



## Environmental Factor Guideline

# Benthic Communities and Habitats

The objective of the factor *Benthic Communities and Habitats* is:

*To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained.*

### Purpose

The purpose of this guideline is to communicate how the factor *Benthic Communities and Habitats* is considered by the Environmental Protection Authority (EPA) in the environmental impact assessment (EIA) process.

Specifically, the guideline:

- describes the factor *Benthic Communities and Habitats* and explains the associated objective
- describes EIA considerations for this factor
- discusses the environmental values of benthic communities and habitats, and their significance
- describes issues commonly encountered by the EPA during EIA of this factor
- identifies activities that can impact on benthic communities and habitats
- provides a summary of the type of information that may be required by the EPA to undertake EIA related to this factor.

### What are benthic communities and habitats?

For the purposes of EIA, benthic communities are biological communities that live in or on the seabed. These communities typically contain light-dependent taxa such as algae, seagrass, mangroves and corals, which obtain energy primarily from photosynthesis, and/or animals such as molluscs, sponges and worms, that obtain their energy by consuming other organisms or organic matter.

Benthic habitats are the seabed substrates that benthic communities grow on or in. They can range from unconsolidated sand to hard substrates such as limestone or igneous rock, and occur either singly or in combination.

## How this factor links with other environmental factors

The EPA recognises that there are inherent links between the factor *Benthic Communities and Habitat* and other environmental factors. For example, impacts or changes to mangrove communities can also impact on the objective for *Coastal Processes* (e.g. through increased erosion). Conversely, the factor *Benthic Communities and Habitat* can be impacted by changes in the quality of riverine discharges, considered under the factor *Inland Waters Environmental Quality*.

While potential losses of benthic communities resulting from changes in marine environmental quality will be addressed under the factor *Benthic Communities and Habitats*, the changes in environmental quality causing the impact are generally considered under the factor *Marine Environmental Quality*. Impacts on the factors of *Coastal Processes*, *Marine Fauna* and *Social Surroundings* resulting from changes in benthic communities are considered under those factors.

## The environmental objective for Benthic Communities and Habitats

The EPA's environmental objective for the factor *Benthic Communities and Habitats* is: "To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained".

In the context of this objective:

*Ecological integrity* is the composition, structure, function and processes of ecosystems, and the natural variation of these elements.

This objective recognises that marine benthic communities are important components of almost all marine ecosystems, and are fundamental to the maintenance of ecological integrity and biological diversity of the marine environment as a whole.

## Considerations for environmental impact assessment

Considerations for EIA for the factor *Benthic Communities and Habitats* include, but are not necessarily limited to:

- application of the mitigation hierarchy to avoid and minimise impacts to benthic communities and habitats, where possible
- the benthic communities and habitat types affected by the proposal and their significance
- the alternative design options considered, and the management measures and approaches proposed, to avoid and minimise impacts to benthic communities and habitats
- the spatial and temporal scale of the residual impacts to benthic communities and habitats from the proposal, in combination with historical and approved losses, and the flow-on implications for ecological integrity and biodiversity
- the current state of knowledge of the affected benthic communities and habitats, including the services they provide, and the level of confidence underpinning the predicted residual impacts
- the risk posed to benthic communities and habitats and their associated environmental values and ecological integrity should those predictions be incorrect
- whether proposed mitigation measures are technically and practically feasible.

## Environmental values supported by benthic communities and habitats and their significance

Benthic communities and habitats play important roles in maintaining the integrity of marine ecosystems and the ecological services they supply. There is strong evidence that the presence of benthic communities can be important for the maintenance of biodiversity through provision of structurally complex and diverse habitat, provision of refuge, and increased food supply. Some of these complex habitats are important recruitment and nursery areas for many marine fauna species and may also provide essential food resources for large marine mammals, such as dugongs and turtles. Benthic primary producer habitats form the foundation of many marine food webs which, in turn, support productive and economically-important fisheries. They also attenuate wave and current energy which helps protect our shorelines and coastal infrastructure. Perennial seagrass meadows may provide shelter and support for large numbers of organisms that filter the water column and maintain water clarity.

