Additional facilities for liquefied petroleum gas project within existing onshore treatment plant, Burrup Peninsula

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Woodside Offshore Petroleum Pty Ltd

Report and recommendations
of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia
Bulletin 694
July 1993

THE PURPOSE OF THIS REPORT

This report contains the Environmental Protection Authority's environmental assessment and recommendations to the Minister for the Environment on the environmental acceptability of the proposal.

Immediately following the release of the report there is a 14-day period when anyone may appeal to the Minister against the Environmental Protection Authority's report.

After the appeal period, and determination of any appeals, the Minister consults with the other relevant ministers and agencies and then issues his decision about whether the proposal may or may not proceed. The Minister also announces the legally binding environmental conditions which might apply to any approval.

APPEALS

If you disagree with any of the contents of the assessment report or recommendations you may appeal in writing to the Minister for the Environment outlining the environmental reasons for your concern and enclosing the appeal fee of $10.

It is important that you clearly indicate the part of the report you disagree with and the reasons for your concern so that the grounds of your appeal can be properly considered by the Minister for the Environment.

ADDRESS

Hon Minister for the Environment
12th Floor, Dumas House
2 Havelock Street
WEST PERTH WA 6005

CLOSING DATE

Your appeal (with the $10 fee) must reach the Minister's office no later than 5.00 pm on 13 August 1993.

Environmental Impact Assessment (EIA)

Process Timelines in weeks

Date	Timeline commences after receipt of full details of proposal from the proponent	Time
27/4/93	Proponent Document Released for Public Comment	4 weeks
25/5/93	Public Comment Period Closed	
10/6/93	Issues Raised During Public Comment Period Summarised by EPA and Forwarded to the Proponent	2 weeks
22/6/93	Proponent response to the issues raised received - Appendix 1	12 days
22/7/93	Proponent informs EPA of changes to Preliminary Risk Assessment - Appendix 3	30 days
28/7/93	Proponent provides risk report addendum to EPA	6 days
30/7/93	EPA reported to the Minister for the Environment	2 days

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Summary and recommendations

Woodside Offshore Petroleum Pty Ltd, the proponent, proposes to establish additional facilities for liquefied petroleum gas (LPG) extraction and export within the existing onshore treatment plant at the Burrup Peninsula (Figure 1).

The existing Gas Treatment Plant occupies 231ha on a lease at Withnell Bay, near Dampier on the Burrup Peninsula about 1,300km north of Perth. The area within the lease has undergone major development, with the portions of Plant constructed to date consisting of a domestic gas plant, a liquefied natural gas (LNG) plant, LNG storage facilities, condensate storage facilities, a ship jetty, ship loading equipment, and administration buildings.

The proposal involves the installation of two LPG storage tanks, a chiller unit, fire protection equipment, an auxiliary substation and associated infrastructure within the existing process area and a new ship jetty parallel with, and to the north of, the existing jetty. No extension of the Plant boundary would be required.

Woodside referred their proposal to the Environmental Protection Authority in January 1993 and the level of assessment was set at Consultative Environmental Review. At the time, the Environmental Protection Authority identified that an additional risk may be associated with the new facilities and requested Woodside to undertake a Preliminary Risk Assessment on the project as part of the Consultative Environmental Review. The Consultative Environmental Review was released for public comment on 27 April 1993, with close of submissions on 25 May 1993. The submissions have been reviewed.

From its evaluation of the proposal, the Environmental Protection Authority considers that the key environmental issues are:

- identification of hazards and management of risk;
- potential marine impacts from dredging for shipping and spoil disposal;
- shipping ballast water disposal;
- disposal of construction liquids;
- escape of hydrocarbons; and
- gaseous emissions.

A preliminary risk study by the proponent indicates that the LPG project would cause little change in the overall risk to the public arising from the Gas Treatment Plant. The Environmental Protection Authority considers that the proposal meets the Environmental Protection Authority's risk criteria. Any further developments in the vicinity of the site should take into account the Environmental Protection Authority's risk criteria.

