



**Interim Report:  
Seabed Mining in the  
Northern Territory**

**November 2012**



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# Glossary of Abbreviated Terms

AAPA – Aboriginal Areas Protection Authority

CSIRO – Commonwealth Scientific and Industrial Research Organisation

DEWHA – Department of the Environment, Water, Heritage and the Arts

EEZ – Exclusive Economic Zone

EIA – Environmental Impact Assessment

EIAR – Environmental Impact Assessment Report

EIS – Environmental Impact Statement

EMP – Environmental Management Plan

EPA – Environment Protection Authority

EU – European Union

IMMS – International Marine Minerals Society

ISA – International Seabed Authority

IUCN – International Union for Conservation of Nature and Natural Resources (The World Conservation Union)

NIWAR – National Institute of Water and Atmospheric Research Ltd

RLRF – Regional Legislative and Regulatory Framework for Deep Sea Minerals Exploration and Exploitation in the Pacific

SMS – Seafloor Massive Sulphides

SOPAC – Secretariat of the Pacific Community's Applied Geoscience and Technology Division

SPC – Secretariat of the Pacific Community

The Area – The International Seabed Area, beyond national jurisdiction

UNCLOS – United Nations Convention on the Law of the Sea

# Executive Summary

In May 2012, the Environment Protection Authority (EPA) was requested by the then Minister for Natural Resources, Environment and Heritage to undertake a comprehensive assessment of seabed mining pursuant to section 5B of the *Environment Protection Authority Act*. The EPA was asked to address the actual or potential impacts of seabed mining activities on the Northern Territory (NT) environment and other resource industries, and methods for managing the impacts.

This referral followed the introduction, on 6 March 2012, of a moratorium on seabed mining for a period of three years. The moratorium precludes, within NT coastal waters, the granting of titles permitting exploration for minerals or mining and the issuing of authorisations permitting mining activities.

Work on the EPA's review of seabed mining commenced immediately. Subsequently, in August 2012 the newly elected NT Government announced that the present EPA would be replaced by a new NT EPA.

This report has been produced by the present EPA to inform future government decision-making and action on seabed mining. It summarises our current knowledge of seabed mining, associated impacts and management options, and includes recommendations for further work.

## Overall recommendation

Although the EPA's seabed mining review is incomplete, the preliminary analysis of relevant environmental and regulatory issues has produced useful findings. To date, there has been limited research into social, cultural and economic matters, but these will be important considerations in the development of NT-relevant management and regulatory frameworks.

It is recommended the seabed mining review be continued, given the:

- novel and technically innovative nature of seabed mining;
- limited seabed mining knowledge and experience presently available within the NT and nationally;
- many unknown problems likely to be encountered in securing sound environmental management and effective impact mitigation strategies;
- increasing public expectations that new developments will be both economically and environmentally sustainable;
- importance of identifying methods and processes for adequate protection of cultural heritage values;
- benefits and certainty that specific policies and regulatory frameworks will provide for government, industry and the wider community; and
- scope for better-informed natural resource management within NT coastal waters to deliver social, cultural, economic and environmental benefits.

Recommendations to support further review work are provided below, based on the EPA's work to date. While many of these recommendations can be addressed through desk-top analysis of relevant literature, some recommendations highlight issues that are likely to be best addressed through on-site studies undertaken by industry rather than government. Pilot projects may also be beneficial for determining specific conditions to be put in place for avoiding, remedying or mitigating negative effects, within an adaptive management framework.

### **Supporting recommendations**

It is recommended that:

1. Further desk-top analysis be done to examine a wider range of seabed mining and dredging examples, with different target minerals, mining/dredging technologies, in varying environmental, social, cultural and economic contexts. Particular attention should be paid to examples that deal with issues relevant to NT coastal waters.
2. Case histories be compiled of management, mitigation and rehabilitation plans developed and applied in similar contexts to those expected with sea bed mining in the NT, to assist in achieving world's leading practice.
3. Future desk-top analysis and possible on-site studies focus on improving understanding of sediment disturbance, mobilisation, transport and redistribution associated with seabed mining, and in particular, its impacts on marine flora and fauna, water quality and marine habitats. This work should also seek to understand the likely impacts of mining-related sediment processes as distinct from other ongoing natural and anthropogenic sediment processes, especially given the shallow coastal waters of the NT. This is essential for interpreting seabed mining impacts in their specific environmental context.
4. For NT waters likely to be targeted for seabed mining, work be done to identify marine organisms expected to be affected; species and ecosystems with special value to society; and species that may be threatened. For identified key species, currently available ecological, management and population information should be used to assess the likely impacts of seabed mining on their status in the short and long-term. Where there are significant gaps in knowledge, on-site studies may be required.
5. Appropriate "indicator" species be identified to measure the recovery of ecological function, and determine the size and composition of healthy successional biological communities. Such information may be important for establishing optimal spatial and temporal mining designs that increase rates of marine ecosystem recovery.
6. A working Geographic Information System (GIS) be developed for NT coastal waters to integrate relevant information across government agencies and to assist with future analysis of project-specific activities in the marine environment, including seabed mining, and assessment of cumulative impacts. Relevant information layers may include: proposed seabed mining areas; fisheries; key flora

and fauna species; biologically-significant habitats; sediment discharges; oil and gas exploration/production; geomorphic and physiochemical features; and cultural sites and values (where publically available). GIS development and maintenance could be undertaken through a partnership arrangement between NT Government and other organisations (e.g. universities, indigenous bodies, specialist research centres, industry) that hold relevant data and expertise.

7. Potential acoustic and lighting impacts associated with seabed exploration and mining be further evaluated, giving consideration to a range of marine mammals, reptiles, fish, seabirds and invertebrates that may be affected.
8. Consideration be given to the Environmental Impact Evaluation and Ranking System used for diamond mining offshore of Namibia and South Africa, to support assessment and classification of risks as part of environmental impact assessment in NT coastal waters.
9. The NT Government develop and implement a dedicated regulatory and legal framework for seabed mining, including clear requirements for the management of environmental, social and cultural issues associated with exploration and production activities, before the expansion of the industry in NT coastal waters.
10. The development of a dedicated regulatory and legal framework include consideration of the following:
  - environmental management principles for seabed mining activities established under the *United Nations Convention on the Law of the Sea 1982* (UNCLOS);
  - guidelines for best practice environmental management by the marine mining industry as established by the International Marine Minerals Society (IMMS) Code for Environmental Management of Marine Mining;
  - the template and guidelines provided for the development of seabed mining policy and legislation by the Regional Legislative and Regulatory Framework for Deep Sea Minerals Exploration and Exploitation in the Pacific (RLRF);
  - regulatory frameworks applying specifically to seabed mining already implemented by other national jurisdictions (e.g. New Zealand, European Union, United Kingdom); and
  - the legal framework for seabed mining in Australian waters established under the *Offshore Minerals Act 1994* (Cth).
11. Further work on a regulatory and legal framework for seabed mining include consultation with Commonwealth and State jurisdictions that have implemented complimentary legislation based upon the *Offshore Minerals Act 1994* (Cth) to determine the suitability of this framework for application in the NT.

12. Development of a regulatory and legal framework include requirements for the payment of a bond or security deposit for environmental risks associated with seabed mining activities. This includes the development of suitable methodologies for calculating the amount of bond that may be required to address potential impacts in NT coastal waters.

# Introduction

## Review Background

On 6 March 2012 the Northern Territory (NT) Government placed a moratorium on seabed mining. The moratorium was implemented through a policy statement and covers exploration and mining activities in all coastal waters of the NT (see Appendix 1). It specifically precludes, for a period of three years, the relevant Minister:

- granting titles permitting exploration for minerals or mining within NT coastal waters; and
- issuing authorisations permitting mining activities within NT coastal waters.

The moratorium was intended to provide time for a review of impacts of seabed mining on the environment and on other resource industries, and identification of ways of managing those impacts.

Seabed mining is a relatively novel and evolving industry worldwide, aimed at extending the ability to recover minerals from areas of the earth's crust that are under the ocean, and have until recently been considered technically unavailable. In comparison to land-based mining, seabed mining is relatively new, technically innovative, and constrained by:

- limited information on the actual or potential impacts on the marine environment, on other marine resource industries, and on methods for managing these impacts; and
- limited best practice standards, which need to be context-, mineral-, technology- and commodity-specific.

Within the NT, seabed mining has come to prominence because of proposals to exploit shallow (< 50 m) undersea deposits of manganese within NT coastal waters, for which there appear to be no precedents worldwide. The moratorium recognises the limited information, knowledge and experience available within the NT and elsewhere, and the public expectation that if seabed mining is permitted within NT coastal waters it will need to be conducted at all stages with:

- appropriate methodologies for the development, management and sustainability of the seabed mining industry; and
- appropriate and consistent conditions for mineral titles and authorisations, that address context-specific risks associated with seabed mining.

In May 2012 the NT Minister for Natural Resources, Environment and Heritage formally referred the issue of seabed mining to the present Environment Protection Authority (EPA) pursuant to section 5B of the *Environment Protection Authority Act*. The EPA was asked to undertake a comprehensive assessment of:

- the actual or potential impacts of seabed mining activities on the environment and other resource industries; and

- methods for managing the impacts.

Government also requested that the Aboriginal Areas Protection Authority (AAPA) undertake a review of:

- appropriate measures to ensure the avoidance of sacred sites and protection of sacred sites as a part of any exploration and/or mining of seabed mineral resources.

Work on the EPA's review of seabed mining commenced immediately, and progress was made in some areas of planning and investigation. Subsequently, the NT Government elected in August 2012 announced that the present EPA would be replaced by a new entity with broadened powers and enforcement capability. Draft legislation was introduced in the October 2012 sittings of the NT Parliament. The Government also indicated that the status of the seabed mining policy would be reviewed at a time to be determined.

The aim of the present report is to summarise findings to date, in anticipation of changes to environmental management in the NT, and to make available to government details of the work done by the present EPA.

# Review Progress

## Project Plan

The EPA Board approved a project plan for the seabed mining review, including Terms of Reference, on 28 June 2012.

The plan refines the referral aims provided by the Minister and clarifies the scope of the review, in particular, the issues to be addressed and outputs to be delivered (see Appendix 2).

## Terms of Reference

The present EPA's specific Terms of Reference to guide the review of seabed mining, including exploration, within NT coastal waters are:

1. Examine seabed mining history and technical practices proposed, adopted and applied both nationally and internationally;
2. Identify environmental, social and economic issues associated with seabed mining as currently practised or proposed nationally and internationally, and specifically, impacts that have occurred as a result of, or in association with, seabed mining;
3. Identify likely impacts on the environment and other resources, including resources supporting commercial and recreational fishing, subsistence harvest, tourism and energy operations;
4. Identify which approaches to seabed mining, based on current knowledge and experience, would be candidates for implementing environmental best practice;
5. Examine mitigation strategies that have or could be used to manage environmental and social impacts;
6. Analyse national and international regulatory frameworks and risk management models and make recommendations for NT regulatory frameworks and environmental assessment processes; and
7. Improve public awareness and understanding of environmental and social issues associated with seabed mining, including mitigation approaches.

## Activities

Since informed of the referral, the EPA Secretariat has:

- done a preliminary desk-top analysis of the definition and history of seabed mining, and environmental, regulatory, social and economic issues associated with it;

- held meetings with AAPA and the AAPA Board to discuss respective approaches to the seabed mining review, areas of common interest and opportunities for joint work;
- met with the Northern Land Council (NLC) to discuss remote community consultation;
- attended relevant events in the NT: Garma Key Forum (Gulkula, Dhupuma Plateau, 1–2 September 2012) and Mining the Territory conference (Darwin Convention Centre, 18–20 September 2012) (Appendix 3);
- attended the IUCN World Conservation Congress (Jeju, Republic of Korea, 6–15 September 2012), where seabed mining was the subject of debate (Appendices 3, 4 and 6); and
- considered resource allocation (human and financial) and budgeting for: external expertise requirements, public engagement, communications planning, and other events and site visits germane to the EPA’s mandate with seabed mining.

# Desktop Analysis

## Definition and History of Seabed Mining

### Seabed Mining – Definition

The seabed is drawing increasing attention for minerals exploration and mining, particularly as onshore resource deposits become more difficult and expensive to access (Tsamenyi 2007; Parr 2008; Rona 2008). In the 1970s the mineral potential of the seabed was widely discussed; the industry grew throughout the 1980s and then stalled in the 1990s (Cook 1974; Conwell 1976; Clark and Clark 1986; Littleboy and Boughen 2007). The stalling was largely due to questions about sea mineral rights, lack of cost-effective enabling technology, low market prices for minerals of interest, the existence of unexploited ore bodies on land that could be exploited with new technologies, uncertainty about environmental impacts, and the absence of a strong 'social licence to operate' in the seabed environment (Earney 2005; Littleboy and Boughen 2007; Rosenbaum 2011). Many of these factors and issues remain relevant or unresolved, but there is currently a resurgent interest in seabed mining, and several companies and countries are pursuing dedicated research and programs of technological innovation (Tsamenyi 2007; Anon. 2010; Van Dover 2011).

Sea-based minerals extraction is variously referred to as seabed mining, seafloor mining, marine mining, deep sea mining, shallow-water mining, mid-water mining and deep-water mining. The different names reflect a spectrum of activities that differ in terms of the types of minerals being mined, how they are mined, and the depth or geographic location at which mining is undertaken. This report will use the phrase "seabed mining" to refer to all ocean-based mining activities, including the intertidal zone, and in particular, potential future mining activities in NT coastal waters.

"Seabed mining" is defined as the commercial recovery of minerals at the surface of or below the seabed (Conwell 1976). We extend this definition by adding "or in the intertidal zone", which is an important consideration for the NT. "Minerals" are defined as naturally occurring substances with a definite chemical composition and crystal structure (Rona 2002). This latter definition does not cover energy resources such as oil, gas and gas hydrates.

### Geological Regions

Two broad geological regions of the seabed are being targeted for minerals (Figure 1, Appendix 7) (Rona 2002, 2008; Earney 2005; Atmanand 2011):

1. continental margins – including the continental shelf (water depths less than 200 m), continental slope (water depths between 200 m and 1400 m) and continental rise (water depths between 1400 and 3200 m); and
2. the deep sea – including ocean basins and mid-oceanic ridges. According to Earney (2005) the deep seabed occurs at depths below 4000 m, although other literature (e.g. Rona 2008; Rosenbaum 2011) refers to “deep sea” minerals occurring at depths of 1000 m and below.

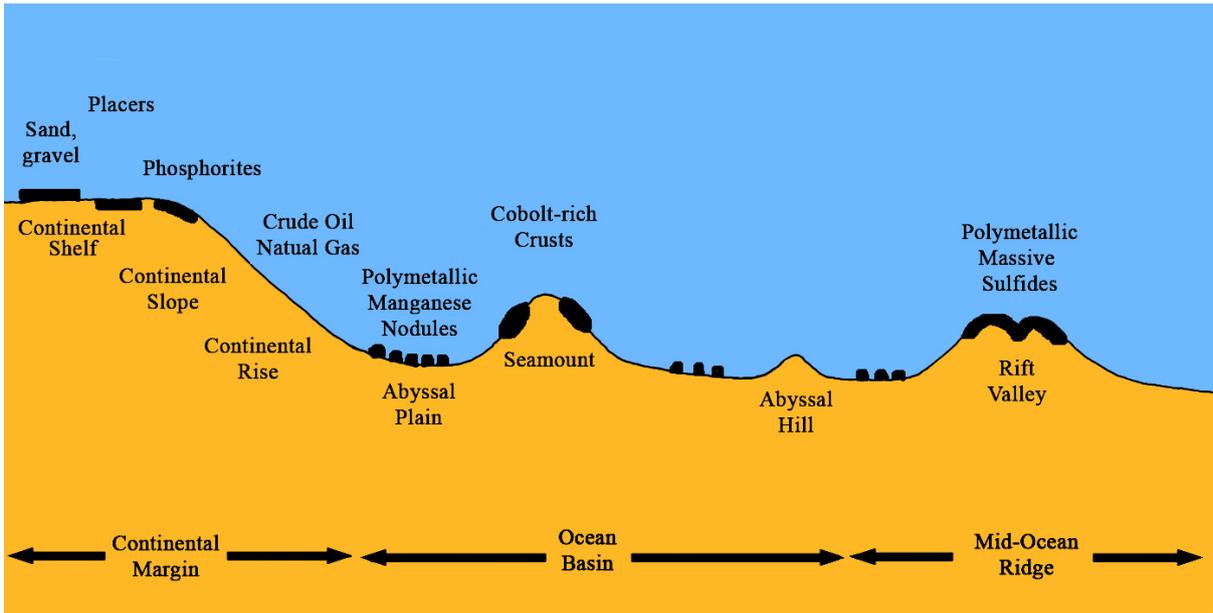
The water depths indicated above and in Appendix 7 provide a general guide only. Seabed topography is a mosaic of mountains, canyons, escarpments and plains and does not necessarily deepen gradually with distance from continents (Earney 2005).

In the context of potential seabed mining in NT coastal waters, the most likely industry focus will be on minerals occurring on the continental shelf at depths  $\leq 50$  m (described below). Despite this focus, an overview of seabed minerals at all ocean depths is provided, to promote understanding of the different types of resources that will potentially be targeted in future years.

## Origin and Development of Seabed Minerals

Prior to the 1960s the ocean was viewed as a passive container that received materials eroded from land, and these materials were seen to comprise seabed minerals. The emergence of plate tectonics theory in the 1960s and 1970s advanced global knowledge of seabed mineral development. It gave rise to the understanding that the ocean is not just a passive sink but also an active source of mineralisation that occurs due to tectonic and magmatic processes at plate boundaries. These processes produce an exchange of heat and chemicals among the earth’s mantle, crust and oceans, and this leads to the concentration of minerals and formation of different types of mineral deposits (Rona 2002, 2008).

It is now recognised that seabed minerals can be derived from: 1) an extension of onshore mineralisation; 2) terrestrial materials that are carried into the ocean in particulate or dissolved form; 3) materials existing in ocean basins; or 4) a combination of terrestrial and ocean basin materials (Rona 2002; UNDOALOS and ISA 2004; Rona 2008). The main types of seabed minerals and their general geological settings (i.e. continental margin, deep sea) are identified in Appendix 7.



**Figure 1: Basic representation of the different types of seabed minerals and the geomorphological settings in which they often, but not exclusively, occur (not to scale). Source: adapted from Atmanand (2011)**

## Seabed Mining Exploration and Production to Date

Seabed mining has occurred for over a century. Development of seabed mineral deposits has been selective to date, with most commercial activities focusing on the recovery of sand, gravel, diamonds, tin and gold on continental shelves. Mining of coal from beneath the sea through land-based tunnels also occurs (UNDOALOS and ISA 2004; Earney 2005; Rona 2008).

Due to the difficulty and expense of seabed mining, its feasibility will ultimately depend on the discovery of minerals with a high value per unit weight or volume that can be recovered at reasonable cost. Deep sea resources such as massive sulfide deposits, manganese nodules and cobalt-rich crusts are regarded as future mineral sources. It has been suggested that the mining of these deep sea minerals is now technologically within reach, and will be realised through increased scientific interest and investment (Rona 2008).

Appendix 8 provides a snapshot of seabed mining activities that have occurred in various locations around the world, including mining techniques and technologies used or proposed.

### Australian Overview

Seabed mining is a relatively small industry in Australia, and known and potential seabed mineral resources are poorly identified, particularly in comparison with onshore mining (Boughen *et al.* 2010; McKay *et al.* 2005). An Australian Offshore Mineral Locations Map was released by CSIRO and Geoscience Australia in 2006, drawing on information from exploration activities by private companies and reconnaissance surveys undertaken by the Australian Commonwealth and State government geoscience agencies (Figure 2) (Geoscience Australia 2012a).

The map shows continental margin resources (e.g. sands, tin, diamonds and phosphorites), extensions of onshore mineralisation (e.g. bauxite, coal, iron ore, manganese), and deep sea minerals (e.g. manganese nodules and crusts). While it does not identify any seabed mineral prospects for the NT, an associated Offshore Minerals Fact Sheet mentions that manganese is likely to exist off Groote Eylandt (Geoscience Australia 2012b) and offshore exploration for tin and tantalum has been undertaken in Bynoe Harbour, although no economic deposits for the latter minerals were found (Johns 2008). The potential for diamonds in the Gulf of Carpentaria, especially at the McArthur River mouth and in the Limmen Bight area, has also been raised (McKay *et al.* 2005).

To date, seabed mining in Australia has primarily focused on shellsand dredging for cement manufacture off Cockburn, south of Fremantle, Western Australia; sand dredging for construction in Moreton Bay, Queensland; sand dredging for beach

replenishment at the Gold Coast, Queensland and Hallett Cove, South Australia; and iron ore recovery from offshore Cockatoo Island, west Kimberley region, Western Australia (Hegge *et al.* 2005; McKay *et al.* 2005).

Community concerns about the impacts of seabed mining have and will continue to influence the development of the industry (Mason *et al.* 2010). For example, the Cockburn shellsand mining operation was relocated due to concerns about impacts on seagrass within the area (McKay *et al.* 2005). Negative community sentiment and lack of government support was implicated in the rejection of sand and gravel mining applications submitted in NSW in 2000 and 2003 (Hudson 2005; Johns 2008; Yeats 2012).

CSIRO is taking a strong interest in seabed mining, from social science and geological perspectives. A recent CSIRO report (Boughen *et al.* 2010) concluded that if seabed exploration and mining is to expand in Australia, building trust in the community will need to be part of the process. They suggest it will require dissemination of the latest science about marine environments, open distribution of information about potential impacts, regulatory systems with integrity and independence, and the provision of a comprehensive and realistic assessment of the costs and benefits.



## International Overview

Many nations are now showing an interest in seabed mining, or have an established interest (Appendix 8), including Brazil, Canada, Chile, China, Cook Islands, Denmark, Federated States of Micronesia, Fiji, Finland, France, Germany, Iceland, Indonesia, Japan, Kiribati, Korea, Malaysia, Marshall Islands, Mexico, Namibia, Nauru, New Zealand, the Netherlands, Niue, Norway, Palau, Papua New Guinea, Peru, Russia, Samoa, the Solomon Islands, South Africa, Thailand, Timor-Leste, Tonga, Tuvalu, the United Kingdom, the USA and Vanuatu (Conwell 1976; Rona 2002; Earney 2005; Littleboy and Boughen 2007; Tsamenyi 2007; Rosenbaum 2011; Commonwealth Business Council 2012; Secretariat of the Pacific Community 2012). For small island developing states with limited economic onshore mineral resources, the potential to develop seabed mineral deposits across their relatively large areas of ocean territory is an attractive option (Commonwealth Business Council 2012; Secretariat of the Pacific Community 2012).

Worldwide, a major seabed mining focus to date has been sand and gravel (aggregates) extraction for roads, other infrastructure and beach replenishment (Yeats 2012). This activity has been driven by the need for cost-effective sources of aggregate material close to urban centres, especially as onshore and river aggregate deposits become depleted (Johns 2010). Sand and gravel mining is an established industry in Canada, Denmark, Japan, the Netherlands, the United Kingdom, and the USA, with technology permitting mining at depths of up to 40 m (Earney 2005; Johns 2010). It is a particularly well-organised, highly regulated and intensely monitored activity throughout the European Union (Johns 2010, Yeats 2012). The techniques, knowledge and experience from sand and gravel mining activities can inform other types of seabed mining (Littleboy and Boughen 2007).

Metallic minerals successfully recovered commercially by seabed mining include gold, platinum and barite from offshore areas of Alaska, sulfur from the Gulf of Mexico and tin offshore of Thailand, Malaysia, and Indonesia (Conwell 1976; Rona 2002; Earney 2005). Diamond mining has been a successful commercial seabed mining operation offshore of South Africa and Namibia since the early 1960s (Earney 2005; Penney *et al.* 2008).

Currently, there are no commercial deep sea mining operations. However, preliminary environmental impact and engineering studies have been undertaken for mining deep sea manganese nodules, cobalt-rich ferromanganese crusts and seafloor massive sulfides (e.g. Solwara 1 project, Papua New Guinea) (Rosenbaum 2011). Future mining awaits further studies and favourable market conditions (Rona 2008).

Deep sea waters off New Zealand are thought to contain highly prospective seafloor massive sulfides and cobalt-rich crusts (Littleboy and Boughen 2007), while exploration work and feasibility studies are assessing the potential for mining iron ore

(Trans-Tasman Resources Ltd 2012) and rock phosphate nodules (Chatham Rock Phosphate Ltd 2012) on New Zealand's continental shelf. New Zealand has similar legal and management systems to Australia, and attributes importance to social and cultural interests and values, including Indigenous, in resource use (Littleboy and Boughen 2007). New Zealand's approach to seabed mining may serve as a useful reference point for the NT.

Namibia is another potential reference country, where an Environmental Impact Assessment Report and an Environmental Management Plan were submitted in March 2012 for the Sandpiper Phosphate Project, which proposes to dredge phosphate enriched sediments off Walvis Bay, Namibia, at depths of 180-300 m (Midgley and Associates *et al.* 2012).

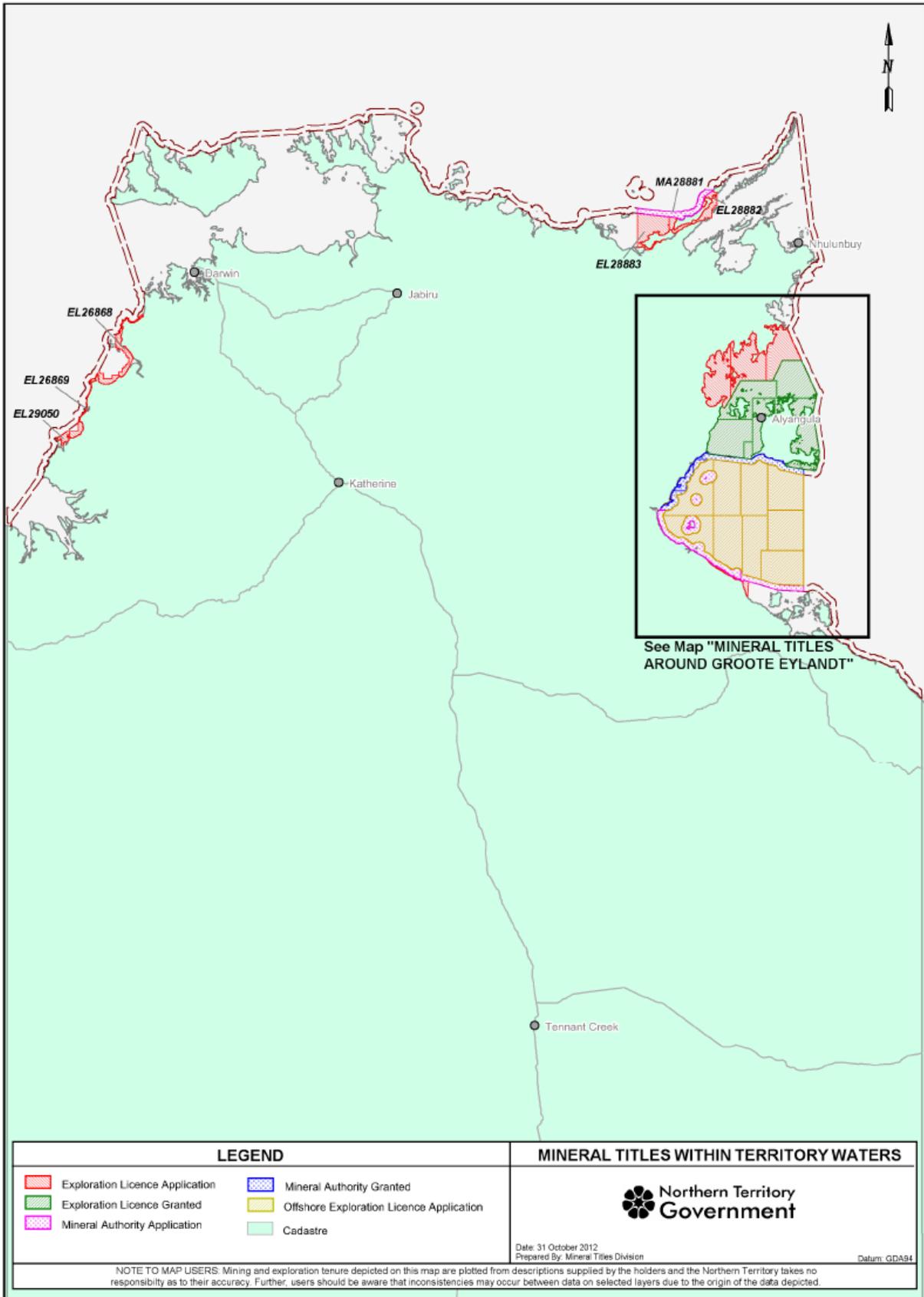
## Seabed Mining – Northern Territory Context

NT coastal waters lie within Australia's North Marine Region, which covers Territory/State and Commonwealth waters from the western side of Cape York to the NT–Western Australian border. Ninety seven percent of this 715 000 km<sup>2</sup> region lies over the continental shelf at depths of less than 200 m, and comprises the shallowest ocean waters in Australia (DEWHA 2007).