When assessing potential impacts on benthic communities and habitats, the EPA is mainly concerned with changes that are likely to significantly impact on biological diversity and ecological integrity. The EPA is therefore mainly focused on the extent, severity and duration of the impact(s) and hence whether any consequent losses to benthic communities or their habitats are temporary or permanent.

### Issues

The following issues are matters that are commonly encountered by the EPA due to the nature of proposals that are referred to it. Background on these issues is provided here to help proponents and the community engage with EIA. This issues section will be updated from time to time to reflect new issues as they arise in referrals and EIA.

#### *Loss of seagrass meadows in Cockburn Sound*

In Cockburn Sound, over 80 per cent of the seagrass meadows have been lost to nutrient pollution from domestic and industrial sources. This has significantly altered the diversity and integrity of the marine ecosystem. The Cockburn Sound Management Council was formed to coordinate monitoring and management in the Sound and, while environmental quality has improved, there has been no significant expansion of existing seagrass meadows, or recruitment of new meadows, into the original areas where seagrass was lost.

Proposals in Cockburn Sound that are likely to result in further loss of seagrass will be considered by the EPA in the context of the historical losses that have already occurred and the success of any seagrass restoration projects in the Sound.

#### *Marine heat waves*

In recent years the WA coast has been subject to an increasing number of marine heat wave events which, in our northern waters, have often resulted in coral bleaching and, in more extreme cases, mortality. In 2010–11 sea water temperatures along the west coast reached unprecedented levels, with mass mortalities and/or reduced recruitment of some fish, crustaceans, molluscs, seagrass and kelp recorded along the coastline.

When undertaking EIA the EPA will consider the more localised impacts of coastal developments in combination with the longer term consequences of these marine heat wave events. The EPA will also take into account the level of understanding of responses in key benthic communities and habitats to marine heat wave events and to the development pressures.

## **Marine fauna**

Some benthic communities are critical to the long-term viability of marine fauna species protected under State legislation or of particular iconic status or commercial importance. They may either function as recruitment sites, nursery areas, or as important feeding areas.

The EPA expects proponents to identify any critical associations between important marine fauna and key benthic communities and habitats that are likely to be impacted.

## **State of knowledge**

Loss of benthic communities and habitats is widely regarded as one of the biggest threats to ecological integrity and biodiversity world-wide. The distribution of benthic communities along the Western Australian coastline is poorly known outside of the major developments zones such as ports, and even here knowledge of the distribution of benthic communities and habitats at the local level is often limited. Some benthic communities are thought to have a limited/localised distribution (e.g. in-shore coral communities in the Pilbara), while others are known to contain species that are only found in the locality.

While there has been a significant amount of study undertaken on some temperate perennial seagrass meadows and tropical coral reefs in WA, the EPA recognises that the understanding of marine biodiversity, ecological functions and the ecological services provided by most benthic communities in Western Australia is incomplete.

Given our limited understanding of benthic communities and how they respond to pressures, the EPA strongly encourages the sharing of information on benthic communities and their response to different pressures so that there is a collective improvement and consolidation of knowledge over time<sup>1</sup>. This consolidation of knowledge should result in sounder, more confident assessments with improved environmental outcomes.

## **Impacts**

Impacts on benthic communities and habitats can be both direct (e.g. dredging or reclamation of habitat), which are often irreversible, or indirect (e.g. shading or smothering) which may be reversible once the pressure is removed. Impacts from most development activities include both direct and indirect impacts to varying degrees and almost all significant marine development proposals will result in some loss of important benthic communities and/or habitat.

The EPA uses a spatial assessment framework for evaluating cumulative temporary and irreversible loss of and/or serious damage to benthic communities and habitats. The evaluation scheme is based on cumulative changes within a defined area and includes determining the spatial extent of benthic communities and their habitats:

- prior to all human-induced disturbance
- existing at the time of the proposal
- remaining after implementation of the proposal.