To ensure that the proposal, if implemented, continues to meet acceptable risk levels, the Environmental Protection Authority recommends that the proponent should amend the Hazards Control Plan for the existing Gas Treatment Plant facilities to incorporate the proposed liquefied petroleum gas and condensate facilities, in stages and at times to meet the requirements of the Minister for the Environment. Should the "as-built" plant be significantly different to this proposal, then a final quantitative risk assessment will be required.

The marine biotic assemblages in the vicinity of the proposed new jetty are oyster-barnacle, coral and mollusc-echinoderm. The potential environmental impacts identified are physical damage to corals as a result of construction activities and an increased siltation on corals through dredging operations and increased shipping activity. These potential impacts are considered by Woodside to be localised and minor, as regular monitoring of the marine environment in the vicinity of the Gas Treatment Plant has found only minor project-related effects. Woodside propose to continue to monitor the effects of the LPG development.

The Environmental Protection Authority is concerned that the proponent's timing for proposed dredging operations (December to April) coincides with the critical time for coral reproduction. This timing also coincides with natural factors such as a higher water temperature, which cause stress to invertebrate communities in the Dampier Archipelago. Previous monitoring studies by the Environmental Protection Authority indicate that high sediment depositional rates in the area in the past as a result of dredging activities may have caused high mortality rates of the

corals. The Environmental Protection Authority considers that all proposals that involve dredging activities should give due regard to the sensitivities of the marine environment when project timelines are planned.

The Environmental Protection Authority considers that that the proponent should minimise the impacts of dredging on the marine environment. In particular, dredging should be undertaken at an appropriate time and in such a manner that there is no significant impact on coral spawning in the area. The timing of actual dredging should meet the requirements of the Minister for the Environment.

The proponent estimates an additional 20 shipments per year would be associated with this proposal. A general concern of the Environmental Protection Authority is the transport into Western Australian waters of marine organisms from others areas of the world, in water taken on board as ballast by ships for their voyage. At least fourteen exotic species, including fish, crustaceans, polychaete worms, a seaweed and a toxic dinoflagellate, have been reported as having established in Australian waters through the ballast water of ships.

Although not addressed in the Consultative Environmental Review, the proponent has indicated in response to submissions that the ballast water from LPG and condensate vessels is discharged over board in accordance with International Marine Pollution Regulations.

The Environmental Protection Authority considers that, prior to the commencement of ship loading operations for this proposal, the proponent should prepare a report to the Environmental Protection Authority on the disposal of ballast water by ships loading LPG and condensate.

Other potential environmental impacts of the development are identified in the proponent's Consultative Environmental Review, together with their proposed management. A number of commitments are made by Woodside with respect to the proposal, including the preparation of a management plan for the onshore disposal of dredge spoil and disposal of pickle liquors and hydrostatic test fluids.

The Environmental Protection Authority has assessed the potential environmental impacts of the proposal, as described in the Consultative Environmental Review, and utilised additional information supplied by other government agencies, the public and the proponent. Additionally, an officer of the Environmental Protection Authority carried out a site inspection and discussed environmental issues with members of the public and relevant government authorities.

Based on the information supplied in the Consultative Environmental Review and additional information supplied by the proponent during the assessment, the Environmental Protection Authority has concluded that the proposal to establish additional facilities for LPG extraction and export within the existing onshore treatment plant at the Burrup Peninsula is environmentally acceptable.

In reaching this conclusion, the Environmental Protection Authority identified the main environmental issues as identification of hazards and management of risk, potential marine impacts from dredging for shipping and spoil disposal, shipping ballast water disposal, disposal of construction liquids, escape of hydrocarbons, and management of gaseous emissions.

The Environmental Protection Authority considers that the emission and monitoring of noise, atmospheric contaminants and solid and liquid waste disposal associated with the construction and operations of additional facilities for LPG extraction and export would be controlled through conditions imposed by a Works Approvals and subsequently, a Licence, under the Environmental Protection Act.

Accordingly, the Environmental Protection Authority recommends that the proposal is environmentally acceptable and could proceed subject to the information given in the Consultative Environmental Review, in responses to issues raised during the assessment and commitments made by the proponent.

