Guidance for assessment of impacts on marine biodiversity

ntepa Northern Territory Environment Protection Authority

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This guidance is not an instrument for predicting outcomes or decisions related to EIA, however it is designed to promote a more certain and consistent approach to marine biodiversity assessments and intended to apply to proposals prior to referring the proposal to NT EPA, and during an EIA process.

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1. Introduction

1.1. Overview

The Northern Territory Environment Protection Authority (NT EPA) objective for its environmental factor 'Marine ecosystems' is 'protect marine habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning'.[1] Potential significant impacts to marine ecosystems from a 'proposed action' or 'strategic proposal' (hereafter collectively referred to as a 'proposal') are assessed under the 'Marine ecosystems' factor.

In order to carry out environmental impact assessment (EIA) of a proposal and inform decision-making under the *Environment Protection Act 2019* (EP Act), the NT EPA) must have sufficient information to understand the marine ecosystem values present within a proposal area, how the proposal would potentially impact those values, and the measures that would be implemented to manage impacts and achieve environmental objectives.

This guidance advises proponents about the information requirements for EIA documents related to the environmental factor 'Marine ecosystems.

1.2. Purpose

This guidance provides advice about how potential impacts to marine ecosystems are considered during EIA, and the type of information that should be provided to facilitate the EIA process, so that proponents:

- have a clear understanding of what is required for EIA of a proposal's impacts on marine ecosystems
- are able to focus their marine biodiversity assessments on significant environmental impacts potentially caused by their proposal
- develop information sufficient to allow planning to avoid and potential significant impacts, and to offset potential residual significant impacts.

2. Statutory context

This section provides an overview of the legislation that is most relevant when assessing marine ecosystems for an EIA process. Proponents should identify the statutory authorisations required for a proposal and describe why and when they would be obtained.

The legislative requirements do not address all values of marine ecosystem potentially impacted by the proposal. These matters must be addressed in the proponent's EIA documents in terms of describing and identifying impacts, assessing the acceptability or otherwise of impacts, and the measures that can be taken to avoid and mitigate potential significant impacts, and offset significant residual adverse impacts that cannot be avoided or mitigated.

[1] Refer to the NT EPA 'Environmental factor guidance: Marine ecosystems' for further detail about how the NT EPA considers this factor in the EIA process.

Environment Protection Act 2019

The EP Act states that the purpose of the environmental impact assessment and approval system in the NT is to ensure there is no unacceptable impact on the environment resulting from proposed development, now or in the future.

Proposals that have the potential to have a significant impact on the environment must undergo EIA under the EP Act and need an environmental approval to commence. Proposals that require EIA and approval must be planned, assessed and carried out considering (section 42(b)):

i. the principles of ecologically sustainable development
ii. the environmental decision-making hierarchy
iii. the waste management hierarchy
iv. ecosystem-based management
v. the impacts of a changing climate.

Section 42(b)(v) applies to all proposals that may have a significant impact on the environment. It places obligations on both the NT EPA and proponents to ensure that marine ecosystem impacts are addressed through the planning and assessment of a proposal and in the carrying out of the proposal.

When addressing marine ecosystem impacts in proposal planning and implementation a proponent has obligations under section 43 of the EP Act (General duty of proponents) which include, among other things:

- to seek and document community knowledge and understanding (including scientific and traditional knowledge and understanding) of the natural and cultural values of areas that may be impacted by the proposal
- to consider the principles of ecologically sustainable development in the design of the proposal
- to apply the environmental decision-making hierarchy in the design of the proposal.

Proponents must also apply the 'Environmental decision-making hierarchy' (section 26 of EP Act) when making decisions in relations to actions that affect the environment.

The 'principle of proportionality' and the 'precautionary principle' should be used in interpreting the conservation significance of findings of ecological surveys.

Territory Parks and Wildlife Conservation Act 1976

The TPWC Act provides for the conservation of biological diversity in the marine environment through mechanisms such as establishing parks and reserves for protection and conservation, and the protection of marine wildlife (animals and plants) and its habitat. The TPWC Act defines several terms that are relevant when preparing EIA documents, such as 'sustainable use', 'threatened wildlife', 'classification', and 'area of essential habitat'.

The TPWC Act is supported by several pieces of subordinate legislation, including regulations and by-laws that address issues of conservation. The Territory Parks and Wildlife Conservation Regulations 2001 assigns individual flora and fauna species to classes according to the determined level of threat to the survival of the species in the wild according to the International Union for the Conservation of Nature (IUCN) red list categories and criteria. The classification of wildlife determines the status that relates to its risk of extinction.

Classes of wildlife include extinct (E) extinct in the wild (EW), critically endangered (CR) endangered (EN), vulnerable (V), near threatened (NT), least concern (LC), data deficient (DD) and not evaluated (NE). Species that have been classified as EW, CR, EN, V are threatened species and have greater protection in the NT under the TPWC Act. The TPWC Act restricts activities relating to protected wildlife unless the person is authorised to undertake the activities. Restricted activities include those which harm, disturb, alter the behaviour of or otherwise affect the capacity of the animal or plant to perform its natural processes; or damage or destroy the habitat of the animal or plant.

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act is the Australian Government's key piece of environmental legislation. It provides a legal framework to protect 'nationally significant (protected) animals, plants, habitats or places' (protected matters) which include, among others, listed threatened species and communities and listed migratory species.

Controlled actions need approval from the Australian Government's Minister for the Environment. The EIA must determine the presence or likelihood of any protected matters in the vicinity of the study area through database searches and field surveys. An assessment of the likely impacts on protected matters is needed if they are present or are likely to be present.

The NT and Australian governments have an agreement (the bilateral agreement) that allows an EIA process under the EP Act to also assess the potential impacts of a proposal on protected matters under the EPBC Act. This avoids duplication and allows proponents to undergo one assessment process for both the NT and Australian Governments. However, the NT and Australian Governments' subsequent approval processes remain separate.

There is often some overlap when assessing marine ecosystem impacts that are relevant under NT or Commonwealth legislation. Nevertheless, the EIA documents should contain a separate section or chapter with an assessment of the impacts on protected matters.

