1 Introduction

1.1 Purpose of the PER

This Draft Public Environment Report/Public Environmental Review (referred to as the Draft PER) presents the findings and conclusions of an environmental review undertaken for the proposed Pluto LNG Development by Woodside Energy Limited (Woodside).

The objective of the environmental review process is to ensure that potential environmental impacts associated with the proposed Development during both routine and non-routine operations, are identified and appropriately assessed. In doing so, relevant preventative and management measures can be developed and implemented to ensure that adverse environmental impacts are managed to be As Low As Reasonably Practicable (ALARP). These management measures are outlined in this Draft PER and will be developed further in detailed Environmental Management Plans (EMPs).

The Pluto LNG Development was referred to the Western Australian Environmental Protection Authority (EPA) for assessment in April 2006. The proposal was referred to the Commonwealth Department of the Environment and Heritage (DEH) in August 2006. The DEH and EPA subsequently determined that the proposal should be assessed at the Public Environment Report and Public Environmental Review levels of assessment. This document meets the requirements outlined in the Environmental Scoping document/Guidelines for both state and Commonwealth processes.

The key objectives of this environmental review are to:

- place this proposal in the context of the local and regional environment
- adequately describe all components of the proposal
- provide the basis of the proponent's environmental management programme
- communicate clearly with stakeholders so that the Western Australian EPA and Commonwealth DEH can obtain informed comment to assist in providing advice to their Ministers
- provide a document which clearly sets out the reasons why the proposal should be judged by the EPA, DEH and their Ministers to be environmentally acceptable.

1.2 Development Background

The Pluto gas field was discovered in April 2005 on the North West Shelf, approximately 190 km north-west of Dampier, Western Australia. Preliminary exploration drilling suggests that the Pluto gas field has a Dry Gas contingent resource of 4.1 trillion cubic feet (tcf) with small amounts of recoverable condensate and low levels of carbon dioxide (CO_2).

Woodside is the sole equity holder in Permit WA-350-P, which covers the Pluto gas field, and plans to develop the field through an offshore subsea gathering system which would be tied-back to an offshore platform located in 80–85 m water depth (**Figure 1-1**). Gas will then be exported to shore for further processing. The Development will require two separate sites in the Burrup West Industrial Area on the Burrup Peninsula: a gas processing plant at Lease Area B (Site B) and a hydrocarbon storage and export facility at Lease Area A (Site A).

The Pluto LNG Development will comprise up to two onshore processing trains each with a maximum production capacity of up to 5.9 million tonnes per annum (Mtpa) of Liquefied Natural Gas (LNG), or a total capacity of approximately 12 Mtpa. An expansion of production capacity, which involves the construction of one or more additional LNG trains, is possible but timing (should the expansion eventuate) will be dependent on market and supply variables and hence is not considered as part of this Draft PER.