Recommendation 1

The Environmental Protection Authority recommends that the proposal for additional facilities for liquefied petroleum gas extraction and export within the existing onshore treatment plant at the Burrup Peninsula is environmentally acceptable.

This decision is based on consideration of the proponent's Consultative Environmental Review, the Preliminary Risk Assessment, submissions received from the public and other Government agencies, responses to issues raised in submissions during the assessment (Appendix 2) and the proponent's commitments (Attachment 1 to Section 7).

In reaching this conclusion, the Environmental Protection Authority identified the main environmental factors requiring consideration to be:

- **identification of hazards and management of risk;**
- **potential marine impacts from dredging for shipping and spoil disposal;**
- **shipping ballast water disposal;**
- **disposal of construction liquids;**
- **escape of hydrocarbons; and**
- **gaseous emissions.**

The Authority considers that these issues have been adequately addressed and that this proposal could proceed subject to its recommendations in this report

(see Section 7, Recommended Environmental Conditions)

Recommendation 2

The Environmental Protection Authority recommends that the proponent should amend the Hazards Control Plan for the existing Gas Treatment Plant facilities to incorporate the proposed liquefied petroleum gas and condensate facilities, in stages and at times to meet the requirements of the Minister for the Environment. The amendments to the Hazards Control Plan should include, but not be limited to, the following:

- **safety engineering design;**
- **a full Process Hazard Review of the facilities;**
- **implementation systems;**
- **a safety management system which includes an emergency response system, fire fighting facilities and pro-active control systems; and**
- **annual auditing, to ensure compliance with the Hazards Control Plan, and to ensure the on-going relevance of the Hazards Control Plan. The on-going results should be forwarded to Environmental Protection Authority and the Department of Minerals and Energy.**

Should the "as-built" plant be significantly different to this proposal, then a final quantitative risk assessment will be required.

Recommendation 3

The Environmental Protection Authority recommends that the proponent should minimise the impacts of dredging on the marine environment. In particular, dredging should be undertaken at an appropriate time and in such a manner that there is no significant impact on coral spawning in the area. The timing of actual dredging should meet the requirements of the Minister for the Environment.

Recommendation 4

The Environmental Protection Authority recommends that, prior to the commencement of ship loading operations for this proposal, the proponent should prepare a report to the Environmental Protection Authority on the environmental impacts of ballast water disposal by ships loading LPG and condensate.

The Environmental Protection Authority concludes that the emission and monitoring of noise, atmospheric contaminants and solid and liquid waste disposal associated with the construction and operations of the additional facilities for liquefied petroleum gas extraction and export will be controlled through conditions imposed by Works Approval and subsequently, a Licence, under the Environmental Protection Act. (see Section 7, Recommended Environmental Condition 3-1).

Finally, based on its assessment of this proposal and recommendations above, the Environmental Protection Authority has developed a list of 'Recommended Environmental Conditions' (see Section 7 of this report) to the Minister for the Environment. The Authority considers that by setting these conditions on the development and operation of the additional facilities for liquefied petroleum gas (LPG) extraction and export, the environment would be protected.

1. Introduction

The proponent, Woodside Offshore Petroleum Pty Ltd (Woodside) proposes to establish additional facilities for liquefied petroleum gas (LPG) extraction and export within the existing onshore treatment plant at the Burrup Peninsula (Figure 1).

In May 1979 an Environmental Impact Statement/Environmental Review and Management Programme was submitted for the phased construction of a natural gas production and processing facility at Withnell Bay on the Burrup Peninsula. Environmental impacts were assessed and, as a result of these studies, an environmental management programme was established by Woodside from that time. The first phase of the project began in early 1982 with the construction of the domestic gas train. The liquefied natural gas (LNG) phase of the work was begun in late 1985 with additional capacity installed from late 1989.

To date the installation of the LPG facilities has been deferred as it has not been economically viable to produce a separate product for sale. LPG is currently separated out of the LNG gas stream and used in the LNG refrigeration process. Excess LPG is mixed with the Domgas stream for consumption in Western Australian scheme gas. In the event that the Goodwyn field comes on line in early 1994, the capacity of the existing plant to utilise all of the LPG components of the hydrocarbon stream would be limited.