3. Investigation and survey

3.1. Incorporating traditional Aboriginal knowledge

Traditional Aboriginal knowledge is an important component of information on marine ecosystems, that should be incorporated into a proponent's assessment of potential impacts to marine biodiversity from their proposal[2]. There is no universally accepted definition of Aboriginal knowledge. The term describes complex knowledge systems embedded in the unique cultures, languages, values, governance systems and worldviews of Aboriginal peoples. Aboriginal knowledge tends to be regionally and community specific, and place based, arising from Aboriginal peoples' intimate relationship with their natural world[3].

A proponent has general duties under section 43 of the EP Act including, among other things, 'to seek and document community knowledge and understanding (including scientific and traditional knowledge and understanding) of the natural and cultural values of areas that may be impacted' by a proposal, and 'to consult with affected communities, including Aboriginal communities, in a culturally appropriate

[2] State of NSW and Department of Climate Change, Energy, the Environment and Water, 2024. *Weaving traditional ecological knowledge into conservation assessments - A guide for project officers*. Parramatta, NSW.
[3] Holcombe, S. Witt, K. Jezierski, P, 2023. *Aboriginal Knowledge Protocol: Guiding Principles for Action* in *Social, Cultural and Economic (SCE) studies of the Strategic Regional Environment and Baseline Assessment (SREBA) for the Beetaloo Sub-basin*, The University of Queensland Centre Natural Gas Report, The University of Queensland.

manner'. Proponents should incorporate traditional Aboriginal knowledge into their EIA in culturally appropriate ways.

In most regions, Aboriginal people and communities will have traditional knowledge of areas that support high biodiversity and locations where threatened flora and fauna species occur. Proponents should engage with knowledge holders according to ethical agreements or research protocols to create transparency, ensure mutual benefit, and to protect indigenous cultural and intellectual property. Information provided by Aboriginal peoples should be communicated with regard for any requirement for confidentiality.

Proponents should engage with Aboriginal people and communities, Aboriginal land councils, the Aboriginal Areas Protection Authority, and the DLPE Environment and Heritage Division with regard to incorporating traditional Aboriginal knowledge into EIA.

3.2. Desktop assessment

Proponents should undertake a comprehensive desktop assessment in the early planning stages of the proposal. Desktop assessments can include database searches; analysis of maps, satellite images and aerial photographs, and a literature review of the marine ecological values that are known to occur or potentially occur in the survey area.

DLPE maintains spatial databases on the Territory's marine flora, fauna, threatened species and benthic habitats. Information can be accessed via the DLPE website (https://environment.nt.gov.au/homepage), including through the NR Maps function. Proponents can request detailed data for particular areas by contacting datarequests.dlpe@nt.gov.au.

Proponents should base the desktop assessment of the likelihood that species and communities are present in the survey area on:

- the general habitat requirements of a species or community
- habitat representation in the survey area
- records of known occurrence(s)
- knowledge of geographic distribution.

Searched data and maps can be used to preliminarily assess the marine ecosystems, threatened species and benthic communities and habitats that are known to occur, or are likely to be present within or surrounding the proposal area. Identify potential marine fauna habitat through aerial photography, marine and benthic mapping (e.g. regional ecosystem mapping), and in the case of large-scale proposals, remote sensing technology. Identify locations of listed threatened marine plant and animal species and communities using a likelihood of occurrence assessment based on desktop assessment of habitat factors, survey records and expert knowledge.

The Australian Government's 'Species Profile and Threats Database' can identify recovery plans and conservation advice for species that might be present in the wider region.

The NT 'Open data portal' provides mapping data for public access and use in a geographic information system.

Proponents must show that they have identified the diversity, distribution and condition of these values in relation to the project footprint and surrounding environment, as well as any associated ecological processes critical to survival. The scale of the 'surrounding environment' should be selected based on the

expected extent, severity and duration of any impacts associated with the proposed activities, with consideration to local hydrodynamics. This relative area is referred to as the area of impact.

To establish the area of impact, the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZWQG, 2018) should be followed. Changes to the diversity, distribution and condition of values within the marine ecosystem are primarily driven by changes in physical environmental conditions. As a result, the area of impact should be determined by changes in water quality as an early indicator of detectable impact. ANZWQG (2018) suggests the use of 80th percentile (20th percentile for low stressors) as a mechanism for deriving local/site specific guideline values and should be used in defining the outer limits of the area of impact.

Once baseline conditions for each value have been established within the area of impact, proponents must robustly quantify and assess the anticipated impacts of proposed actions on the current state of these values.

In the context of this guidance:

- 'robust' data and analysis is defined as up-to date, spatially and temporally comprehensive, fit for purpose and of sound methodology
- 'marine' is it relates to 'marine ecosystems' encompasses all marine, estuarine and coastal environments in Northern Territory waters, as defined by the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000).

3.2.1. Knowledge gaps

Use the desktop searches to identify gaps in the knowledge of the distribution of marine biodiversity, particularly in areas where detailed studies have not been undertaken or reliable survey data is not available. The EIA documents for a referred proposal should clearly explain these knowledge gaps and address any gaps that are relevant to assessing potential significant impacts through marine surveys.

3.3. Field surveys

3.3.1. Survey personnel and preparation

Proponents should ensure that the person undertaking ecological surveys of the proposal area and preparing the reports has appropriate skills, qualifications and experience in marine ecological survey planning and in the identification and documentation of all the marine ecosystem values of interest, including knowledge of NT species and their habitat.

Proponents should engage an experienced specialist to deal with matters related to threatened marine species. Proponent EIA documents should identify the contribution of ecologists who undertook field studies and those that wrote the ecology sections of the document.

Proponents undertaking surveys should ensure they have the necessary survey equipment readily available, and that sufficient time has been allocated to identify and document all the marine ecosystem values that are likely to be encountered.

The person undertaking the survey must ensure that any necessary permits to take, interfere with or undertake scientific research on NT wildlife, and any site access authorisations, have been obtained prior to going the survey. Further information on wildlife permits is available on the Department of Lands Planning and Environment (DLPE) website: https://nt.gov.au/environment/animals/wildlife-permits

Appropriate biosecurity procedures may also need to be considered and implemented.

3.3.2. Survey area and effort

The survey area must be large enough to identify all the relevant marine ecological values that may be impacted by the proposal, and to provide some local context for those impacts. The survey area should include those areas where the proposal will be directly located, as well as surrounding areas that may be impacted and associated components such as access roads, tracks, vessel navigation routes, parking and material storage areas.