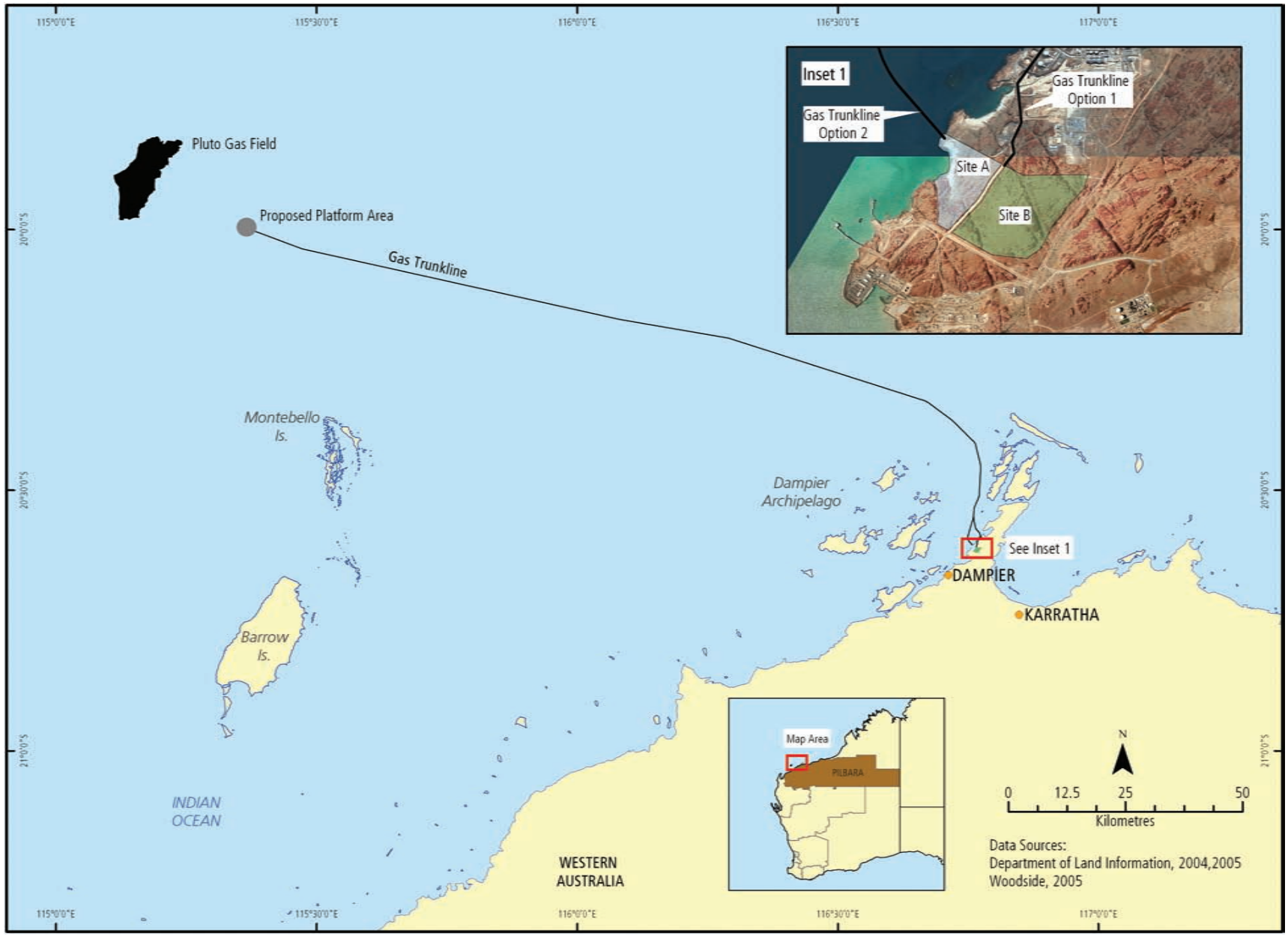
The gas processing plant is being designed to potentially cater for domestic gas supply (Domgas), should favourable market conditions eventuate. It is anticipated that the Domgas capacity will be in the order of 3.5 to 4 Mtpa, however, this capacity will be refined at a later stage.

Total capital investment will be between AUD$6 and AUD$10 billion, with the estimate to be further refined during detailed design.

1.3 Development Proponent

Woodside is the proponent for the proposed Pluto LNG Development and will also be the owner and operator. Woodside is Australia's largest publicly traded oil and gas company and is one of the nation's most successful explorers, developers and producers. The company operates Australia's biggest resource development, the North West Shelf Venture (NWSV) in Western Australia, a project that produces approximately 40% of Australia's oil and gas.

Figure 1-1 Pluto LNG Development Concept



Since the early 1980s, the company has overseen expenditure on the NWSV of more than A$19 billion (US$14 billion) as the Venture has grown into one of the world's leading LNG exporters.