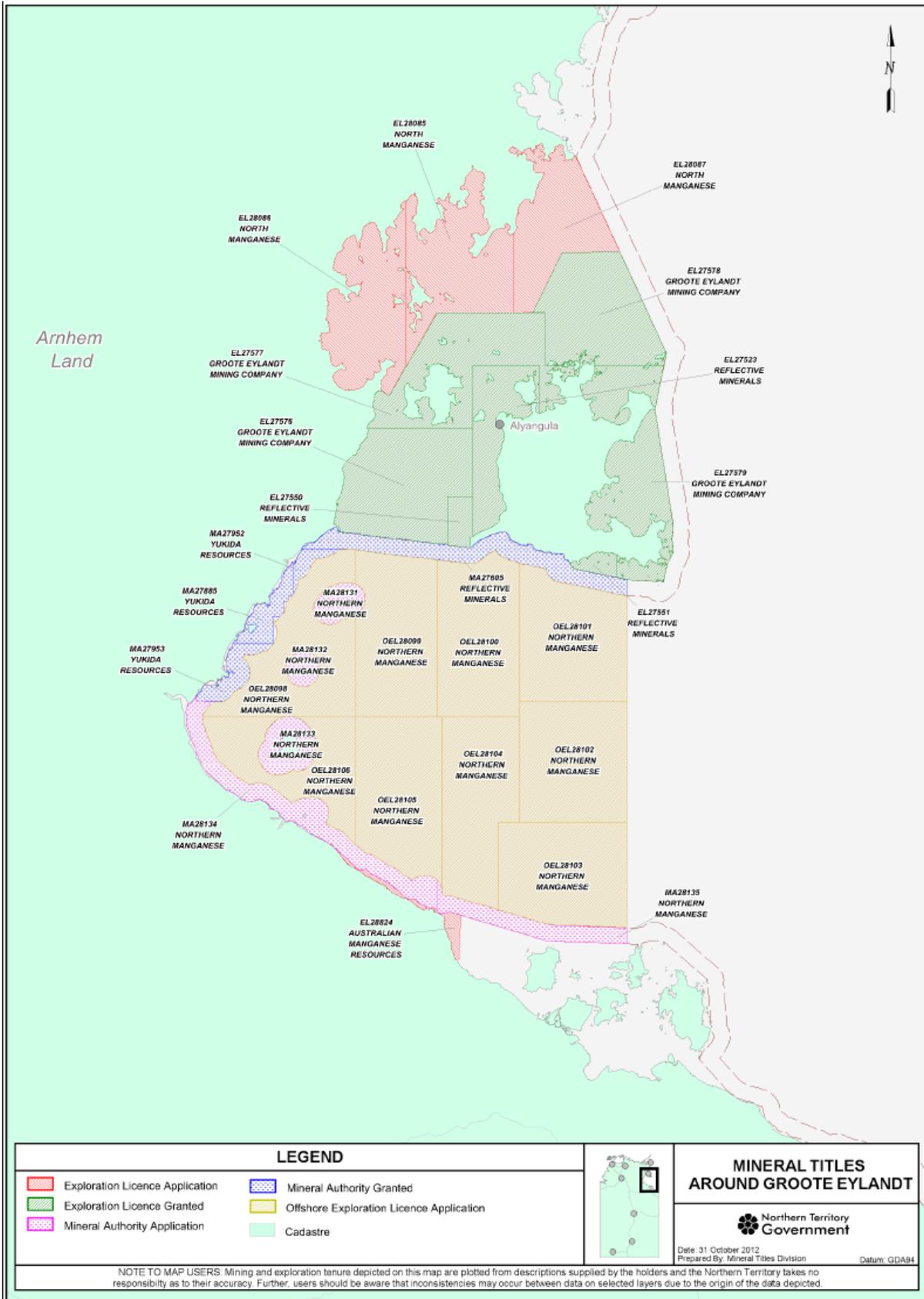
In NT coastal waters, specifically, the continental shelf depth is generally  $\leq 50$  m (Harris *et al.* 2005). Any future seabed mining in NT coastal waters will thus occur in relatively shallow zones, and involve minerals of the continental margin rather than deep sea deposits. Likely mineral targets include manganese and diamonds (Geoscience Australia 2012b; Northern Manganese Ltd 2012).

There are some specific NT projects expecting guidance on seabed mining. Prior to the seabed mining moratorium several companies had submitted applications for exploration licences and mineral authorities, within both NT coastal and adjacent Commonwealth waters (Figures 3 and 4, Appendices 9 and 10). Northern Manganese Ltd, for example, had obtained NT and Commonwealth Government approvals to commence acoustic surveys, and had completed some preliminary bathymetric, hydrodynamic and seabed habitat survey work, pre-moratorium (L. Jones, pers. comm., 16 Apr 2012). Extensive exploration work is yet to be undertaken by any company to determine whether seabed mineral prospects offshore of the NT will be economically and technologically feasible to extract.

If seabed minerals such as manganese are targeted, it is likely that mining will occur over extensive areas using dredging technologies (L. Jones, pers. comm., 16 Apr 2012). To begin to understand potential environmental impacts and determine appropriate management and regulatory frameworks, it will be helpful to review activities such as seabed sand and gravel mining, phosphate mining (especially offshore of Namibia) and harbour/port dredging, which also occur mostly in shallow waters (examples provided below).



**Figure 3: Mineral titles within NT waters. Source: Department of Mines and Energy, 31<sup>st</sup> October 2012**



**Figure 4: Targeted exploration areas in the western Gulf of Carpentaria, including around Groote Eylandt. Source: Department of Mines and Energy, 31<sup>st</sup> October 2012**

## Environmental Issues

A large number of studies and reports, with information potentially relevant to the environmental impacts of seabed mining, have been compiled by the EPA. Much of this literature is yet to be reviewed, so this section highlights:

- the most probable environmental impacts identified to date;
- considerations for environmental impact assessments;
- examples of mitigation methods; and
- case studies and references relevant to environmental impacts of seabed mining in the NT marine environment.

### Environmental Impacts Identified to Date

Continental Shelf Associates Inc. (1993), Penney and Smith (2004), Penney *et al.* (2008) and the National Institute of Water and Atmospheric Research Ltd. (NIWAR) (2012) have analysed and synthesised information from a range of sources on the environmental effects of seabed mining. Key points from their reports are summarised below.

Seabed mining can result in direct or primary effects, including:

- removal of the mined material, along with seabed sediments and their associated benthic organisms<sup>1</sup>;
- introduction of new materials to the marine environment, such as processing wastes, tailings and discharges; or energy in the form of heat, light or seismic and acoustic waves; and
- seabed perturbation or mixing.

Alteration of existing physical, chemical or biological equilibria, subsequent to or in association with seabed mining, can potentially cause a wide range of environmental problems, including changes in:

- wave dynamics and the pattern and direction of currents, affecting rates of beach erosion or sediment deposition, thereby altering parts of the coastline;
- the amount of particulates present in the water column, limiting light and generating siltation that may affect benthic plants and animals;
- the presence and/or levels of nutrients, trace elements and toxic substances, affecting water quality, which in turn can alter the population dynamics and behaviour of benthic fauna and flora;
- ecological relationships, such as predator-prey relationships, species abundance and diversity, food webs and community and ecosystem structures; and
- the productivity of marine habitats and thus, their quality and availability for specific purposes.

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<sup>1</sup> “Benthic organisms” are the plants and animals living on the seabed or within seabed sediments.

Sediment disturbance, mobilisation, transport and redistribution are perhaps the major issues of concern, particularly in the short-term. In the context of diamond mining offshore of Namibia and South Africa, the most damaging activities associated with dredging and mining are linked to seabed excavation and overspill, and the dumping of dredge spoil (Penney and Smith 2004; Penney *et al.* 2008). In the short-term these activities cause smothering of benthic organisms, oxygen-depletion of near-bottom waters, habitat alteration (e.g. through deposition of sediments that have different size distributions to the receiving sediments), and reduced light penetration throughout the water column. They increase mortality rates among benthic organisms, change benthic community structure, and adversely affect the photosynthetic capability of phytoplankton and other aquatic plants.

Penney *et al.* (2008) examined data associated with offshore aggregate dredging and experimental deep sea mining, which left behind trenches 20-30 cm deep. They found these activities resulted in an initial 25-70% reduction in benthic species diversity and a 45-95% reduction in the abundance of benthic fauna.

In the case of diamond mining where both the overburden and underlying ore body are removed from the seabed, it is assumed that 100% of the benthic fauna in the path of the mining tool will be lost (Penney *et al.* 2008). The loss of benthic organisms can mean that food availability is reduced for benthic predators, and mining impacts can resonate throughout the food chain, especially locally and in the short-term.

The recovery of benthic communities is dependent on natural processes, and rates of recovery can be influenced by a multitude of factors (Penney and Smith 2004; Penney *et al.* 2008), some of which may be:

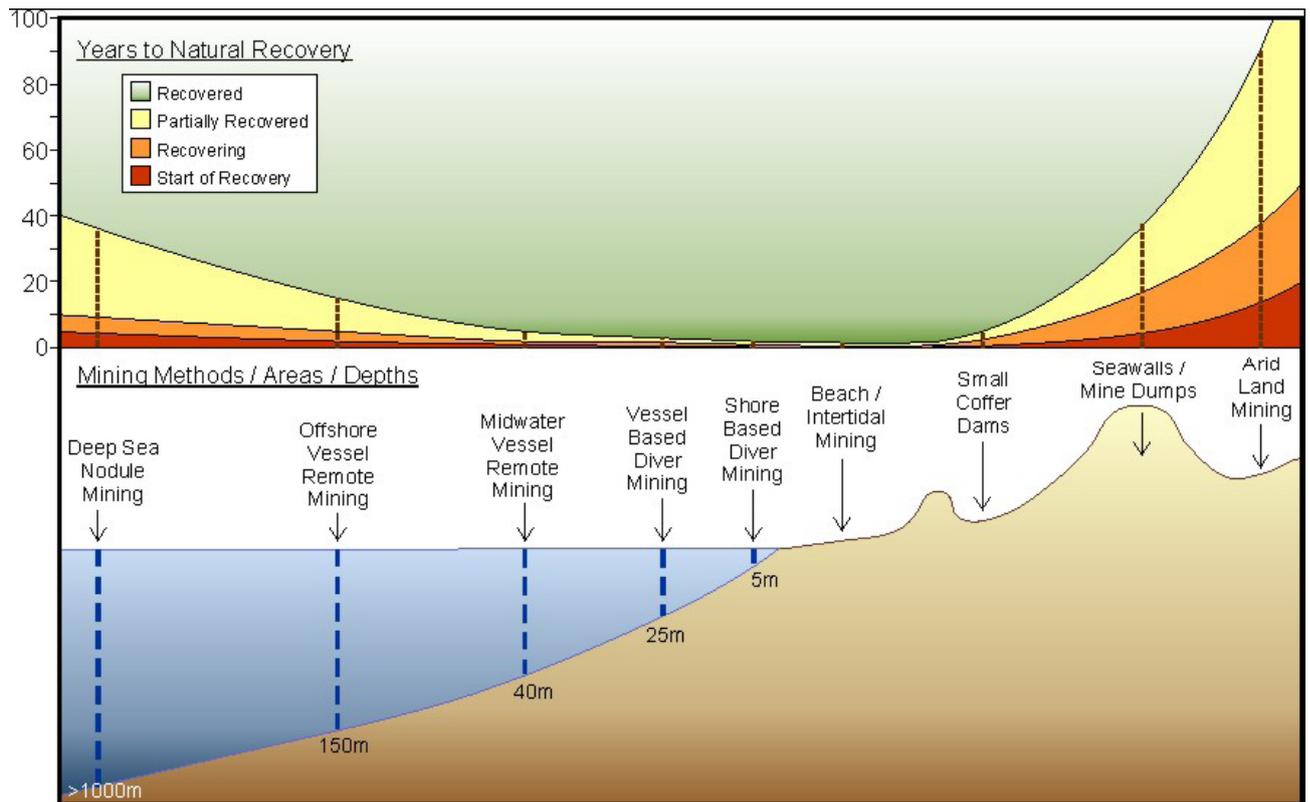
- surface area impacted;
- mining or dredging technology used;
- mining/dredging intensity and strategy, for example, whether undisturbed intervening hummocks of sediment are left between dredged furrows;
- type of communities that existed before mining;
- extent to which the affected communities are adapted to high levels of natural disturbance;
- immigration distance of stocks of potential recolonising species from unmined areas;
- sediment character (particularly grain size) and mobility;
- amount of sediment remaining in the impacted area; and
- local hydrodynamic conditions, including the depth and degree of natural re-mobilisation of fine sediments by seabed currents and swell turbulence.

Based on an extensive review of dredging and offshore mining studies, Penney *et al.* (2008) found benthic recovery to be most rapid (< 2 years) in the intertidal and shallow subtidal zone (around 5 m depth), where fine-grained sandy sediments are affected by high wave action and strong current effects that allow removed or disturbed sediments to be rapidly replaced, redistributed and restratified. Penney *et al.* (2008) noted recovery to be slower in coarse gravel-type sediments and slowest in deep-sea areas, where it takes approximately 40 years for substantial recovery (Figure 5, Appendix 11).

Penney *et al.* (2008) also found natural benthic recovery rates, following cessation of seabed mining in Namibia, to be substantially faster than recovery of vegetation communities following cessation of land-based mining (Figure 5, Appendix 11). They illustrated this point by comparison with the arid Namibian desert where natural recovery processes are extremely slow, potentially taking decades before vegetation communities show significant signs of recovery, with some impacts still obvious after a century or more. In contrast, the turbulent, high-energy nearshore marine environment, with its benthic components well-adapted and robust to high levels of natural disturbance, supports much faster recovery processes.

In some cases, a markedly different benthic community may recolonise the disturbed seabed area following the cessation of mining or dredging, particularly if sediment characteristics have been altered. Sand extraction, for example, can result in reduced sediment depths or exposure of different seabed sediments that support a different benthic community structure (Penney *et al.* 2008).

Consideration needs to be given to differing recovery rates between different biological components of the marine environment. For example, nearshore benthic recovery rates may be relatively rapid (Penney *et al.* 2008) but recovery times for seagrass beds may be relatively slow (D. Parry, pers. comm., 29 Oct 2012). Differing recovery rates will need to be factored into seabed mining impact mitigation and rehabilitation programs.



**Figure 5: Curves reflecting maximum known rates of recovery following mining/dredging disturbance in marine and coastal areas. Actual recovery rates will depend on specific local circumstances and methods used during individual operations. Source: Penney *et al.* (2008)**

Seabed mining introduces additional anthropogenic noise and vibrations to the marine environment, which are increasingly being identified as problematic for some marine fauna, especially mammals (NIWAR 2012), but also animals like squid (André *et al.* 2011). Potential difficulties include (Firestone and Jarvis 2007; Tyack 2008; André *et al.* 2011; NIWAR 2012):

- disturbance of normal behaviour and displacement from noise source areas; or “freezing” and staying in the one place, thereby increasing the risk of direct injury;
- restricted detection of natural sounds (auditory “masking”);
- temporary or permanent reductions in hearing sensitivity; and
- morbidity or death.

Additional lighting introduced to the marine environment, particularly if it remains for several years, as opposed to transient lighting, may also disturb the behaviour of some marine fauna. The NIWAR (2012) has highlighted that platform lights on seabed mining vessels could disturb and attract seabirds, and cause collisions with the vessels, resulting in injury or death. In an independent review of the Environmental Impact Statement prepared for Nautilus Minerals’ Solwara 1 deep sea mining project, Steiner (2009) has speculated on the potential impacts of subsurface lighting and recommended consideration be given to using a different spectra of

lighting and positioning lighting away from the vicinity of the cutter-suction head, to reduce the risk of attracting and/or disorienting marine fauna, which may result in entanglement.

## Considerations for Environmental Impact Assessments

Continental Shelf Associates Inc. (1993), Penney and Smith (2004), Littleboy and Boughen (2007) and Penney *et al.* (2008) have all highlighted areas that should be considered in environmental impact analyses of seabed mining activities. Penney and Smith (2004) and Penney *et al.* (2008) also consider the cumulative effects of seabed diamond mining activities in the Benguela region, offshore of Namibia and South Africa. Key points related to different impact assessment themes are outlined below.

### Impact Uncertainty, Perception of Risk and Public Confidence

Uncertainty surrounds the environmental impacts of seabed mining, and consequently, the perception of acceptable risk is variable amongst stakeholders and tends to reflect their underlying value systems, or experiences with and observations of mining on land.

A sound and objective basis for the community to assess proposals, and weigh possible costs and benefits, needs to be derived. This requires clear protocols for proponents to follow, including a clear indication of what is expected of them, when making submissions to explore or mine. Certainty of process is as important as certainty of evaluation. A reliable analysis of the known or possible environmental impacts of seabed mining needs to take into account a wide range of commodity-, site- and technology-specific information. Biological issues, in particular, span all three focal points and lie at the heart of most environmental concerns. Meaningful impact prediction and management will require guidelines for assessing the significance or otherwise of the many biological effects of any significant development.

To help build public confidence in seabed mining assessment, it will be important to comprehensively analyse the known and possible environmental impacts of an operation across atmospheric, oceanic/aquatic, terrestrial, geological, biological, socio-economic and cultural dimensions. It will also be important to assess the full range of operational methods and technologies proposed, the associated infrastructure requirements, and the processes that will be undertaken when new and innovative technologies are derived and it is proposed to implement them. Some of the basic areas that will need to be covered in environmental impact assessment are:

- Mining techniques – scraping, excavation, tunnelling, fluidizing (i.e. extracting the mineral through a bore hole or other conduit as a fluid)
- Ore processing – land and/or sea-based
- Waste disposal – onshore and/or offshore
- Product transportation – onshore and/or offshore
- Cycling of materials – onshore and/or offshore

Additional to the best possible evaluation of the direct physical impacts of a proposed seabed mine on the marine environment, there are clearly other important considerations. These include alternative uses of the proposed site that may be adversely affected by the exploration or mining of minerals. Such alternative uses could be commercial, recreational, cultural or social, and valued by few or many people in the immediate vicinity or more distant areas.

### Sediment-related Impacts

As highlighted above, sediment disturbance, mobilisation, transport and redistribution are key potential causes of environmental problems, particularly in the short-term. However, natural sediment transport and redistribution processes can also be substantial and continual, especially in shallow waters, and strongly influence the composition, variability and resilience of marine ecosystems. Indeed, many marine communities have evolved with turbulent and dynamic natural conditions and are thus highly adaptable and relatively hardy.

In order to place the impacts of seabed mining in context, and ultimately gauge their level and extent, it will be important to have a good understanding of:

- natural environmental processes and their effects on physical and biological variability;
- seabed disturbance produced by other anthropogenic activities (e.g. trawling, offshore oil and gas exploration/production);
- the characteristics, behaviour, physiological tolerances and recolonisation responses of benthic organisms; and
- natural recovery potential of the seabed environment, including rates of recovery and thresholds at which rates of change are likely to exceed rates of recovery, resulting in detrimental outcomes.

### Cumulative Impacts

Assessment of cumulative impacts should be an integral part of the objective evaluation of the effects of seabed mining on marine environments. The types of information required are:

- the relative and combined effects of anthropogenic and natural factors that are influencing the marine environment at the site of interest;
- extent to which these effects are themselves being offset by natural recovery processes; and
- impact management or mitigation options that might be necessary and useful to address declines in environmental status.

Cumulative impacts analysis has been done for the Benguela coastal region offshore of Namibia and South Africa, where there has been commercial seabed diamond mining since the 1960s (Penney *et al.* 2008). Quantitative data were compiled for: the baseline environment; impacts of seabed diamond mining over time, and as a combination of numerous operations; impacts of and on fisheries; impacts of oil and gas exploration; and natural variability in environmental factors such as sediment input and movement.

A major project output was a Cumulative Impacts GIS Database that contained information layers relating to: seabed mining impact area and production; fisheries catch data, including effort or abundance; oil and gas exploration; environmental variables such as kelp bed areas and sediment discharges and texture; and, contextual information such as bathymetry, borderlines, concession areas and place names. The GIS database enabled the production of a series of maps integrating the natural and anthropogenic processes in the region of interest. These maps displayed information such as: points or areas mined using various methods, showing the estimated status of natural recovery for each point or area; and marine resource distribution (particularly fish resources) and fishing intensity and effort, in relation to seabed mining activity.

The cumulative impacts analysis of Penney *et al.* (2008) proved particularly important when seabed mining was correlated with a failure in the commercial rock lobster fishery in the nearshore and coastal zones of the Benguela region, and was assumed to be linked by cause and effect. The analysis revealed that the main impact on rock lobster fisheries had been unsustainable fishing effort. The extreme environmental variability and harsh natural conditions in the region (e.g. low oxygen events, substantial sediment deposition following flood events) were also found to have adversely affected rock lobster recruitment and productivity, particularly during recent years when the stocks were already depressed by over-fishing. It was concluded that in comparison to the interaction between fishing effort, natural environmental change and low recruitment, the impact of seabed mining activities on the lobster fishery had been insignificant. Correlated, but not linked by cause and effect. However, the possibility that ongoing and increasing seabed mining activities might impact negatively on lobster fishery recovery could not be rejected, and ongoing monitoring was advised.

Penney *et al.*'s (2008) suggestions for future seabed mining research and management, to assist with mitigation of cumulative impacts, include:

- standardised geospatial recording and reporting of areas impacted by seabed mining;
- annual environmental audits of all seabed mining operations against agreed environmental performance indicators, and requirement for remedial actions in cases of inadequate environmental performance;
- identification of areas to remain unmined into the future, because they are already mined out or considered non-viable for commercial mining, with cooperative processes to designate areas for closure;
- studies of impact and recovery rates for various mining methods and depths;
- regional seabed biodiversity surveys;
- comparative evaluation of magnitude and frequency of natural impacts and of anthropogenic impacts on marine biodiversity; and
- broader dissemination and understanding of results of studies conducted on relative impacts, recovery and rehabilitation of seabed mining, and natural impacts, particularly among those involved in Environment Impact Assessment processes and development of Environmental Management Plans.

Cumulative impacts management may also need to consider the displacement of commercial fishing, if restricted access zones are established in association with seabed mining (NIWAR 2012). These zones could lead to increased fishing pressure in other areas, creating negative impacts on some fish stocks. This is a problem that is likely to increase where multiple mining or other extractive operations (e.g. offshore oil and gas), that need restricted access sites, occur simultaneously in a region.

#### Defining and Measuring “Recovery”

From the outset of environmental impact analysis it is important to define what “recovery” means within any specific context. Recovery goals need to be objective and precise, so that firm commitments can be made to implementing rehabilitation programs, monitoring their progress objectively, and deciding when a specific goal has been achieved.

Penney *et al.* (2008) observed that benthic communities in the Benguela region were subject to remarkably high natural variability, affecting the rates of mortality, reproduction and recruitment of component species, and ultimately causing continual change in community composition across both time and space. The authors concluded that it would be neither helpful nor realistic to define recovery as a return to the abundance, biomass and proportional species composition that existed before mining (i.e. recovery to “statistical similarity”). They considered it would be more useful to focus on recovery to “functional similarity”. This means defining recovery as the establishment of a successional community of species that includes “indicator” species which provide evidence of progression towards a community that is similar in species composition, population density and biomass to that previously present, or to a comparable control site community.

Where seabed mining is designed so that it occurs across a restricted area of a granted mining lease, this can help to facilitate recovery by ensuring that adjacent, undisturbed areas are available for recruitment of species, and cumulative impacts are minimised (A. Pulfrich, pers. comm., 5 Oct 2012). Research into benthic larval connectivity and recolonisation potential will likely be required so as to determine mining designs optimal for recovery, which could include chequerboard or strip patterns (NIWAR 2012).

#### Environmental Impact Evaluation and Ranking System

Penney *et al.* (2008) describe an environmental impact evaluation and ranking system that has been developed for environmental impact assessments (EIAs) and applied to many Namibian and South African seabed diamond mining proposals. For each impact identified in relation to a mining activity, the impact evaluation and ranking system considers:

- what will be affected and how;
- extent of the impact, i.e. site-specific, local, regional, national or international;
- expected duration of the effects of the impact, i.e. days, weeks, months;
- impact intensity or magnitude, described as none, low, medium or high; and
- cumulative impacts over time and space.

Results from these five areas of consideration are then integrated and evaluated altogether, to determine the overall significance of each impact, which is classified as “low”, “medium” or “high” (see Box 1). Low impacts are usually local scale and of temporary duration, having negligible influence on the environment and not requiring any modification or mitigation efforts. Medium impacts are likely to be short-term and of moderate severity/magnitude, and will require modification of the intended approach and/or mitigation so as to minimise negative effects. High impacts are described as those that are local but which last for longer than a month, or which are of high magnitude regionally and beyond. High impacts can have a significant influence on the environment and require substantial management, mitigation and/or proactive rehabilitation to reduce negative effects.

The impact evaluation and ranking system methodology has been standardised by establishing set definitions for the various rating criteria. Penney *et al.* (2008) explain that where possible, allocation to different ranks or classifications is based on quantitative data. Any impacts predicted to have an overall significance of medium or high require the implementation of specific monitoring, management and mitigation measures, which aim to reduce the level of impact to low. Where it is not feasible to undertake mitigation measures during operations, active rehabilitation that supports natural recovery processes is required after the operations have ceased.

Risk assessment is an implicit component of Environmental Impact Assessments required for any significant development in the NT under the *Environmental Assessment Act* and the *Environment Protection and Biodiversity Conservation Act*, and will apply to seabed mining projects. The protocols developed for environmental impact evaluation for the specific case history of diamond mining offshore of Namibia and South Africa, and the use of a logical ranking system to assign priorities to mitigation and rehabilitation, would seem to be an excellent model to adapt to local circumstances and contexts within the coastal waters of the NT.

## Impacts of Dredge-Mining

### *Dumping of Dredge Spoils*

*Description of Impact:* It is planned to use TSHD-technology to strip excessive layers of overburden, to access deeper gravels. Overburden sediments will be transported to predetermined sacrificial dump sites. Dumping of the sediments will result in:

- Smothering or mortality of benthic organisms
- Potential oxygen-depletion of near-bottom waters through decay of macerated organic matter dumped with the sediments
- A shift in benthic community structure if deposited sediments have size distributions different from the receiving sediments.

*Extent:* Local – **Regional**    *Duration:* **Long**    *Intensity:* Medium - **High**  
*Cumulative Impact:* **Definite**      *Overall Significance:* **High**

*Extent* – Local to regional: the impact at each dump site is site-specific, but future dredging may be practiced extensively in the offshore mud-belt in the Atlantic 1 Mining Licence Area.

*Duration* – Long: although recolonisation of the spoils will start rapidly, restoration of species diversity and biomass to pre-dumping levels may take up to 3 years.

*Intensity* – Medium to High: although some macrofauna will be capable of burrowing upwards through the deposited sediments, the communities in the impacted areas will be severely disturbed or eliminated, and environmental functions and processes will temporarily cease.

*Cumulative Nature* – Definite: as TSHD-technology will potentially be used to mine extensive areas and recovery in deeper water is slow.

*Mitigation* – Mitigation options include land-based dumping, potentially to backfill previously mined out areas, or possible back-filling of older dredge pits.

*Rehabilitation* – Active rehabilitation of the seabed is not feasible. Recovery of marine communities in disturbed habitats is a natural process, with recovery rates being highly dependent on the physiological tolerances of the impacted communities to high deposition rates, organic enrichment and/or hypoxia, and recruitment of benthos.