The proposal footprint will need to be well defined to accurately determine the extent of potential impacts, including during construction and operational phases. If the proposal footprint is not defined, further studies may be necessary to cover any areas omitted. For some types of proposals, the potential significant impacts to marine ecosystem values will extend beyond the proposal footprint. For example, pile driving can create significant underwater noise disturbance, and dredging, spoil disposal and marine infrastructure construction can result in sediment disturbance outside the proposal footprint.

In situations where the impact of the activity is likely to exceed the proposal 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 other marine ecosystem values that may be impacted. The area of impact should be robustly calculated by an experienced specialist based on the expected impacts of the proposal and local hydrodynamics. Correctly estimating the area of impact should therefore incorporate this 'buffer zone', and the survey area should account for this.

3.3.3. Survey timing and method

This guidance outlines a minimum recommended level of surveying. A preliminary assessment and characterisation of the site is used to assess the likelihood of marine species, benthic habitats and communities i.e. reefs, seagrass habitats, occurring in the area of interest and the potential for them to be impacted by the proposal. 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. Targeted species 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.

EPBC specific survey guidelines can be found here: https://www.dcceew.gov.au/environment/epbc/publications.

Please also refer to the National Guidelines for Survey of Cetaceans, Marine Turtles and the Dugong here https://www.dcceew.gov.au/environment/epbc/publications/national-guidelines-survey-cetaceans-marine-turtles-dugong.

3.3.4. Survey requirements

This section provides guidance on the minimum requirements for surveys. When surveying for marine ecosystem 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 marine ecosystem values as well as a full species list, including non-threatened species, threatened species and introduced species
- Any potential opportunities for avoiding or mitigating impacts to the extent known at the time of survey
- Potential offset sites/areas (if likely to be required)
- Any other information or data considered relevant.

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 the potential significant impacts.

3.3.5. Survey data

Marine biodiversity data compiled during the field surveys should be submitted in accordance with the NT EPA Biodiversity data guidance. The NT EPA strongly encourages proponents to share their biodiversity data as open datasets that can be accessed, shared and used without restriction, in line with its Biodiversity data policy.

3.3.6. Currency of surveys

Proponents are required to undertake surveys of the proposal site and any other areas that may be impacted, to determine the marine ecosystem values and inform the preparation of EIA documents. Marine ecological surveys are 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. After two years, the information provided may be out of date and new surveys may be required to enable the assessment of marine ecosystem values that may be present.

4. Benthic communities and habitats assessment

4.1. Objectives

The objectives of a benthic communities and habitat assessment are for the proponent to:

- establish the presence, extent and significance of benthic communities and habitats at and surrounding the proposal site
- predict and assess the potential impact and risk to benthic communities and habitats in relation to the proposed activities at and surrounding the proposal site
- propose appropriate methods to eliminate, mitigate or manage risks to benthic communities and habitats at and surrounding the proposal site.

4.2. Information requirements

4.2.1. Desktop assessment

An initial desktop assessment of known or predicted habitats, communities and local abiotic factors should guide the design, site selection and parameters for in-field ground truthing. The desktop assessment should be informed by modelling where available. Baseline information must be provided for the area that is predicted to be impacted by the proposal. Long-term background datasets provide the best baseline information as they give an indication of natural variation in environmental conditions (i.e. suspended solids, light, turbidity) over time. Proponents should collect at least 12 months of data to describe baseline conditions, and ideally 24 months of data to capture inter-annual variability. ANZWQG (2018) recommends minimum two years for physical and chemical stressors in water quality. The minimum length of baseline data should cover at least three consecutive neap-spring tides for the wet, dry and transitionary seasons (under natural environmental conditions).

If cyclonic activities occur during monitoring of baseline conditions, then three additional neap-spring tidal cycles should be monitored following the cyclone.

The variability captured throughout this period informs the natural tolerances and sensitivities of local benthic organisms. Regional and historic information is also useful for informing impact assessments and can assist in some instances, with reducing the extent of, or entirely the need for project specific collection of baseline information.

The scope of the baseline information required and the methods for collection and presentation depends on the environmental setting and the intensity and scale of the proposal. An important consideration that influences the scale of baseline studies is the influence of suspended sediments, particularly from activities involving dredging or seabed disturbance, which can have a range of influences on local biota some distance from the disturbance footprint. This is particularly important in the NT where the turbidity of marine habitats can be highly variable, with benthic communities in more turbid environments being dominated by more tolerant species.

Once sufficient baseline data has been obtained, the desktop assessment should either identify the area of impact and likely impacted biota to inform ground truthing sites or highlight data and knowledge gaps where in-field data collection is required to answer these questions.

4.2.2. Benthic communities and habitat mapping

Where an activity is presumed to have an impact on benthic communities and habitats, proponents are required to present an up-to-date benthic habitat map within the predicted area of impact at an appropriate resolution to provide confidence in habitat boundaries and inform the design and site selection for any ongoing monitoring program.

Spatial coverage of benthic habitat surveys and mapping should extend across the entire area of predicted impact and should be developed using predictive modelling where possible. This should be followed up by a qualitative and quantitative assessment of the extent to which collected data matches the predictive habitat maps[4], and an assessment of the accuracy of habitat boundaries. The scale at which

[4] Proponents of marine proposals in Darwin Harbour should refer to the most recent version of the predictive benthic habitat map for Darwin Harbour (Australian Institute of Marine Science (AIMS) (2024): Darwin Harbour Middle Arm Benthic Habitat Mapping. Australian Institute of Marine Science (AIMS) dataset. https://apps.aims.gov.au/metadata/view/3b7f11f5-bf57-4290-aa7f-681de1b24042

habitat maps are produced must be suitable to detect change in habitat coverage, composition and extent, in the event that the potential significant impacts from the proposal do occur.

Data contributing to habitat maps should be collected following a design and methodology that considers the seasonality, detectability and cryptic nature of many benthic groups and species. In general, data collection to identify an unknown benthic community or expected mixed community should be undertaken over the course of a year at minimum, to establish temporal variability of composition, cover and spatial extent (particularly with respect to seagrass and macroalgal communities).

Data should be collected via imagery from diver or diver-less epibenthic transect surveys, such as towed video (Towvid), slow towed video (Slowvid) or drop cameras. The National Benthic Habitat Classification Scheme (CATAMI) (Althaus et al., 2015) should be used to classify communities, with the modification that life form information be included to enable the assessment of risk relative to functional traits. Benthic habitat types may be broadly defined based on the abundance of dominant and sub-dominant functional groups. Knowledge developed through surveys should also inform the selection of local biota that may be suitable surrogates or indicators of impact in ongoing monitoring efforts.