Over the past 50 years, Woodside's business has grown to cover four continents with core areas of focus being Australia, the United States and Africa. In Australia, the company has major exploration and development interests in Western Australia, including the new oil province in the Carnarvon Basin which includes the Enfield, Vincent and Laverda fields, and significant gas discoveries in waters off Victoria and the Northern Territory.

In the United States, Woodside produces gas and oil from fields in the Gulf of Mexico, where it also has an extensive exploration programme in the continental shelf and the deep water. Woodside has offices in Houston, Texas; Covington, Louisiana; and Los Angeles, California.

In Africa, Woodside is operator of the Chinguetti oil project off Mauritania. It is also operator of the Tiof, Tevet and Banda oil and gas discoveries in the same region, and has exploration interests in Libya, Kenya, Sierra Leone, Liberia and the Canary Islands and is a participant in major producing gas and condensate fields in Algeria.

Woodside operates three floating production, storage and offloading facilities: the *Northern Endeavour* is based on the Laminaria and Corallina oil fields in the Timor Sea; the *Cossack Pioneer* is based on the North West Shelf and the *Berge Helene* is based at Chinguetti. Woodside also operates the *Legendre, North Rankin* and *Goodwyn* platforms off Western Australia.

By 2008, the company expects to be producing the equivalent of up to 80 million barrels of oil and gas a year from its LNG, oil, condensate, liquefied petroleum gas and natural gas projects around the world. It also expects to be operating five floating production systems, five major offshore platforms and five LNG processing trains.

At 30 September 2006, Woodside was capitalized at more than A$26 billion. It employs more than 3200 people and has its headquarters in Perth, Western Australia. Woodside has a long record of safe and environmentally sound LNG production with no major incidents in over 15 years operating the NWSV. This record has been recognised through numerous awards.

Woodside is dedicated to a corporate Environmental Policy (**Appendix A**) that provides a public statement of its corporate commitment to protecting the environment during all activities, including offshore exploration and production. The company also has a number of more specific environmental guidelines.

1.4 Development Rationale

The Pluto gas field is being developed to meet a market opportunity in late 2010. Woodside discovered the field in April 2005 and since that time has moved quickly to progress the Development and secure foundation LNG customers.

Two Heads of Agreement have been signed with Tokyo Gas and Kansai Electric, for a combined total of 3.25 to 3.75 Mtpa of LNG, with deliveries starting by the end of 2010 and continuing for 15 years with an option to extend for a further five years. The balance of the Pluto gas reserves will be targeted at the North American market.

The Pluto LNG Development is located in an area where significant offshore reserves of gas exist, although not all reserves are commercially viable to develop on their own. Woodside has developed a commercial model for the Development that provides for other resource owners access to Pluto LNG Development foundation infrastructure with the intention of creating 'Burrup LNG Park' as a potential aggregator for otherwise stranded or yet to be discovered gas fields within the region. Should this occur the Pluto LNG Development has the potential to minimise the long-term footprint of LNG onshore processing facilities in the region.

The Pluto LNG Development will also deliver a range of significant economic benefits to the local area, Western Australia and Australia. These include:

- creation of training, employment and business opportunities
- increased revenue to state and Commonwealth governments
- flow-on economic activity (for example, services and social infrastructure).

Australia's Position in the Global LNG Market

With an estimated 153 trillion cubic feet of discovered gas, Australia has yet to fully capitalise on its potential as a global LNG player.

A strong reputation for reliable supply of LNG has been built by the North West Shelf Venture, which has focussed predominantly on export to Asian markets. Recently a second project, based on the Baya Udan field in northern Australia, came online.

The Pluto LNG Development represents a significant opportunity for Australia to significantly boost its profile in the global LNG market. As well as meeting a market window opportunity to supply premium customers based on the development of the Pluto gas field, the development provides the foundations for a new 'LNG hub' in the Carnarvon Basin. By adopting an open access model which provides the technical and commercial flexibility to aggregate currently stranded regional gas, the Pluto LNG Development has the potential to significantly increase Australia's LNG exports.