**Box 1: Example of the Impact Evaluation and Ranking System used for diamond mining offshore of Namibia and South Africa. The assessed ecological impact, dumping of dredge spoils, is associated with dredge-mining. Source: Penney *et al.* (2008). TSHD – trailing suction hopper dredge.**

## Examples of Mitigation Methods

Seabed mining currently proposed for Northern Territory coastal waters is likely to use dredging methods (Lloyd Jones, pers. comm., 16 Apr 2012), the impacts of which will include: seabed disturbance, sediment mobilisation, changes in hydrodynamic processes, increased underwater noise, and potential for marine fauna to collide with or become entangled in operating vessels. Mitigation methods have been developed for dealing with some of the biggest risks associated with dredge-based mining, although ultimately, the most appropriate mitigation measures will be site-specific and dependent on the minerals being targeted, technology employed, marine ecological communities etc. Some of the mitigation measures now used with dredging operations (Continental Shelf Associates Inc. 1993; NIWAR 2012) include:

- use of silt curtains to contain dredge plumes within a specified area;
- return of overflow waste to the seabed, ensuring that particulate matter settles close to its source;
- imposition of daily or annual limits on the quantity of dredged material;
- locating mining activities away from known migratory pathways and calving or feeding grounds;
- limiting the number of vessels or operations in given areas;
- requiring reduced boat speeds in areas likely to support marine mammals;
- engineering to reduce the noise of the primary recovery and ore-lift operations;
- leaving patches within a mining site un-mined to increase the rate of recolonisation and recovery of benthic fauna;
- excluding areas from mining if they support unique populations of marine life;
- depositing tailings within as small an area as possible surrounding the mining block, or onshore;
- avoiding the need for re-mining areas by mining target areas to completion during initial mining; and
- using “keyhole” technologies (rather than dredging) to remove target minerals that lie well below the surface sediments, thereby minimising seabed disruption and impacts on benthic organisms.

The efficacy of different mitigation methods in any specific mining context would need to be investigated. Given the lack of experience in NT coastal waters, small-scale pilot mining projects may provide information needed before issuing full-scale mining permits. Pilot projects may help to determine the specific conditions to be put in place for avoiding, remedying or mitigating negative effects, within an adaptive management context.

## Case Studies: Seabed Mining and Dredging

Seabed mining and dredging information is available from many sources. Much is in the grey literature and is not easy to locate and/or access, and in cases where the goals of a report are commercially-oriented, circumspect analysis and use may be justified.

To develop a comprehensive understanding of the nature of seabed mining and its associated impacts, there are obvious advantages in reviewing a wide range of examples, with different target minerals, mining technologies and environmental, social, cultural and economic complexities. Suggestions for key case studies, most of them yet to be reviewed in full, are highlighted in Table 1.

Some case studies, such as the proposed phosphate mining project offshore of Namibia (Midgley and Associates *et al.* 2012), may be more similar than others to the proposed manganese mining offshore of Groote Eylandt. The shellsand dredging, sand extraction, and diamond mining activities offshore of Owen Anchorage (Fremantle), Moreton Bay (Brisbane) and Namibia/South Africa, respectively, may provide particular insights into social, cultural and economic issues yet to be addressed by the EPA.

**Table 1: Useful seabed mining or disturbance case studies**

Mining or disturbance type	Entity/entities	Location	Key points	Report(s) sourced
Phosphate mining (proposed)	UCL Resources Ltd, Minemakers, Tungeni Investments	Walvis Bay, Namibia	<ul style="list-style-type: none"><li>• 5.5 Mt of phosphate enriched marine sediments to be dredged from 190 to 275 m water depths on an annual basis, over 20 years</li><li>• Environmental Impact Assessment Report (EIAR) for the project's marine component finalised March 2012</li><li>• Issues addressed in EIAR: governance; the EIA process; biogeochemical impacts; benthic impacts; marine fauna – flora impacts; cumulative impacts; socio-economic impacts</li></ul>	Yes
Shellsand dredging	Cockburn Cement Ltd	Owen Anchorage, south-west of Fremantle, Western Australia	<ul style="list-style-type: none"><li>• Shellsand dredging in shallow nearshore waters associated with significant conservation values e.g. seagrass, coral communities</li><li>• Concerns raised about potential impacts on marine habitats due to direct seabed disturbance and indirect effects such as elevated turbidity levels. Other concerns surround changes in nearshore wave and current conditions, which could impact on shipping movements and seabed/shoreline stability</li><li>• Cockburn Cement Ltd has done detailed numerical modelling and regular monitoring surveys to address concerns</li></ul>	Yes
Diamond mining (cumulative effects)	Namdeb, De Beers Marine Namibia, De Beers Consolidated Mines South Africa	Benguela Region, Africa (offshore Namibia and South Africa)	<ul style="list-style-type: none"><li>• Cumulative impacts of seabed diamond mining assessed over time and as a combination of numerous operations</li><li>• The report specifically addresses concerns and accusations related to potential negative impacts of seabed mining on the marine environment, and particularly on commercially exploited marine resources such as rock lobsters</li><li>• There may be project-specific Environmental Impact Statements (EISs) that can be sourced</li><li>• Face-to-face meeting held with one of the lead authors (A. Pulfrich) in Oct 2012, when they were visiting Perth from South Africa</li></ul>	Yes

Mining or disturbance type	Entity/entities	Location	Key points	Report(s) sourced
Sand dredging	Brisbane Airport	Middle Banks, Moreton Bay, Queensland	<ul style="list-style-type: none"> <li>Dredging and reclamation of approximately 15 Mm<sup>3</sup> of unconsolidated marine sand for the New Parallel Runway Project at Brisbane Airport</li> <li>Volume C of the EIS reports on investigations linked to dredging</li> </ul>	Yes
Dredging	INPEX	Darwin Harbour	<ul style="list-style-type: none"> <li>The INPEX EIS contains relevant information on identifying and managing impacts</li> <li>Data from the current dredging program is likely to inform management of seabed mining</li> </ul>	Yes (EIS)
Coral dredging	Queensland Cement and Lime Company	Moreton Bay, Queensland	<ul style="list-style-type: none"> <li>Impact assessment study prepared for the Queensland Cement and Lime Company Ltd by Oceanics Australia Pty Ltd</li> <li>Impact Assessment Study available from National Library of Australia</li> </ul>	No
Sand extraction	Moreton Bay Sand Extraction Study Steering Committee	Moreton Bay, Queensland	<ul style="list-style-type: none"> <li>Study to compare issues associated with land-based sand extraction versus extraction from within Northern Moreton Bay</li> <li>Addresses environmental, social, economic and cultural issues associated with sand extraction</li> </ul>	Yes
Phosphate nodule mining (proposed)	Chatham Rock Phosphate Ltd	Chatham Rise, between the South Island and Chatham Islands, New Zealand	<ul style="list-style-type: none"> <li>Mining of 1-150 mm nodules in 1 m layer of sandy silt, at depths of 400 m or less</li> <li>Environmental and mining design (dredging) studies currently underway</li> </ul>	Yes (basic company outline)
Seafloor massive sulphides (proposed)	Nautilus Minerals	Bismarck Sea, Papua New Guinea	<ul style="list-style-type: none"> <li>Mining of seafloor massive sulfides – different to continental shelf mining but may provide useful insights nonetheless</li> <li>EIS covers project components and viability; policy, legal and administrative framework; stakeholder consultation; environmental and socio-economic impacts; management and mitigation</li> </ul>	Yes
Sand and gravel extraction	Various	UK, Europe, USA	<ul style="list-style-type: none"> <li>A number of reports and journal papers have already been sourced that address environmental impacts and management issues</li> </ul>	Yes

Mining or disturbance type	Entity/entities	Location	Key points	Report(s) sourced
Dredging	Various	Ports of Gladstone, Melbourne, Cape Lambert and North West Shelf, Western Australia	<ul style="list-style-type: none"> <li data-bbox="943 304 1039 331">• N.A.</li> </ul>	No

## Northern Territory Marine Environment

Many aspects of the NT marine environment are likely to be affected by seabed mining in various ways and at different levels, including: marine fauna and flora, bathymetry, ocean hydrodynamics, water quality, nutrient cycling, extreme weather events, fisheries resources, energy resources, cultural and recreational values/resources etc. Relevant marine references identified to date for NT coastal and adjacent Commonwealth waters are listed in Appendix 12. This literature is yet to be reviewed in depth, but it may be useful for developing understanding of baseline environmental conditions, including natural processes and rates of change; flora and fauna unusually significant or vulnerable; and high-value cultural resources.

Aside from the references listed in Appendix 12, other relevant NT marine environment information could be sourced from:

- the NT Government Department of Primary Industries and Fisheries, Department of Land Resource Management (including Biodiversity Conservation) and Department of Arts and Museums;
- Australian Institute of Marine Science;
- CSIRO;
- Geoscience Australia;
- universities;
- indigenous organisations (e.g. NAILSMA) and ranger groups; and
- industry (e.g. BHP-Billiton GEMCO, Groote Eylandt; Pacific Aluminium, Gove; Xstrata MRM, south west Gulf of Carpentaria; Inpex, Darwin Harbour and seabed west of Darwin; Conoco Philips, Darwin Harbour and seafloor into the Timor Sea).

## Regulatory and Legal Issues

An important component of the EPA's review is to assess international and Australian regulatory and legal frameworks and provide recommendations on standards that may be applied to evaluate and manage the risks of seabed mining in Northern Territory coastal waters.

In assessing possible standards to apply to seabed mining activities in the Northern Territory it is appropriate to consider what can be learnt from the development and implementation of regulatory frameworks in both Australian and international jurisdictions. This includes frameworks established under the *United Nations Convention on the Law of the Sea 1982* (UNCLOS) and laws made by other nations. Frameworks examined should include those covering comparable activities such as dredging and marine aggregates extraction.

This section provides an overview of international and Australian regulatory and legal frameworks for seabed mining, including:

- the international framework under UNCLOS
- industry codes of practice
- other nations
- Australian jurisdictions and the Northern Territory

### International Framework under UNCLOS

While the purpose of the EPA review is to provide recommendations relevant to Northern Territory coastal waters, the international law of the sea provides an important framework applying to seabed mining activities.

The *United Nations Convention on the Law of the Sea 1982* provides a comprehensive international legal regime for the world's oceans and seas. It establishes the rights and duties of States in various ocean zones, covering all ocean-related activities, including the exploitation of resources of the seabed and ocean floor and protection of the marine environment.<sup>2</sup>

Through the system of marine jurisdiction established under UNCLOS marine space is divided into a number of zones. A coastal State is entitled to a territorial sea, a contiguous zone, an exclusive economic zone (EEZ) and a continental shelf over which it has specific rights and jurisdiction.<sup>3</sup>

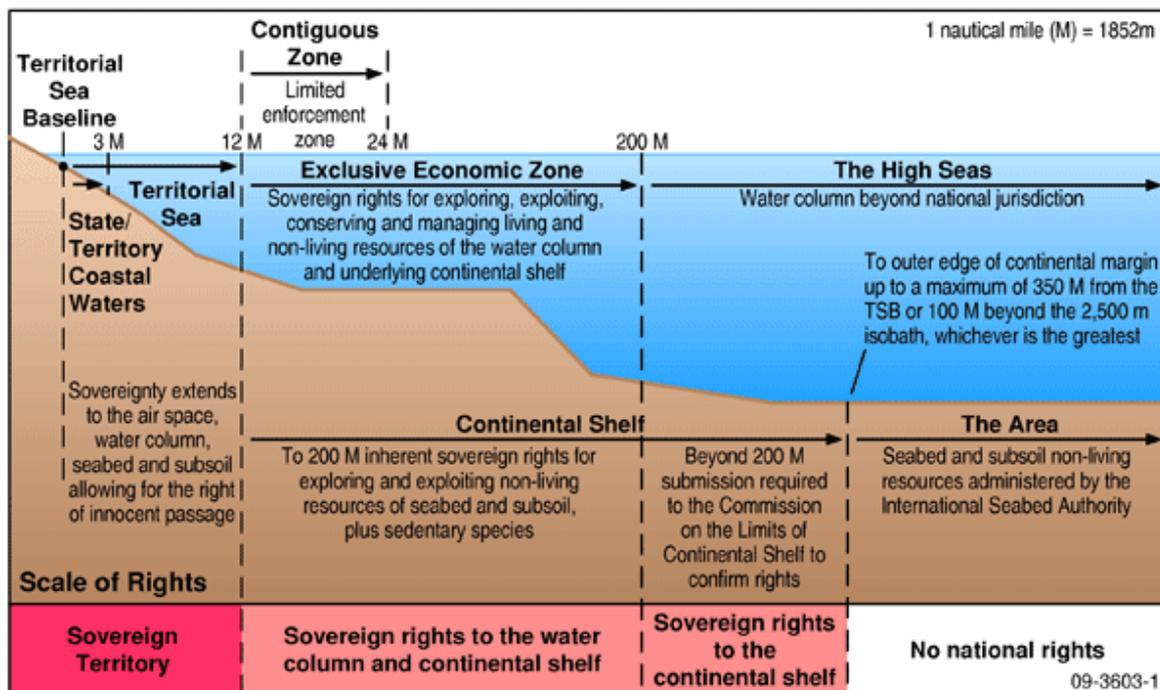
In addition to rights that the coastal States have in their national zones, UNCLOS establishes the rights and duties of States in the international zones such as the high seas and the international sea bed area, which are beyond national jurisdiction.<sup>4</sup>

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<sup>2</sup> *United Nations Convention on the Law of the Sea 1982* (UNCLOS), opened for signature 10 December 1982, 1833 UNTS 3, entered into force 16 November 1994, and the *Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982* (Implementing Agreement), UN Doc A/RES/48/263 (28 July 1994), entered into force 28 July 1996.

<sup>3</sup> UNCLOS Part II, Part IV and Part V.

<sup>4</sup> *Ibid*, Part XI.



**Figure 6: Marine Jurisdiction Established Under UNCLOS. Source: Geoscience Australia**

**Coastal Waters** - extends not more than 3 nautical miles (nm) from the territorial sea baseline (TSB). Under the Offshore Constitutional Settlement negotiated in 1979 the Commonwealth conferred power on the States and the Northern Territory to make laws for matters including mining operations in respect of the coastal waters and granted them proprietary rights to the seabed (Gregorczyk 1998; Attorney General’s Department 1980).

**Territorial Sea** - extends not more than 12 nm from the TSB. A coastal country has sovereignty over this zone (just as it has sovereignty over its land territory), including the water column, seabed and subsoil, as well as the airspace above it. In the territorial sea, this sovereignty is subject to the right of innocent passage of foreign vessels.

**Contiguous Zone** - this is the next 12 nm beyond the territorial sea in which a coastal State may exercise control over customs, immigration and quarantine matters.

**Exclusive Economic Zone (EEZ)** - extends beyond the territorial sea to not more than 200 nm from the TSB. Within the EEZ, a coastal country has sovereign rights for the purposes of exploring and exploiting, conserving and managing the natural resources (living or non-living) of the water column, seabed and subsoil. This is not full sovereignty.

**Continental Shelf** - extends beyond the territorial sea to 200 nm from the TSB, or beyond that to the outer edge of the continental margin as defined in Article 76 of UNCLOS. In this zone a coastal country has sovereign rights for the purposes of exploring and exploiting mineral and other non-living resources of the seabed and subsoil, together with sedentary living organisms.

**High seas** - the area beyond national jurisdiction in which all countries have freedom of navigation and overflight and, subject to other parts of the Convention, the freedom to lay cables/pipelines, construct artificial islands/installations, fish and conduct scientific research.

**The Area** - seabed and subsoil beyond national jurisdiction. The Area and its non-living 'mineral' resources are the common heritage of mankind and are managed on behalf of mankind by the International Seabed Authority - a body established under UNCLOS (Geoscience Australia 2012).

### Protection of the Marine Environment

Besides its jurisdictional framework, UNCLOS establishes a general obligation<sup>5</sup> and legal framework for the protection and preservation of the marine environment and for the conservation and management of marine living resources.

In accordance with UNCLOS, States must take all measures that are necessary to prevent, reduce and control pollution of the marine environment from any source.<sup>6</sup> These obligations apply everywhere, regardless of the location of the activity (including in marine areas beyond national jurisdiction, for example, the high seas and the Area) or the nature of the activity.

A specific requirement under UNCLOS is for coastal countries to adopt laws and regulations to prevent, reduce and control pollution of the marine environment arising from or in connection with seabed activities subject to their jurisdiction. These laws and regulations must be no less effective than the international rules, standards, recommended practices and procedures.<sup>7</sup>

### International Framework for Seabed Mining

A key component under UNCLOS is the regulatory regime established for seabed mining activities in the international seabed area. This framework is important for seabed mining in the NT, because it provides the most substantive example of a legal and regulatory regime developed specifically for application to seabed mining activities. It also provides important guidance on standards for protection of the marine environment.

The International Seabed Authority (ISA) is the international organisation established under the Convention to organize and control activities in the international seabed area "The Area".<sup>8</sup> The ISA is responsible for the development and administration of the comprehensive set of rules that regulate prospecting, exploration and

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<sup>5</sup> UNCLOS, Part XII, Article 192.

<sup>6</sup> Ibid, Article 194.

<sup>7</sup> Ibid, Article 208.

<sup>8</sup> Ibid, Part XI.

exploitation of marine minerals in the Area. The rules, regulations and procedures issued by the ISA are referred to as the "Mining Code".<sup>9</sup>

In accordance with UNLCOS, countries are required to adopt laws and regulations to apply to companies under their jurisdiction that conduct seabed mining activities in the international seabed area. These laws and regulations must be no less effective than international rules, regulations and procedures.<sup>10</sup> Countries are also required to apply regulations to activities undertaken in their national jurisdictions that are no less effective than international rules, regulations and procedures.<sup>11</sup>

Direct obligations under and international law in respect of seabed mining include:

- applying the precautionary approach
- employing best environmental practice
- conducting prior environmental impact assessment (EIA).<sup>12</sup>

In accordance with these requirements, countries must apply a precautionary approach in situations "where scientific evidence concerning the scope and potential negative impact of the activity in question is insufficient but where there are plausible indications of potential risks".<sup>13</sup>

Best environmental practice refers to the application of the most appropriate combination of environmental control measures and strategies.<sup>14</sup>

Environmental impact assessment is both a direct obligation under UNCLOS and a general obligation under international law. Accordingly, national laws and regulations adopted to govern seabed mining must make provision for these obligations.<sup>15</sup>

### Environmental Management

The regulatory framework established through UNCLOS and the ISA Mining Code includes a number of environmental management requirements applying to activities in the international seabed area.

Under this framework, operators undertaking seabed mining exploration or exploitation activities are required to:

- prevent reduce and control pollution and other hazards to the marine environment, applying a precautionary approach and best environmental practices.
- gather environmental baseline data against which to assess the likely effects their activities on the marine environment.

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<sup>9</sup> International Seabed Authority (ISA) (2012) *Mining Code*, <<http://www.isa.org.jm/en/mcode>>, accessed 26 October 2012.

<sup>10</sup> Seabed Disputes Chamber of the International Tribunal for the Law of the Sea (ITLOS), *Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area*, Advisory Opinion, 1 February 2011 (ITLOS Advisory Opinion).

<sup>11</sup> UNCLOS, Article 208 and ITLOS Advisory Opinion.

<sup>12</sup> ITLOS Advisory Opinion.

<sup>13</sup> Ibid.

<sup>14</sup> Ibid.

<sup>15</sup> UNCLOS, Article 206 and ITLOS Advisory Opinion.

- establish comprehensive programs for monitoring and evaluating the impacts of seabed mining on the marine environment.
- include proposals, as may be appropriate, for “impact reference zones” (areas which are to be used for assessing the effect of activities on the marine environment that are representative of the environmental characteristics of the area being impacted).
- include proposals, as may be appropriate, for “preservation reference zones” (areas in which no mining shall occur to ensure representative and stable biota of the seabed in order to assess any changes in marine biodiversity).<sup>16</sup>

The legal and regulatory framework established under UNCLOS provides important guidance on international requirements and accepted standards for the management of risks to the environment associated with seabed mining activities. These environmental management principles and requirements have direct application to the NT.

## Industry Codes of Practice

A range of voluntary industry codes of practice have been developed for land-based mining activities and components of a number of these are relevant to seabed mining (GRI 2011; MCA 2005; ICMM 2003; IIED 2002; IIED 2003). However, a specific industry code of practice for marine mining has been developed by the International Marine Minerals Society (IMMS 2011) that provides direct guidance on best-practice standards for the marine mining industry.

### IMMS Code for Environmental Management of Marine Mining

The IMMS is a professional society with a worldwide membership of individuals from industry, national and international governmental and non-governmental agencies and organizations, and academia. The IMMS Code for Environmental Management of Marine Mining provides a comprehensive, voluntary code of practice for the marine mining industry.

The IMMS Code provides a framework for the development and implementation of an environmental programme for marine minerals exploration and extraction by marine mining companies at their operations. It also provides benchmarks for stakeholders to assess proposed and actual applications of best environmental practices at marine mining sites (ISA 2010).

In addition, the IMMS Code contributes towards meeting the marine mining industry’s requirement for regulatory predictability and minimization of risk, including environmental regulations and risks, and in facilitating financial and operational planning (IMMS 2011).

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<sup>16</sup> ISA (2012) *Draft Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area* (ISBA/13/C/WP.1) and *Draft Regulations on Prospecting and Exploration for cobalt-rich ferromanganese crusts in the Area* (ISBA/13/LTC/WP.1), <<http://www.isa.org/jm/en/mcode>>, accessed 26 October 2012.

The IMMS Code for Environmental Management of Marine Mining was first adopted in 2001 and following extensive consultation, a revised edition was adopted in 2011(Appendix 13).

### *Principles and Operating Guidelines*

The IMMS Code consists of a statement of environmental principles for the marine mining industry, followed by a set of operating guidelines for application as appropriate at specific mining sites.

Marine mining companies/entities adopting the environmental code commit themselves to the following principles:

- To observe the laws and policies and respect the aspirations of sovereign states and their regional sub-divisions, and of international law, as appropriate to underwater mineral developments.
- To apply best practical and fit-for-purpose procedures for environmental and resource protection, considering future activities and developments within the area that might be affected.
- To consider environmental implications and observe the precautionary approach, from initiating a project through all stages including exploration, development operations, waste disposal, eventual closure, and post-closure monitoring.
- To consult with stakeholders and facilitate community partnerships on environmental matters throughout the project's life cycle.
- To maintain an environmental quality review program and deliver on commitments.

These principles are reflected in the IMMS Code's operating guidelines, which address:

- Responsible and sustainable development
- Environmentally responsible company ethic
- Community partnership
- Environmental risk management
- Integrated environmental management
- Company environmental performance targets
- Review, improvement and updating of environmental policies and standards
- Rehabilitation and decommissioning
- Reporting and documentation
- Environmental data collection, exchange and archiving
- Performance reviews.

The IMMS Code provides comprehensive and specific guidance on best-practice approaches to the management of environmental impacts from marine minerals exploration and mining activities. It is a valuable reference for the development of guidelines to apply to potential seabed mining activities in NT coastal waters

## Other Nations

### The Pacific Region

In recent years there has been an upsurge in exploration activity for seabed mineral resources within the territorial seas and EEZ's of Pacific Island countries. This has resulted in a significant increase in applications for or grant of exploration licences in Fiji, Tonga, Papua New Guinea, Vanuatu, Solomon Islands, the Cook Islands, Kiribati, Nauru and other nations (ISA 2012).

At present, legislative instruments that govern the territorial seas, EEZ and continental shelf of individual nations in the Pacific Region are largely limited to a declaration of sovereign rights and ownership of the non-living resources of the seabed. Most of the active legislation concerning minerals and mining in these jurisdictions is applicable only to onshore exploration and exploitation, with little or no mention of offshore mineral resources (Tsamenyi, Kaye and Mfodwo 2007).

There are concerns that the significant marine mineral resources in the region may be explored for and potentially exploited, in the absence of legal frameworks governing these resources (IUCN 2012; Tsamenyi, Kaye and Mfodwo 2007). In particular, there are concerns that environmental impacts may be addressed through land-orientated legislation not designed to manage the specific nature of environmental impacts faced during seabed mining activities (IUCN 2012; Tsamenyi, Kaye and Mfodwo 2007; SPASC 1999).

In response to these issues, Pacific Island nations have recognised the need for new policy and legislation to apply specifically to seabed mining. To develop these frameworks, Pacific Island countries have undertaken to work collectively through the Secretariat of the Pacific Community, to develop a regional framework for development of national legislation for seabed mining activities (ISA 2012).

### *Regional Legislative and Regulatory Framework for Deep Sea Minerals*

In 2010, the Secretariat of the Pacific Community Applied Geoscience and Technology Division (SOPAC), with financial and technical assistance from the European Union (EU), established a four-year project to provide assistance and support to develop a Regional Legislative and Regulatory Framework (RLRF) for Deep Sea Minerals.

The aims of the RLRF project are to:

- Promote an integrated approach to seabed mining regulation in the Pacific Region
- Assist in the development of national policy and legislation on seabed mineral exploration and exploitation activities, both within national jurisdictions and in the international seabed area
- Provide countries with a guide to implementation of national policies and legislation that is consistent with international obligations, rules and standards

- Balance regulatory requirements with sufficient incentives and security of tenure to promote investment and private sector participation in developing national marine minerals industries (SOPAC 2012).

In July 2012, the final RLRf report was released providing guidelines and a template for the development of national deep seabed mining regulation by Pacific Island countries. This report makes a number of recommendations for the environmental management of seabed mining activities which have direct application to seabed mining in the NT.

### *Environmental Impact Assessment*

The RLRf report recommends the licensing part of legislation should include provisions requiring that seabed mining activities likely to have significant impacts on the environment should not be permitted until a comprehensive EIA report assessing those impacts and meeting set standards is submitted for expert independent assessment (SOPAC 2012).

The report also identifies that the requirement for EIA should not be limited to a narrow interpretation of 'environmental' considerations, but should be required to take into account the interests of other stakeholders, including in near-shore waters or on-land. Accordingly, any EIA should assess the impact of seabed activities and any associated activities (e.g. land-based transport and/or processing) on existing community uses and values for areas that may be affected (SOPAC 2012). These recommendations have direct relevance to seabed mining activities in coastal waters of the Northern Territory.

### *Precautionary Approach*

The RLRf final report recommends that legislation regulating seabed mining activities should apply the precautionary approach by requiring decision-makers to take into account the best available information, to identify any uncertainty or insufficiency in the information available and to exercise caution when the information is uncertain or insufficient. The report highlights that application of the precautionary approach does not necessarily prevent activities with unknown effects from proceeding, but rather requires that if they proceed, they do so with caution, cognisant of unknown potential impacts and with appropriate checks and risk-minimising controls in place (SOPAC 2012).

### *Adaptive Management*

Given the largely untested nature of seabed mining, and the risks and uncertainties involved, the report recommends that adaptive management, which can be described as 'learning by doing', is an appropriate principle that can be applied to implement the precautionary approach. An adaptive management approach allows activities to proceed, provided they are carefully monitored and adjusted as information is generated. The report identifies that an adaptive management approach should also feed into policy and law development, as the regulatory framework for seabed mining is likely to require ongoing amendment as new scientific knowledge and practical experience is gained (SOPAC 2012).

### *Best Environmental Practices*

Another recommendation of the RLRf report is that legislation which applies to the seabed should include provisions to establish the principle of best environmental practice as a requirement for seabed mining activities. While it is important that seabed mining legislation incorporate this principle, it is not necessary that the specifics of best environmental practice are prescribed. This will enable best environmental practice to evolve over time and to adapt to specific scenarios. The report also stresses that what constitutes 'best environmental practice' is likely to evolve as an operation proceeds and the duty should be a continuing one. Regulations and licence documentation should establish, not only the seabed mining operator's obligation to satisfy the requirement of best environmental practices, but also to provide the regulating authority with reporting information to confirm that best practices are being employed (SOPAC 2012).

### *Public Participation*

The report emphasises that affording interested parties and local communities appropriate opportunity to participate upfront in decision-making on seabed mining is likely to lead to better-informed and more durable decisions. In legislation, this can be achieved through provisions requiring public notification of applications to relevant stakeholders, and processes providing an opportunity for interested parties to make submissions and appear at hearings on licensing applications (SOPAC 2012).