Technical reports that describe how benthic habitat surveys and mapping were conducted and how maps were produced must be submitted as part of the EIA documentation. Reports should clearly state any assumptions, consider their implications, and describe methodologies including those employed in the field for surveys and in the office to interpret data and prepare spatial products. Spatial data associated with the benthic habitat maps should be supplied to the NT EPA in a suitable GIS compatible format (refer to NT EPA Biodiversity data policy and guidance).

4.2.3. Targeted surveys

Based on the results of initial desktop assessments or benthic habitat maps, it may be necessary in some cases to collect in-field, ground truthing data for a particular benthic community or habitat. Targeted surveys may be required to confirm the presence, absence or extent of a habitat or community within the predicted area of impact. Targeted surveys must consider the seasonality and detectability of the particular benthic community or habitat of interest and ensure site selection, time of year, and methodology for sampling are suitable to detect presence/absence, and changes in the extent or condition of the marine ecosystem value.

Proponents are advised to refer to specific resources for guidance on appropriate survey methods and considerations for impact assessment with respect to each key group, as outlined below.

4.2.3.1. Mangroves

In the NT, mangrove communities are considered to be a significant and/or sensitive vegetation type under the NT Planning Scheme. Clearing of mangroves cannot proceed without approval/consent

Mangrove communities are critical habitat for juvenile fish and invertebrates and protect the coast from storm surge, intercept pollutants, sequester carbon and largely contribute to nutrient cycling. They are an ecosystem that is sensitive to changes in salinity (water and sediment pore water), sediment chemistry (pH, sediment redox, oxygen availability within sediments), period of inundation and tidal currents.

With regards to development proposals, common risk factors for mangrove communities include coastal reclamation, coastal discharges (sewage, stormwater, thermal discharges and overland runoff) and changes to coastal geomorphology or hydrodynamics that may influence sediment transport, erosion and sedimentation. Any activity that may influence one or multiple of these factors, or other biological

interactions, such as the dispersal or predation of propagules and seedlings, must be considered with respect to mangrove community composition, biomass and structure within the area of impact.

Due to coastal conditions and varying sensitivity thresholds between species, mangrove communities are composed in zones that run parallel to the shoreline; the seaward, middle and landward zone. The seaward zone is dominated by species that have higher tolerances to increased salt concentration and tidal inundation, while more sensitive species dominate the middle and landward zones.

Activities that may alter the environmental conditions within a particular zone, such as saline discharge into a landward zone, have the potential to significantly impact the zonation, diversity and health of mangrove communities. Where a predicted area of direct or indirect impact encompasses a mangrove community that will likely be subject to altered environmental conditions, proponents are expected to identify the zonation and species assemblages to effectively assess the risk of predicted abiotic conditions against appropriate sensitivity thresholds.

Proponents are advised to first refer to the NT Open Data Portal for comprehensive mangrove community mapping data within Darwin Harbour (https://data.nt.gov.au/dataset/mangrove-extent-mapping-across-the-darwin-harbour-integrated-marine-monitoring-and-research-program) (Darwin Harbour Integrated Marine Monitoring and Research Program (DHIMMRP), 2024) and the broader NT (https://data.nt.gov.au/dataset/nt-mangroves--scale-100k) (NT DEPWS, 2021). Further surveys should be required where data is not available at a sufficient scale to determine project impacts, or if baseline monitoring requires an updated condition assessment.

Mangrove surveys generally require remote sensing using unmanned aerial vehicles to establish the spatial extent, photosynthetic vegetation cover, mangrove age and species composition or vegetation community. Proponents should refer to the Darwin Harbour Mangrove Monitoring Plan for methods used in Darwin Harbour to monitor and assess mangrove health and composition.[5]

Additionally, the mud in which mangroves grow often contains iron sulfides, causing acid sulfate soils when exposed to air through activities such as land clearing or excavation. The liberation of acid sulfate soils poses a risk to the health of fish, plants and other species within the proposal's area of impact. Where an activity is expected to disturb mangrove sediment, proponents must ensure appropriate acid sulfate soil testing, risk assessment to surrounding communities and management actions have been considered. Proponents should refer to the National Acid Sulfate Soils Guidance for advice on acid sulfate soil testing and management (Simpson et al., 2018).

4.2.3.2. Corals

Hard corals in the Northern Territory occur on subtidal rocky platforms and outcrops in areas of strong current, low sediment load, low turbidity and relatively high light levels. The habitat depth ranges from +1.5m LAT (lowest intertidal zone), where assemblages are subject to low tide exposure and freshwater runoff, to approximately 5-10m below LAT (subtidal), where light attenuation drives a gradual transition to soft coral and filter feeder dominated communities.

Activities that pose a risk to coral health and abundance in the Northern Territory include those that alter turbidity and light levels/penetration, suspended sediments, nutrient concentration and currents or hydrodynamic conditions. It is critical that proponents identify trigger values for keystone or dominant

[5] Lynch, Dominique and Northern Territory. Department of Environment Parks and Water Security. Land Assessment Branch, 2021. Development of an integrated long-term mangrove monitoring program for the IMMRP project area. Available at: https://hdl.handle.net/10070/851729

species within a community, relevant to the likely pressures associated with the proposal, to effectively assess the risk and likelihood of impacting coral communities within the area of impact.

When performing targeted assessments of coral communities, proponents must collect data at a resolution adequate to identify the species composition, abundance, life-form characteristics, spatial extent and exposure levels (seasonal, temporal and time duration variability). As corals are perennial, seasonality of occurrence is not a consideration for field surveys, however the assessment of critical abiotic conditions should take place over both the wet and dry seasons to establish natural variation in turbidity and light levels.

A survey of hard coral habitat must identify any keystone species and/or sensitive habitat for feeding, spawning, nesting, refuge or broader marine connectivity to assess vulnerability and risk relating to the proposal. Proponents must collect adequate data to assess risks to guilds (groups of species that exploit the same resources in a similar way (Precht, 1994)) and ecological functions in relation to the proposal. Surveys should record depth and time (to provide a reference to chart datum) and substrate type, exposure and orientation to prevailing swell waves (useful for habitat modelling). Observations of recognised bioindicators of coral health such as bleaching, deposited sediments and recent mortality should also be recorded where notable.