Woodside referred their proposal to establish additional facilities for LPG extraction and export to the Environmental Protection Authority (EPA) in January 1993 and the level of assessment was set at Consultative Environmental Review (CER). At the time, the EPA identified that an additional risk may be associated with the new facilities and requested Woodside to undertake a Preliminary Risk Assessment on the project as part of the CER. The CER was released for public comment on 27 April 1993, with close of submissions on 25 May 1993.

On the 22 July 1993 the proponent advised the EPA (Appendix 3) that , from time to time, ships would be present at both jetties and loading simultaneously. This strategy differs from that outlined in the Preliminary Risk Assessment which formed part of the CER, and the EPA subsequently sought advice from the Department of Minerals and Energy (Appendix 4) - see Section 5.1 of this report.

2. Description of the proposal

2.1 Location, zoning and buffer zones

The existing Onshore Gas Treatment Plant occupies 231ha on a lease at Withnell Bay, near Dampier on the Burrup Peninsula about 1,300km north of Perth (Figure 1). The nearest major urban areas are at Dampier (10km SSW) and Karratha (14km SSE).

The area within the lease has undergone major disturbance. The portions of plant constructed to date consist of a Domgas Plant, an LNG Plant, LNG storage facilities, condensate storage facilities, a ship jetty, ship loading equipment, and administration buildings.

The Burrup Peninsula is classified under two Ministerial Temporary Reserves over which the Minister for Resources Development has effective control. Woodside leases are all prescribed under a State Agreement Act.

Woodside's existing lease at Withnell Bay is uniformly surrounded on its southern and eastern perimeters by a 93ha buffer zone. The northern and western perimeters are surrounded by water. Currently a 500m exclusion zone exists around the LNG jetty, and a similar exclusion zone would be required around the new jetty.