The RLRf provides a comprehensive template and guidelines for the development of dedicated policy and legislation for seabed mining activities. The particular nature of environmental risks associated with seabed mining activities has led to recognition of the need for development of specific seabed mining legislation by countries in the Pacific Region. Recommendations included in the RLRf for the management of environmental and social issues associated with seabed mining activities are also directly relevant to the NT.

### New Zealand

The introduction of a new legal regime for seabed mining within New Zealand's EEZ provides a good example of a regulatory framework applying specifically to seabed mining activities.

New Zealand has a range of marine mineral resources under its territorial waters, EEZ and continental shelf jurisdiction, including coastal sand and aggregates, iron sands, placer gold, polymetallic nodules and seafloor massive sulphides (Johns and Boughen 2007).

The *Resource Management Act 1991* (NZ) regulates natural resource management activities on land and in the territorial sea out to 12 nautical miles. Fishing and shipping are separately regulated. Beyond 12 nautical miles New Zealand historically has had limited or no means to assess and regulate the environmental effects of

other activities such as seabed mining, oil and gas development, scientific research, and the laying of submarine cables (Ministry for the Environment 2011).

In 2011 New Zealand moved to address this gap with the introduction of a dedicated regulatory regime to manage the environmental effects of activities in its EEZ, including seabed mining. In August 2012, this new regime was introduced into law under the *Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012* (NZ).

The New Zealand EEZ legislation establishes a licensing regime that enables activities to be classified in accordance with regulations as permitted, discretionary or prohibited, depending on the potential environmental risks and impacts involved. Under this regime, marine consent applications for activities in the New Zealand EEZ, including seabed mining, will be considered by the New Zealand Environmental Protection Authority (NZ EPA). The NZ EPA will have responsibility not only to decide applications for marine consents, but monitor and enforce compliance with the Act and regulations made under it (Ministry for the Environment 2011).

### *Environmental Impact Assessment*

Under the new Act, any application for consent to undertake a discretionary activity (such as seabed mining) must be accompanied by an EIA. The Act specifies a number of criteria that an EIA must address. These include identifying the likely or known effects of the activity on the environment, including cumulative effects, and on any persons whose existing interests are likely to be adversely affected by the activity.<sup>17</sup>

The Act also establishes a range of criteria that the NZ EPA is to take into account in deciding upon an application for a marine consent. These include:

- effects on the environment or existing interests of allowing the activity, including cumulative effects
- effects on human health that may arise from effects on the environment;
- protecting the biological diversity and integrity of marine species, ecosystems, and processes
- protecting rare and vulnerable ecosystems and the habitats of threatened species
- the economic benefit of allowing the application
- the efficient use and development of natural resources
- best practice in relation to an industry or activity.<sup>18</sup>

### *Information Principles*

The Act also establishes information principles that the NZ EPA is to observe when considering an application for marine consent. These include requirements to base its decisions on best available information and to take into account any uncertainty or inadequacy in the information available. If the information available is uncertain or

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<sup>17</sup> *Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012* (NZ), s 39.

<sup>18</sup> *Ibid*, s 59.

inadequate, the NZ EPA must favour caution and environmental protection.<sup>19</sup> In the case where the NZ EPA favours caution and environmental protection, it is also required to consider whether taking an adaptive management approach would allow the activity to proceed.<sup>20</sup>

### *Public Participation*

The Act includes a number of important provisions to promote public participation in decisions on marine consent for activities in the EEZ, including seabed mining. These provisions include requirements for public notice to be given of applications for marine consent and for the NZ EPA to serve a copy of the notice on potentially affected stakeholders.<sup>21</sup> Any person may make a submission about an application for a marine consent and all submissions are required to be considered by the NZ EPA in its decision-making.<sup>22</sup>

### *Dispute Resolution*

Procedures in regard to applications for marine consent are included in the Act. A public hearing may be conducted by decision of the NZ EPA or if requested by an applicant or third parties that have made a submission on an application.<sup>23</sup> The Act also contains provisions for meetings and mediation to resolve matters in dispute before a decision is taken.<sup>24</sup> Applicants and submitters also have rights of objection to the NZ EPA against certain decisions.<sup>25</sup> Where objections cannot be resolved through a hearing, applicants and submitters also have rights of appeal on questions of law.<sup>26</sup>

The regulatory context for seabed mining activities in New Zealand involves important similarities with Northern Territory situation including social, cultural and environmental issues. The introduction of the *Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012* (NZ) provides an important example of a dedicated regulatory framework applying specifically to seabed mining activities. An important element of this framework is the inclusion of a range of specific requirements for the management of environmental and social issues. This legislation provides a valuable example for consideration in the development of regulatory and legal frameworks for seabed mining in the NT.

### The European Union

Relative to other regions, the European Union (EU) has a comparatively low level of seafloor mineralisation. The extraction of sand or aggregates is the principal type of seabed mining (Johns 2010). The Netherlands and the United Kingdom (UK) are the main producers of marine aggregates but the industry also operates at smaller scales in other countries including Denmark, Sweden, Germany, Poland and France (ICES 2012).

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<sup>19</sup> Ibid, s 61.

<sup>20</sup> Ibid, s 64.

<sup>21</sup> Ibid, s 54.

<sup>22</sup> Ibid, s 59.

<sup>23</sup> Ibid, s 50.

<sup>24</sup> Ibid, s 49.

<sup>25</sup> Ibid, s100.

<sup>26</sup> Ibid, s105.

Marine aggregates mining activities in EU countries are converging towards common practice as a result of requirements established through EU law and regional agreements (Tsamenyi, Kaye and Mfodwo 2007). These include:

- *Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora* (EU Habitats Directive)
- *Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment* (EU EIA Directive)
- *The Convention for the Protection of the Marine Environment of the North-East Atlantic* (OSPAR Convention) incorporating the International Council for the Exploration of the Sea (ICES) Guidelines for the Management of Marine Sediment Extraction.

While marine aggregates mining activities are covered by specific legislation at the national scale, common elements from these regional requirements include:

- Best environmental practices
- Monitoring of environmental impacts
- EIA for activities with significant impacts
- Public consultation.

From these requirements, the regulatory framework for marine aggregates extraction in the EU has developed into a generally well organised system, with clear requirements for public consultation and environmental assessment and ongoing monitoring of project impacts (Johns 2010). In some jurisdictions, such as the Netherlands, smaller scale projects are regulated through systems of marine regional planning, which also incorporate processes of environmental assessment and public consultation (Tsamenyi, Kaye and Mfodwo 2007).

The regulatory system applying to the EU marine aggregates provides an example of an established regulatory framework applying to an activity with some similarities in nature to the type of seabed mining activities that might be undertaken in NT coastal waters. Requirements for public consultation and environmental management are an important component of the EU regulatory framework and appear to have contributed to public acceptance of the marine aggregates industry. This system provides a useful example for consideration in development of regulatory frameworks to apply to seabed mining activities in the NT.

### The United Kingdom

The marine aggregates industry, which primarily involves dredging of marine aggregates and sands, is a small but active sector of the maritime economy in the United Kingdom (UK). Regulatory frameworks are complex and have undergone significant change in recent years with the introduction of new legislation, policy, EIA procedures and regulatory guidance for the offshore region (Johns 2010; Bayer, Barnes and Rees 2008).

The *Marine and Coastal Access Act 2009* (UK) was introduced to provide for better management of the marine environment through improved planning, licensing, environmental conservation, fisheries management and enforcement.<sup>27</sup>

Activities in the offshore region are regulated by the Marine Management Organisation (MMO), a non-government public body. The MMO is in charge of:

- preparing a series of marine plans based upon a government approved Marine Policy Statement
- setting and monitoring conditions on marine development including aggregate extraction and dredging
- making decisions on applications and issuing licences
- consulting with government advisory bodies and affected stakeholders.<sup>28</sup>

Procedures for EIA are established under specific regulations for each of England, Northern Ireland, Scotland and Wales.<sup>29</sup> The regulations implement requirements of the EU EIA Directive, the EU Habitats Directive, as well as EU legislation for the conservation of wild birds. They require that any application for permission for marine dredging include an environmental statement. A formal EIA is required on the effects of such dredging, where it is likely, either alone or cumulatively with other plans or projects, to have an impact on sites that are significant in relation to any of these matters (Bayer, Barnes and Rees 2008).

Marine aggregates extraction is a developed industry in the UK with an established regulatory and legal framework. This framework has recently been reviewed and updated and incorporates specific requirements for environmental assessment and management of marine mining activities. It provides a useful reference for consideration in the development of regulatory frameworks for seabed mining activities in the NT.

### The United States

The United States (US) has one of the largest EEZ areas in the world that includes extensive marine mineral resources. Mineral deposits in US waters include massive phosphate beds, manganese nodules, gold bearing sands, titanium bearing sands, seafloor massive sulphides, mineral sands and aggregates (Tsamenyi, Kaye and Mfodwo 2007).

Marine jurisdiction in US waters has similarities with the Australian system, as activities in territorial waters out to 3 nautical miles are regulated through the laws of adjacent States. This creates a complex legal system with a multitude of State laws applying to marine mining activities in coastal waters. Beyond 3 nautical miles

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<sup>27</sup> *Marine and Coastal Access Act 2009* (UK).

<sup>28</sup> *Ibid.*

<sup>29</sup> The *Environmental Impact Assessment and Natural Habitats (Extraction of Minerals by Marine Dredging)(England and Northern Ireland) Regulations 2007*, the *Environmental Impact Assessment and Natural Habitats (Extraction of Minerals by Marine Dredging)(Scotland) Regulations 2007*, and the *Environmental Impact Assessment and Natural Habitats (Extraction of Minerals by Marine Dredging) (Wales) Regulations 2007*.

seabed mining is regulated by the US Federal Government through the *Outer Continental Shelf Lands Act* (US). Environmental impacts are regulated through the *National Environmental Policy Act 1970* (US), which requires a detailed environmental review before any major action in Federal land or marine territory (Johns 2010; Tsamenyi, Kaye and Mfodwo 2007).

Marine dredging of sand for beach replenishment is currently the only large-scale marine mining activity undertaken in US waters. This is partly due to the issue of financial viability of the seabed mining industry, but also reflects public concern about environmental impacts (Johns 2010). In contrast, the offshore marine sand mining industry is now well established, with regulatory and public consultation processes that have helped to establish broad community support (Johns 2010; Tsamenyi, Kaye and Mfodwo 2007).

The lack of clarity in the regulatory regime applying to seabed mining activities other than sand mining in US waters has been identified as a potential constraint to the future development of the marine minerals industry (Mielke 1997). The US has undertaken some preliminary work towards creating a new framework specifically focused on marine mining in the EEZ (Tsamenyi, Kaye and Mfodwo 2007).

## Australian Jurisdictions and the Northern Territory

The Commonwealth has sovereignty in respect of the territorial sea, and sovereign rights in respect of both the continental shelf and the exclusive economic zone for the purpose of exploitation of their natural resources. However, following the Offshore Constitutional Settlement negotiated between the Commonwealth Government and the States in 1979, the Commonwealth conferred power on the States and the Northern Territory to make laws for matters including mining operations in respect of the coastal waters and granted them proprietary rights to the seabed (Gregorczyk 1998; Attorney-General's Department 1980). These powers are established under the *Coastal Waters (State Powers) Act 1980* (Cth) in respect of the states and under the *Coastal Waters (Northern Territory Powers) Act 1980* (Cth) in respect of the Northern Territory.

### The Commonwealth Offshore Minerals Act 1994

The *Offshore Minerals Act 1994* (Cth) provides for the exploration and production of minerals other than petroleum on Australia's continental shelf for the area beyond the coastal waters of the States and the Northern Territory.

The Act is based on principles from the Offshore Constitutional Settlement. Under this legislation:

- all offshore mineral activity in the Commonwealth area adjacent to a particular state is governed by a Joint Authority, consisting of the relevant Commonwealth Minister and State Minister;
- the Joint Authorities are responsible for major decisions relating to titles, such as grants, and refusals, and in the event of disagreement, the Commonwealth Minister's views prevail;
- the day to day administration of the Commonwealth legislation is carried out by the relevant state through the Designated Authority (the department of the

State or Territory Minister responsible for mining) and they are the primary contact point between industry and government (Gregorczyk 1998).

Subject to the *Offshore Minerals Act 1994* the licensing system for offshore mining activities is based upon five kinds of authorisations. They are:

- **exploration licences** – designed to cover the exploration phase of a project and which confers exclusive rights to the exploration for and recovery of mineral samples from the licence area.
- **retention licences** – an intermediate form of tenure, between the exploration licence and the mining licence.
- **mining licences** – designed to cover the commercial mining phase of a project and authorises the exploration for and full recovery of minerals from the licence area.
- **works licences** – authorising operations associated with an exploration, a retention or a mining licence to be carried outside the area of the principal licence, such as a jetty.
- **special purpose consents** – authorising the holder to carry out either scientific investigations, a reconnaissance survey or collect a small amount of minerals.

#### Offshore Minerals Legislation in Australian State Jurisdictions

The *Offshore Minerals Act 1994* provides a basis for the implementation of complementary offshore minerals legislation by State jurisdictions and the Northern Territory. This is aimed at providing a common mining code to operate in both Commonwealth waters and coastal waters of the States and Northern Territory. To date, complementary offshore minerals legislation has been introduced by Queensland, New South Wales, South Australia and Western Australia.<sup>30</sup>

The introduction of complimentary legislation by the States and the Territory is intended to mirror the framework applying in the adjacent Commonwealth waters, and in the process simplify the administrative arrangements dealing with offshore mining. This is particularly helpful for proponents and regulators of projects which straddle both jurisdictions, as it reduces regulatory burden and improves clarity.

The *Offshore Minerals Act 1994* provides limited guidance on environmental management. However, projects with the potential for significant impacts on the environment, such as seabed mining, are likely to require environmental assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth)(EPBC Act).

#### The *Environment Protection and Biodiversity Conservation Act 1999*

Any action that is likely to have a significant impact on a matter of national environmental significance needs to be considered for environmental assessment

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<sup>30</sup> *Offshore Minerals Act 1998* (Qld), *Offshore Minerals Act 1999* (NSW), *Offshore Minerals Act 2000* (SA) and *Offshore Minerals Act 2003* (WA).

and approval under the EPBC Act. The matters of national environmental significance protected by the EPBC Act are:

- Commonwealth marine environment
- World Heritage properties
- National Heritage places
- Ramsar wetlands of international importance
- nationally threatened species
- migratory species
- nuclear actions.

Marine mining activities of significant scale in NT waters are likely to trigger requirements for assessment under the EPBC Act.

#### The Existing Northern Territory Framework

Exploring and mining for minerals on the sea-bed within Northern Territory coastal waters is currently regulated by the same laws that apply to these activities on land. These laws are the Northern Territory *Mineral Titles Act* and *Mining Management Act*.

The *Mineral Titles Act* applies to all “the land of the Territory”. Under the Act, the “land of the Territory” is defined as including the coastal waters of the Territory as described in section 3(1) of the *Coastal Waters (Northern Territory Powers) Act 1980* (Cth).<sup>31</sup>

A mineral title is all the documents comprising any one of the following instruments:

- a mineral exploration licence
- a mineral exploration licence in retention
- a mineral lease
- an extractive mineral exploration licence
- an extractive mineral permit
- an extractive mineral lease
- a mineral authority.<sup>32</sup>

The *Mineral Titles Act* operates in conjunction with the *Mining Management Act*, which deals with the authorisation and management of exploration for, and the extraction and processing of minerals or extractive materials to ensure the protection of the environment.<sup>33</sup>

Mining activities, including seabed mining, may be undertaken on a site only if the Minister has granted the operator an authorisation.<sup>34</sup> In applying for an authorisation an operator is required to submit an environmental management plan (EMP) with

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<sup>31</sup> *Mineral Titles Act 2010* (NT), s 5.

<sup>32</sup> *Ibid*, s 11.

<sup>33</sup> *Mining Management Act* (NT), s 3.

<sup>34</sup> *Ibid*, s 35.

their application.<sup>35</sup> However, this requirement applies to exploration activities only if the exploration will involve substantial disturbance of the mining site.<sup>36</sup> Under the *Mining Management Act* substantial disturbance of a mining site includes:

- waterworks (for example, works in connection with dams, impoundments, canals or the drainage or alteration of river or creek banks, water courses or shorelines)
- extracting resources from the surface of the land, underground, riverbeds or under the sea
- active remote sensing and seismic techniques in water
- an activity that is likely to have a significant impact on flora or fauna.<sup>37</sup>

Before approving a mining management plan, the Minister must be satisfied that:

- the management system for the mining site, as detailed in the plan, is appropriate for the mining activities described in the plan
- will, as far as practicable, operate effectively in protecting the environment
- the mining activities described in the plan will be carried out in accordance with good industry practice.<sup>38</sup>

In accordance with section 43 of the *Mining Management Act*, the Minister may also require the payment of a security bond as a condition of an authorisation for a mining activity. A security may be required for the purposes of:

- ensuring compliance with the Act or the conditions of authorisation
- payment of costs in relation to actions required to prevent, minimise or rectify environmental harm resulting from a mining activity
- payment of costs in relation to actions required to complete rehabilitation of a mining site.<sup>39</sup>

These provisions can be applied to both mining exploration and production activities and are implemented through supporting policy and guidelines administered by the Department of Mines and Energy (DME 2012; DPIFM 2007). However, current security arrangements under the *Mining Management Act*, and supporting policy and guidelines, do not include provisions specifically applying to seabed mining activities. Existing security calculation procedures also do not include methodologies that account for the particular nature of seabed mining techniques or the marine environment (DME 2012).

Part 3 of the *Mining Management Act* includes provisions relating to the environment. It contains a general obligation to take care of the environment and particular obligations for environmental protection by persons in respect of a mining site.<sup>40</sup> It also establishes offences for environmental harm resulting from mining

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<sup>35</sup> Ibid, s 36.

<sup>36</sup> Ibid, s 35,

<sup>37</sup> Ibid.

<sup>38</sup> Ibid, s 36.

<sup>39</sup> Ibid, s 43.

<sup>40</sup> Ibid, ss 12-21.

activities.<sup>41</sup> While these provisions enable the application of specific environmental management obligations as conditions of a mining authorisation, they do not provide clear guidance on specific requirements for environmental management and do not address the specific nature of risks involved with seabed mining.

Under the current NT framework, seabed mining activities, including exploration and production, are regulated under existing land-oriented mining legislation. This framework provides limited guidance on the management of the particular nature of environmental risks involved with seabed mining. There is also limited provision for the management of associated social and cultural issues, which is reflected in limited requirements for stakeholder consultation and public participation in decision-making on licensing and approvals.

In reviewing regulatory and legal arrangements applying to seabed mining activities an important consideration for the NT is the implementation of complementary legislation based upon the *Offshore Minerals Act 1994* (Cth). This framework provides dedicated licensing regime for offshore minerals, which is consistent with the system applying in adjacent Commonwealth waters. However, the *Offshore Minerals Act 1994* also provides limited guidance on the management of environmental and social issues. The implementation of this framework alone is unlikely to provide a suitable basis for managing the particular nature of environmental, social and cultural issues associated with seabed mining activities in NT coastal waters.

#### *Future Development of the NT Regulatory and Legal Framework*

In its approach to the regulation of seabed mining activities, the NT faces particular challenges posed by its unique biophysical and social environment. These challenges include significant climatic and biophysical variability associated with a tropical environment, limited baseline data on ecological systems and biodiversity in many regions, and important indigenous cultural values associated with the environment including sacred sites. The management of these challenges would benefit from the development of a regulatory and legal framework that is specific to the nature of seabed mining activities and the demands of the NT context.

Internationally, there is increasing recognition of the need to establish specific policy and legislation to deal with the particular requirements of seabed mining. Work undertaken by the CSIRO has found a high expectation among the Australian community for robust regulation of this kind of activity (Parsons et al. 2010; Paxton and Mason 2009).

A number of nations, in particular in the Pacific Region, have moved to implement new dedicated legal frameworks for the regulation of seabed mining activities (SOPAC 2012; Ministry for the Environment 2011). An important feature of these frameworks is that they establish not only licensing arrangements, but also clear requirements for the management of environmental and social issues.

These developments and the longer-standing laws, policy and practice on sand and aggregates extraction in Europe, provide useful background for the future

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<sup>41</sup> Ibid, ss 25-28A

development of the NT regulatory and legal framework. In particular, they point to the essential features of regulatory regimes capable of meeting the particular challenges associated with seabed mining activities.

Important among these features is the establishment of clear requirements in regulatory and legal frameworks for:

- prior environmental impact assessment;
- application of the precautionary approach and adaptive management principles;
- use of best environmental practices;
- consideration of cumulative impacts and existing uses, including cultural values;
- gathering of environmental baseline data and ongoing monitoring of impacts;
- stakeholder consultation and public participation in decision-making processes, including mechanisms for dispute resolution.

The commencement of the review by the EPA, and work conducted to date, has allowed preliminary investigation and assessment of Australian and international regulatory frameworks for seabed mining. It has also enabled and the identification of relevant environmental management approaches that would address the needs of the Territory community for protection of the environment. However, further work is required to enable the development of a suitable regulatory and legal framework for seabed mining activities in the NT. A critical component is also to link this work together with issues to be examined in the review by AAPA in order to ensure and protection of sacred sites as a part of future potential exploration and mining of NT seabed mineral resources.

## Recommendations

Although the EPA's seabed mining review is incomplete, the preliminary analysis of relevant environmental and regulatory issues has produced useful findings. To date, there has been limited research into social, cultural and economic matters, but these will be important considerations in the development of NT-relevant management and regulatory frameworks.

It is recommended the seabed mining review be continued, given the:

- novel and technically innovative nature of seabed mining;
- limited seabed mining knowledge and experience presently available within the NT and nationally;
- many unknown problems likely to be encountered in securing sound environmental management and effective impact mitigation strategies;
- increasing public expectations that new developments will be both economically and environmentally sustainable;
- importance of identifying methods and processes for adequate protection of cultural heritage values;
- benefits and certainty that specific policies and regulatory frameworks will provide for government, industry and the wider community; and
- scope for better-informed natural resource management within NT coastal waters to deliver social, cultural, economic and environmental benefits.

Recommendations to support further review work are provided below, based on the EPA's work to date.

### Supporting recommendations

It is recommended that:

1. Further desk-top analysis be done to examine a wider range of seabed mining and dredging examples, with different target minerals, mining/dredging technologies, in varying environmental, social, cultural and economic contexts. Particular attention should be paid to examples that deal with issues relevant to NT coastal waters.
2. Case histories be compiled of management, mitigation and rehabilitation plans developed and applied in similar contexts to those expected with seabed mining in the NT, to assist in achieving world's leading practice.
3. Future desk-top analysis and possible on-site studies focus on improving understanding of sediment disturbance, mobilisation, transport and redistribution associated with seabed mining, and in particular, its impacts on marine flora and fauna, water quality and marine habitats. This work should also seek to understand the likely impacts of mining-related sediment processes as distinct from other ongoing natural and anthropogenic sediment processes, especially given the shallow coastal waters of the NT. This is

essential for interpreting seabed mining impacts in their specific environmental context.

4. For NT waters likely to be targeted for seabed mining, work be done to identify marine organisms expected to be affected; species and ecosystems with special value to society; and species that may be threatened. For identified key species, currently available ecological, management and population information should be used to assess the likely impacts of seabed mining on their status in the short and long-term. Where there are significant gaps in knowledge, on-site studies may be required.
5. Appropriate “indicator” species be identified to measure the recovery of ecological function, and determine the size and composition of healthy successional biological communities. Such information may be important for establishing optimal spatial and temporal mining designs that increase rates of marine ecosystem recovery.
6. A working Geographic Information System (GIS) be developed for NT coastal waters to integrate relevant information across government agencies and to assist with future analysis of project-specific activities in the marine environment, including seabed mining, and assessment of cumulative impacts. Relevant information layers may include: proposed seabed mining areas; fisheries; key flora and fauna species; biologically-significant habitats; sediment discharges; oil and gas exploration/production; geomorphic and physiochemical features; and cultural sites and values (where publically available). GIS development and maintenance could be undertaken through a partnership arrangement between NT Government and other organisations (e.g. universities, indigenous bodies, specialist research centres, industry) that hold relevant data and expertise.
7. Potential acoustic and lighting impacts associated with seabed exploration and mining be further evaluated, giving consideration to a range of marine mammals, reptiles, fish, seabirds and invertebrates that may be affected.
8. Consideration be given to the Environmental Impact Evaluation and Ranking System used for diamond mining offshore of Namibia and South Africa, to support assessment and classification of risks as part of environmental impact assessment in NT coastal waters.
9. The NT Government develop and implement a dedicated regulatory and legal framework for seabed mining, including clear requirements for the management of environmental, social and cultural issues associated with exploration and production activities, before the expansion of the industry in NT coastal waters.
10. The development of a dedicated regulatory and legal framework include consideration of the following:

- environmental management principles for seabed mining activities established under the *United Nations Convention on the Law of the Sea 1982* (UNCLOS);
  - guidelines for best practice environmental management by the marine mining industry as established by the International Marine Minerals Society (IMMS) Code for Environmental Management of Marine Mining;
  - the template and guidelines provided for the development of seabed mining policy and legislation by the Regional Legislative and Regulatory Framework for Deep Sea Minerals Exploration and Exploitation in the Pacific (RLRF);
  - regulatory frameworks applying specifically to seabed mining already implemented by other national jurisdictions (e.g. New Zealand, European Union, United Kingdom); and
  - the legal framework for seabed mining in Australian waters established under the *Offshore Minerals Act 1994* (Cth).
11. Further work on a regulatory and legal framework for seabed mining include consultation with Commonwealth and State jurisdictions that have implemented complimentary legislation based upon the *Offshore Minerals Act 1994* (Cth) to determine the suitability of this framework for application in the NT.
12. Development of a regulatory and legal framework include requirements for the payment of a bond or security deposit for environmental risks associated with seabed mining activities. This includes the development of suitable methodologies for calculating the amount of bond that may be required to address potential impacts in NT coastal waters.

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## **Legislation**

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*Environmental Assessment Act (NT)*

*Environmental Assessment Procedures (NT)*

*Environment Protection and Biodiversity Conservation Act 1999 (Cth)*

*Mineral Titles Act (NT)*

*Mining Management Act (NT)*

*Offshore Minerals Act 1994 (Cth)*

*Offshore Minerals Act 1998 (Qld)*

*Offshore Minerals Act 1999 (NSW)*

*Offshore Minerals Act 2000 (SA)*

*Offshore Minerals Act 2003 (WA)*

## **International**

*Agreement relating to the implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, UN Doc A/RES/48/263 (28 July 1994), entered into force 28 July 1996.*

*Continental Shelf Lands Act (US)*

*Exclusive Economic Zone and Continental Shelf (Environmental Effects) Act 2012 (NZ)*

*International Seabed Authority Draft Regulations on Prospecting and Exploration for Polymetallic Sulphides in the Area (ISBA/13/C/WP.1).*

*International Seabed Authority Draft Regulations on Prospecting and Exploration for cobalt-rich ferromanganese crusts in the Area (ISBA/13/LTC/WP.1).*

*International Seabed Authority Legal and Technical Commission Recommendations for the guidance of contractors on the assessment of the environmental impacts of exploration for polymetallic nodules.*

*Marine and Coastal Access Act 2009 (UK)*

*National Environmental Policy Act 1970 (US)*

*The Convention for the Protection of the Marine Environment of the North-East Atlantic 1992 (OSPAR), opened for signature 22 September 1992, entered into force 25 March 1998.*

*The Environmental Impact Assessment and Natural Habitats (Extraction of Minerals by Marine Dredging) (England and Northern Ireland) Regulations 2007 (NI), SI 2007/1067.*

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*The Environmental Impact Assessment and Natural Habitats (Extraction of Minerals by Marine Dredging) (Wales) Regulations 2007 (Wales) 2007/2610 nawm 221. Responsibilities and Obligations of States Sponsoring Persons and Entities with Respect to Activities in the Area (Advisory Opinion) (Seabed Disputes Chamber of the International Tribunal for the Law of the Sea, 1 February 2011).*

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# Appendices

**MORATORIUM ON EXPLORATION  
AND MINING IN COASTAL WATERS  
OF THE NORTHERN TERRITORY  
UNTIL 2015**

6 MARCH 2012

## TERMS

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### 1. POLICY STATEMENT

The Northern Territory Government has established a moratorium on granting titles permitting exploration for minerals or mining and on issuing authorisations permitting mining activities to be undertaken within the coastal waters of the Northern Territory until a review of actual or potential impacts of seabed mining has been undertaken.