Proponents are advised to refer to the WA Technical Guidance - Environmental impact assessment of marine dredging proposals, Appendix C: Dredging-related environmental surveys, monitoring and management, for more technical details regarding field surveys for coral communities (Environmental Protection Authority WA, 2021).

4.2.3.3. Seagrass

Seagrass in the NT is seasonally and annually variable in its extent and biomass, peaking in abundance in the dry season around October. Four species are known to dominate the shallow, coastal environment on muddy-sandy substrates and occasionally rocky reef habitats, ranging from approximately +2m LAT to -1-4m LAT depending on the species, with some reports of *Halophila* as deep as -9.6m LAT. Shallow water meadows are often influenced by seasonal wind and wave action and are at higher risk of resuspension of sediments and excavation of shallow rhizome systems.

Seagrass cover and extent is dictated by light, depth, temperature, tide, currents, nutrients, salinity and species-specific sensitivity thresholds. Activities that have the potential to alter these functions are likely to impact on seagrass health and abundance within the area of predicted impact. When performing targeted assessments of seagrass communities, proponents must collect data at a time and resolution adequate to confirm presence/absence in the area, identify the species composition, abundance, spatial extent and temporal and spatial variability.

Proponents must identify the dominant species within the community, and the value of the habitat for feeding, refuge or broader marine connectivity. Evidence of dugong feeding scars should be recorded if observed, as a record of habitat utilisation and an aid in quantifying the value of the habitat relative to its surroundings. Due to high turbidity in NT waters, towed video or still cameras alone are often unreliable methods to detect seagrass. Grab samples should be taken to confirm presence/absence, identify the species and assess reproductive status. Proponents undertaking targeted seagrass surveys are advised to refer to the Seagrass Watch Rapid Assessment Manual (McKenzie, 2003) for technical details on timing and execution of seagrass surveys and mapping the extent and coverage.

Proponents are also advised to refer to the WA Technical Guidance - Environmental impact assessment of marine dredging proposals, Appendix C: Dredging-related environmental surveys, monitoring and management, for further details regarding field surveys for seagrass communities (Environmental Protection Authority WA, 2021).

4.2.3.4. Macroalgae

Macroalgae communities in the NT consist of turfing algae, red, green and brown-macroalgae and coralline algae. Species composition within a macroalgae community is highly seasonal, dominated by turfing algae in the 'build-up' season (October – December) and larger species in the dry season. Species composition in each community is also dictated by exposure duration at low tide, light availability, substrate characteristics such as sediment type and rugosity, and local hydrodynamic conditions. Macroalgae tend to occupy reef crests on hard substrate or rubble-covered pavement and can occur a few metres either side of the low water mark (0m LAT).

When performing targeted assessments of macroalgae communities, proponents must collect data at a time and resolution adequate to confirm presence/absence of each community type (turfing, red, green, brown or coralline), identify the composition, abundance, spatial extent and temporal and spatial variability. Proponents must identify the dominant community type, percent cover and density of community types, and the value of the habitat for feeding, refuge or broader marine connectivity.

Data must be sufficient to assess the potential for declining health of macroalgae habitats or loss of coverage due to changes in environmental conditions. Video imagery or photo-quadrats through drop-cameras, towed video or remotely operated vehicles are generally appropriate methods to obtain high quality data for larger macroalgae, however turfing algae may be difficult to detect with low visibility or high levels of sedimentation and may require grab sampling to accompany remote imagery.

4.2.3.5. Microalgae and microphytobenthos

It is important to recognise the roles and functional importance of subtidal/intertidal sandy seabed areas that support benthic microalgae or microphytobenthos (MPB, micro-algae which live amongst or on sediment particles). Although MPB communities are relatively inconspicuous and lack three-dimensional structure, they are significant contributors to overall benthic primary productivity and can provide habitat for marine fauna. In general, MPB communities have greater potential for recovery from disturbance (generally in the order of days to weeks) than macrobenthic communities dominated by e.g. sponges, hydroids, macrophytes or hard corals.

In view of these issues, proponents should describe the extent of impact of their proposal on sandy MPB-dominated habitat, however it is unlikely that impacts on these communities would be a significant consideration for most assessments unless they support high densities of marine invertebrate fauna or there has been significant permanent loss of MPB habitat.

4.2.3.6. Filter feeders

In the NT a filter feeder community may be made up of ascidians, bryozoans, sea pens, sea whips, soft corals, sponges and zoanthids. Species within this community may be found anywhere from the intertidal to subtidal zones, however most species require hard substrate, such as bedrock, platforms/terraces, hard banks and rocky outcrops for larval recruitment, with the exception of sea pens, some gorgonians and sponges which can settle on soft sediment. The interaction of sediment type and other abiotic factors such as exposure rate, light intensity, current, wave action and turbidity dictate the dominant species and the species assemblage within a filter feeder community.

When performing targeted assessments of filter feeder communities, proponents must collect data at a resolution adequate to identify the species composition, abundance, life-form characteristics, spatial extent and exposure levels (seasonal, temporal and time duration variability). In the Northern Territory, the dominant filter feeder community is the sponge-gorgonian community, termed 'sponge gardens', which includes sponges, sea fans and sea whips. This community is predominantly constrained by sedimentation, light availability, wave and flow exposure and reef steepness, and generally requires current-exposed but wave-protected habitats. Activities that have the potential to alter these conditions are likely to impact the health, abundance and diversity of sponge gardens within the predicted area of direct and indirect impact.

A survey of filter feeder communities must identify any keystone species and/or sensitive habitat for feeding, spawning, nesting, refuge or broader marine connectivity to assess vulnerability and risk relating to the proposal. Where an activity is likely to impact sedimentation levels, turbidity or suspended sediments, proponents are encouraged to pay particular attention to identifying any cup or phototrophic sponge species, as these species tend to be sediment-sensitive and can be used to inform adaptive management and/or compliance monitoring programs.

Species can generally be identified through hand-held or drop-cameras, towed video or remotely operated vehicles, however simple single beam echo sounders may also be used as a starting point to identify possible 'vegetated' areas for further investigation. This method allows proponents to broadly delineate filter feeder habitats and communities and target suitable locations for further quantitative surveys. Sea whips tend to be particularly conspicuous on echo traces, appearing as thin bent lines rising from the seabed.