Potential Regional Development

Woodside has interests in a number of prospective permits to the north and west of WA-350-P and the Pluto LNG Development represents a potential tie-in point for any gas discoveries. The Pluto LNG Development provides a critical conduit for maximising the value of gas from future discoveries.

The Pluto gas field is located within the Carnarvon Basin and provides the opportunity to aggregate regional gas discoveries, particularly those with low inerts content, for delivery to the Burrup Peninsula.

Over 70 tcf of undeveloped Dry Gas has been discovered in the Carnarvon Basin excluding the North West Shelf Venture acreage. Depending on the sequence of projects in the region, some of these resources may be available to be produced through the Pluto LNG Development infrastructure.

The Development's offshore facilities will be constructed to enable tie-in of third party fields should this be commercially attractive. Discussions are being progressed with the owners of adjacent fields to pursue early commitment to tie-in to the Pluto LNG Development infrastructure. Potential synergies with the existing NWSV Karratha Gas Plant will continue to be explored.

1.5 Scope of the Draft PER

The scope of this Draft PER includes the construction, commissioning, operation and decommissioning of the proposed Pluto LNG Development. A reference case has been developed which represents the most likely development scenario to be pursued. This includes the following key components:

- subsea wells tied-back to an offshore riser platform
- a 42" (1068 mm) diameter gas/condensate trunkline to shore crossing
- an onshore gas/condensate trunkline from shore crossing to the gas processing plant
- an onshore gas processing plant located at Site B
- onshore LNG and condensate storage tanks located at Site A
- a standalone navigation channel, turning basin and berth pocket
- export jetty and causeway
- ancillary facilities.

Site preparation activities for hydrocarbon storage facilities at Site A are covered under a separate PER entitled 'Development of Industrial Land on the Burrup Peninsula for Future Gas Development' (Woodside 2006a). This approach was taken as these facilities require a longer construction lead time than the rest of the Development. Site preparation activities for Site A are therefore not included within the scope of this Draft PER.

1.6 Environmental Approvals Process

This proposal requires environmental assessment by the EPA under Part IV of the *Environmental Protection Act 1986* (WA) (EP Act) and the DEH under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act).

Proposed disposal of dredge material at sea requires approval under Section 19 of the *Environment Protection (Sea Dumping) Act 1981* (Cwth). Disposal of dredge material has been determined a prescribed action under the EPBC Act; hence, assessment of dredge spoil disposal is required under the EPBC Act before consideration can be given to issuing a sea dumping permit.

To initiate the state environmental assessment process, a referral and an Environmental Scoping document was submitted to the EPA in April 2006 (Woodside 2005a and 2005b). The EPA determined that the proposal should be formally assessed at the Public Environmental Review level of assessment.

In parallel to the state process, the proposal was also referred to DEH under the EPBC Act (1 August 2006, DEH reference No. 2006/2968), and was subsequently deemed a 'controlled action' on 24 August 2006. The controlling provisions (that is, those matters deemed significant for this proposal) for the action under the EPBC Act are:

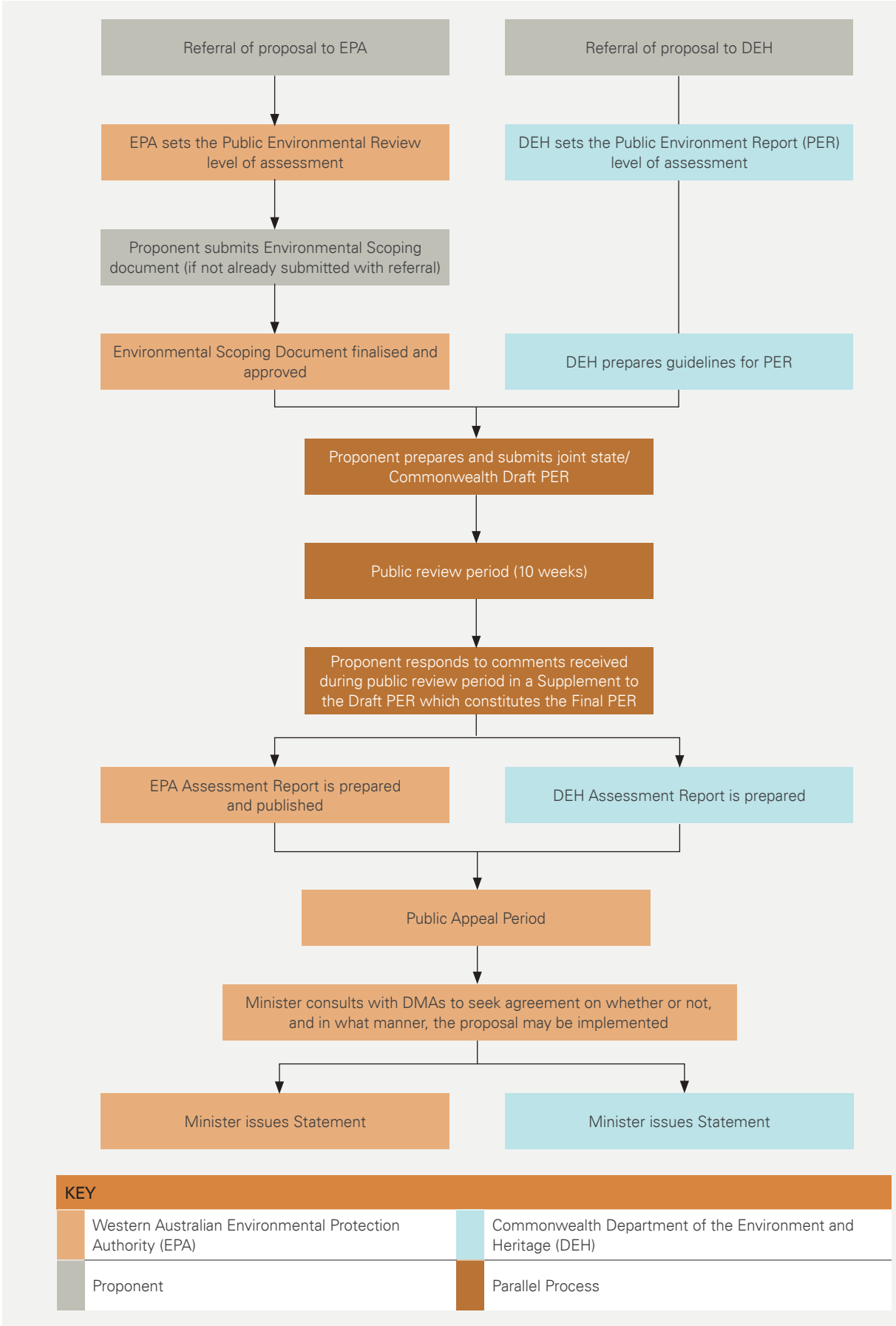
- Sections 18 and 18A (listed threatened species and communities)
- Sections 20 and 20A (listed migratory species)
- Sections 23 and 24A (marine environment).

Species of particular interest under the EPBC Act include the following:

- Pilbara olive python (*Liasis olivaceus barroni*)
- northern quoll (*Dasyurus hallucatus*)
- southern giant petrel (*Macronectus giganteus*)
- Pilbara leaf-nosed bat (*Rhinonicteris aurantius*, Pilbara form)
- green turtle (*Chelonia mydas*)
- flatback turtle (*Natator depressus*)
- hawksbill turtle (*Eretmochelys imbricata*)
- loggerhead turtle (*Caretta caretta*)
- blue whale (*Balaenoptera musculus*)
- humpback whale (*Megaptera novaeangliae*).

The DEH determined on 21 September 2006 that assessment by PER is the approach to be followed.