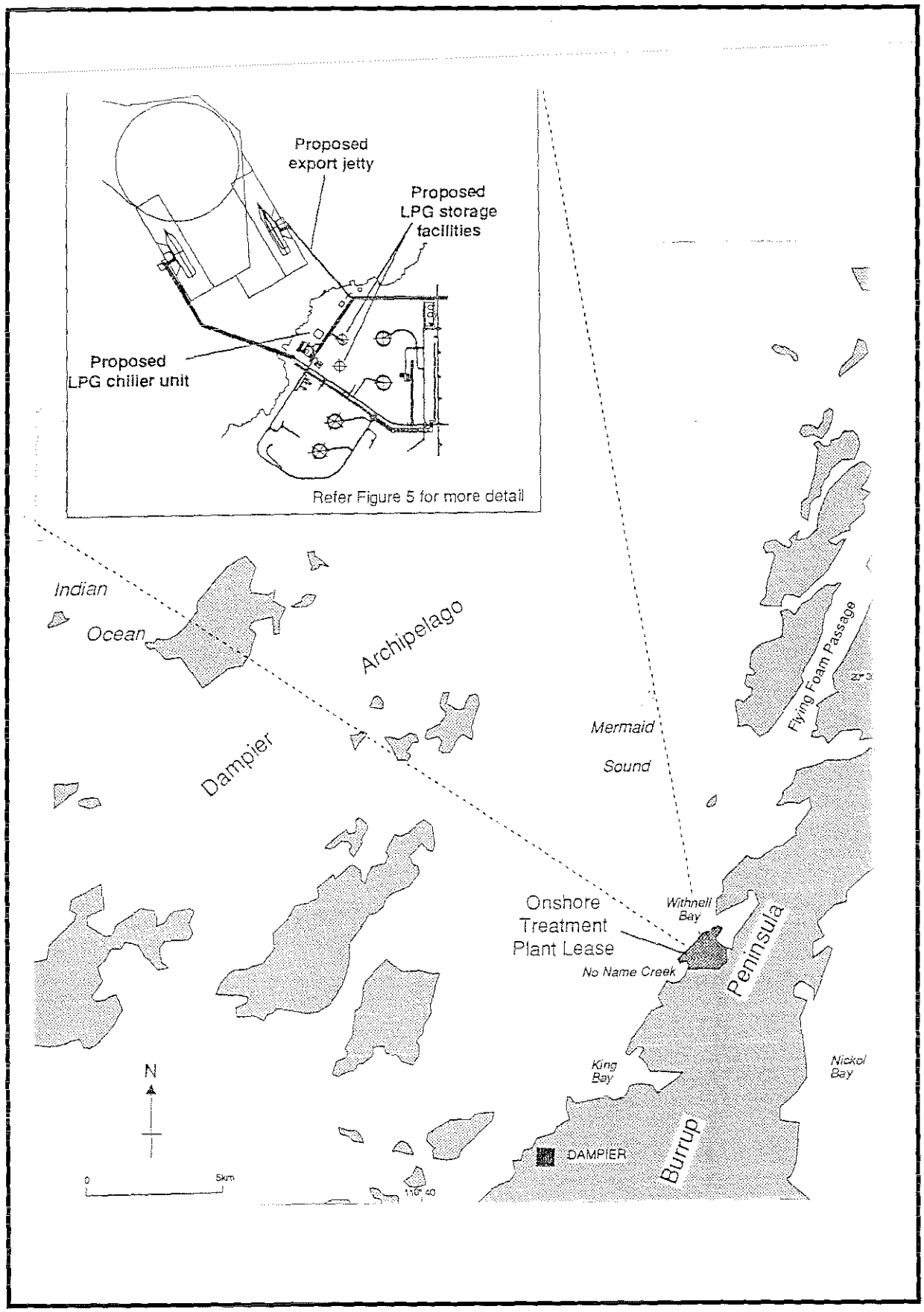


Figure 1: Location plan and proposed facilities for LPG export (from CER)

2.2 Proposed facilities and process description

The proposal involves the installation of two LPG storage tanks, a chiller unit, fire protection equipment, an auxiliary substation and associated infrastructure within the existing process area and a new ship jetty parallel with, and to the north of, the existing jetty. No extension of the plant boundary would be required.

Construction is due to commence during late 1993 with plant commissioning targeted for late 1995. The work force would be housed in existing accommodation in either Karratha or Dampier. No construction camp is envisaged.

LPG is the name given to the propane and/or butane fraction of natural gas that is collected as a by-product of LNG. LNG is the methane portion of the natural gas that has been collected by cooling to minus 161 degrees Centigrade. Excess propane and butane which is not required for refrigeration for the LNG plant or blending into the Domgas (which is piped to Perth) would be stored and exported using the proposed facilities.

The other alternatives considered by Woodside included flaring the LPG fraction, and reinjecting the LPG fraction into the North Rankin A Reservoir. Woodside concluded that flaring was environmentally and economically unsound, and reinjection required double handling and was therefore rejected on a cost basis.

3. Existing environment

3.1 Terrestrial flora and fauna

The site proposed for construction of the LPG facilities is within the existing plant boundary and is situated on fill material.

3.2 Marine Biotic Assemblages

In the vicinity of the project area a number of marine biotic assemblages exist which have the potential to be affected by the proposed construction of the LPG berth. The main assemblages are oyster-barnacle (occurs on intertidal solid substrates and is the main intertidal assemblage along the western shore of Burrup Peninsula), coral (inhabits subtidal rock substrates and is another of the major assemblages along the west coast of Burrup Peninsula), and mollusc-echinoderm (occurs on unconsolidated sediments in shallow subtidal and low intertidal areas in protected embayments; it is composed of a wide diversity of organisms and is the main assemblage in the project area).

A number of other minor biotic assemblages also occur in proximity to the project area, including mollusc-coral (colonises low tidal rock substrates but is not a major assemblage in the project area), crustacea-mollusc (occurs on unconsolidated intertidal sediment in embayments and on beaches along the west coast of Burrup Peninsula), mangal (occur in protected embayments in the intertidal zone at only four localised areas along the west coast of Burrup Peninsula), mollusc-coral (colonises low tidal limestone substrates), and seagrass (colonises shallow subtidal unconsolidated sediments and occur sparsely in nearshore sediments along the west coast of Burrup Peninsula).