Proponents are advised to refer to the WA Technical Guidance - Environmental impact assessment of marine dredging proposals, Appendix C: Dredging-related environmental surveys, monitoring and management, for more technical details regarding field surveys for sponge communities (Environmental Protection Authority WA, 2021).

4.2.4. What to submit to the NT EPA

After establishing the distribution of benthic communities and habitats within and surrounding the proposed development site through desktop assessment and targeted surveys, the following information should be provided in the initial referral:

- Details and maps of the survey area/s
- Information about the existing environment
- Maps detailing the extent of key habitats, also showing the extent of habitat that may be lost or degraded due to the proposed action
- Methodologies used for predictive habitat mapping where applicable
- Explanation of the survey methods chosen and why (e.g.: desktop, aerial and boat survey etc.)
- Survey results and discussion of results
- Details on survey effort and timing
- Discussion of detectability and statistical confidence in survey results

Once the spatial distribution of the benthic environment is established with robust data, proponents must assess the conservation significance of all benthic communities and habitats identified within the area of impact of the proposal.

4.3. Assessment of conservation significance

Assessment of the conservation significance of benthic communities and habitats should be based on:

- the functional role of the ecosystem
- the rarity of the habitat and supported species on a regional scale
- the condition of the ecosystem; size, extent and health

These data should be interpreted in the context of the broader region to determine the uniqueness and utility of the benthic community and habitat relative to the marine fauna they support and the ecosystem services they provide.

The precautionary principle should be used when interpreting the conservation significance of findings.

4.4. Assessment of impacts

4.4.1. Direct and indirect impacts

Direct impacts on benthic communities and habitats occur through direct interaction with an activity that leads to the damage or removal of the ecosystem. These impacts are often severe but tend to be localised and restricted to a single impact pathway.

Indirect impacts on benthic communities and habitats often result from alterations to the marine and coastal environment and can occur far from the development activity as a result of complex impact pathways. Indirect impacts commonly follow alterations to chemical and physical properties such as temperature, pH, sedimentation, suspended solids, hydrodynamic processes, and light availability in the water column. For example, activities that disturb the benthic environment, such as dredging, trawling or coastal construction, are likely to increase suspended sediment load in the water column and drive-up turbidity levels within the predicted area of direct and indirect impact.

This change in environmental conditions will reduce light penetration through the water column and indirectly impact the availability or intensity of light in the benthic environment. As a result, indirect impacts to photosynthetic benthic receptors may be observed, such as reduced health or density of primary producers such as seagrass, corals or macroalgae within the area of direct and indirect impact.

These impacts might be temporary, long-term or permanent in nature and occur at different project stages. Such actions that pose a threat to benthic communities and habitats include, but are not limited to:

- Alterations to turbidity, suspended sediments and light attenuation
- Disrupting the recruitment or breeding cycle of an important population
- Alterations to marine environmental quality (such as chemical run-off, organic waste or discharge) – outlined under Environmental factor: Marine environmental quality
- Alterations to coastal processes (such as changes to sediment transport pathways and sedimentation) – outlined under Environmental factor: Coastal processes

Proponents must consider the direct impacts of a proposal on the benthic habitats and communities, and the complex interactions that may lead to indirect impacts.

4.4.2. Cumulative impacts

In addition to direct and indirect impacts, cumulative impacts are the result of combined actions and pressures leading to exacerbated and often negative outcomes. They may be related to compounding occurrences of a single activity, multiple activities or interactions with other development activities and pressures.

A benthic community or habitat is likely experiencing cumulative impacts if it is situated within the area of impact of multiple development activities, in a popular locality for activities associated with recreational fisheries and boating or is made up of sensitive species with low tolerance to pressures associated with climate change, ocean warming and acidification.

The NT EPA will assess the potential impacts of proposed activities in the context of existing pressures on benthic communities and habitats.

5. Marine fauna impact assessment

5.1. Objectives

The objectives of a marine fauna impact assessment are for the proponent to:

- establish the presence, extent and significance of marine fauna values at and surrounding the proposed development site - this includes all populations and habitats for important species listed under the TPWC Act and/or EPBC Act as threatened or migratory
- predict and quantify the anticipated risk and significance of impact to marine fauna values in relation to the proposed activities within the area of impact
- propose appropriate methods to eliminate, mitigate or manage risks to marine values at and surrounding the proposed development site.

When establishing and assessing marine values at a site, it is critical to take an ecosystem approach and consider the relationship within, among and between species and their environment. While a threatened species may not be directly impacted by a proposal, the activity may alter coastal processes or impact on habitats so that the population of another trophic level is affected. This may alter a food source for a threatened species, introduce new competition to an environment or alter mutualistic relationships between species that may indirectly affect the threatened population. The ecosystem approach is a conceptual framework that should underpin the marine fauna assessment.

5.2. Information requirements

5.2.1. Desktop assessment

A thorough desktop assessment should be the first step to consolidate and review all information relating to marine fauna values for the proposed development site to identify data that is lacking or may require updating. This assessment should include a review of published scientific knowledge, government documents, grey literature and a review or analysis of appropriate datasets that are relevant to the region in which the proposal will occur. Data sets should include those made available to the public and those in Commonwealth and Territory fisheries reports and databases.

In some cases, a written request for data may be required and a discussion with specialists to ensure the most recent data is captured. Datasets should cover annual and seasonal variation and include, where possible, genetic boundaries between populations.

Proponents should be mindful of the limitations and assumptions of the information used, as well as the original scope for which the data were collected.

5.2.2. Spatial tools for establishing species distribution

Spatial data for establishing species distribution and the presence of threatened species can be sourced via the DLPE website (https://nt.gov.au/environment/animals/threatened-animals) including through the NR Maps NT mapping function (https://nrmaps.nt.gov.au/nrmaps.html). Detailed data for specific sites can be acquired by contacting datarequests.DLPE@nt.gov.au. Marine fauna information for threatened and migratory species may also be extracted through the NT government environment site (https://nt.gov.au/environment/environment-data-maps/environment-data) and through the Australian Government's online search tool for nationally protected matters.

5.2.3. Targeted surveys

Targeted surveys should aim to fill critical knowledge gaps regarding marine fauna values such as species presence/absence, and spatial and temporal patterns of habitat use and/or behaviour in the region of the proposed action. Many marine fauna species are naturally cryptic and require specialised survey methods.

