechanisms

- Offsets must be legally enforceable through permit conditions or some other legal mechanism established as a condition of approval. Offsets should be designed so as to have outcomes that are certain.
- Offsets that form part of a development approval should be linked to a legally enforceable mechanism prior to the impacts on natural values commencing, such as through tenure, management agreement or consent conditions. The approval should include a time frame for implementing the offset/s.

Previous approvals

- Where offset-like actions have been required under a regulatory process, these will not be considered as an offset for any future development proposal. However, additional offset actions may occur on the same site if it can be demonstrated that an environmental benefit will occur, such as additional active management of the area.
- If a subsequent development proposal will impact on an existing offset, the values that were protected under the offset may not be further impacted upon without additional offsetting. Additional offsets will need to adequately address the impacts of the current proposal and the impacts on the offset provided under the original proposal.

INFORMATION REQUIREMENTS FOR ASSESSMENT OF DEVELOPMENT APPLICATIONS

- The best available information should be used in determining the potential impacts of a proposal on natural values and the determination of appropriate mitigation actions and offsets, as required. As such, proponents (or their representatives) should ensure that the most current tools and resources are used during the assessment process.

- Proposals should include adequate information on the natural values at the impacted site and at any proposed offset site.
- Proposals must clearly define the impacts that are being offset. Where the impacts on natural values cannot be fully described or quantified, a risk assessment should be undertaken and provided.
- Proposals should specify the conservation requirements of the natural values (e.g. breeding and foraging habitat or management requirements for threatened species), to aid in determining appropriate offsets.
- Information derived through the application and assessment process that adds to the records of natural values on a site will form part of the assessment of the proposal. Provision of this new information is not considered to be an offset. However, other research may be used as an offset in some cases.
- If a proposal is modified and additional impacts will occur, the proposal should be reassessed.

APPENDIX 8: REFERENCES

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