### 2. MORATORIUM

- (a) A Moratorium is in place in respect to all activities, whether they involve substantial disturbance or not, including those related to or associated with, exploration for minerals within the coastal waters of the Northern Territory, mining in the coastal waters of the Northern Territory, or both.
- (b) Despite the legislative ability to grant mineral titles under the *Mineral Titles Act* and to grant an authorisation to carry out mining activities under the *Mining Management Act* in respect of mining activities, the Minister administering those Acts (the "Minister") will not for a period of 3 years from the date of this Moratorium (or any extension of it by the Minister):
  - (i) grant any:
    - A. mineral exploration licence;
    - B. mineral exploration licence in retention;
    - C. mineral lease;
    - D. mineral authority; or
  - (ii) issue any:
    - A. authorisation,in respect of exploration for minerals within the coastal waters of the Northern Territory or mining within the coastal waters of the Northern Territory.
- (c) For the term of this Moratorium the Minister will not exercise any functions in respect to assessing, granting, or reviewing mineral titles relating to exploration for minerals within the coastal waters of the Northern Territory or mining in the coastal waters of the Northern Territory.
- (d) For the term of this Moratorium the Minister will not exercise any functions in respect to assessing and issuing authorisations in relation to any activities for or associated with exploration for minerals or mining within the coastal waters of the Northern Territory.

- (e) For the sake of certainty:
  - (i) All applications for mineral titles, authorisations, or both, in respect of any area or activity within the coastal waters of the Northern Territory lodged prior to the commencement of this Moratorium will not be assessed, or granted or issued with the relevant title or authorisation during the term of this Moratorium.
  - (ii) All applications for mineral titles, authorisations, or both, in respect of any area or activity within the coastal waters of the Northern Territory lodged after the commencement of this Moratorium will be received but not assessed and no title or authorisation will be granted or issued during the term of this Moratorium.

### **3. BACKGROUND**

- (a) Applications in relation to grants of titles and authorisation of activities in respect to exploration for minerals within the coastal waters of the Northern Territory have been lodged.
- (b) Seabed mining is a new and evolving worldwide industry with a minimum number of generally accepted practice standards. The methods applied in seabed mining are rapidly changing. Limited information is available on:
  - (i) the actual or potential impacts on the environment and other resource industries; and
  - (ii) methods for managing the impacts of the extraction of minerals from the seabed.
- (c) The current paucity of information decreases the ability of the Minister to:
  - (i) accurately assess the appropriate methodology for management of the industry, its development, and sustainability; and
  - (ii) develop appropriate conditions for mineral titles and authorisations relating to seabed mining.

### **4. POLICY IMPLEMENTATION**

#### **4.1 Effect of Moratorium**

A Moratorium on the following matters is in effect:

- (a) the granting by the Minister of any titles over any land within the coastal waters of the Northern Territory in relation to exploration for minerals and mining; and
- (b) the issuing by the Minister any authorisations for activities relating to exploration for minerals or mining within the coastal waters of the Northern Territory.

If a mineral title holder or authorised operator considers this Moratorium impacts upon their legal obligations under the *Mineral Titles Act* or the *Mining Management Act* and a detriment is suffered by that person as a result, that person may make an application to the Minister for relief (in the form of a waiver of those legal obligations), and the Minister may, to the extent possible under the laws of the Northern Territory, give that application consideration.

NOTE: An application for relief could seek to reduce or halt statutory obligations imposed on a title holder or operator under the respective Acts, such as the payment of fees or charges, or to provide reports or other information within particular timeframes. The applications for relief could not seek to prevent the application of either Act in respect to environmental obligations and could not seek to exclude the title holder or operator from the application of this Moratorium.

#### **4.2 Moratorium to continue until review completed**

- (a) Until completion of a formal review of the actual or potential impacts on the environment and other resource industries, and the Minister is satisfied that appropriate methods for managing these impacts have been identified all:
  - (i) current and new applications lodged for mineral titles or authorisations relating to exploration for minerals or mining within the coastal waters of the Northern Territory will not be assessed;
  - (ii) mineral titles, authorisations or both will not be granted or issues; and
  - (iii) the status of all currently issued mineral titles and authorisations will remain as it was at the commencement of this Moratorium and the Minister will not exercise any of his functions under either the *Mineral Titles Act* or the *Mining Management Act* in respect to assessment, review, renewal, transfer or the like to alter that status.
- (b) For the term of this Moratorium the Minister will hold over the determination of all applications for mineral titles and authorisations and will not exercise certain legislative functions in respect of mineral titles and authorisations previously granted.

#### **4.3 Status of mineral title during Moratorium**

- (a) Each granted mineral title will be retained on the register of titles maintained by the Director of Mineral Titles in the form and to the extent of the title as at the commencement of this Moratorium.
- (b) For the term of this Moratorium the Minister will not:
  - (i) assess or approve an application to transfer a mineral title; or
  - (ii) require a mineral title holder to comply with the requirements of the *Mineral Titles Act* or regulations in respect to such matters as those relating to annual reporting, reduction of the title area and the like.

#### **4.4 Status of authorisation during Moratorium**

- (a) Each authorisation issued will remain on the register of authorisations maintained by the Director of Mining Performance in the form and to the extent of the title as at the commencement of this Moratorium.
- (b) The Minister will retain all security deposits paid by appointed operators in respect of any authorisations issued.
- (c) For the term of this Moratorium, in respect to an authorisation permitting exploration or mining activities to be carried out within the coastal waters of the Northern Territory the Minister will not:
  - (i) review or assess an original, revision or amended version of a Mining Management Plan; or
  - (ii) review a security calculation submitted by a person in connection with a security deposit required for an authorisation or any conditions imposed on an authorisation to review the security amount.

#### **4.5 National Approach**

The Northern Territory Government will, through appropriate Ministerial Councils, also pursue development of a nationally consistent approach to the assessment of seabed mining.

### **5. REVIEW**

- (a) The review of seabed mining will provide a basis for assessment of the possible future development and sustainability of this industry.
- (b) The review will:
  - (i) examine practices adopted or applied in seabed mining both internationally and within Australia, and identify which of these are considered as environmentally best practices;
  - (ii) identify the likely impacts of seabed mining on the environment and other resources, including commercial and recreational fishing, including identification of impacts which have occurred as a result of, or in association with, seabed mining;
  - (iii) examine the mitigation strategies that have or could be used to manage the impacts of sea based exploration and seabed mining on the environment and other resources; and
  - (iv) include consideration of advice from the Aboriginal Areas Protection Authority on appropriate measures to ensure the avoidance of sacred sites and protection of sacred sites as a part of any exploration and/or mining of seabed mineral resources.
- (c) The aim of the review will be to:
  - (i) identify the appropriate standards for acceptance by the Territory which will adequately address the needs of the

community in respect of industry “best practice”, protection of the environment, protection of social and cultural impacts, mitigation strategies and community involvement; and

- (ii) permit the development of regulations, guidelines, or both, for the assessment of applications (received but not assessed due to the moratorium and future applications) to ensure consistency of assessment procedures and appropriate determinations, taking into account the relevant factors.
- (d) The Environmental Protection Authority will be asked to undertake a review of the following elements:
    - (i) the actual or potential impacts on the environment and other resource industries; and
    - (ii) methods for managing the impacts of seabed mining.
  - (e) The Aboriginal Areas Protection Authority, in association with relevant NTG agencies, will be asked to review:
    - (i) appropriate measures to ensure the avoidance of sacred sites and protection of sacred sites as a part of any exploration and/or mining of seabed mineral resources.
  - (f) Ad hoc decisions to grant mineral titles or authorisations will not adequately address the issues outlined above. Such decisions could create risks and have the potential to be inconsistent.

## **6. AREA**

- (a) The proposed policy extends seaward of the low water mark in all coastal waters of the Northern Territory.
- (b) For the sake of certainty, land to the low water mark of any islands located within the coastal waters of the Northern Territory is excluded from this Moratorium.

## **7. APPLICATIONS FOR MINERAL TITLES**

For the term of this Moratorium applications made under the *Mineral titles Act* for the grant of a mineral title over land within the coastal waters of the Northern Territory, whether lodged prior to or after the commencement of this Moratorium, will not be assessed or granted.

## **8. APPLICATIONS FOR AUTHORISATION**

For the term of this Moratorium, applications for authorisation by a mineral title holder as required by the *Mining Management Act*, whether received prior to or after commencement of this Moratorium will not be assessed and an authorisation will not be granted for any activities, whether they involve substantial disturbance or not, in respect to (including those related to or associated with) exploration for minerals and mining within the coastal waters of the Northern Territory.

## **9. EXCLUSIONS**

This Moratorium does not include any application or grant in respect to petroleum exploration and production, dredging for port development and maintenance activities, geothermal activities and fishing.

## Seabed Mining Project Plan V. 8.1

### 1. Project details

Project Title	Review of seabed mining in Northern Territory coastal waters
TRIM File Numbers and Titles	EPA2012/0013 ENVIRONMENT PROTECTION – REVIEWING – Seabed Mining Referral EPA2012/0034 ENVIRONMENT PROTECTION – PROJECT MANAGEMENT – Seabed Mining Referral EPA2012/0035 ENVIRONMENT PROTECTION – RESEARCH – Seabed Mining Referral
Network files	O:\02 Environment Protection\Advice\Seabed mining
Group/Division/Branch	Environment Protection Authority
Location of Project	Darwin
Target Commencement	June 2012
Target Completion	June 2014

### 2. Background

On 6 March 2012 the Northern Territory (NT) Government established a 3 year moratorium on exploration and mining activities in coastal waters of the NT. The moratorium covers the granting of titles permitting exploration for minerals or mining, and the issuing of authorisations permitting mining activities within NT coastal waters.

The Minister for Natural Resources, Environment and Heritage formally referred the issue of seabed mining to the Environment Protection Authority (EPA) pursuant to section 5B of the *Environment Protection Authority Act*.

During the moratorium period Government has requested that the EPA undertake a comprehensive assessment of:

- The actual or potential impacts of seabed mining activities on the environment and other resource industries; and
- Methods for managing the impacts.

Government has also requested that the Aboriginal Areas Protection Authority (AAPA) undertake a review of:

- Appropriate measures to ensure the avoidance of sacred sites and protection of sacred sites as a part of any exploration and/or mining of seabed mineral resources.

### 3. Aims

The aims of the EPA's seabed mining review, as specified by the Minister for Natural Resources, Environment and Heritage, are to:

- Identify the appropriate standards for acceptance by the Territory which will adequately address the needs of the community in respect of industry "best practice", protection of the environment, protection of social and cultural impacts, mitigation strategies and community involvement; and
- Permit the development of regulations, guidelines, or both, for the assessment of applications (received but not assessed due to the moratorium and future applications) to ensure consistency of assessment procedures and appropriate determinations, taking into account the relevant factors.

### 4. Scope

#### 4.1 Spatial scope

The spatial scope of the EPA's review covers all coastal waters of the NT, as defined under the Commonwealth *Coastal Waters (Northern Territory Powers) Act 1980*. Coastal Waters<sup>42</sup> refers to the belt of water between the limits of the NT and a line 3 nautical miles (M) seaward of the territorial sea baseline. Jurisdiction over the adjacent water column and the subjacent seabed is vested in the NT as if the area formed part of the Territory.

The territorial sea baseline will vary depending on the shape of the coastline in any given locality:

- The **Normal baseline** corresponds with the low water line (i.e. the level of the Lowest Astronomical Tide) along the coast, including the coasts of islands.
- **Straight baselines** are a system of straight lines joining specified or discrete points on the low-water line, usually known as straight baseline end points. These may be used where the coastline is deeply indented and cut into, or where there is a fringe of islands along the coast.
- **Bay or river closing lines** are straight lines drawn between the respective low-water marks of the natural entrance points of bays or rivers.

This project will not consider mining activities within Australia's Maritime Zone beyond the NT's coastal waters. It is recognised, however, that some of the issues to be investigated may be relevant to wider waters within Australia's Maritime Zone. It is further recognised that any future mining activities in wider waters could potentially impact on the Territory's coastal waters and their economic, environmental and cultural values, either directly or indirectly.

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<sup>42</sup> Maritime boundary definitions from: <http://www.ga.gov.au/marine/jurisdiction/maritime-boundary-definitions.html>

## 4.2 Subject scope

Based on the referral issued by the Minister for Natural Resources, Environment and Heritage the EPA has established a set of specific Terms of Reference to guide its review of seabed mining, including exploration, within Northern Territory coastal waters:

1. Examine seabed mining history and technical practices proposed, adopted and applied both nationally and internationally;
2. Identify environmental, social and economic issues associated with seabed mining as currently practised or proposed nationally and internationally, and specifically, impacts that have occurred as a result of, or in association with, seabed mining;
3. Identify likely impacts on the environment and other resources, including resources supporting commercial and recreational fishing, subsistence harvest, tourism and energy operations;
4. Identify which approaches to seabed mining, based on current knowledge and experience, would be candidates for implementing environmental best practice;
5. Examine mitigation strategies that have or could be used to manage environmental and social impacts;
6. Analyse national and international regulatory frameworks and risk management models and make recommendations for NT regulatory frameworks and environmental assessment processes; and
7. Improve public awareness and understanding of environmental and social issues associated with seabed mining, including mitigation approaches.

Terms of Reference	Scope	Outputs
1 & 2	<ol style="list-style-type: none"> <li>1. Define seabed mining for the purpose of this review</li> <li>2. Investigate the history of seabed mining nationally and internationally, considering issues such as:               <ol style="list-style-type: none"> <li>a) Where seabed mining exploration and production have occurred to date</li> <li>b) What minerals have been explored for, or mined</li> </ol> </li> </ol>	<ul style="list-style-type: none"> <li>• Written chapter defining and outlining the history of seabed exploration and mining</li> </ul>

	<p>c) How seabed mining has been conducted, including the techniques and technologies that have been used (or proposed)</p> <p>d) Other marine-based activities that might be similar to seabed mining (e.g. dredging)</p> <p>e) The nature of seabed exploration and mining, and the differences and similarities between the two activities, particularly in terms of techniques and technologies used, and the extent and intensity of disturbance to the marine environment</p>	
3	<p>3. Identify what spatial/mapping information is available for NT coastal waters at relevant spatial scales, that covers matters such as:</p> <p>a) Likely mineral deposits and/or areas likely to be targeted for seabed mining</p> <p>b) Commercial fishing tenure, activity and production</p> <p>c) Offshore petroleum tenure</p> <p>d) Commercial and defence shipping channels</p> <p>e) Recreational fishing and boating/sailing hot-spots</p> <p>f) Current and proposed marine parks/protected areas</p> <p>g) Indigenous Protected Areas</p> <p>h) Known core habitat areas (e.g. breeding, feeding or nursery grounds) for species threatened or at risk of extinction, commercially valuable or of particular Indigenous customary significance</p> <p>i) Marine-related infrastructure (e.g. ports, jetties, subsea cables)</p> <p>j) Sacred sites and songlines (need to consult with AAPA)</p> <p>k) Land Council jurisdiction (need to consult with AAPA)</p> <p>l) Land Rights claims (need to consult with AAPA)</p> <p>m) Native title decisions and claims (probably best to go to Native Title Tribunal)</p> <p>n) Identified potential tidal energy sites</p> <p>4. Identify issues of particular significance for the Territory and requiring focus in the review.</p>	<ul style="list-style-type: none"> <li>Multi-layered mapping product and explanatory report for NT coastal waters, identifying areas most likely to be targeted for seabed mining</li> </ul>
4 & 5	<p>5. In NT coastal waters likely to be targeted for seabed minerals: (i) examine mitigation strategies that have or could be used to manage the risks and/or impacts of seabed exploration and mining, and (ii) identify critical issues that require further research for understanding risks and/or impacts.</p> <p>5.1 Consider <b>environmental</b> risks and/or impacts associated with:</p> <p>a) Marine fauna and flora that are threatened or at risk of extinction, or considered to</p>	<ul style="list-style-type: none"> <li>Written chapters (covering environmental, social and economic issues) examining and providing recommendations on known mitigation strategies and areas requiring further</li> </ul>

	<p>be 'keystone species' (i.e. critical for maintaining ecosystem structure or function)</p> <ol style="list-style-type: none"> <li>b) Habitat loss, fragmentation, degradation (particularly breeding, feeding, nursery grounds), or creation (e.g. artificial habitat from waste rock)</li> <li>c) Introduction and establishment of pest fauna/flora</li> <li>d) Noise (above and below water) and artificial lighting from operation of vessels/machinery</li> <li>e) Nutrient cycling</li> <li>f) Water quality (including issues such as waste discharge, sedimentation and turbidity, mobilisation of trace metals bound in sediments etc.)</li> <li>g) Ocean hydrodynamics (circulation, inundation, wave propagation) and bathymetry</li> <li>h) Air quality (including issues such as emissions from operation of equipment/machinery, combustion of fuels)</li> </ol> <p>5.2 Consider <b>social</b> risks and/or impacts associated with:</p> <ol style="list-style-type: none"> <li>a) Local and regional food security (especially related to fisheries, customary harvest activities - need to consult with relevant bodies)</li> <li>b) Recreational activities (particularly access to sites along the NT coastline)</li> </ol> <p>5.3 Consider <b>economic</b> risks and/or impacts associated with:</p> <ol style="list-style-type: none"> <li>a) The range of industries operating, or with the potential to operate, along the NT coastline (e.g. commercial fishing, tourism, barge operations, petroleum/renewable energy activities)</li> </ol>	<p>research. These chapters will provide a basis for developing guidelines around leading practice seabed exploration and mining</p>
6	<ol style="list-style-type: none"> <li>6. Review international and Australian regulatory frameworks and risk management models to identify standards, codes of practice and guidelines applied to the mining of resources, or other relevant activities (e.g. dredging), which promote leading practices and the achievement of acceptable environmental, social and cultural outcomes. Standards, codes of practice and guidelines to be considered for the whole mining life cycle, from exploration through to site rehabilitation.</li> <li>7. Review the current NT and Commonwealth regulatory regimes (including Marine Management Plans) and their capacity to effectively manage the potential impacts and risks surrounding seabed mining.</li> <li>8. Following on from 6 and 7, give particular consideration to the development of appropriate</li> </ol>	<ul style="list-style-type: none"> <li>• Written chapter reviewing international and Australian regulatory frameworks and risk management models and analysing their strengths and weaknesses</li> <li>• A set of objectives and standards for evaluating and managing the risks associated with seabed mining activities in NT coastal waters</li> </ul>

	impact assessment guidelines, risk management frameworks and community engagement processes.	
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**N.B.** The environmental, social and economic impact reviews will not investigate or detail impacts as with a project-based Environmental Impact Assessment, but rather, focus on highlighting issues that will need to be addressed as part of a comprehensive impact assessment and risk management framework. The reviews may need to consider cumulative and off-site/"downstream" impacts. They may also need to identify future areas of research that will be critical for effective risk identification, analysis and management.

#### 4.3 Out of scope

- Critical analysis of the offshore petroleum industry
- Potential impacts of seabed mining on registered sacred sites

## 5. Methods

- Desk top research and analysis based on detailed literature review (including grey literature so far as it is available)
- Development of a stakeholder list with weightings to focus the engagement and communication effort
- Targeted consultation with relevant experts e.g. Department of Resources; Department of Natural Resources, Environment, The Arts and Sport; CSIRO (particularly the 'Wealth from Oceans' flagship); Charles Darwin University; Australian Institute of Marine Science, the mining industry, dredging experts etc.
- Site visits where appropriate
- Possible organisation of a seabed mining conference in Darwin to bring together leading experts to explore some of the more challenging issues and key questions
- Production of an EPA report, including description of seabed mining, and processes, models and guidelines for managing seabed mining activities and their impacts
- Integration of the EPA and AAPA reports into a single review report
- Engagement of the public through interim reports (as discussion papers), public meetings etc)

## 6. Project milestones

No.	Task	Due date
1	Draft project plan	8 June 2012
2	Review of project plan with EPA Board	28 June 2012
3	Finalisation of project plan (technical work)	9 July 2012
4	Agreement on budget requirements	13 July 2012
5	Review of project plans/joint project mapping with AAPA	3 <sup>rd</sup> week July
6	Preliminary literature review (incl. legislation and standards, relevant EIS documents etc.)	24 August 2012
9	EPA Report 1 <sup>st</sup> draft	TBA
10	EPA Report 2 <sup>nd</sup> draft	TBA
11	EPA Report finalisation	June 2014
12	EPA & AAPA Report integration	September 2014

## 7. Assumptions and constraints

The project plan has been designed on the basis of the following assumptions:

- The moratorium will remain in place until March 2015, regardless of the outcome of the August 2012 Northern Territory election;
- The EPA's human resources and financial capacity will remain relatively constant throughout the life of the project, although additional resources will be sought for specialist tasks (e.g. mapping of NT coastal waters, social and economic analysis); and
- Government will be seeking to consider and understand the findings of the project before the end of the moratorium period.

A current research constraint is the inability to access relevant scientific, environmental management and policy journals through the Department of Justice library system. The Secretariat is currently investigating relevant database and journal subscription options.

## 8. Communications

A communications and public engagement plan will be developed to address:

- Public information and consultation meetings;
- Publications (e.g. project updates, discussion papers); and
- Public release of the final report.

Particular consideration will need to be given to:

- The issues that we want to consult on, and the extent of consultation;
- Capacity for consultation;
- Joint meetings and consultation with AAPA; and
- Appropriate media and forums for providing project updates to a range of stakeholders.

## 9. Risk management

<b>Risk type</b>	<b>Description</b>	<b>Mitigation Strategies</b>
Project management	The EPA and AAPA have not worked together before	<ul style="list-style-type: none"> <li>• Initial meetings have been held to share perspectives and approaches to the seabed mining review</li> <li>• Regular meetings to be established once project work gets underway</li> <li>• It has been suggested that a joint project report manager and/or editor be appointed towards the end of the review period to assist with the compilation and presentation of findings to Government</li> </ul>
Political pressure	Government may try to exert its influence over the findings of the review	<ul style="list-style-type: none"> <li>• The EPA has been established as an independent authority to provide advice on ecologically sustainable development</li> <li>• The EPA has a Board and Secretariat that are committed to using an evidence-based approach in working independently and objectively</li> </ul>
Stakeholder pressure	Different stakeholders with vested interests may expect the EPA to produce findings to support their respective cases for/against seabed mining	<ul style="list-style-type: none"> <li>• The EPA has been established as an independent authority to provide advice on ecologically sustainable development</li> <li>• The EPA has a Board and Secretariat that are committed to using an evidence-based approach in working independently and objectively</li> </ul>

Gaps in locally available expertise	Limited local experience with seabed mining and its associated technical, environmental, social and economic issues	<ul style="list-style-type: none"> <li>• Suitable consultants will be identified and their services contracted, as needed</li> </ul>
Inadequate information	Some emerging technologies may be little tested. Impacts and their variation in scale are likely to have been little reported.	<ul style="list-style-type: none"> <li>• Information on technologies and impacts can potentially be drawn from parallel activities (e.g. dredging) and industries (e.g. offshore petroleum)</li> </ul>
Weak support from agencies	Lack of internal EPA facilities for analysis (e.g. simple GIS coverage intersections) and unwillingness to provide services	<ul style="list-style-type: none"> <li>• EPA is building productive working relationships with relevant government Departments</li> <li>• Department of Resources has offered to share its expertise and resources, if needed</li> </ul>
Public disquiet about approach and EPA independence		<ul style="list-style-type: none"> <li>• Development of public engagement processes, including public meetings and publication of project updates/findings via a range of media and forums</li> <li>• Public engagement to be conducted alongside AAPA, where/when appropriate</li> </ul>

## Appendix 3: Activity Reports

### **EPA and AAPA: first meeting**

When: 10/07/2012, 10:00am

Location: W Rubuntja Board Room (AAPA, RCG Centre, 4th floor, 47 Mitchell Street, Darwin)

Purpose: Follow up meeting from initial meetings between the EPA and AAPA, providing an opportunity to discuss progress with the seabed mining review, especially the research findings of four Aurora interns being hosted by AAPA. The interns have been focusing on legal and cultural information relevant to the seabed mining review, with a particular emphasis on sacred site matters.

Attendees:

AAPA – Malene Bjornskov, Eleanor Smith, Hannah Belnick, Billeigh Waaha, Ben English, Natalie Merida, Christopher Capper, Jackie Gould, Ben Scambary, Donna Dwyer, Benedict Scambary

EPA – Melanie Bradley, Elizabeth Jacob, Richard Horton, Jack Ellis, Roslyn Vulcano

### **EPA and AAPA: second meeting**

When: 26/07/2012, 10:00am

Location: EPA Board Room

Purpose: Meeting and morning tea to share research findings to date, from both the AAPA interns and EPA.

Attendees:

AAPA – Malene Bjornskov, Eleanor Smith, Hannah Belnick, Billeigh Waaha, Ben English, Natalie Merida, Christopher Capper, Jackie Gould, Ben Scambary, Donna Dwyer, Benedict Scambary

EPA – Melanie Bradley, Elizabeth Jacob, Richard Horton, Jack Ellis, Roslyn Vulcano, Grahame Webb, Peter Whitehead

### **EPA meeting with AAPA Board**

When: 17/08/2012, 2:00pm

Location: W Rubuntja Board Room (AAPA, RCG Centre, 4th floor, 47 Mitchell Street, Darwin)

Purpose: Consideration of seabed mining review; sharing of approaches to be taken by the EPA and AAPA; and identification of issues of common interest or additional issues that need to be addressed.