Surveys should:

- be designed and conducted by a suitably qualified person(s) with demonstrated skill and experience in marine fauna surveys.
- ensure survey coverage is representative of the impact site, adjacent areas and all available habitat to marine fauna within the area.
- maximise the probability of detecting the target species through adequate survey design and effort.
- account for detectability, uncertainty and error.
- account for seasonal variability and prevailing weather conditions.
- account for repeatability, replication and survey effort.
- be consistent with published techniques.
- be conducted at least one year prior to commencement of proposed actions to provide adequate baseline data.

Where spatial and temporal habitat use is being monitored, surveys must be designed to identify important aggregations of, or sites for marine fauna, including:

- seasonal feeding/roosting areas of migratory species
- colonies of roosting species
- breeding colonies or subpopulations
- breeding areas for species with known highly specific breeding area requirements
- isolated and possibly spatially rare habitat resources important to marine fauna, or of importance to marine fauna at a time of year or life-cycle stage

Any occurrences of important aggregations or sites within or surrounding the area of direct and indirect impact are to be mapped and investigated to characterise the resources provided to marine fauna, and the marine fauna using those resources (seasonal or otherwise).

Additional methods may be required for assessment of species abundances. Sampling regimes to estimate species abundance should be designed based on behavioural patterns to ensure species are effectively observed and quantified. Proponents must demonstrate the adequacy of the sampling regime, with consideration to species behaviour and detectability, through reference to relevant literature, data and/or expert knowledge.

If the proposed development site is data-deficient, pre-referral surveys should be carried out; particularly in areas identified as Biologically Important Areas as defined by the Australian Government Conservation Values Atlas (https://www.dcceew.gov.au/environment/marine/bias). Information about surveys conducted (or justification for why surveys were not conducted) must be provided with a referral, when submitted.

5.2.4. What to submit to the NT EPA

The following information should be provided in the initial referral:

- details and maps of the survey area/s
- information about the existing environment
- any/all threatened or migratory species within the survey area/s
- maps detailing the extent of important or valuable habitat
- maps detailing the extent of habitat that may be impacted due to the proposed action
- detail and justification of survey methods
- survey results and discussion of results.

Once all relevant knowledge gaps are filled with robust data, proponents must assess the conservation significance of all marine fauna values identified within the area of impact of the proposal.

5.3. Assessment of conservation significance

Assessment of conservation significance of marine fauna should be based on the observed number of threatened / migratory species present, the regional significance of these records, and the size of the population of threatened species or aggregation of marine fauna. These data should be interpreted in the context of the broader region in which the proposal will occur, however, in many cases there will be limited information other than that observed at the site. Interpretation must use existing information from off-site, including supplementing with similar habitats outside the development area in order to develop a suitable comparative basis for the assessment of conservation significance. The precautionary principle will need to be used in interpreting the conservation significance of findings. The conservation significance of aggregations of, or sites for marine fauna can only be assessed based on:

- Ecology of marine fauna species involved (to be accessed from the scientific literature)
- Pattern of occurrence, abundance and importance to the species of those habitat features and in the marine ecosystem

The Australian Government has developed a hierarchy of habitat classes which may assist proponents and the NT EPA in assessing the significance of an action's impact for certain species, including:

- Marine turtles
- River sharks
- Seabirds
- Dugong
- Coastal dolphins

To identify whether a project is likely to impact on a population, the habitat hierarchy categorises ecosystems into 'Habitat critical to the survival of the species' and 'Biologically Important Areas'. Proponents are referred to the Australian Government website for comprehensive information on the habitat hierarchy criteria (http://www.environment.gov.au/marine/marine-species/bias#BIA_Species_tables).

Proponents should take a precautionary approach if they are unsure about whether the impacts of a proposed action may affect biologically important areas or habitat critical to the survival of marine fauna.

5.4. Assessment of impacts

5.4.1. Direct and indirect impacts

Direct impacts on marine fauna in the NT can include entrainment, vessel strike or entanglement. These impacts, while severe are relatively easy to monitor and measure. As such, they are amenable to adaptive management actions to avoid and minimise impacts.

Indirect impacts on marine fauna in the NT frequently include, but are not limited to:

- increasing levels of marine debris
- facilitating an increase in water vessel activity
- fragmenting a marine fauna population
- disrupting the breeding cycle of an important population
- facilitating the introduction or establishment of invasive species
- facilitating the introduction of disease leading to species decline
- alterations to marine environmental quality (such as chemical run-off or organic waste) – outlined under Environmental factor: Marine environmental quality
- alterations to coastal processes (such as changes to sediment transport pathways and sedimentation) – outlined under Environmental factor: Coastal processes

Some activities exert pressures that can have both direct and indirect impacts depending on the fauna within the area of direct and indirect impact. For example, underwater noise can cause direct mortality on fauna such as zooplankton and small fish, due to the intensity of sound pressure waves. Indirectly, underwater noise can also impact larger species by inducing avoidance behaviours and reducing prey availability.

One of the most significant indirect impacts to marine fauna is the removal or degradation of important habitat. A loss of habitat reduces food resources, thereby reducing survival and reproduction within a population. Depending on the species of marine fauna present within the area of impact, a single pressure may have various impacts, each of which must be addressed.

Proponents must consider both the direct impact of a proposal on the marine fauna and the complex interactions that may lead to indirect impacts.

5.4.2. Cumulative impacts

In the NT, interactions between pressures associated with commercial fishing, climate-related impacts, oil spills, pollution and multiple dredging campaigns have the potential to drive cumulative impacts to marine fauna.

The NT EPA will assess all proposed actions in the context of existing impacts to biological diversity and ecological integrity; therefore, proponents should consider all sources of interaction between pressures and the potential for cumulative impacts on marine fauna when assessing the impact of a proposal.

6. Assessment of the significance of impacts

Three key principles of environmentally sustainable development apply when assessing an action for its potential to have a significant impact on any value under the Environmental factor: Marine ecosystems, including benthic habitats and communities, and marine fauna:

- precautionary principle (section 19 of EP Act)
- principle of intergenerational and intragenerational equity (section 21 of EP Act)
- principle of conservation of biological diversity and ecological integrity (section 23 0f EP Act).

Proponents should refer to the EP Act to consider how these principles relate to their proposed action when determining if there is potential for significant impact.

