

PLUTO LNG PROJECT

Offshore Environment Plan Summary

This summary of the Pluto LNG Offshore Commissioning and Operations Environment Plan (Environment Plan) has been prepared and submitted to comply with Regulation 11(7) and (8) of the *Offshore Petroleum and Greenhouse Gas Storage (Environment) Regulations 2009*. It may not be used for any other purpose without prior approval from Woodside.

DESCRIPTION OF THE ACTIVITY

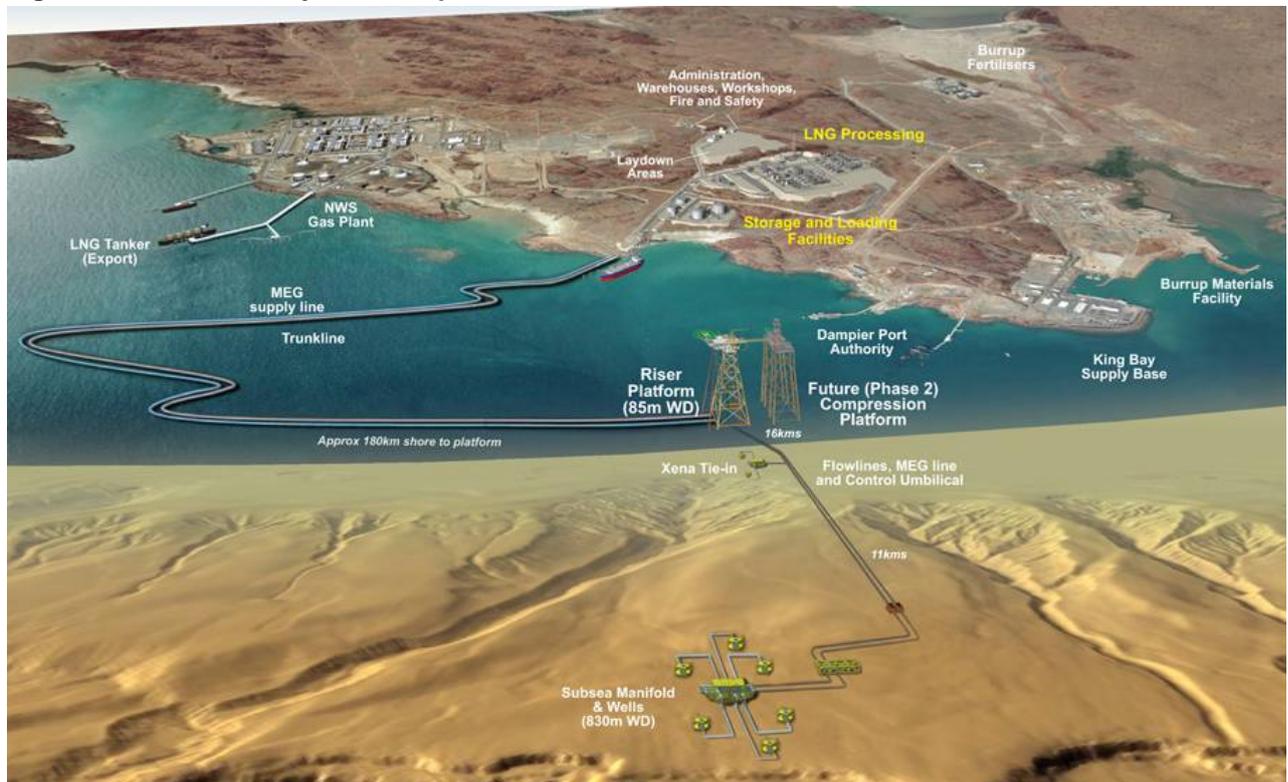
Woodside Burrup Pty Ltd (Woodside) is approaching the commissioning phase of the Pluto LNG Project in the North West of Western Australia. The offshore element of this project will extract gas and condensate from the Pluto gas field on the North West Shelf and deliver these hydrocarbons to an onshore liquefied natural gas (LNG) plant on the Burrup Peninsula.