Attendees:

AAPA – all AAPA Board members present? Ben Scambary, Malene Bjornskov, Chris Capper

EPA – Traci Keys, Peter Whitehead, Melanie Bradley

Key issues discussed:

- Identification of “risks” in Indigenous terms, i.e. beyond a standard technical risk assessment, and in a way that involves local communities
- Key concerns for AAPA around the breaking of songlines, impacts on sacred sites, and disruption of connections with totems and dreaming
- Rehabilitation techniques available for seabed mining – potential for replacing/repairing culturally-important resources that have been degraded
- Potential impacts on other livelihood opportunities
- Incorporating traditional and contemporary ecological knowledge in the review e.g. connections between people, land and water; intimate knowledge of and responsibilities for ocean currents, seabed etc; overlap between sacred sites and customary activities; biodiversity monitoring work of ranger groups and NAILSMA e.g. turtles, seabirds

#### **EPA meeting with Carol Christopherson (NLC) and David Martin (consultant)**

(Note: Carol and David developed the methodology and coordinated the consultation for Blue Mud Bay)

When: 24/08/2012, 2:30pm

Location: Northern Land Council, 45 Mitchell Street, Darwin

Purpose: Indigenous engagement/consultation approaches for the seabed mining review

EPA Attendees:

Traci Keys, Melanie Bradley

Key issues discussed:

- Indigenous people are very familiar with land-based mining exploration but the seabed is seen as different; they don't have the same rights, therefore, there will be concern about what they can legally look after, particularly given they consider their custodianship to extend to the horizon – “where the clouds come up”
- Need to clearly set the scene and explain the context for the consultation process:
  - Map out the “cultural logic” – the legal, administrative and cultural factors that have led to, and which shape, the consultations
  - Explain what “development” means from a government perspective
  - Be clear that the consultation is not about asking people to reach a decision on seabed mining, and that the EPA's consultation is distinct from AAPA consultation
- Use a consistent information set throughout the consultation period – especially when it comes to defining key terms etc.
- Think about using a range of media to support consultation work:
  - Radio, TV, YouTube, smart phones

- Develop a set of appropriate supporting materials e.g. maps, diagrams, physical samples of minerals, pictures/samples of products that the minerals can be turned into. A diagram could be used to outline the legal framework around seabed mining, including where/when people can comment on exploration permits and how their comments will be used
- Borrow ideas from other sources e.g. an informative/easy to understand technical presentation was developed for the gas to Gove project
- Work with translators to distil rather than “dumb down” information. Do upfront preparation with translators to ensure that key concepts can be effectively translated/explained
- EPA and AAPA could initially travel to communities together to provide background information, with the EPA presenting technical/scientific information first, followed by AAPA. EPA could then return at a later time to do consultation, when it is appropriate/convenient for communities
- Send out meeting notices ahead of community visits via regional officers. Keep the notices simple and include information on who the EPA is (including management structure), our relationship with government, what powers/responsibilities we have, what work we generally do, why we’re doing the consultation work, the history of the moratorium etc.
- Focus group consultation can allow for better engagement with people and higher quality dialogue
- Could ground-truth/pilot information and consultation methodology with the NLC Executive and Sea Ranger groups, and provide a briefing to the NLC Council before consultation begins
- People will be interested in impacts on sealife and sacred sites, any known remediation strategies, what other people think about seabed mining (including politicians), what legal regimes apply (including who owns the minerals), which mining companies are involved and whether they are from Australia or overseas etc. Need to be able to provide direct answers, and to explain what processes exist for addressing impacts
- Blue Mud Bay Native Title Case – extensive anthropological information available, including Aboriginal values of sea country
- Some cultural values in the sea arise from local topography – implications for mining
- Carol and David offered to develop a cross-cultural framework for the EPA to use, and to assist with the community consultations

### **Garma Key Forum: Australia’s resources boom. A stepping stone to an Indigenous future**

When: 1-2/09/2012

Location: Gulkula, Dhupuma Plateau

Purpose of attendance: To understand a range of views on mining/economic development, and in particular, opportunities and challenges for Indigenous communities

EPA attendee: Melanie Bradley

Key issues:

- The Minerals Council of Australia has helped to develop the idea of an Indigenous Community Development Corporation – a tax exempt entity to ensure that the benefits of mining agreements accrue for future generations and that distributions support investment in social infrastructure, service delivery and enterprise development

- Joint venture and community development arrangement recently established between Njamal and Fortescue Metals Group in the Pilbara – believed to be the first of its kind in Australia. Njamal will mine the ore on the FMG tenement and FMG will buy it at an agreed price and also pay an annual management fee. Agreement also includes establishment of exclusion zones around sacred sites for continuation of cultural practices, training and employment opportunities, and business development opportunities. FMG paid for Njamal's legal and accounting advice to help develop the agreement, but Njamal chose their own advisors
- Monitoring and mentoring critical for transitioning people into the workforce. Important to build training, housing, financial and health services around identified jobs
- Responsible development: capturing long term benefits for communities, minimising physical and cultural impacts, achieving real economic participation for Indigenous people
- Mining income streams can be used to support Homelands policies e.g. agreement between TOs in Tennant Creek region and OM Holdings
- Need to think about sustainable economic futures beyond the life of single mining operations
- "Sustainability": the value of the asset extracted must be greater than the value of the asset in the ground, for all stakeholders, including future generations
- Financial benefits for communities seen as a critically important component of mining agreements – a way for companies to contribute to enduring value
- Rapid enterprise growth taking place for Aboriginal contracting companies
- Mining industry changing and innovating quickly in its engagement with indigenous people
- No presentations on seabed mining, but a general discussion on the topic held with the representative of the Minerals Council of Australia

### **Mining the Territory Conference**

When: 18-20/09/2012

Location: Darwin Convention Centre

EPA attendee: Elizabeth Jacob

Seafloor mining in the NT – Workshop:

Dept. Resources, Energy & Tourism outlined legal framework, acknowledged Offshore Minerals Act is not very current but unlikely to be reviewed in short term, as resources don't justify it. There are no specific environmental requirements in the Act. Currently only 3 offshore exploration licences granted.

CSIRO is conducting a project into assessment tools for marine and coastal management in northern Australia. "Ecosystem-based management", "management strategy evaluation" and "adaptive management" terms used. Believes policy development supporting ESD ran ahead of scientific tools and methods to support policy. CSIRO has computer modelling program, developing for public use. EPA could benefit from exploring CSIRO's framework for tool development, could assist us in making recommendations. Also CSIRO's emphasis on participatory approach in making management decisions.

CSIRO research into social attitudes toward mining addresses the question of what makes mining activity acceptable or unacceptable to people. We don't know what criteria the public has. The economic development argument of mining sector will only succeed if people are happy with the direction of the country. They emphasised information needs of general

public and the importance of effective stakeholder engagement to generate positive views toward mining. They acknowledge the research was not representative of Australians and did not include Indigenous views. The message I got was that the social acceptability of SBM relies on people's perceptions. Perceptions may or may not bear much relationship to the facts. CSIRO & Geoscience Australia have produced a map showing what is known of the minerals in coastal waters around Australia (2006). Modelling has been done to identify impacts on water quality and marine life.

Howard Smith, NLC, spoke of concerns by Aboriginal people that SBM will impact on people spiritually. NLC want community consent, research, knowledge of baseline ecological systems, integration of traditional knowledge and science, identification and mitigation of impacts, identification of costs to remote communities.

Stuart Blanch, ECNT stressed the lack of knowledge about impacts, success of rehabilitation, baseline data.

Lloyd Jones, Northern Manganese Resources, agreed that baseline data is critical and as yet largely unknown. NMR is yet to research sediment issues and effective preventative measures. However, he asserted dredging techniques have been around a long time and dredging is already adequately regulated. (National Dredging Guidelines, Commonwealth Sea Dumping Act) He said NMR has already offered itself to the EPA as a 'test case' and is happy to provide data.

### **International Union for Conservation and Nature (IUCN) World Conservation Congress (WCC)**

When: 5-15/09/2012

Location: JeJu Republic of Korea

EPA attendee: Roslyn Vulcano a/Director EPA

Purpose of attending the meeting:

- The IUCN WCC Congress provided a timely and cost effective opportunity for the EPA to connect with specialists from the world who are working on issues related to seabed mining, and the broader the marine environment and sustainable development more generally. The EPA attended in observer status for the primary purpose of networking to gather contacts and information on seabed mining.
- The IUCN Meeting Motions contained a number of items of relevance to the EPA's. Motion 105, Protection of the Deep Sea Ecosystem and Biodiversity from the Threats of Seabed Mining, was of relevance to the EPA's seabed mining review.
- The WCC was attended by approximately 10,000 people, from 153 countries and included 5,000 conservation experts, from 153 countries and featured some 600 events, consisting of meetings, workshops, seminars and networking events.

Key outcomes and messages:

Motion 105 Protection of the Deep Sea Ecosystem and Biodiversity from the Threats of Seabed Mining.

- This motion was proposed by the Te Ipukarea Society of Cook Islands and Agence des Aires Marines Protégées and 20 co-sponsors.
- Motion was refined during the meeting and approved by the Members.
- The approved Motion:

- calls on IUCN to develop specialist groups and knowledge on the impacts of seabed exploration or mining activities.
- also recommended that indigenous and local people are able to participate effectively in decisions that have an impact on ocean biodiversity and ocean ecosystems which may affect their rights and interests as custodians over their territories.
- Approval of this motion strengthens international support for gaining best knowledge on mining impacts before making decisions to mine the deep seabed.
- The approved Motion does not directly impact on seabed mining in the Northern Territory, as it is specific to the deep ocean, when the NT mining would largely be in shallow waters; however, the recommendations do strengthen support for the NT approach of gathering best knowledge to gain a solid understanding of the impacts on the environment and people of seabed mining. (See Appendix 4)

Key messages from discussions attended that related to mining (land or sea) and/or similar activities:

- Impacts of mining activities are felt beyond the local area and regions need to be taken into account.
- People in the immediate local and broader regional areas need to be afforded the opportunity to be informed about the proposal, contribute to knowledge and information about possible impacts.
- Need to ensure people understand what is being proposed, early in the process.
- Strong focus on the “social licence to operate’ issues, as well as, the economic outcomes.
- Environmental responsibility, community and commercial realities need to be balanced with good science and social trust.
- Scientists and business need to communicate in a way that makes information accessible and understandable for most people not just the decision makers.
- Greater recognition of leadership and traditional ways of doing, including local people’s governance and conservations actions is needed.
- Support for strong legislative frameworks.
- Support for strengthening financial mechanisms to manage and control the impacts of mining activities.
- Indigenous people want to be included in dialogue and decision making with equal footing.
- Healthy ecosystems such as marine environments, forests, wetlands and river basins play a major role in supporting local livelihoods as well as providing investment opportunities- it’s not one or the other.
- Indigenous territories hold some of the most diverse ecosystems in the world. This is because in part due to the way indigenous people live and manage nature. Natural systems may need to be given an economic value to determine the most effective longer term benefits to people and the environment.
- Include the management of natural resources upfront – it’s not a natural resource management versus financing for health, education, security etc. They are all dependent on one another.
- Need to involve the community right from the beginning to get sustainable outcomes.

## Deep Sea Mining

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## Summary

Minimal Overburden, which on land can be up to 75% of the mineral

World demand for metals and minerals on the rise including to meet demands of a green economy.

Nautilus's Approach has been early Transparent and inclusive stakeholder engagement Workshops to develop ESIA, EIS EMPs

- CARES Community? Responsible??
- Independent Researchers (36 Publications – peer reviewed) working of the science associated with the project. All publications and EIS on the Nautilus website
- Looked at the potential Impacts with a local and international focus.

Reference sites for impacts assessment within the mine lease, refuge site etc

Limiting impacts on the surface water

- Fully enclosed system
- No hazardous chemicals
- No tailings discharged to the sea
- No blasting
- Biodegradable fluids and oils to be used in all subsea equipment
- No impart shallower than 1300 m water depth at Solwaal (ie below where the tuna live etc)

Transparency (on the web and independent reports)

- Fisheries College in Papua and New Guinea involved in the monitoring

Working with South Pacific University

Duke University in America – marine conservation biology

Another Nautilus project in Tonga

Developing resource documents – intend to be publicly available

Involved in the social aspects of the project - in local communities.

## References:

Risks from Marine Traffic to Biodiversity in the Mediterranean Sea Identification of Issues and Possible Responses IUCN (2010)

Mediterranean Seagrass Meadows: Resilience and Contribution to Climate Change

Mitigation IUCN (2012) (Good examples of Atlas of use of seabed mapping)

Innovation in 21<sup>st</sup> Century Partnerships IUCN Publication Due out later in 2012.

International Ocean Governance Using International Law and Organisations to Manage Marine Resources Sustainability – by Lee A. Kimball

McIvor, A.L., Möller, I., Spencer, T. and Spalding, M. (2012) Reduction of wind and swell waves by mangroves. Natural Coastal Protection Series: Report 1. Cambridge Coastal Research Unit Working Paper 40. Published by The Nature Conservancy and Wetlands International. 27 pages. ISSN 2050-7941

## Other Tools:

Terralook makes satellite Images available to conservation managers. Free software that can be used as a tool to plot changes over time in various area. NASA provide the imagery at minimal cost. Could be useful in assessing impacts over time.

<http://terralook.cr.usgs.gov/>

## Contacts List:

See Excel spreadsheet, Appendix 6

## Appendix 4: IUCN Motion

### **M105**

#### **Protection of the deep ocean ecosystem and biodiversity from the threats of seabed mining**

RECALLING the pertinent provisions of the United Nations Convention on the Law of the Sea (UNCLOS), of the Convention on Biological Diversity (CBD) as well as the activities and recommendations implemented for the oceans and seas of the world, in particular by the International Seabed Authority (ISA), and the scientific reports and studies carried out to date;

CONSIDERING the unique, vulnerable character of deep ocean and seabed ecosystems and their importance in terms of biodiversity and genetic heritage, which are likely to suffer a major impact in relation to the future exploitation of mining resources, namely in the seabed ecosystems with polymetallic nodules, the seabed ecosystems with cobalt-rich ferromanganese crusts, and hydrothermal ecosystems with sulphide deposits;

NOTING that a number of countries have signed contracts for prospecting and exploration for polymetallic sulphides and polymetallic nodules with the International Seabed Authority which may influence the pace and development of future deep seabed mining;

NOTING ALSO the obligations of the CBD, in particular Articles 1, 3, 4, 8 and 14, related decisions and referencing Aichi Biodiversity Targets 3, 4, 11, and 19;

RECALLING that Resolution 14.6 *Deep Sea Mining*, adopted by the 14th IUCN General Assembly (Ashkhabad, 1978) “urged all nations engaged in, or considering, deep sea mining activities to:

(a) precede commercial mining operations by commissioning a comprehensive ecological survey to determine the impact of such mining activity; designate appropriate areas of the deep seabed as base line reference and resource zones in which no mining will be allowed; designate the size and shape of such area or areas to ensure that their stability will be maintained; (b) establish guidelines for scientific research to ensure minimum disruption of the natural state of such areas”;

NOTING the 15th IUCN General Assembly (Christchurch, 1981) in its Resolution 15.18 *Deep Sea Mining and Establishment of Protected Areas of the Deep Ocean* recommended the establishment of large sanctuaries in the areas where mining is contemplated before licensing to explore and exploit the deep ocean begins;

RECALLING Resolution 16.11 *on Deep Sea Mining and the Establishment of Protected Areas of the Deep Ocean* adopted by the 16th IUCN General Assembly (Madrid, 1984), and the Principle 15 of the 1992 *Rio Declaration on Environment and Development*,

FURTHER RECALLING Resolution 4.031 adopted by the 4th IUCN World Conservation Congress (Barcelona, 2008) *Achieving Conservation of Marine*

*Biodiversity in Areas Beyond National Jurisdictions* which noted with alarm the multiplying threats to marine biodiversity;

AWARE that the first commercial deep sea mining license was issued in Papua New Guinea in January 2012, for a 20-year period;

ALSO AWARE that the Fiji and Nauru Governments have issued seabed minerals exploration licenses for exploration of areas of the seabed in the respective exclusive economic zones;

FURTHER AWARE that approximately 600,000 km<sup>2</sup> of the Pacific Ocean are the subject of applications for deep sea mining leases or exploration licenses in the western Pacific, specifically in Papua New Guinea, the Solomon Islands, Fiji, Vanuatu and Tonga, as well as in international waters in the eastern Pacific;

RECOGNIZING the importance of the role and the ongoing work of the International Seabed Authority in accordance to the United Nations Convention on the Law of the Sea;

ACKNOWLEDGING Indigenous peoples' and local communities' collective governance to their traditional territories, areas, and natural resources in some countries;

WELCOMING the adoption of the *IUCN Programme 2013–2016* and current regional and international commitments to conserve the natural environments and protect the livelihoods of communities;

RECOGNIZING the increasing interest in mining the minerals on the deep sea floor and around thermal vents;

FURTHER RECOGNIZING that, while economic benefits may be gained from seabed mining, this activity may also generate significant costs and damage other economic activities including food security and sustainable tourism and other values, often adversely impacting indigenous and local communities, host economies, the future and the environment;

CONCERNED about the potential for significant impacts on marine biodiversity of exploration and any seabed mining operation, when undertaken at depths that have not yet been adequately explored or understood and using processes and machinery that have not been proven adequate to contain environmental impacts;

FURTHER CONCERNED to ensure that areas of exploration do not foreclose the ability to protect key areas of ecological, biological, historic or scientific interest, and that the system of Areas of Particular Environmental Interest are established with full scientific rigour regardless of pre-existing Areas of Exploration; and

REMAINING CONCERNED about the potential impact on the marine environment of future deep seabed mining activities given the current level of knowledge and understanding of deep seabed mining;

***The World Conservation Congress, at its session in Jeju, Republic of Korea, 6–15 September 2012:***

CALLS on the Director General, IUCN Commissions, Members and partners to urgently dedicate efforts, expertise and resources to conduct research to determine the impacts on biodiversity of deep-seabed mining activities, especially on deep sea biodiversity in areas where deep sea exploration or mining may be undertaken, or are currently underway, recognizing the value of deep ocean ecosystems as the essential elements of the biodiversity of the ocean floor;

1. URGES all State members of IUCN, national, regional and global agencies, and all other States, international organizations and stakeholders to facilitate:
  - a. the identification of areas that should be set aside as representative marine protected areas recognizing the importance of ocean biodiversity and ocean ecosystems;
  - b. comprehensive strategic and environmental impact assessments, including environmental, cultural and social impact studies, ensuring stakeholders are engaged to provide rigour and transparency and allowing for independent review prior to any decision to authorize exploration or seabed mining;
  - c. the adoption of precautionary and ecosystem approaches, including the precautionary principle, to protect the marine environment and apply safeguards such as financial security and trust funds, prior to any decision to approve exploration or seabed mining, in order to ensure that adverse environmental impacts are avoided;
2. CALLS on all constituent parts of IUCN to cooperate to develop specialist groups and knowledge products on impacts of seabed exploration or mining activities;
3. URGES all States and relevant intergovernmental organisations to work to improve the governance of the seabed beyond national jurisdiction by implementing and, as appropriate, strengthening international and regional instruments to protect the marine environment; and
4. RECOMMENDS that States ensure that indigenous and local people are able to participate effectively in decisions that impact on ocean biodiversity and ocean ecosystems which may affect their rights and interests as custodians over their territories.

Sponsors:

TE IPUKAREA SOCIETY, Cook Islands  
Agence des Aires Marines Protégées

Co-sponsors:

Tonga Community Development Trust

University of the South Pacific  
National Trust of Fiji Islands  
Royal Forest and Bird Protection Society of New Zealand Inc.  
The Environment and Conservation Organisations of NZ Inc.  
Nature Conservation Council of New South Wales  
Fondation pour la nature et l'homme  
Réserves Naturelles de France  
Noé Conservation  
Centre international de Droit Comparé de l'Environnement  
Fédération Française des Sociétés de Sciences Naturelles  
Société Réunionnaise pour l'Etude et la Protection de l'Environnement Ile de la Réunion  
Fondation Nature & Découvertes  
Fédération des Conservatoires d'Espaces Naturels  
Association Française des Ingénieurs Ecologues  
Pro-natura International  
Association Kwata  
Fondation Internationale pour la Sauvegarde de la Faune  
Office pour les insectes et leur environnement  
Syndicat National des Directeurs de Parcs Zoologiques

## Appendix 5: General Contacts List

Name	Organisation	Telephone	Email	Notes
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	Marine Environment			Coastal Region
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Chris Yeats	CSIRO Earth Science & Resource Engineering, Australian Resources Research Centre	08 6436 8519	chris.yeats@csiro.au	Research Program Leader - Mineral System Science
Joanna Parr	CSIRO Wealth from Oceans Flagship	02 9490 8566	joanna.parr@csiro.au	Project Leader, Seabed Minerals
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## Appendix 6: IUCN Conference Contacts

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Big Ocean		Network of World's Marine Managed Areas					www.BigOceanManagers.org
Conservation International							www.conservation.org/WCC2012
KnowHow Consulting		Human resources development consulting	yamamiku_saranhe@yahoo.co.jp	010 3128 0319			www.khckorea.com
Parks		International Journal of Protected Areas and Conservation					

## Appendix 7: Overview of Seabed Minerals and their Geological Settings

(Earney 2005; Rona 2002, 2003, 2008, Van Dover 2011; UNDOALOS and ISA 2004)

Continental margin minerals	Deep sea minerals
<p><u>Extensions of onshore mineralisation*</u></p> <ul style="list-style-type: none"> <li>• Onshore deposits that extend into the current seabed</li> <li>• Include deposits of coal, scheelite, manganese, bauxite, copper and iron ore</li> </ul> <p><u>Aggregates</u> (sand and gravel, including carbonates)*</p> <ul style="list-style-type: none"> <li>• Can be derived from erosion and weathering of rocks on land, with materials transported into the ocean by rivers</li> <li>• Carbonates are precipitated directly from seawater, sometimes around a nucleus or amorphous grain; or precipitated biologically, whereby marine fauna extract dissolved components from seawater to manufacture shells/skeletons, and when the fauna die their shells/skeletons become incorporated into sedimentary grains</li> <li>• Dredged from beaches and shallow offshore bars for use in construction materials and beach restoration</li> <li>• Numerous sites worldwide, including offshore United Kingdom, Denmark, the Netherlands, Canada, United States of America (USA), Japan, Australia</li> </ul> <p><u>Placer deposits*</u></p> <ul style="list-style-type: none"> <li>• Deposits of metallic minerals (e.g. gold, tin, titanium, platinum, rare earth elements) and gemstones (e.g. diamonds) derived from eroded rocks on land, transported into the ocean by rivers, sorted and concentrated by waves, tides and currents, and deposited in sediments of continental margins</li> <li>• Diamonds mined off the coasts of</li> </ul>	<p><u>Polymetallic manganese nodules</u> (also known as ferromanganese nodules)</p> <ul style="list-style-type: none"> <li>• Usually located at depths between 3000 and 6000 m, lying on or within soft sediments</li> <li>• Golf- to tennis ball-size nodules that incorporate dissolved metals from both terrestrial and deep ocean sources. The metals precipitate from seawater over millions of years around a nucleus e.g. nodule fragments; biogenic materials such as a whale's earbone or shark's tooth; or rocks formed from volcanic material</li> <li>• Composition is dominated by manganese and iron oxides, but the nodules can also contain other minerals such as nickel, copper, cobalt, zinc, vanadium and molybdenum in varying concentrations</li> <li>• Occur in all oceans, although not common in the Arctic Ocean. Particularly prospective areas occur in the Indian Ocean and the Pacific Ocean between Hawaii and Central America</li> <li>• Indian government actively researching the development of technology for nodule mining from depths of 6000 m</li> </ul> <p><u>Cobalt-rich crusts</u> (ferromanganese crusts)</p> <ul style="list-style-type: none"> <li>• Located at depths between 1000 and 4000 m</li> <li>• Metals from terrestrial and deep ocean sources precipitate from seawater and accumulate in thin-layered crusts (up to 25 cm thick) on substrates of seamounts and ocean ridges</li> </ul>

<p>South Africa and Namibia; tin mined off Thailand, Burma and Indonesia; gold mined intermittently offshore Alaska</p> <ul style="list-style-type: none"> <li>• The sediment column of the entire continental margin potentially holds placer deposits, but the deposits targeted to date have been those that lie on the seabed in relatively shallow waters</li> </ul> <p><u>Phosphorites</u></p> <ul style="list-style-type: none"> <li>• Derived from chemical weathering of rocks on land, transported by rivers in a dissolved state into the ocean, taken up by marine plankton, transferred into deep water masses by sinking and dissolution, returned to surface waters by upwelling, then precipitated in the form of nodules or layers on hard rock substrates of continental margins. Can also be deposited by cementation and replacement of carbonates on submarine plateaus and banks</li> <li>• Current proposals to mine phosphate between the South Island and the Chatham Islands in New Zealand's territorial waters and off the coast of Namibia</li> <li>• Other known phosphorite deposits include offshore India, Peru, Chile, Morocco, eastern Australia, south-eastern USA</li> </ul>	<ul style="list-style-type: none"> <li>• Composition is dominated by manganese and iron oxides, but can also comprise cobalt, nickel, platinum, titanium, iron and manganese</li> <li>• The richest of crusts lie within and beyond the exclusive economic zones of the island nations of the western Pacific</li> </ul> <p><u>Seafloor massive sulfides</u></p> <ul style="list-style-type: none"> <li>• Located at depths of 1000 to 4000 m</li> <li>• Form in areas of volcanic activity at divergent oceanic plate boundaries, where upward-welling magma interacts with seawater circulating through the seabed. This seawater takes into solution metallic minerals, and then the hydrothermal solution is carried upwards and discharged through active vents ("black smokers"). Metals precipitate from the discharge, building platforms and mounds containing sulfides of zinc, copper, iron, silver, cobalt and gold</li> <li>• The term "massive sulfide" refers to metallic sulfide content (<math>\geq 60</math> percent) independent of texture, size and shape of the deposit</li> <li>• Still to be determined if they are renewable or non-renewable resources, based on length of time taken to accumulate prospective grade and tonnage</li> <li>• Target locations include the southwest Pacific – maritime Exclusive Economic Zones of PNG, Tonga, NZ, Fiji, Solomon Islands. Massive sulfides have also been identified in the Atlantic and Indian oceans</li> </ul>
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\*Main seabed mining targets to date

## Appendix 8: National and International Examples of Seabed Mining

Region	Mineral	Location(s)	Entities	Date(s) of operation	Depth(s) below sea level	Methods/technology	References (short-hand)
Continental margin	Tin (Cassiterite)	Several sites offshore Indonesia, Thailand, Malaysia and Burma	PT Tambang Timah (Indonesia)	Primitive tin mining has been conducted offshore Thailand and Indonesia for more than 100 years. Large-scale mining commenced in late 1980s offshore Indonesia. Operations still active	Up to 50 m	Suction and bucket-ladder dredging	"Marine Minerals for the 21st Century", Rona 2002 <a href="http://earthsci.org/mineral/mindep/depfile/tin.htm">http://earthsci.org/mineral/mindep/depfile/tin.htm</a> "Marine Mineral Resources" International Seabed Authority "Minerals from the Oceans" Cook 1974 <a href="http://www.isa.org.jm/files/documents/EN/Brochures/ENG6.pdf">http://www.isa.org.jm/files/documents/EN/Brochures/ENG6.pdf</a> "Marine Mineral Resources" F.C.F. Earney <a href="http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF">http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF</a> <a href="http://geology.uprm.edu/Morelock/9_image/T1min.gif">http://geology.uprm.edu/Morelock/9_image/T1min.gif</a> <a href="http://www.mining-journal.com/reports/marine-mining-the-new-wave?SQ_DESIGN_NAME=print_friendly">http://www.mining-journal.com/reports/marine-mining-the-new-wave?SQ_DESIGN_NAME=print_friendly</a>
Continental margin	Diamonds	Coastal strip between Oranjemund & Chameis Bay, Namibia	Marine Diamond Corporation, De Beers Marine, De Beers Namibia	First diamonds recovered in 1960, commercial mining started in 1962, shallow water reserves exhausted by 1971. Mining began again in late 1980s, with full-scale commercial mining commencing in 1991. Operations still active	< 30 m to 200 m	Airlift mining method: large pipe lowered from the ship to the ocean floor, at the bottom of the pipe are two horizontal pipes that blow air onto the seabed, because of the pressure this causes a vacuum in the central pipe, which transports the material up to the surface. Horizontal marine mining: a seabed crawler uses flexible hoses along the ocean floor to bring diamond bearing gravels to the surface. Vertical marine mining: a large-diameter drill used to bring diamond-bearing gravels to the surface. The drill is able to find diamonds at greater depths than the crawler. Activities are ISO 14001 Environmental Management certified	<a href="http://www.miningweekly.com/article/miners-eye-sea-land-resources-diminish-2009-10-30">http://www.miningweekly.com/article/miners-eye-sea-land-resources-diminish-2009-10-30</a> <a href="http://www.namdeb.com/about_namdeb_history.php">http://www.namdeb.com/about_namdeb_history.php</a> <a href="http://www.saimm.co.za/Journal/v107n06p393.pdf">http://www.saimm.co.za/Journal/v107n06p393.pdf</a> <a href="http://s3.amazonaws.com/zanran_storage/www.bclme.org/ContentPages/51851511.pdf">http://s3.amazonaws.com/zanran_storage/www.bclme.org/ContentPages/51851511.pdf</a> <a href="http://xa.yimg.com/kq/groups/15186538/828406171/name/article4.pdf">http://xa.yimg.com/kq/groups/15186538/828406171/name/article4.pdf</a> <a href="http://www.isa.org.jm/files/documents/EN/Brochures/ENG6.pdf">http://www.isa.org.jm/files/documents/EN/Brochures/ENG6.pdf</a> "Marine Mineral Resources" F.C.F. Earney <a href="http://www.debeersgroup.com/Operations/Mining/mining-methods/Marine-Mining/">http://www.debeersgroup.com/Operations/Mining/mining-methods/Marine-Mining/</a> Penney A. J., Pulfrich A., Rogers J., Steffani N. and Mabile V. (2008) Project: BEHP/CEA/03/02: Data Gathering and Gap Analysis for Assessment of Cumulative Effects of Marine Diamond Mining Activities on the BCLME Region
Continental	Diamonds	North west	De Beers,	De Beers	90-140 m?	Diver-based mining (shallow water): diver	<a href="http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF">http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF</a>

margin		South Africa	Alexkor	commenced commercial production in late 1991		guides suction hose into gravel deposits, which are sucked up off the seafloor. See other methods described above	DF <a href="http://geology.uprm.edu/Morelock/9_image/T1min.gif">http://geology.uprm.edu/Morelock/9_image/T1min.gif</a> <a href="http://www.zaoerv.de/55_1995/55_1995_2_a_348_390.pdf">http://www.zaoerv.de/55_1995/55_1995_2_a_348_390.pdf</a> <a href="http://www.mbendi.com/indy/ming/dmnd/af/sa/p0005.htm">http://www.mbendi.com/indy/ming/dmnd/af/sa/p0005.htm</a> <a href="http://www.isa.org.jm/files/documents/EN/Brochures/ENG6.pdf">http://www.isa.org.jm/files/documents/EN/Brochures/ENG6.pdf</a> <a href="http://www.alexkor.co.za/Operations_Marine.asp">http://www.alexkor.co.za/Operations_Marine.asp</a> <a href="http://www.debeersgroup.com/Operations/Mining/mining-methods/Marine-Mining/">http://www.debeersgroup.com/Operations/Mining/mining-methods/Marine-Mining/</a>
Continental margin	Gold	Nome, Alaska	WestGold Company & Inspiration Gold Incorporated. Also recreational mining	Beaches at Nome have been mined since the early 1900s. Commercial dredging in the late 80s. Operations still active	Intertidal beach and shallow submerged areas	Bucket-ladder dredging used initially. Later, a track-mounted mining system deployed on the seabed from an anchored barge, the beach, or sea-ice	<a href="http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF">http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF</a> <a href="http://geology.uprm.edu/Morelock/9_image/T1min.gif">http://geology.uprm.edu/Morelock/9_image/T1min.gif</a> "The changing vision of marine minerals" Rona 2008 <a href="http://www.isa.org.jm/files/documents/EN/Brochures/ENG6.pdf">http://www.isa.org.jm/files/documents/EN/Brochures/ENG6.pdf</a> <a href="http://notes3.state.ak.us/pn/pubnotic.nsf/0/7d2944f2f7fe40e892578f5006dd78e/\$FILE/2011+Nome+Lease+Sale+Final+Decision.pdf">http://notes3.state.ak.us/pn/pubnotic.nsf/0/7d2944f2f7fe40e892578f5006dd78e/\$FILE/2011+Nome+Lease+Sale+Final+Decision.pdf</a> "Marine Mineral Resources" F.C.F. Earney <a href="http://www.mining-journal.com/reports/marine-mining-the-new-wave?SQ_DESIGN_NAME=print_friendly">http://www.mining-journal.com/reports/marine-mining-the-new-wave?SQ_DESIGN_NAME=print_friendly</a>
Continental margin	Platinum	Offshore villages of Platinum and Goodnews Bay, Alaska	N.A.	N.A.	N.A.	Dredging	<a href="http://geology.uprm.edu/Morelock/9_image/T1min.gif">http://geology.uprm.edu/Morelock/9_image/T1min.gif</a> "Marine Mineral Resources" F.C.F. Earney
Continental margin	Sulfur	Gulf of Mexico, offshore Louisiana, USA	Freeport McMoRan	Operations still active	65 m	The Frasch extraction process - superheated water injected into sulphur formations; melted sulphur migrates to collection pipes & is pushed to the surface by a compressed air pipe	<a href="http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF">http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF</a> <a href="http://www.mcdermott.com/News/Publications/FreeportSulfur-Imperial.pdf">http://www.mcdermott.com/News/Publications/FreeportSulfur-Imperial.pdf</a> "Minerals from the Oceans" Cook 1974 "Marine Mineral Resources" F.C.F. Earney
Continental margin	Potash	North Yorkshire Coast, UK	Cleveland Potash Ltd	Operations still active	800 -1300 m	N.A.	<a href="http://www.thecrownestate.co.uk/marine/minerals-potash/boulby-potash/">http://www.thecrownestate.co.uk/marine/minerals-potash/boulby-potash/</a> <a href="http://www.bgs.ac.uk/downloads/start.cfm?id=1367">www.bgs.ac.uk/downloads/start.cfm?id=1367</a> <a href="ftp://ftp.bgs.ac.uk/">ftp://ftp.bgs.ac.uk/</a>
Continental margin	Phosphate	South southwest of Walvis Bay,	UCL Resources Ltd,	Proposed project - Env Impact	180 - 300 m	Trailing suction hopper dredging	<a href="http://www.miningweekly.com/article/eia-submitted-for-namibia-marine-phosphates-project-2012-01-13">http://www.miningweekly.com/article/eia-submitted-for-namibia-marine-phosphates-project-2012-01-13</a> <a href="http://www.unionresources.com.au/?page=25">http://www.unionresources.com.au/?page=25</a>