For the purposes of an EIA under the Environmental factor: Marine ecosystems, the NT EPA considers an impact significant if it leads to:

- mortality or harm to individuals of an important (through cultural values, conservation status or ecological function) species or population
- reduction in populations of important species at a local or regional scale
- impacts to species or guilds that fulfil critical ecological functions within the ecosystem
- loss or impact to critical habitat, including habitats such as nesting beaches, nursery areas, specific foraging or breeding areas, and spawning or aggregation areas
- reduction in species diversity in an area, which may be due to factors such as migration or range contraction resulting from a decline in the quality of the local environment
- introduction and/or spread of invasive marine species or diseases
- alteration to habitat quality (condition, composition and extent) or species diversity in areas of conservation value, such as Indigenous Protected Areas (IPA's) or nationally protected matters.

The Australian Government has developed robust methodology to quantify the significance of impacts to marine and migratory shorebirds. Proponents are directed to EPBC Act Statement 3.2.1, *Significant Impact Criteria for Migratory Shorebirds* (EPBC Act policy statement 3.21 - Significant impact guidelines for 36 migratory shorebird species).

7. Avoidance and mitigation measures

As outlined in the EP Act, the preferred method for managing potential significant impacts to marine ecosystems is through avoidance. Where impacts to ecosystem values cannot be avoided, they should be mitigated through robust mitigation planning and/or adaptive management. Proponents should be aware of the environmental conditions that limit natural productivity, ecosystem structure, functioning and diversity within the area of impact for their proposal, and consider these factors when designing

management objectives so as not to alter sensitive processes. Management of ecosystem values should be bounded by spatial and temporal scales that are appropriate to the proposed development activities and objectives.

The proponent must provide sufficient detail for the NT EPA to assess the robustness of the proposed avoidance and mitigation measures. This should be provided for each potential significant impact to a marine ecosystem value. In many cases this will require establishing ecological thresholds for sensitive receptors. These thresholds ensure that ongoing management practices effectively protect sensitive receptors from proposal-related impacts and reduce exposure levels to within acceptable limits.

7.1. Establishing ecological thresholds

Ecological thresholds are quantitative critical values whereby once passed; there is a change in ecosystem quality, property or phenomenon from which natural recovery is extremely unlikely. Ecological thresholds vary across species and stressors, and at various spatial, temporal and functional scales. In order to develop accurate ecological thresholds, baseline information at the proposed development site must be collected across these scales to understand natural variability and resilience of ecosystems to major impacts.

Ecological thresholds should be investigated and established for important functional communities or species that will be placed at risk of the proposed development. These thresholds should be accompanied by conservative trigger values to indicate when impacts are nearing threshold limits and prompt response actions. Ecological thresholds, trigger values and response actions should be clearly developed for all major impact pathways that are likely to occur as a result of the proposal. Common parameters and receptors associated with development activities in the marine environment include:

- Turbidity in relation to functional groups of at-risk sensitive receptors (i.e. filter feeders, mangroves, etc.)
- Water quality (with respect to likely pollutants associated with the specific development activity, e.g. elevated nutrients for agricultural development) in relation to functional groups of at-risk sensitive receptors (i.e. corals, seagrass, macroalgae, infauna, fish, etc.)
- Sediment quality (with respect to toxicants including metals, metalloids, organometallics and organics)

Proponents must demonstrate that all anticipated stressors have been considered with respect to the appropriate receptors, and that receptor-specific thresholds have been established relative to the local environment, considering temporal and spatial variation. As per the ANZWQG, an activity that drives conditions to within the 80th percentile of long-term ambient conditions, is considered a detectable impact, and should be treated as a precautionary ecological threshold for any parameters where species or community-specific sensitivity thresholds cannot be established beyond localised natural variation.

Proponents must then outline how management and mitigation measures will ensure conservative compliance within threshold values.

8. Reporting

Proponents are required to submit the methodologies and findings of the Marine ecosystems environmental impact assessment to the NT EPA as an addendum chapter in the appendices of the broader EIA proposal, along with all spatial data used in the assessment in a suitable GIS compatible format.

With regards to the benthic communities and habitats value, proponents are expected to submit the predictive habitat map using geo-referenced GIS data in ESRI format following the below parameters:

- Coordinate System: GDA2020 (datum) and projected into the appropriate Map Grid of Australia (MGA) zone
- Format: Geopackage (.gpkg) or ESRI file Geodatabase format.
- Attribution: a description of each feature of the spatial data (i.e. points, lines or polygons) should be included in the attribute table of the spatial data
- where a series of activities are proposed, the area of impact of each activity should be individually mapped.

Refer to the NT EPA Biodiversity data policy and guidance for further information.

Proponents should include assessment of the relevant risks to predicted and ground-truthed communities and habitats, and any proposed mitigation measures, as outlined in this guidance.

For the marine fauna values, proponents are required to submit a list of TPWC and EPBC threatened and migratory species within the area of direct and indirect impact, and the proponent's assessment of relevant risks to these species, along with any mitigation measures to be adopted, as outlined in this guidance.

Overall, the Marine ecosystems EIA chapter must include a summary of the factors below for the NT EPA to effectively consider the risks of a proposal to marine ecosystem values:

- identification of the benthic communities, habitats, and marine fauna likely to be impacted by the proposal, including identification of critical habitat and ecological windows for affected species
- an assessment of the values and significance of the benthic communities, habitats, and marine fauna likely to be impacted at a relevant local, regional and NT scale
- identification of the threats and pressures on the benthic communities, habitats, and marine fauna from the proposal
- a description of how the 'Principles of environment protection and management' under Part 2 of the EP Act have been considered in proposal planning, design, and implementation
- quantification of the likely direct and indirect impacts to benthic communities, habitats, and marine fauna in terms of the extent, duration and severity, in order to predict the consequent impacts on the maintenance of biological diversity and ecological integrity of the broader ecosystem
- consideration of cumulative impacts in order to determine whether the proposal, in combination with other developments and environmental pressures, will significantly impact any benthic communities, habitats, or marine fauna and any consequent impacts to ecological integrity and/or biodiversity
- demonstration of how impacts to benthic communities, habitats, and marine fauna have been avoided, managed and mitigated; and whether environmental offsets can be provided for significant residual adverse impacts on the environment that cannot be avoided or mitigated
- detailed demonstration of the proposed monitoring strategy, including methods, metrics and assessment criteria to identify, manage and respond to any ongoing impacts to benthic communities, habitats and marine fauna.

9. References

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