The development activities that have the potential to impact on benthic communities and habitats include, but are not necessarily limited to:

- Dredging, through the direct take of benthic habitat and indirectly through increased turbidity and sedimentation and the mobilisation of contaminants contained within the sediments.

---

<sup>1</sup> A dredging science node has been established by Government under the Western Australian Marine Science Institution to address key information gaps on the sensitivity of tropical benthic communities to smothering and shading pressures associated with dredging. Programs include reanalysis of industry impact assessment and compliance data and the collection and analysis of new data.

- Dumping of rocks and other material for the construction of infrastructure such as breakwaters, groynes, bridges and rock walls, which directly destroys benthic habitat and has the potential to indirectly impact adjacent benthic communities and habitats through increased turbidity and by altering wave and current energy patterns.
- Construction of barriers to tidal movement (e.g. bridges, walls, berms) can potentially change the hydrodynamics and flushing of estuaries and embayments, causing mortality of benthic communities and loss of habitat through changes in inundation patterns and salinity.
- Waste water discharges such as brine, bitterns, domestic waste water, industrial waste, cooling water and tail-water from onshore dredge spoil disposal all have the potential to affect the quality of water, sediment and biota in the vicinity of the discharge and impact on the health of benthic communities or, in extreme cases, cause the mortality of benthic communities.
- Marine sea cage aquaculture can directly impact on benthic communities and habitats through anchoring systems or shading by the cages. Indirect impacts can result from the deposition of organic waste and other contaminants causing changes in environmental quality.
- Direct removal of benthic communities and habitats in intertidal or supratidal zones (e.g. mangroves, algal mats) for access corridors or placement of infrastructure.

## Information required for EIA

Where *Benthic Communities and Habitats* has been identified as an environmental factor the EPA may require the proponent to provide information or studies within the following broad topics:

- appropriate scale mapping showing the types of benthic communities and habitats and their distribution extending to the edge of the zone of influence of the proposal
- assessment of the environmental values and significance of the benthic communities likely to be impacted at relevant scales (i.e. local, regional and state-wide)
- identification of the threats and pressures the proposal is likely to have on the benthic communities and associated habitats and prediction of the extent, severity and duration of direct and indirect impacts (this is likely to involve predictive modelling to determine the 'most likely worst case' and 'most likely best case' loss scenarios)
- description of the likely consequences for ecological integrity and biological diversity
- the likely impact that any changes in the benthic communities and/or habitat will have on other dependent factors
- design options and management measures and approaches to be implemented to avoid and/or minimise impacts on benthic communities and habitat
- cumulative impacts from other existing and approved developments in order to determine whether the proposal, in combination with other developments, will significantly impact benthic communities and/or their habitat, and any consequent impacts to ecological integrity and biodiversity
- proposed methods for determining actual losses of benthic communities and their habitats resulting from implementation of the development, and evaluation against the predicted loss
- analyses of the above to a standard consistent with recognised published guidance where available
- specification of how the results of monitoring and evaluation of actual impacts on benthic communities and habitats will be publically reported.

More detailed guidance on the composition and format of the information required for assessment can be found in the *Technical Guidance - Benthic Communities and Habitats*.

Environmental Protection Authority 2016, *Environmental Factor Guideline: Benthic Communities and Habitats*, EPA, Western Australia.

This document is available in alternative formats upon request.

National Relay Service

TTY: 133 677

(To assist persons with hearing and voice impairment)

**More information**

Office of the Environmental Protection Authority

Level 8, The Atrium

168 St Georges Terrace

Perth WA 6000

Locked Bag 10,

East Perth WA 6872

p: 08 6145 0800

e: [info@epa.wa.gov.au](mailto:info@epa.wa.gov.au)

w: [www.epa.wa.gov.au](http://www.epa.wa.gov.au)