		Namibia	Minemakers & Tungeni Investments	Assessment Report & Env Mgmt Plan for marine component submitted March 2012			<a href="http://xa.yimg.com/kq/groups/15186538/828406171/name/article4.pdf">http://xa.yimg.com/kq/groups/15186538/828406171/name/article4.pdf</a> <a href="http://www.minemakers.com.au/projects-development-sandpiper.php">http://www.minemakers.com.au/projects-development-sandpiper.php</a>
Continental margin	Shellsand, primarily calcium carbonate	Owen Anchorage, south-west of Fremantle, Western Australia	Cockburn Cement Ltd	Commenced in 1972, current permit covers activities until 2031	~ 20 m	Suction hopper dredging	<p>McKay W. J., Mieztis Y., Exon N. F. and Sait R. (2005) Australia's Offshore Minerals: An Overview. In: Yeats, C.J. and McConachy, T.F., 2005. Deep Blue Minerals – towards a sustainable marine minerals industry: extended abstracts. CSIRO Exploration and Mining Report P2005/135, pp 9-14.</p> <p>Hegge B., Sabeau J. A. R. and Ward G. (2005) Marine Carbonate Mining. In: Yeats, C.J. and McConachy, T.F., 2005. Deep Blue Minerals – towards a sustainable marine minerals industry: extended abstracts. CSIRO Exploration and Mining Report P2005/135, pp 26–30.</p> <p><a href="http://www.cockburncementcommunity.com.au/environment/marine/environmental-management/">http://www.cockburncementcommunity.com.au/environment/marine/environmental-management/</a>  <a href="http://www.cockburncementcommunity.com.au/media/2606/stage2_demp_11_email_-_chapter_12.pdf">http://www.cockburncementcommunity.com.au/media/2606/stage2_demp_11_email_-_chapter_12.pdf</a>  <a href="http://cockburncementcommunity.com.au/media/44400/ccl_final_decomplan_rev6.pdf">http://cockburncementcommunity.com.au/media/44400/ccl_final_decomplan_rev6.pdf</a>  <a href="http://www.publish.csiro.au/?act=view_file&amp;file_id=PVv2008n135.pdf">http://www.publish.csiro.au/?act=view_file&amp;file_id=PVv2008n135.pdf</a>  <a href="http://www.environment.gov.au/soe/2001/publications/technical/marine-disturbance/appendix4.html">http://www.environment.gov.au/soe/2001/publications/technical/marine-disturbance/appendix4.html</a></p>
Continental margin	Calcerous sediments (coral sands)	Moreton Bay, Queensland	Queensland Cement & Lime Company Ltd	Ceased	N.A.	Dredging	<a href="http://www.publish.csiro.au/?act=view_file&amp;file_id=PVv2008n135.pdf">http://www.publish.csiro.au/?act=view_file&amp;file_id=PVv2008n135.pdf</a>
Continental margin	Phosphate nodules	Chatham Rise, between the South Island and the Chatham Islands, New Zealand	Chatham Rock Phosphate Ltd	Proposed operation. Exploration & research in the 1970s and 80s helped to define the deposit.	400 m or less	Resource recovery & separation system applying adapted dredging technology - hydraulic agitation & suction, no cutting	<a href="http://www.rockphosphate.co.nz/">http://www.rockphosphate.co.nz/</a> <a href="http://www.maritimejournal.com/features101/marine-civils/port,-harbour-and-marine-construction/boskalis-wins-contract-for-seabed-mining-deal">http://www.maritimejournal.com/features101/marine-civils/port,-harbour-and-marine-construction/boskalis-wins-contract-for-seabed-mining-deal</a>

				Environmental studies currently underway			
Continental margin	Barite	Petersburg, Alaska	Chromalloy Company	Began in 1963 on barite above high tide mark, offshore mining since 1967	Up to 25 m	Ore drilled & blasted underwater, broken material recovered by clam shell & loaded onto bottom-dump barge, which is towed close to shore & opened. Rock pulled ashore with drag line, crushed and stockpiled	"Minerals from the Oceans" Cook 1974 <a href="http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF">http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF</a>
Continental margin	Iron ore	Cockatoo Island, 140 km north of Derby, west Kimberley Coast, Western Australia	HWE Cockatoo Pty Ltd (since 2000)	Onshore mining from 1951. Seawall embankment constructed in 2002, extended from 2008-2010, & to be extended further in 2012/13	Up to 58 m	Seawall embankment constructed to keep seawater out of mine pit and permit mining below sea level	<a href="http://portal.environment.wa.gov.au/pls/portal/docs/PAGE/ADMIN_LICENSING/WORKS%20APPROVALS/TAB9013228/5190COCKATOO_8_0.PDF">http://portal.environment.wa.gov.au/pls/portal/docs/PAGE/ADMIN_LICENSING/WORKS%20APPROVALS/TAB9013228/5190COCKATOO_8_0.PDF</a> <a href="http://www.leightoncontractors.com.au/projects/cockatoo-island-project/">http://www.leightoncontractors.com.au/projects/cockatoo-island-project/</a>
Continental margin	Iron ore - iron sands	West coast of New Zealand's North Island	Trans-Tasman Resources Ltd	Proposed	Core samples collected from depths of 3-30 m	Dredging plus offshore beneficiation plant on a processing vessel to separate ore from sediment	<a href="http://www.ttrl.co.nz/">http://www.ttrl.co.nz/</a> <a href="http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&amp;objectid=10829768">http://www.nzherald.co.nz/business/news/article.cfm?c_id=3&amp;objectid=10829768</a>
Continental margin	Sand	South of Hallett Cove, South Australia	South Australian Department of Mines & Energy	Early 1990s	10-20 m	Trailer suction dredge	McKay W. J., Mieztis Y., Exon N. F. and Sait R. (2005) Australia's Offshore Minerals: An Overview. In: Yeats, C.J. and McConachy, T.F., 2005. <i>Deep Blue Minerals – towards a sustainable marine minerals industry: extended abstracts</i> . CSIRO Exploration and Mining Report P2005/135, pp 9-14
Continental margin	Sand & gravel	Northern Shikoku, southern Shikoku, south-western Honshu & north-western Kyūshū, Japan	N.A.	Production began in early 1960s	Up to 70 m	Clamshell & hydraulic (suction pump) dredging	"The changing vision of marine minerals" Rona 2008 "Minerals from the Oceans" Cook 1974 "Marine Mineral Resources" F.C.F. Earney

Continental margin	Coal	Cape Breton Island, Nova Scotia, Canada	Dominion Coal Company	Undersea mining commenced during last quarter of 19th century. Current status unclear	N.A.	Advance & retreat longwall mining techniques	"The changing vision of marine minerals" Rona 2008 "Marine Mineral Resources" F.C.F. Earney
Ocean basin	Copper, gold, zinc, and silver - seafloor massive sulphides	Bismarck Sea, Papua New Guinea, approx 30 km from nearest coast (New Ireland Province) and 50 km north of the Port of Rabaul	Solwara 1 Project, Nautilus Minerals. PNG govt also has a stake in the project	The first massive sulphides were discovered in the late 1970s. Exploration licences issued by the PNG government in 1997. Mining lease issued in January 2011 (world's first deep sea mining lease)	~ 1,600 m	Disaggregate and gather ore on the seafloor using cutter suction technology; lift ore to surface with seawater; separate ore and seawater on board the vessel; filter seawater and then return it to deep water, just above the seafloor	<a href="http://www.nautilusminerals.com/s/Projects-Solwara.asp">http://www.nautilusminerals.com/s/Projects-Solwara.asp</a> <a href="http://www.cares.nautilusminerals.com/Solwara11Mpacts.aspx?npath=1,4,5,44#EIS">http://www.cares.nautilusminerals.com/Solwara11Mpacts.aspx?npath=1,4,5,44#EIS</a> <a href="http://icesjms.oxfordjournals.org/content/68/2/341.full">http://icesjms.oxfordjournals.org/content/68/2/341.full</a>
Ocean basin	Manganese, copper, cobalt, nickel, iron, nickel, platinum, gold, zinc, rare earths etc - polymetallic manganese nodules	The greatest densities of nodules occur off the west coast of Mexico (in the Clarion-Clipperton Zone), in the Peru Basin, & the Indian Ocean	Deep Sea Technologies and Ocean Mining Group, National Institute of Ocean Technology, Ministry of Earth Sciences, Government of India; University of Tokyo; Rare Earth Research and	Recovery of manganese nodules first reported in 1873. Subsequent "rediscovery" of manganese nodules during the 1960s. Since 2001 several permits have been issued to governmental institutions by the ISA to	Usually 4000 to 6000m	Under development - crawler based, remote controlled, electrohydraulically operated mining machine that pumps nodules through a flexible riser system using a single positive displacement pump. Multiple mining machines connected to mother station	<a href="http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF">http://www.dggs.alaska.gov/webpubs/dggs/ic/text/ic022.PDF</a> <a href="http://worldoceanreview.com/wp-content/downloads/WOR_chapter_7.pdf">http://worldoceanreview.com/wp-content/downloads/WOR_chapter_7.pdf</a> (2010?) "Marine Metallic Mineral resources of the Pacific Basin" Clark & Cook Clark, 1986 "The changing vision of marine minerals" Rona 2008 <a href="http://xa.yimg.com/kq/groups/15186538/828406171/name/article4.pdf">http://xa.yimg.com/kq/groups/15186538/828406171/name/article4.pdf</a> <a href="http://www.niot.res.in/projects/dsm/dsm_introduction220210.php">http://www.niot.res.in/projects/dsm/dsm_introduction220210.php</a> <a href="http://www.deeпоceanmining.org/docs/atmanand.pdf">http://www.deeпоceanmining.org/docs/atmanand.pdf</a> <a href="http://www.miningaustralia.com.au/news/india-looks-to-deep-sea-mining?utm_source=SilverpopMailing&amp;utm_medium=email&amp;utm_campaign=Mining%20Australia%20Newsletter%20-%20send%20-">http://www.miningaustralia.com.au/news/india-looks-to-deep-sea-mining?utm_source=SilverpopMailing&amp;utm_medium=email&amp;utm_campaign=Mining%20Australia%20Newsletter%20-%20send%20-</a>

			Technology Transfer Centre - Hanoi; Japan Oil, Gas and Metals National Corporation	survey manganese fields. These are not for actual mining but for a detailed initial investigation of potential mining areas			<a href="http://www.nature.com/news/japan-and-vietnam-join-forces-to-exploit-rare-earth-elements-1.11009">http://www.nature.com/news/japan-and-vietnam-join-forces-to-exploit-rare-earth-elements-1.11009</a> <a href="http://www.nature.com/news/2011/110703/full/news.2011.393.html">http://www.nature.com/news/2011/110703/full/news.2011.393.html</a>
Ocean basin	Manganese, cobalt, copper, nickel, iron, platinum, titanium - cobalt-rich crusts	Regions with high volcanic activity such as the territorial waters around the island states of the South Pacific	N.A.	Conceptual stage	Usually 1000-4000 m	Under development - self-propelled miner with mechanical slicing and crushing and hydraulic pick-up devices	<a href="http://worldoceanreview.com/wp-content/downloads/WOR_chapter_7.pdf">http://worldoceanreview.com/wp-content/downloads/WOR_chapter_7.pdf</a> "Marine Metallic Mineral resources of the Pacific Basin" Clark & Cook Clark, 1986 "Marine Minerals for the 21st Century", Rona 2002 "The changing vision of marine minerals" Rona 2008 <a href="http://www.isa.org.jm/files/documents/EN/Workshops/Jul06/Yamazaki-Crust.pdf">http://www.isa.org.jm/files/documents/EN/Workshops/Jul06/Yamazaki-Crust.pdf</a>

## Appendix 9: Summary of Mineral Titles over NT and Commonwealth Waters

Source: Department of Mines and Energy

CURRENT MINERAL TITLES OVER WATER - EFFECTIVE 31 OCTOBER 2012

TITLE TYPE	TITLE NUMBER	STATUS	HOLDER
EL	26869	application	TERRITORY MINERALS PTY LTD *
EL	29050	application	MINEMAKERS (SALT) PTY LTD
EL	28882	application	OCRE ROUGE RESOURCES PTY LTD
EL	28883	application	OCRE ROUGE RESOURCES PTY LTD
EL	28086	application	NORTH MANGANESE PTY LIMITED
EL	28087	application	NORTH MANGANESE PTY LIMITED
EL	28085	application	NORTH MANGANESE PTY LIMITED
EL	28824	application	AUSTRALIAN MANGANESE RESOURCES PTY LTD *
EL	26868	application	TERRITORY MINERALS PTY LTD *
EL	27579	grant	GROOTE EYLANDT MINING COMPANY PROPRIETARY LIMITED
EL	27576	grant	GROOTE EYLANDT MINING COMPANY PROPRIETARY LIMITED
EL	27577	grant	GROOTE EYLANDT MINING COMPANY PROPRIETARY LIMITED
EL	27578	grant	GROOTE EYLANDT MINING COMPANY PROPRIETARY LIMITED
EL	27523	grant	REFLECTIVE MINERALS PTY LTD
EL	27550	grant	REFLECTIVE MINERALS PTY LTD
EL	27551	grant	REFLECTIVE MINERALS PTY LTD
MA	28131	application	NORTHERN MANGANESE LIMITED*
MA	28133	application	NORTHERN MANGANESE LIMITED*
MA	28134	application	NORTHERN MANGANESE LIMITED*
MA	28132	application	NORTHERN MANGANESE LIMITED*
MA	28135	application	NORTHERN MANGANESE LIMITED*
MA	28881	application	OCRE ROUGE RESOURCES PTY LTD
MA	27605	grant	REFLECTIVE MINERALS PTY LTD
MA	27885	grant	YUKIDA RESOURCES PTY LTD
MA	27952	grant	YUKIDA RESOURCES PTY LTD
MA	27953	grant	YUKIDA RESOURCES PTY LTD
OEL	28100	application	NORTHERN MANGANESE LIMITED*
OEL	28101	application	NORTHERN MANGANESE LIMITED*
OEL	28105	application	NORTHERN MANGANESE LIMITED*
OEL	28098	application	NORTHERN MANGANESE LIMITED*
OEL	28099	application	NORTHERN MANGANESE LIMITED*
OEL	28102	application	NORTHERN MANGANESE LIMITED*
OEL	28103	application	NORTHERN MANGANESE LIMITED*
OEL	28104	application	NORTHERN MANGANESE LIMITED*
OEL	28106	application	NORTHERN MANGANESE LIMITED*

EL – exploration licence

MA – mineral authority

OEL – offshore exploration licence

N.B. the asterisk symbols are not significant, they reflect a function in the Department of Mines and Energy database.

# Appendix 10: Article that appeared in Galiwin'kupy Dhäwu, November 2011

Galiwin'kupy Dhäwu is a local newspaper produced by the Marthakal Homelands Resource Centre, East Arnhem Land

## Mining Exploration Applications

The notice below was sent to the NT News and the Objection Period has closed.

The Galiwin'kupy Dhäwu is running this story to inform you of these mining exploration applications lodged, we hope to have applications like this advertised in our newspaper in future and we need your support to show that our newspaper is important to pass information like this on locally.

**EXPLORATION LICENCES**  
An application for an exploration licence may be made over any land in the Northern Territory by following the procedures set out in the Mining Act and Regulations. Different land tenure has different processes for granting exploration licences.

The Mining Act is administered by the Minerals and Energy Group of the Department of Primary Industry, Fisheries and Mines (the Department) and is responsible to the Minister for Mines and Energy.

Exploration licences may be granted for an initial period of up to 6 years and allow the holder to explore for all minerals. (It is important to note that minerals are the property of the Crown and the Northern Territory has a right to benefit from those minerals.) However, the grant of an exploration licence is not automatic and the Mining Act provides an opportunity for affected landholders and occupiers to comment on or object to the proposed exploration licence.

The Mining Act has a number of provisions designed to protect the rights of landholders while allowing legitimate explorers access to land. The Applicant must notify the affected landholders or occupiers within 14 days of lodging an application for

Authorisation Under Sect 178 28131 sought by GROOTE RESOURCES LIMITED, ACN 119 494 772 over an area of 78 Blocks (197 Sq Kms) depicted below for a term of 6 years, within the ROSE RIVER locality.



Not To Scale NMG Map Sheet No. 6369

Authorisation Under Sect 178 28132 sought by GROOTE RESOURCES LIMITED, ACN 119 494 772 over an area of 91 Blocks (115 Sq Kms) depicted below for a term of 6 years, within the LAMREN locality.



Not To Scale NMG Map Sheet No. 6368

Authorisation Under Sect 178 28133 sought by GROOTE RESOURCES LIMITED, ACN 119 494 772 over an area of 117 Blocks (278 Sq Kms) depicted below for a term of 6 years, within the LAMREN locality.



Not To Scale NMG Map Sheet No. 6368

Authorisation Under Sect 178 28134 sought by GROOTE RESOURCES LIMITED, ACN 119 494 772 over an area of 319 Blocks (773 Sq Kms) depicted below for a term of 6 years, within the METYOUNG locality.



Not To Scale NMG Map Sheet No. 6367

Authorisation Under Sect 178 28132 sought by GROOTE RESOURCES LIMITED, ACN 119 494 772 over an area of 91 Blocks (115 Sq Kms) depicted below for a term of 6 years, within the LAMREN locality.



Not To Scale NMG Map Sheet No. 6368

Authorisation Under Sect 178 28131 sought by GROOTE RESOURCES LIMITED, ACN 119 494 772 over an area of 78 Blocks (197 Sq Kms) depicted below for a term of 6 years, within the ROSE RIVER locality.



Not To Scale NMG Map Sheet No. 6369

Authorisation Under Sect 178 28133 sought by GROOTE RESOURCES LIMITED, ACN 119 494 772 over an area of 117 Blocks (278 Sq Kms) depicted below for a term of 6 years, within the LAMREN locality.



Not To Scale NMG Map Sheet No. 6368

Authorisation Under Sect 178 28134 sought by GROOTE RESOURCES LIMITED, ACN 119 494 772 over an area of 319 Blocks (773 Sq Kms) depicted below for a term of 6 years, within the METYOUNG locality.



Not To Scale NMG Map Sheet No. 6367

Authorisation Under Sect 178 28133 sought by GROOTE RESOURCES LIMITED, ACN 119 494 772 over an area of 117 Blocks (278 Sq Kms) depicted below for a term of 6 years, within the LAMREN locality.



Not To Scale NMG Map Sheet No. 6368

Exploration Licence 28824 sought by AUSTRALIAN MINERAL RESOURCES PTY LTD, ACN 129 524 151 over an area of 79 Blocks (193 Sq Kms) depicted below for a term of 6 years, within the ROSE CREEK locality.



Not To Scale NMG Map Sheet No. 6369

Exploration Licence 28825 sought by AUSTRALIAN MINERAL RESOURCES PTY LTD, ACN 129 524 151 over an area of 79 Blocks (193 Sq Kms) depicted below for a term of 6 years, within the ROSE CREEK locality.



Not To Scale NMG Map Sheet No. 6369

Exploration Licence 28826 sought by OCRE ROUGE RESOURCES PTY LTD, ACN 151 217 079 over an area of 108 Blocks (452 Sq Kms) depicted below for a term of 6 years, within the ELCHO locality.



Not To Scale NMG Map Sheet No. 6374

Authorisation Under Sect 178 28134 sought by GROOTE RESOURCES LIMITED, ACN 119 494 772 over an area of 319 Blocks (773 Sq Kms) depicted below for a term of 6 years, within the METYOUNG locality.



Not To Scale NMG Map Sheet No. 6367

Exploration Licence 28825 sought by OCRE ROUGE RESOURCES PTY LTD, ACN 151 217 079 over an area of 108 Blocks (452 Sq Kms) depicted below for a term of 6 years, within the ELCHO locality.



Not To Scale NMG Map Sheet No. 6374

Exploration Licence 28826 sought by OCRE ROUGE RESOURCES PTY LTD, ACN 151 217 079 over an area of 108 Blocks (452 Sq Kms) depicted below for a term of 6 years, within the ELCHO locality.



Not To Scale NMG Map Sheet No. 6374

Exploration Licence 28827 sought by OCRE ROUGE RESOURCES PTY LTD, ACN 151 217 079 over an area of 108 Blocks (452 Sq Kms) depicted below for a term of 6 years, within the ELCHO locality.



Not To Scale NMG Map Sheet No. 6374

an exploration licence  
**COMMENTS OR OBJECTIONS**  
It is a requirement under the Mining Act that an exploration licence application is advertised in the newspaper (the NT News). This application was advertised in the NT

News. The landholders / occupiers then have 2 months to lodge a comment about or an objection to that application, with the Department. Comments or objections must be in writing, detailing the grounds on which they are made. The 2 month

deadline for this application has passed. If a comment or objection is received within the 2 month period, the Department will forward a copy to the Applicant, allowing 21 days for them to respond. The 2 months period

has passed for comments or objections but Galiwin'kupy Dhäwu have been told some objections have been lodged and the Gumurr Marthakal Rangers would like to thank those who lodged their concerns.