Table 1 Approx Coordinates of Key Infrastructure (GDA94)

Infrastructure	Easting	Northing
Pluto Gas Field (Production Manifold)	304 466	7 796 990
Pluto Riser Platform	329 285	7 788 101
Trunkline Shore Crossing (Holden Point)	474 774	7 721 556

The design of the offshore infrastructure allows for the introduction of other fields into the production system. The development concept is shown in Figure 1.

Figure 1 Pluto LNG Project Concept Overview



The physical infrastructure covered by this Environment Plan includes the following:

- A subsea gathering system including manifolds and well tie-ins;
- Twin 20 inch gas flowlines, and an associated 4 inch MEG line and umbilical running from the gathering system to the offshore riser platform;
- A not-normally manned offshore riser platform; and
- A 36 inch gas trunkline and associated 6 inch MEG line running from the riser platform to the LNG plant.

The Environment Plan becomes active upon introduction of live hydrocarbons into the 36 inch trunkline and covers all aspects of live hydrocarbon commissioning and long term operation, maintenance and (if required) repair of the infrastructure.

1. GEOGRAPHIC LOCATION

The Pluto gas field was discovered in April 2005 on the North West Shelf, approximately 190 km west-north-west of Dampier, Western Australia. The onshore LNG processing facilities are sited on Industrial Lot A and B, on the Burrup Peninsula, adjacent to the North West Shelf Karratha Gas Plant.

2. DESCRIPTION OF THE RECEIVING ENVIRONMENT

An extensive research programme has been conducted on biological and physical aspects of the deep water and nearshore marine environments as part of Woodside's environmental review of the proposed project area. The following summarises the key environment and social values of the project area.

2.1. Physical Marine Environment

The bathymetry of the offshore development area is characterised by three distinct features: the continental shelf, continental slope and the abyssal plain. The continental shelf extends approximately 150km offshore, where the continental slope drops sharply away to depths of 4000 – 5000 m on the abyssal plain.

The Pluto gas field is located on the continental slope in water depths ranging from 150 – 1000 m. The seafloor in this area is characterised by a series of submarine canyons and fine silty sediments. The riser platform is located on the continental shelf in approximately 85 m water depth, in an area that is relatively flat and featureless with fine sandy sediments. The gas trunkline traverses the continental shelf in gradually decreasing water depth from the riser platform to the receiving facility at Holden Point, on the Burrup Peninsula.

2.2. Ecological Marine Environment

The area around the nearshore approaches of the trunkline route to Holden Point represents the only sensitive marine habitat in the vicinity of this project, although the offshore marine environment does represent a transit path for larger marine mammals (discussed further below). Several areas in this vicinity are formally protected under legislation and include marine parks and conservation areas.

Offshore benthic primary productivity is low and is a function of water depth, associated light attenuation, low nutrient availability and the absence of hard substrates. Seafloor communities in deeper waters are relatively unproductive, as light penetration at these depths is generally insufficient for the development of benthic primary producers (i.e. seagrass, algae and scleractinian corals). One area of deep water coral pinnacles was identified during geotechnical investigations of the gas field.

Phytoplankton in the waters of the North West Shelf is not particularly abundant, and concentrations vary little throughout the year. Benthic sampling offshore of the Pluto field found that the seabed comprises uncontaminated soft sediments supporting a sparse but diverse community of deep-water invertebrates, typical of the North West Shelf.

Seabirds may use the project area for foraging, populations generally concentrating around roosting or breeding areas along the coastline and adjacent to islands such as the Montebello Group and Dampier Archipelago.

The offshore waters of the North West Shelf support a diverse assemblage of fish species. Whale Sharks congregate at Ningaloo Reef, approximately 100 km south-west of the project area from March to July each year. Sea turtles and sea snakes both occur in the development area, though the populations are spread sparsely due to the mobility of individuals.