Figure 1-2 EPA and DEH Coordinated PER Assessment Approach



The Draft PER has been prepared to satisfy both regulatory bodies and will be submitted to both the Western Australian and Commonwealth governments simultaneously under a joint assessment process. This Draft PER has been prepared in accordance with the final approved Environmental Scoping document and Guidelines which provide guidance on the environmental factors to be assessed and the level of investigation required to address potential impacts.

The Draft PER is subject to review by stakeholders and the general public for a period of ten weeks. Once the public comment period is closed, Woodside will formally respond to comments made in a Supplement to the Draft PER to the satisfaction of the Minister as required under s99 of the EPBC Act. This document along with the Draft PER will constitute the Final PER. The EPA and DEH will then review Woodside's responses to the public submissions and prepare separate environmental assessment reports for both the state and Commonwealth Environment Ministers. At the conclusion of the assessment, the Commonwealth Minister for the Environment and Heritage is responsible for considering the issue of an approval in relation to the matters protected under the EPBC Act. Both Ministers will then issue a statement as to whether the proposal may be implemented, and if so, on what conditions. A flow chart summarising the approval process is presented in **Figure 1-2**.

1.6.1 Guidelines, Standards and Codes

EPA Guidance Statements

Guidance Statements are issued by the EPA to assist proponents, and the public generally, to understand the minimum requirements that the EPA expects to be met during the assessment process, for the protection of elements of the environment. Accordingly, during studies and investigations for this Draft PER, the following guidelines have been considered and applied where appropriate:

- Protection of Tropical Arid Zone Mangroves along the Pilbara Coastline – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 1 (Final)
- Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 2 (Final)
- Separation Distances between Industrial and Sensitive Land Uses – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 3 (Final)
- Minimising Greenhouse Gases – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 12 (Final)
- Emissions of Oxides of Nitrogen from Gas Turbines – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 15 (Final)
- Prevention of Air Quality Impacts from Land Development Sites – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 18 (Final)
- Benthic Primary Producer Habitat Protection for Western Australia's Marine Environment – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 29 (Final)
- Linkage between EPA Assessment and Management Strategies, Policies, Scientific Criteria, Guidelines, Standards and Measures Adopted by National Councils – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 34 (Final)
- Assessment of Aboriginal Heritage – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 41 (Final)
- Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 51 (Final)
- Implementing best practice in proposals submitted to the environment impact assessment process – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 55 (Final)
- Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia – Guidance for the assessment of environmental factors (in accordance with the EP Act 1986) No. 56 (Final).

Other Applicable Guidelines

Other applicable national and international guidelines include the following:

- Water Quality Monitoring and Reporting – Australian and New Zealand Environment Conservation Council (ANZECC) Guidelines 2000
- Ballast Water Guidelines – AQIS 2001
- National Code of Practice for the Storage and Handling of Dangerous Goods – National Occupational Health and Safety Commission 2001
- National Standards for the Control of Major Hazard Facilities – National Occupational Health and Safety Commission 2002
- Oil Companies International Marine Forum Guidelines 1981–2004
- International Safety Guide for Oil Tankers and Terminals Guidelines 1996
- Guidelines for Naturally Occurring Radioactive Materials – APPEA 2002
- National Ocean Disposal Guidelines for Dredged Material 2002.

It is noted that *The Pilbara Coastal Water Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives* was released in June 2006 (DoE 2006a). This document establishes an Environmental Quality Management Framework (EQMF) and presents the EPA's interim set of environmental goals (Environmental Values and Environmental Quality Objectives) and spatially allocates these goals (Levels of Ecological Protection) for

state waters of the Pilbara coast (DoE 2006a). These levels are allocated based on specific target environmental quality conditions and range from *Low* for existing industrial discharges, *Medium* for existing developed areas including shipping berths and spoil grounds, *High* for unzoned areas including port areas through to *Maximum* for areas of environmental significance.