**CONTACT INFORMATION**

Department of Primary Industry, Fisheries and Mines - Minerals and Energy Titles Division  
Address: 5th Floor Centrepoint Building, 48-50 Smith Street, DARWIN NT 0800 Postal Address: GPO Box 3000, DARWIN NT 0801  
Phone: 08 8999 5322 Fax: 08 8981 7106  
Email: [titles.info@nt.gov.au](mailto:titles.info@nt.gov.au)  
Website: [www.nt.gov.au/dpfm](http://www.nt.gov.au/dpfm)

## Appendix 11: Summary of Recovery Rates for Marine and Coastal Areas Disturbed by a Range of Activities, at Different Depths

Source: Penney *et al.* (2008)

	Method/Depth	Start of Recovery	Recovering	Substantially Recovered	References
1	Deep-Sea Nodule Mining: >1,000 m	5	10	40	<ul style="list-style-type: none"> <li>• Nodule mining off Peru: signs of recovery &gt;7 years (Schriever <i>et al.</i> 1997)</li> <li>• Recovery after disturbance at &gt;100 m depth likely to take decades (Foell <i>et al.</i> 1990, 1992a, 1992b; Thiel &amp; Schriever 1994)</li> </ul>
2	Deepwater Remote: 130 m	2	5	15	<ul style="list-style-type: none"> <li>• Swedish fjord recovery after a major anoxic event: 2 years (Rosenberg <i>et al.</i> 2002)</li> <li>• Benthic communities in Atlantic 1 area: recovery takes 10 years or more (Savage 1996; van der Merwe 1996; Winckler 1999; Parkins &amp; Field 1997, 1998; Pulfrich &amp; Penney 1999; Savage <i>et al.</i> 2001)</li> <li>• Atlantic 1 drill mining effects persist &gt;5 years. Crawler mining impacts recovery: Northern area &gt;9-10 years, Southern area 5-6 years (Pulfrich &amp; Penney 1999)</li> </ul>
3	Midwater Remote: 40 m	1	2	5	<ul style="list-style-type: none"> <li>• Marine dredger gold placer mining off Alaska: 3 years for benthic recolonization of dredged area (Garnett &amp; Ellis 1995; Jewett 1999)</li> <li>• Physical replenishment of fine deposits within the wave base: Within 1 year. Medium grain deposits: 1 - 3 years. Coarse deposits with some fines: 5 years. Coarse deposits, rocks &amp; boulders: &gt;5 years (Ellis 1996 and others)</li> </ul>
4	Vessel-Based Divers: 25 m	0.5	2	3	<ul style="list-style-type: none"> <li>• Diver mining in 25 m off Zweispitz: Taxonomic diversity recovered within 1 year (Barkai &amp; Bergh 1993; Parkins &amp; Branch 1995, 1996, 1997; Pulfrich 1998a, 2004a; Pulfrich &amp; Penney 1998, 1999, 2001; Pulfrich <i>et al.</i> 2005; Pulfrich &amp; Penney in press)</li> <li>• Recovery of reefs off Zweispitz impacted by dumping of overburden: 1 - 2 years (Parkins &amp; Branch 1996, 1997; Pulfrich 1998a; Pulfrich &amp; Penney 2001)</li> <li>• Boulders beds exposed by pumping: 3 years to re-fill with sediments and 'recover' (Pulfrich &amp; Penney 2001; Pulfrich &amp; Penney in press)</li> </ul>

	Method/Depth	Start of Recovery	Recovering	Substantially Recovered	References
5	Shore-Based Divers: 10 m	0.5	1	2	<ul style="list-style-type: none"> <li>Recovery of subtidal mined areas: &lt; 2 years (Pulfrich <i>et al.</i> 2003a).</li> <li>Re-growth of cut kelp in cleared lanes: within 1 year (Pisces 2007)</li> </ul>
6	Intertidal/Beach	0.1	0.5	1.5	<ul style="list-style-type: none"> <li>Physical recovery of mined beaches within a few months (Nel &amp; Pulfrich 2002; Nel <i>et al.</i> 2003; Pulfrich <i>et al.</i> 2004)</li> <li>Rapid recovery in beach communities to pre-mining condition after 20 - 50 months (Nel &amp; Pulfrich 2002; Nel <i>et al.</i> 2003; Pulfrich <i>et al.</i> 2004)</li> <li>Physical recovery of Cornwall surf-zone communities after platform tests within 2 weeks (Seiderer &amp; Newell 2000)</li> <li>Beach re-colonization rapid (van der Merwe &amp; van der Merwe 1991; Brown &amp; Odendaal 1994; Petersen <i>et al.</i> 2000, Schoeman <i>et al.</i> 2000)</li> <li>New Zealand trampling of rock intertidal: recovery within 2 years (Schiel &amp; Taylor 1999)</li> <li>West coast rocky intertidal after mining/trampling: recovery &lt;2 years (Parkins &amp; Branch 1995, 1996, 1997; Pulfrich 1998a; Pulfrich <i>et al.</i> 2003a)</li> <li>Recovery occurred after experimental removal of limpets (Eekhout <i>et al.</i> 1992)</li> <li>Recovery of mussel cover after wave disturbance: 80% in &lt;24 months (Steffani &amp; Branch 2003)</li> <li>Recovery of experimentally cleared mussel patches 20-24 months (Steffani &amp; Branch 2005)</li> </ul>
7	Small Cofferdams	0.5	2	5	<ul style="list-style-type: none"> <li>Extrapolated from above</li> </ul>
8	Seawall/Mine dumps	5	20	50	<ul style="list-style-type: none"> <li>Recovery of shoreline and beaches after large-scale seawalls slow; little recovery after 18 years due enduring physical changes. May take decades or centuries (Watson 1992; Brown &amp; Odendaal 1994; Rickard <i>et al.</i> 1994)</li> <li>Namibian mine dumps: recovery of plants starts about 5 years, fair cover after 15 years, 80% of species after 40 years (Pallett <i>et al.</i> 1995)</li> </ul>
9	Arid area terrestrial	20	50	120	<ul style="list-style-type: none"> <li>Namibian gravel plains - removal of topsoil: no observed natural recovery to date since mining (Burke &amp; Raimondo 2002)</li> <li>Gravel and sand dumps at Jammerbucht still physically different after 80 years, with different/reduced plant communities (Pallett <i>et al.</i> 1995)</li> </ul>

## Appendix 12: Preliminary Collection of Marine Environment References for NT Coastal and Adjacent Commonwealth Waters

### **Benthic ecosystems**

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# Appendix 13: Anindilyakwa Indigenous Protected Area Land and Sea Management Plan

## ANINDILYAKWA INDIGENOUS PROTECTED AREA LAND AND SEA MANAGEMENT PLAN

### Warnindilyakwa People and Country



Gracile Eylandt archipelago is the traditional land and sea country of the Warnindilyakwa Traditional Owners, referred to by our language name Anindilyakwa.

Ancestral spirits brought us here from the mainland along Songlines that created the land, rivers, animals, plants and sacred sites.

About 1200 Anindilyakwa people live at Anjanjuru and Umbakumba on Gracile Eylandt and Milyakburra on Bickerton Island.

### Our Landscape/Seascape Values

- Relationship between people, culture and country
- Kinship with animals and plants on land and sea
- Identity as island and saltwater people
- Songlines that link us to the mainland
- Sacred sites on land and sea
- Traditional food from land and sea
- Traditional knowledge and practices
- Culturally significant species on land and sea
- Habitats that sustain people, animals and plants

### Conservation Significance

- Nationally and internationally significant nesting sites for marine turtles and seabird colonies
- Approximately 900 plant species and 330 vertebrate species
- 12 threatened animal species, including Northern Hopping-mouse, Brush-tailed Rabbit-rat and Northern Quoll
- Absence of cane toads, feral pigs, feral horses, feral donkeys, feral buffaloes and most invasive pasture plants
- Pristine marine environment supporting populations of dugong, four species of marine turtle, many fish and shark species, and coral reefs.

### Managing Country

#### Legal Means

- Recreation permits for access to land areas (Land Rights Act)
- Negotiated access arrangements for tidal areas (Land Rights Act)
- Sacred Sites Act
- NT Fisheries Act
- Negotiated compliance training and authorisation

#### Other Effective Means

- Ranger patrols
- Ghost nets removal
- Fee-for-Service contracts (AQIS and others)
- Weed management
- Feral animal management (including cane toad monitoring)
- Fire management
- Site recording, protection and management
- Research and monitoring




### Our Shared History

1600s – 1900s  
Macassan fishermen sailed down from Indonesia with the annual northwest monsoon.

1920s  
Church Missionary Society brought Christianity and formal education to our communities.

1960s  
GEMCO manganese mine established.

2007  
Dugong Beach Resort opened.

### Warnindilyakwa Songlines



Boundary of Anindilyakwa IPA

### Threats to Our Country

#### Seabed mining would:

- Go through our Songlines
- Destroy our sacred sites
- Destroy dugong and turtle feeding grounds
- Pollute our waters
- Lock us out of hunting areas

#### Weeds

- Weeds present on the IPA include Buffel Grass, Greater grass, Mission Grass, Coffee Bush, Guinea Grass, Hightail, Nene and Snake Grass
- Invasive pasture grasses present in Arrnhemland threaten the local ecology and fire regimes.

#### Feral Animals

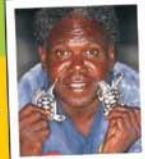
- Many feral animals common to the Top End do not yet occur on the IPA.
- Rusa Deer, Asian House Gecko, Eurasian Tree Sparrow, House Mouse, Black Rat, feral cats and wild dogs are found on the IPA.

### Our Vision for Culture and Country

- Our riches are in the land, the sea and the Songlines.
- Our land and sea country are more important to us than money – once country is destroyed it cannot be replaced.
- We want to keep our land and sea country healthy like it is now for our future generations and for all our countrymen that our Songlines connect us to on the mainland.

### Research and Monitoring

- Toad monitoring using sniffer dogs and remote sensing
- Animal and plant surveys
- Turtle research and monitoring (nesting surveys and satellite tracking)
- Northern Quoll tracking
- Fisheries research
- Climate change
- Monitoring and reporting on implementation of Management Plan



### Supporting Culture

- Traditional knowledge recording and application
- Cultural mapping on land and sea
- Junior Ranger Program
- Culture camps
- Supporting Elders to access country
- Education, communication and community involvement

### Our IPA Journey

2006:  
Anindilyakwa IPA over all our islands.

2010/2011:  
Consultations with TOs, government and others about expanding our IPA into sea country.

2012:  
All our land and sea country within the Anindilyakwa Land Council boundary dedicated as an IPA (IUCN Category V Protected Landscape/Seascape).



### IPA Governance

- Direction by Warnindilyakwa Traditional Owners
- Implementation through Anindilyakwa Land Council
- Collaboration with government and stakeholders through IPA Consultative Committee



### Using Our Country

#### Our main food from the sea includes:

- Dugong, Green Turtle, Flatback Turtle, Trevally, Milkfish, Parrot fish, Stingray, Mudcrab, oysters, mud mussels, clams

#### Our main food from the land includes:

- Mandakimiyerrea - long yams
- Yilyaku-wa - native honey or "sugarbag"
- Vibaradu-wa - agile wallabies
- Yanaju-wa - goannas
- Yimandakowabu-wa - blue-tongued lizards
- Mangkarriba - wild plum
- Angarrakakia - jungle currant
- Marrimayur-da - bush currant
- Yimuranga - wild prune




### What the IPA Dedication Means

We are committed to protecting, caring for and sustainably using our land and sea country through:

- Traditional law and practices
- Land & sea patrols, management, education and research
- Negotiation & collaboration with government
- Negotiation & collaboration with others
- Aboriginal Land Rights (NT) Act
- Native Title Act

IPA dedication is a non-legal process. It does not impact on any current authorities, licences or access rights. Any changes to current arrangements will only occur through negotiation and agreement.



### Management Principles

- Respect for Warnindilyakwa law, Songlines, spiritual and cultural values
- Maintenance of biodiversity values
- Protection of biosecurity integrity
- Sustainable use of natural resources on land and sea by Traditional Owners
- Sustainable recreational fishing
- Economically viable and ecologically sustainable commercial fishing
- No seabed mining
- Land and sea managed together



### Supporting Documents

### Anindilyakwa Land and Sea Rangers

Rangers based on Gracile and Bickerton Islands

- Implement IPA Management Plan
- Carry out regular land & sea patrols
- Control weeds and feral animals
- Remove ghost nets from the sea
- Undertake research, monitoring & biosecurity and fire management projects
- Maintain roads to outstations
- Support cultural knowledge and practices
- Engage in training and professional development



### Healthy People – Healthy Country

#### Healthy Culture

- Maintaining ceremony
- Maintaining language

#### Economic and Social Development

- Ranger jobs, training and mentoring
- Business opportunities in environmental services and tourism

#### Health Promotion

- Supporting access to bush foods
- Supporting wellbeing and healthy choices through culture camps



## Appendix 14: IMMS Code for Environmental Management of Marine Mining



# CODE FOR ENVIRONMENTAL MANAGEMENT OF MARINE MINING

**Originally Adopted by the  
INTERNATIONAL MARINE MINERALS SOCIETY  
ON 2 NOVEMBER 2001  
REVISED VERSION ADOPTED 16 SEPTEMBER 2011**

## **Introduction**

**The Code: Its Content and Format.** The Code consists of a statement of Environmental Principles for marine mining, followed by a set of Operating Guidelines for application as appropriate at specific mining sites. These Guidelines are designed to serve industry, regulatory agencies, scientists and other stakeholders, as benchmarks for development, implementation and assessment of environmental management plans and as advice on best fit-for-purpose practices at sites targeted for marine minerals research, exploration and extraction. The Principles and Guidelines set broad directions in a context of shared values rather than prescribing specific practices. It is important to note that this is a VOLUNTARY code which marine mineral companies/entities/other stakeholders are encouraged to strive towards and use.

**Initiative for the Code.** The International Marine Minerals Society approved development of this Code at its Annual General Meeting in January 2000, following a proposal made at the 2000 Underwater Mining Institute (UMI 2000) by Julian Malnic, founder and first Chief Executive Officer (CEO) of Nautilus Minerals Corporation (PNG).

**Development of the Code.** The Code draws on other marine mining environmental statements, guidelines, policies, and codes issued by industry, governments, intergovernmental and non-governmental organizations, as well as on the experience of industry personnel, marine scientists, marine environmental scientists, engineers and lawyers. The Code takes into account and endeavors to comply with and implement international legal obligations relating to the protection and preservation of the marine environment with regard

to marine mining activities, including mining of mineral resources at or beneath the seabed, such as those established by and in accordance with the 1982 United Nations Convention on the Law of the Sea (LOSC) and the 1994 Agreement implementing LOSC Part XI, the relevant Conventions for safe and environmentally responsible shipping promulgated under the auspices of the International Maritime Organization, and the London Convention and Protocol on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter.

Appendix 1 lists the principal published sources and Appendix 2 lists individuals who offered comments on the current revision in their personal capacity, and provides examples of the wealth of practical experience employed in the development and revision of the Code.

**Who Will be Served by the Code?** The Code will serve mining companies/entities<sup>1</sup> with an interest or activity in marine mining, governments, local communities and stakeholders, intergovernmental and non-governmental organizations, scientists, and other groups with an interest in or affected by marine mining research, exploration and/or activities.

**How Will the Code Function?** The Code provides a framework and benchmarks for development and implementation of an environmental program for marine minerals research, exploration and extraction by marine mining companies/entities at their operations. It also provides a framework and benchmarks for local communities and other stakeholders, governments, and intergovernmental and non-governmental organizations to assess proposed and actual applications of best fit-for-purpose environmental practices at marine mining sites. The Code seeks to complement applicable binding national and international regulations for the protection of the marine environment with regard to marine mining where these regulations exist. The Code also seeks to provide environmental principles and guidelines where these are absent or could be improved upon, within the scope of the Principles outlined in the Code. Where the Code sets higher standards than those legally required, companies/entities are encouraged to follow the Code and strive to improve the legally binding requirements accordingly. The Code is *voluntary* and any company/entity and/or stakeholder is/are eligible to strive towards, adopt or use it. IMMS membership is not required.

**Reporting.** As well as complying with any applicable national and international requirements, companies/entities adopting the Code commit themselves to provide transparency in their environmental activities by regular reporting of environmental planning, monitoring, assessment and other actions relating to protecting and preserving the marine environment. These reports will demonstrate the company/entity's commitment to, and implementation of, the Code, will describe the company/entity's performance in relation to the Principles and Operating Guidelines, and will be made public. Companies/entities and stakeholders adopting or using the Code or following its Principles and Operating Guidelines are encouraged to publicize this.

**Benchmarking.** The Operating Guidelines provide benchmarks by which a mining company/entity can set its environmental program for a marine exploration or extraction site.

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<sup>1</sup> 'Mining companies/entities' include all public (e.g., wholly or partly state-owned and/or operated by or with an intergovernmental organization or agency) and private, commercial, non-profit/non-commercial, and scientific research groups and enterprises engaged in all marine mining and minerals-related activities.

Site stakeholders, including government agencies, intergovernmental and non-governmental organizations, scientists and local communities can also use the Guidelines as benchmarks for checking the company/entity's environmental management plans and their implementation.

**Implementation and Feedback.** Companies/entities and stakeholders adopting or using the Code are encouraged to inform the IMMS of the effectiveness of the Code, including any problems and corrective action taken/required in implementing it. For this purpose an 'Implementation and Feedback Form' is provided in Annex 1. This will assist IMMS in keeping track of companies/entities/stakeholders adopting or using the Code and in obtaining yearly feedback from them, to assess the success of the Code in achieving its objectives and to facilitate further revisions of the Code to better meet its goals. IMMS will compile and circulate the received Feedback Forms to the IMMS membership and to the International Seabed Authority, as per its request, prior to each meeting of the Underwater Mining Institute.

**Code Review.** The Code is intended to be a living, adaptive document, responsive to, e.g., experience with its implementation, improvements in best fit-for-purpose environmental practices, technological developments, and changes in applicable regulations. The Code will be reviewed by IMMS every five years, after consultation with the marine mining industry and other stakeholders in marine mining operations.

## Principles

Marine mining companies/entities adopting this Environmental Code commit themselves to the following principles:

- To observe the laws and policies and respect the aspirations of sovereign states and their regional sub-divisions, and of international law, as appropriate to underwater mineral developments.
- To apply best practical and fit-for-purpose procedures for environmental and resource protection, considering future activities and developments within the area that might be affected.
- To consider environmental implications and observe the precautionary approach, from initiating a project through all stages from exploration through development and operations, including waste disposal, to eventual closure, and post-closure monitoring.
- To consult with stakeholders and facilitate community partnerships on environmental matters throughout the project's life cycle.
- To maintain an environmental quality review program and deliver on commitments.
- To report publicly on environmental performance and implementation of the Code.

## Operating Guidelines

**Responsible and Sustainable Development.** Manage activities in a manner consistent with environmentally, economically and socially responsible and sustainable development of the operating area, such that environmental, economic and social considerations are integrated into planning, decision-making and management on an equal footing.

1. Pursue environmentally responsible operations through innovations in technology and equipment, improvements in operational, natural resource, equipment and energy use efficiencies, as well as in prevention, minimization and recycling of emissions and wastes and minimization of noise, in scientific and engineering research, in environmental monitoring and in providing regular information and feedback to management, relevant government agencies and affected stakeholders, including non-governmental organizations.
2. Reduce the possible environmental impacts of mine-related waste in a manner that is consistent with the Principles of the Code and that will facilitate future environmentally and socially responsible use of the area (both seabed and water column).
3. Minimize the impacts of mining operations on and maintain long-term ecosystem health, functions and services affected by mining operations, and protect cultural heritage, knowledge and values of the marine environment, including designated marine protected areas and reserves.
4. Re-use and recycle mineral products and by-products, where possible, to maximize their utility and enhance availability of mineral resources to current and future generations.
5. Improve knowledge of the properties, short- and long-term availability and use of marine mineral resources and their related ecological and environmental effects, including development and use of methods to quantify and integrate the valuation, preservation of value and enhancement of value of ecosystem services adjacent and/or related to the resource to be developed.
6. Encourage customers, business partners, contractors and suppliers of equipment, goods and services to adopt environmentally responsible and sustainable development principles and practices.
7. Consider *biological* resource potential and value of living organisms at potential marine mining sites as well as the *mineral* resource potential and value.

**Environmentally Responsible Company/Entity Ethic.** Develop an environmentally responsible company/entity ethic by showing management commitment, implementing environmental management systems, and providing time and resources to demonstrate requirements of the environmental ethic to employees, contractors and suppliers of equipment, goods and services.

1. Develop, implement and communicate an environmental policy consistent with the Code.
2. Demonstrate management commitment through application of environmental management practices consistent with the Code.
3. Inform employees, contractors and suppliers of equipment, goods and services about and require compliance with company/entity policies, goals, guidelines and practices for environmental, socio-economic and heritage protection.
4. Implement environmental education and training programs for employees, and, if appropriate and feasible, contractors.

5. Facilitate and engage in community and other stakeholder education about company/entity environmental principles and their application at the area of operations.

**Community Partnership.** Consult affected communities on their concerns, aspirations and values regarding development and operation of marine mining projects, recognizing that environmental, socio-economic, cultural and scientific research values and interests are linked.

1. Identify directly and indirectly affected stakeholders, including the marine scientific research community, and their concerns.
2. Encourage openness and dialogue with employees, marine research scientists and the regional community, including indigenous peoples, ensure equitable and culturally appropriate engagement, promote cross-cultural awareness, and specifically address concerns about environmental, social and scientific research impacts.
3. Provide to the community non-proprietary technical information about potential effects and duration of operations, of waste products and their management, of rehabilitation procedures, and of socio-economic benefits and costs.
4. Establish community consultation prior to each stage of operations, be prepared to modify project plans and practices according to the consultations, develop and maintain appropriate community consultation through all stages of exploration, extraction, waste disposal and closure, including, where appropriate and feasible, inviting a community observer to visit and a marine research scientist to join a marine mining vessel.

**Environmental Risk Management.** Use appropriate risk management strategies and the precautionary approach to guide exploration, extraction, waste disposal and closure, and to identify environmental risks, their possible consequences, and their probabilities of occurrence, including but not limited to the following:

1. Conduct and utilize environmental baseline and monitoring studies as the basis for risk management, as recommended by, e.g., relevant Guidelines issued by the International Seabed Authority.
2. Evaluate the environmental risks of alternative project concepts, weighing positive, negative, direct, indirect, cumulative and secondary environmental consequences, provide opportunities for appropriate stakeholder participation in this evaluation, and select and implement the project concepts that give the appropriate balance to environmental, economic and social responsibilities.
3. Develop and implement management strategies preferably to prevent, and if prevention is not feasible, to minimize and maximally mitigate environmental impacts of the selected project.
4. Adopt the precautionary approach in managing identified environmental risks.
5. Develop, test and implement contingency and emergency response plans to address incidents and unusual operating and environmental conditions, in collaboration with potentially affected parties and relevant government agencies.
6. Develop and implement appropriate long-term environmental monitoring programs at suitable spatial and temporal scales.

7. Establish<sup>2</sup> procedures in consultation with the marine scientific community to aid in the recruitment, re-establishment and migration of biota and to assist in the study of undisturbed, comparable habitats before, during, and after mining operations that are suitably close to mining operations for this purpose.
8. Inform interested and/or potentially affected parties, as part of stakeholder consultations, of any significant environmental risks from mining operations and of the measures that will be taken to manage these risks.

**Integrated Environmental Management.** Recognize environmentally responsible and sustainable management as a company/entity priority and integrate environmentally responsible and sustainable management into all operations from exploration, through design and construction to mining, minerals processing, waste disposal, mine site rehabilitation and decommissioning.

1. Establish a senior executive environmental manager, preferably accountable to the CEO, and an environmental management system that allocates management and employee responsibilities relevant to:
  - The company/entity's activities
  - Applicable legal and regulatory requirements
  - The Operating Guidelines of this Code and of any other applicable Code or Guidelines
  - Company/entity environmental policies, objectives and targets
  - Environmental management plans and procedures
  - Environmental monitoring procedures
  - Reliable, secure, transparent and accessible storage for environmental data and, where practical, specimens collected
  - Setting and testing of contingency and emergency response plans
  - Regular or otherwise appropriately scheduled auditing of the environmental management system and environmental performance
  - Internal and external reporting procedures.
2. Periodically review and update the environmental management system in a structured, iterative process that involves the local or affected community, to ensure that the system remains up-to-date, effective and relevant to the company/entity's evolving needs, improvements in best fit-for-purpose environmental practices, and to changing community values and expectations.

**Company/Entity Environmental Performance Targets.** Set environmental performance targets that meet and aim to exceed the requirements of directly applicable legislation, regulations, licenses and permits. Specifically:

1. Identify legal and other requirements applicable to the environmental aspects of the company/entity's marine mining activities, products or services.

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<sup>2</sup> Unless such procedures are already established by the International Seabed Authority, the relevant coastal State(s) or other competent authority according to the latest scientific criteria.

2. Set internal environmental performance targets and periodically assess achievements in order to reinforce policy commitments and to enable demonstration of continual improvement.
3. Ensure that legal requirements and internal performance targets are effectively communicated to the employees and contractors who are accountable for the relevant activities.

**Review, Improvement and Updating of Environmental Policies and Standards.** Implement management strategies to meet current and anticipated environmental standards and regularly review targets in the context of changing company/entity and community needs, aspirations, legal requirements and ISO criteria to achieve optimal environmental management.

1. Regularly review and update company/entity environmental policies, programs and performance to correct any deficiencies.
2. Assess and rank environmental issues to identify priority areas where maximum environmental benefits are achievable.
3. Undertake, participate in, and/or support research on priority environmental issues by, e.g., appropriate funding, on-site support, etc.
4. Facilitate employee education about non-proprietary environmentally related technical developments, scientific understanding, consumer needs and community expectations as needed to improve their understanding of the company/entity's environmental policies.
5. Provide technical and professional level skill-enhancement opportunities to environmental employees, e.g., through attendance at appropriate workshops and conferences.
6. Provide professional environmental employees with reporting opportunities on non-proprietary environmental topics at relevant conferences and in refereed international environmental publications.
7. Facilitate communication of relevant, non-proprietary information to the community about environmentally related technical developments, scientific knowledge, consumer needs and community expectations as needed to improve their understanding of the company/entity's environmental policies.

**Rehabilitation and Decommissioning.** Taking into account former, current and future beneficial uses of the site and its surrounding environment, develop and implement an appropriate closure plan to leave decommissioned sites and associated ecosystems in a safe, stable, and where possible, rehabilitated condition, carried out according to best fit-for-purpose practices.

1. Incorporate ecosystem and site rehabilitation and decommissioning options in the conceptual design of operations at the feasibility-study stage.
2. Develop clearly defined ecosystem and site rehabilitation plans and targets, monitor and review rehabilitation performance and progressively refine such plans against the targets.
3. Determine and account for ecosystem and site rehabilitation and decommissioning costs, periodically review their adequacy during the life of the operation, and adjust budget to meet any increases in those costs.

4. Establish a program of progressive ecosystem and site rehabilitation commensurate with the nature of the operation and the type and rate of disturbance.
5. Periodically review the ecosystem and site rehabilitation and decommissioning strategies during the period of operations so as to incorporate changing regulatory requirements, public expectations, and environmental and cultural information.
6. Address issues and programs related to long-term responsibility for the seabed and associated ecosystems in the final decommissioning plan, including long-term monitoring and definition of the period necessary to ensure remediation plans are effective and that any unforeseen consequences are detected.
7. Provide adequate compensation using appropriate mechanisms where damage is caused due to company/entity/project activities.

**Reporting and Documentation.** Demonstrate commitment to the Code's principles by reporting on the company/entity's implementation of the Code and its environmental performance.

1. Implement regular (at least annual) reporting of environmental performance to all stakeholders, including the board of directors, shareholders, employees, relevant government bodies and authorities, local communities, scientific researchers, non-governmental organizations, and the general public.
2. Ensure that reporting requirements of all authorities are met in scope and in good time.
3. Provide an annual environmental report written for community understanding.
4. Reports should describe the company/entity's processes for:
  - Setting and communicating environmental policy
  - Assessing and communicating environmental performance
  - Community consultation and responding to concerns
  - Code implementation.
5. Reports should also include but not be limited to:
  - Organization profile, environmental policies and objectives
  - Environmental management processes
  - Establishment of benchmarks against which continual improvement can be measured
  - Documentation and availability for eventual independent review by interested parties at their expense of relevant, site-specific data to support the reported results
  - Opportunities and progress in improvements
  - Significant environmental events and their consequences
  - Environmental incidents, "near-misses" and any regulatory and remedial action taken
  - Performance in relation to regulatory requirements and internal targets
  - Environmental, socio-economic and cultural issues to be addressed and strategies to address and implement these issues.
6. The first report after adoption of the Code by the company/entity is to be released within two years.
7. The annual environmental reports are to be made available for consultation, free of charge, to the public through the company/entity's corporate and regional offices and on the company/entity's website. Additional copies, preferably in electronic form, of each annual report may be lodged in the central library of the State(s) exercising sovereign rights or jurisdiction where the company/entity operates or, in the case of

activities carried out in areas beyond national jurisdiction, in the central library of the State where the company/entity is incorporated. Companies/entities will identify where additional copies will be deposited when they make their annual report and on the company/entity's website.

**Environmental Data Collection, Exchange and Archiving.** Facilitate free exchange and easily accessible availability of environmental information and geological and biological sample collections gathered (other than proprietary technical information) for international scientific peer review and understanding and national and global heritage use.

1. Exclude non-proprietary environmental data from confidentiality requirements, standardize these data according to the latest and highest standards for the relevant discipline in order to facilitate analysis and comparisons, and make these data freely available to all stakeholders and for exchange, review and analysis in fora such as workshops.
2. Deposit on request non-proprietary environmental data securely in freely and easily accessible appropriate national and international archives for review, further scientific analysis and reporting.
3. Deposit for review, further reporting, and scientific research representative collections of geological and biological specimens in appropriate repositories with requisite long-term storage facilities, which may include national museums, government institutions, relevant specialized global repositories and universities, on request and after prior consultation with the selected host(s); such consultation to occur early in the project planning.
4. Preserve, report and deliver any incidentally collected cultural, archaeological and anthropological artifacts to appropriate agencies and repositories.
5. Disseminate non-proprietary scientific data on and lessons learned in marine environmental and biodiversity assessment and management.
6. Promote good practices in marine environmental and biodiversity assessment and management.

**Performance Reviews.** Regularly (preferably every three years) evaluate company/entity performance under the Code by a team of qualified, externally accredited environmental auditors both from within and independent of the adopting company/entity.

## **Acknowledgements**

*The Society thanks the many individuals who have contributed to the development and revision of this Code. The Society recognizes in particular Julian Malnic, initiator and original architect of the Code, Derek Ellis, who further drafted, edited and updated the 2001 version, and Philomène Verlaan, who coordinated the update of the 2011 version. Appendix 1 lists the individuals who participated in the current revision. The Society is also grateful to the Minerals Council of Australia for the use of sections of text from the Council's 2000 Code for Environmental Management. The Society appreciates the support of InterRidge, its Working Group on Seafloor Mineralization, and the Woods Hole Oceanographic Institution in enabling the presentation of the revised draft (2008) Code by Philomène Verlaan at the 2009 Science and Policy Workshop on Deep-Sea Mining of Seafloor Massive Sulphides, Woods Hole, MA, and the support of the International Seabed Authority in enabling her presentation of the revised draft (2009) Code to the Legal and Technical Commission and the Members of the Authority at their 16<sup>th</sup> session, April 2010, Kingston, Jamaica.*

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