There are 27 marine mammal species known to be present or to pass through the offshore project area which are listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). One, the Blue whale (*Balaenoptera musculus*) is listed under the EPBC Act as endangered. Humpback whales (*Megaptera novaeangliae*), known to migrate through the project area, are listed as vulnerable. The other whale, dolphin and dugong species found within the project area are listed migratory and/or marine species and hence are protected under the EPBC Act. A full list of species covered by the EPBC Act that could occur in the project area can be found in Appendices B - E of Woodside's *Pluto LNG Development Draft Public Environment Report / Public Environmental Review* (December 2006).

2.3. Social and Economic Environment

The principal fisheries in the Pilbara region target tropical finfish, tuna and other large pelagic species, as well as crustaceans and molluscs (e.g. prawn and pearl oyster). The management of commercial fisheries with the project area is undertaken by the Commonwealth Australian Fisheries Management Authority (AFMA) and the Department of Fisheries (Government of) Western Australia (DFWA)

AFMA manages four fisheries beyond the three nautical mile offshore extent of the Australian Fishing Zone, which overlap parts of the offshore project area. Similarly, DFWA manages six fisheries on the North West Shelf which overlap or are in close proximity to the offshore project area.

A relatively low number of vessels are observed within a shipping route heading north-east in the vicinity of the Pluto gas field. Few recreational fishing boats are expected in the offshore development area, and along much of the trunkline length due to the distance from shore and the depth of water. Within the limits of the Dampier Port, Dampier Port Authority is responsible for the management of marine traffic.

Tourism and recreational activities such as fishing, swimming, diving and boating generally occur within two nautical miles of the shoreline. The majority of the offshore project area is located outside this nearshore region and therefore will have little interaction with such activities.

The Pluto gas field also falls within the Western Australian Exercises Area (WAXA). The area of the WAXA within which the Pluto gas field falls is used as a military flying area as detailed in Woodside's *Pluto LNG Development Draft Public Environment Report / Public Environmental Review* (December 2006)

3. MAJOR ENVIRONMENTAL HAZARDS

Offshore commissioning and operational activities have been subject to a comprehensive impact and risk assessment process which allows certain impacts and potential risks to be systematically identified and addressed.

The main environmental aspects of the offshore commissioning and operational phases of the Pluto LNG Project and the main impacts and potential risks these activities pose to the environment or the socio-economic values of the project area are summarised from the Environment Plan in Table 2. The Environment Plan ranks each source of risk against the likelihood of it occurring and the consequence if it does occur, to provide a qualitative assessment of risk.

Table 2 Summary of Key Hazards, Source of Risk and Potential Consequences

Hazard	Source of Risk	Description of Key Potential Consequences
Disturbance to marine fauna	Light and noise emission from platform and vessels, including navigational and operational lighting, vessel and helicopter movements and flaring	<p>Attracts and disorientates marine fauna (e.g. turtles) and bird species</p> <p>Localised disturbance to marine fauna</p> <p>Disturbance to migration patterns of marine fauna such as cetaceans, dugongs and turtles</p>
Disturbance to marine habitat	Physical presence and footprint - platform and support vessels affecting other marine users and disturbance to marine fauna	<p>Disturbance to shipping and fishing operations</p> <p>Potential for collision, e.g. vessel to platform or other vessel, collision with marine fauna</p> <p>Disturbance to migration patterns of marine fauna</p> <p>Provision of artificial habitat for benthic and pelagic fauna</p>
Reduced air quality due to atmospheric emissions	Accidental emissions from platform or vessels due to minor mechanical failures and/or incorrect operation / maintenance, flaring and venting during commissioning and operations (pilot/purge operation, ESD testing, pigging and emergency events etc), accidental loss of ozone depleting substances and routine atmospheric emissions from combustion of fuel etc	<p>Localised decrease in air quality</p> <p>Release of greenhouse gases, NO_x and SO_x</p> <p>Poor combustion can result in emissions of CO and dark smoke</p> <p>Depletory effect on ozone layer</p> <p>Use of non-renewable resource</p>
Marine pollution from routine discharges	Discharge of sub-sea control fluids during activation of the subsea valve control system or due to unplanned leakage, and sewage and putrescibles to the marine environment from vessels and the platform	<p>Negligible toxic effect to local marine biota</p> <p>Localised water quality impacts</p> <p>Amenity impact</p>
Marine pollution from accidental discharges	Loss of hazardous waste, solid waste or Naturally Occurring Radioactive Waste (NORMS) to the marine environment from platform or vessels	<p>Adverse impact on water/sediment quality and potential toxic effects on marine biota</p> <p>Incorrect disposal of waste onshore may result in ground / water contamination</p> <p>Consumed by or entanglement with marine fauna</p> <p>Lost opportunity to reuse or recycle</p> <p>Increased waste to landfill</p> <p>Potential generation of NORMS requiring special waste management</p>
	Hydrocarbon spill during bunkering operations or failure of platform drains, vessel chemical storages or bilge systems, vessel collision or helicopter crash etc	Adverse impact on water quality and potential toxic effects on marine biota
	Hydrocarbon release due to well blowout, subsea equipment failure or damage, platform damage and trunkline failure or damage	Adverse impact on water quality and potential toxic effects on marine biota
	Loss of hazardous chemicals to the marine environment from the MEG pipelines, umbilicals, vessels or the platform	Adverse impact on water quality and potential toxic effects on marine biota
Introduction of invasive marine and terrestrial species	Introduction of non-native invasive marine species via hull fouling or ballast water and terrestrial species (via international cargo)	Introduction of invasive marine and terrestrial invasive species, possibly resulting in competition for food, the invasive species filling a vacant niche, the invasive species replacing a native one occupying the same or similar niche (analogue species), predation of native species, or hybridisation between native and introduced species