It is acknowledged that the Levels of Protection have been spatially allocated to Mermaid Sound and while a comprehensive set of Environmental Quality Criteria on which these Levels of Protection wil be based has yet to be formally established, they are likely to be based on the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000). It is envisaged that the level of Ecological Protection allocated to the Pluto LNG Development nearshore marine infrastructure area will be commensurate with the level allocated to exisiting industrial development areas in Mermaid Sound. The other four Environmental Values, collectively referred to as social-use values, represent specific human benefits or uses that rely on a clean, healthy marine environment. They are:

- fishing and aquaculture
- recreation and aesthetics
- cultural and spiritual and
- industrial water supply.

These values have been considered during assessment of potential impacts to social values in the vicinity of the Pluto LNG Development and will be considered development of marine monitoring programmes.

1.6.2 Applicable Legislation

Some of the applicable Western Australian and Commonwealth statutes and regulations under which the Development will be constructed and operated are listed in **Table 1-1**. Applicable international agreements are included in **Table 1-2**.

Table 1-1 Key Western Australian and Commonwealth Statutes and Regulations

Western Australian Legislation	Legislation Summary
Environmental Protection Act 1986	This is the principal statute pertinent to environmental protection in WA. It gives the EPA overall responsibility for the prevention, control and abatement of environmental pollution and for the conservation, preservation, protection, enhancement and management of the environment.
Environmental Protection (Noise) Regulations 1997	These regulations provide guidelines for noise assessment and control, and set noise limits to ensure that noise from premises are kept to acceptable levels.
Conservation and Land Management Act 1984	This Act provides for the use, protection and management of public lands, including parks and forests. It includes water, flora and fauna on these lands. The Department of Environment and Conservation (DEC) administers the Act.
Petroleum Act 1967; Schedule of Onshore Petroleum Exploration and Production Requirements 1991	This Act and the Schedule relate to the exploration for, and the exploitation of, petroleum resources within certain lands of Western Australia, including vacant Crown land.
Petroleum (Submerged Lands) Act 1982 and Regulations 1990	This Act and its regulations provide for the exploration and exploitation of petroleum resources on submerged lands adjacent to the coast of Western Australia.
Petroleum Pipelines Act 1969 (Section 8) and Regulations 1970	This Act and its regulations relate to the construction, operation and maintenance of pipelines for the conveyance of petroleum.
Fish Resources Management Act 1994 and Regulations 1995	This Act and its regulations are concerned with commercial exploitation and development of fisheries and marine resources. Under the Act, development projects must be carried out so as not to adversely impact on fisheries and marine resources.
Marine and Harbours Act 1981 and Marine and Harbours (Fuelling) Regulations 1985	This Act contains regulations to control the refuelling of ships and boats and is administered by the Department of Planning and Infrastructure (DPI).
Pollution of Waters by Oil and Noxious Substances Act 1987; Pollution of Waters By Oil and Noxious Substances Regulations 1993	This Act prohibits the discharge of oil or noxious substances into Western Australian state waters, and provides for the removal of oil or any mixture containing oil from affected waters. The harbour authority or the DPI administers the Act.
Aboriginal Heritage Act 1972 and Regulations 1974	This Act applies to the protection of registered significant archaeological, anthropological and historical sites and objects with traditional or current sacred, ritual or ceremonial significance to persons of Aboriginal descent in WA.
Agriculture and Related Resources Protection Act 1976	This Act imposes controls for the containment of pests and weeds.
Explosives and Dangerous Goods Act 1961 and Regulations 1963; Explosives and Dangerous Goods (Dangerous Goods Handling and Storage) Regulations 1992	This Act imposes controls for storage and handling of dangerous and explosive goods.
Soil and Land Conservation Act 1945 and Regulations 1992	This Act and its regulations relate to the conservation of soil and land resources, and to the mitigation of the effects of erosion, salinity and flooding.