To ensure that activities that present the key impacts/risks identified in Table 2 are managed to reduce the impact/risk to as low as reasonably practicable (ALARP), Woodside has identified objectives, performance standards and criteria that set the targets for environmental performance, assign a set of rules underpinning the objective and provide a mechanism to assess compliance against these rules. The objectives for each aspect are listed in Table 3, along with a summary of the key controls and mitigation measures to manage the risk and ensure the objectives are achieved.

Table 3 Performance Objectives

Impact Category	Objectives	Summary of Controls and Mitigation Measures
Disturbance to marine fauna	<p>Ensure light on vessels and platform is directed, as far as practicable, inboard.</p> <p>Limit potential impact on cetaceans by adhering to Australian Government cetacean interaction guidance.</p>	<p>Limit platform lighting to that required for safety and operability and confirm via inspections.</p> <p>Helicopters and vessels used on the Project will adhere to Part 8 of the EPBC Regulations and cetacean interaction guidelines.</p>
Disturbance to marine habitat	<p>Ensure that the maritime community is aware of fixed and non-maneuvrable infrastructure and limit potential impact on cetaceans by adhering to Australian Government cetacean interaction guidance.</p> <p>Ensure vessel anchoring does not impact on sensitive receptors.</p>	<p>Facilities are marked on navigational charts and a 500m safety zone is in force around the platform.</p> <p>Anchoring restrictions set by the Port Authority within the Port of Dampier will be adhered to by Project vessels.</p>
Reduced air quality due to atmospheric emissions	<p>Ensure measures are in place to keep vessel and platform engine emissions in line with design specifications</p> <p>Ensure flaring is minimised to that required for safe and reliable operation of the facility and the facility annual flaring limit is not exceeded</p> <p>Operate the facilities to ensure cases necessitating operational venting are kept to as low as reasonably practicable</p> <p>Manage inventories of ozone depleting substances and/or synthetic greenhouse gases in accordance with sound industry practices and legislative requirements.</p> <p>Ensure measures are in place to keep vessel and platform engine emissions in line with design specifications</p>	<p>Project vessels will comply with IMO requirements regarding combustion emissions.</p> <p>Emissions to flare will comply with a facility annual flaring limit, monitored via equipment on the platform.</p> <p>Bulk refrigerants selected during platform design are non-ozone depleting. Servicing of refrigerant systems will be conducted by competent personnel.</p> <p>Project vessels and the platform will use diesel that complies with Australian and IMO standards for sulphur content.</p> <p>Platform generators will be monitored to ensure they are operating correctly.</p>
Marine pollution from routine discharges	<p>Ensure subsea control fluids are at all times suitable to release into the marine environment at facility design rates.</p> <p>Manage sewage and putrescible wastes in line with legislative requirements</p>	<p>Suitable chemicals have been selected for use within the subsea control system. Chemical consumption rates will be monitored. A chemical selection process is in place to ensure process chemicals used comply with OCNS rating "silver" or better.</p> <p>Project vessels will comply with MARPOL requirements for sewage and putrescible wastes and, when in Port, Dampier Port Marine Notice 002/2005.</p>
Marine pollution from accidental discharges	<p>Manage wastes in line with legislative requirements</p> <p>Identify and manage any NORM in accordance with legal requirements and sound industry practice.</p> <p>No significant (>80L) hydrocarbon spills to the marine environment</p> <p>Manage chemicals to ensure chemicals offshore are as least toxic as practicable and physical and procedural controls are in place to prevent loss to the environment.</p>	<p>Wastes will not be discharged to sea unless separate authorisations are in place (e.g. when complying with MARPOL standards etc).</p> <p>Wastes will be tracked and disposed of in accordance with legislated requirements.</p> <p>Chemical and waste handling procedures (including for any NORM) are in place and will be followed.</p> <p>A chemical selection process is in place to ensure process chemicals used comply with UK Offshore Chemical Notification Scheme rating "silver" (or equivalent) or better.</p> <p>Engineering controls and operations and maintenance procedures are in place to ensure that the potential for loss of containment of hydrocarbons from the production system is low.</p> <p>Facilities are marked on navigational charts and a 500m safety zone is in force around the platform.</p> <p>Emergency response and oil spill contingency plans are in place on vessels and for the facilities (including Shipboard Oil Pollution Emergency Plans and an oil spill contingency plan that covers the facilities).</p>
Introduction of invasive marine and terrestrial species	<p>Manage all activities to ensure that there is no introduction of an invasive species as a result of Pluto operations.</p>	<p>Project vessels will comply with Australian Quarantine Inspection Service Ballast Water Requirements and Quarantine Regulations 2000 to manage ballast water and cargo. Woodside's invasive marine species management procedure will be implemented to manage risks from hull fouling by invasive marine species.</p>

4. MANAGEMENT APPROACH

The Woodside Management System will be implemented throughout commissioning and operation of the offshore Pluto LNG Project facilities. The system is aligned to ISO14000. Key components of the management system include:

Planning: To identify the legal requirements covering the activity, identify the risks associated with the activity and development of objectives, targets and improvement plans.

Implementation and Operation: To define accountabilities and responsibilities for personnel involved in both the field and in office roles and ensuring personnel are provided tailored inductions covering environmental values of the project area and control measures the project is implementing to manage these.

Documentation and Change Management: To ensure a robust document control and change management process is in place to manage the flow of information and seamlessly implement necessary change.

Emergency Response Preparedness: To ensure that, where credible risk of a significant incident exists, emergency response plans are in place. This includes the preparation, implementation and testing of vessel-based and regional oil spill response plans.

Checking: To track and monitor key performance indicators against agreed targets, maintain a robust assurance process that includes formal (i.e. audit, incident analysis) and informal review processes, backed up with formal action tracking and close-out processes and implement an incident reporting process internally and, where required, externally to key regulatory stakeholders.

Management Review: To ensure the performance of the organisation and the facility is meeting or exceeding its objectives and targets.

5. CONSULTATION

From early project planning and impact assessment phases, Woodside has actively and openly consulted with interested community, government and non-government organisations to ensure key risks were identified and views heard.

External stakeholder engagement during the commissioning and operations phase will be primarily coordinated by members of the Pluto Corporate Affairs and Community Relations functional group and focus on petroleum title holders through which Woodside will be operating and third parties with an interest in the project (e.g. commercial vessel operators including commercial fisheries and recreational Port users).

6. CONTACT DETAILS

For further information about the project or this Environment Plan, please contact the Pluto Corporate Affairs and Community Relations team toll-free on 1800 634 988 or visit our website at:

<http://www.woodside.com.au/Our+Business/Pluto/>