Wildlife Conservation Act 1950 and Regulations 1970	This Act and its regulations provide for the protection of native flora and fauna, including rare or endangered species.
Health Act 1911 (Part IV)	This Act consolidates and amends the law relating to public health. In particular Part IV and V relate to sanitary provisions and dwellings respectively.
Commonwealth Legislation	**Legislation Summary**
Environment Protection and Biodiversity Conservation Act 1999	This Act protects the environment, particularly matters of National Environmental Significance (NES). It streamlines national environmental assessment and approvals process, protects Australian biodiversity and integrates management of important natural and culturally significant places.
Petroleum (Submerged Lands) Act 1967	This Act relates to the exploration and exploitation of petroleum resources in the area of the continental shelf of Australia and certain Territories of the Commonwealth. In this case, Commonwealth law applies to areas beyond three nautical miles (nm) off the mainland coast.
Petroleum (Submerged Lands) (Occupational Health and Safety) Regulations 1993	This regulates matters pertaining to occupational health and safety on offshore facilities.
Petroleum (Submerged Lands) (Management of Environment) Regulations 1999	These regulations ensure that petroleum activities in Commonwealth waters are carried out in an ecologically sustainable manner and as directed in the proponents Environment Plan.
Management of Safety of Offshore Facilities Regulations 1996 (and the subsequent amendments)	These regulations ensure that offshore facilities are installed, operated and modified in Commonwealth waters in accordance to the Safety Authority and that all risks have been identified and mitigated through constant monitoring, audits and reviews.
Historic Shipwrecks Act 1976	This Act protects shipwrecks that have lain in territorial waters for 75 years or more. It is an offence to interfere with any shipwreck covered by the Act.
Australian Heritage Council Act 2003	This Act identifies areas of heritage value listed on the Register of the National Estate and sets up the Australian Heritage Council and its functions.
Environment Protection (Sea Dumping) Act 1981	This Act regulates permitted sea dumping and under the 1996 Protocol to the London Convention Australia is required to minimise its waste disposal into the marine environment. Approval is required under this Act for the disposal of dredged material at sea.
Protection of the Sea (Prevention of Pollution from Ships) Act 1983	This Act disallows any harmful discharge of sewage, oil and noxious substances into the sea and sets the demands for a shipboard waste management plan.
Quarantine Act 1908	This Act implements mandatory controls in the use of seawater as ballast in ships and the declaration of sea vessels voyaging out of and into Commonwealth waters.
Quarantine Regulations 2000	These regulations stipulate that all information regarding the voyage of the vessel and the ballast water is declared correctly to the quarantine officers.
Submarine Cables and Pipelines Protection Act 1963	The breaking or injuring of submarine cables and/or pipelines is a punishable offence under this act, and the penalties include fines and/or imprisonment.
Civil Aviation Act 1988	This Act provides a regulatory framework to maintain, enhance and promote the safety of civil aviation; especially in the prevention of aviation accidents and incidents.
Navigation Act 1912	This Act requires that ships carrying oil and chemical tankers conform to Annex I of the International Convention for the Prevention of Pollution from Ships (MARPOL).

Table 1-2 International Agreements

International Agreements	Agreement Summary
The Japan-Australia Migratory Bird Agreement (1974) (JAMBA)	This agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between Australia and Japan.
The China-Australia Migratory Bird Agreement (1986) (CAMBA)	This agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between Australia and China.
United Nations Convention on the Law of the Sea 1982 (UNCLOS)	This convention recognises the desirability of establishing a legal order for the seas and oceans which will facilitate international communication, and will promote the peaceful uses of the seas and oceans, the equitable and efficient utilization of their resources, the conservation of their living resources, and the study, protection and preservation of the marine environment.
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (1979)	The Bonn Convention aims to improve the status of all threatened migratory species through national action and international agreements between range states of particular groups of species.
International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC 90)	This convention comprises national arrangements for responding to oil pollution incidents from ships, offshore oil facilities, sea ports and oil handling. The Convention recognises that in the event of pollution incident, prompt and effective action is essential.
International Convention for the Prevention of Pollution from Ships (MARPOL 73/78)	This convention aims to preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimisation of accidental discharge of such substances.