3.3 Aboriginal heritage

An Aboriginal (archaeological) Site Survey was undertaken at the Gas Treatment Plant during February and March 1993. The survey covered an area of approximately 30ha within Woodside's LNG lease. A total of 13 archaeological sites have been previously recorded from

the survey area. Woodside reports that eleven of these sites have been cleared and all of their obligations under the Aboriginal Heritage Act have been met.

Two archaeological sites are located in the proposed project area near the shore. One site is considered of high significance consisting of 165 engravings, 4 grinding patches and 1 standing stone and Woodside's consultants have recommended that the site be preserved. The other site is considered to be of moderate to high significance consisting of 65 engravings and one grinding patch.

Woodside intends to locate the LPG jetty and associated infrastructure in such a manner that damage to the above two sites is avoided.

4. Issues raised in submissions

A total of six submissions were received by the EPA for this proposal, comprising five Government agency and one public submission. A list of those who made submissions is given in Appendix 1.

Relevant comments from submissions fell into the following broad categories:

- marine impacts (dredging, solid and liquid waste disposal);
- gaseous emissions;
- risk; and
- aboriginal sites.

The Authority has addressed these issues in its assessment, with the exception of aboriginal sites. The aboriginal sites issue has not been addressed in detail in this report, as it lies outside the EPA's area of responsibility. Specific legislation through the Aboriginal Heritage Act deals with these issues. The EPA notes that the proponent reports that its obligations under the Act have been met.

The EPA considers that the proponent has addressed most of the issues relating to potential environmental impacts from this proposal with specific commitments (Attachment 1 to Section 6) and, in responses to issues raised in submissions (Appendix 2).

5. Environmental impacts and their management

5.1 Hazard identification and risk management

5.1.1 Risk standards and criteria

The EPA has established risk assessment criteria and processes that account for both the technical and the locational safety aspects of hazardous industry. Present criteria for individual fatality risk levels are given in the EPA Bulletin 611 as follows:

a. a risk level in residential zones of one in a million per year or less, is so small as to be acceptable to the EPA;

b. a risk level in "sensitive developments", such as hospitals, schools, childcare facilities and aged care having developments of between one half and one in a million per year is so small as to be acceptable to the EPA;

c. risk levels from industrial facilities should not exceed a target of fifty in a million per year at the site boundary for each individual industry and the cumulative risk level imposed upon an industry should not exceed a target of one hundred in a million per year;

d. a risk level for any non-industrial activity located in buffer zones between industrial facilities and residential zones of ten in a million per year or lower is so small as to be acceptable to the EPA.

The term "individual risk level" refers to the frequency per year (the measure of likelihood) of death of an individual due to an accident. Individual risk levels are typically represented on a map by a series of contours showing the risk of fatality to an individual at a certain place over a year of exposure to a particular hazard.

In regard to cumulative risk, the EPA considers that no extra risk would be acceptable where the cumulative risk of existing industry, combined with assessed risk of the proposed new industry, exceed the risk criteria for new industry. Thus, for a proposed new facility, it is necessary to show that all industry (new and old) in the area meets the criteria. The EPA considers that cumulative risk should take into account the Gas Treatment Plant currently in operation, together with the proposed new facility.

The EPA provided the proponent with specific guidelines for preliminary risk analysis, and these were appendicised in the CER.

5.1.2 Recent changes to Preliminary Risk Assessment

On the 22 July 1993 the proponent advised the EPA (Appendix 3) of a number of inaccuracies and corrections that were required to the initial Preliminary Risk Assessment. In particular, from time to time, ships would be present at both the LNG and the LPG jetties and loading simultaneously. This strategy differs from that outlined in the Preliminary Risk Assessment which formed part of the CER. Although Woodside indicated that these changes would not have a significant impact on the risk contours, the EPA sought advice from the Department of Minerals and Energy (Appendix 4).

5.1.3 Preliminary Risk Assessment

The results of the analysis show that only two of the risk contours extend from the Gas Treatment Plant lease into the Buffer Lease (see Figure 2). The first, the one half in a million per year risk contour, is the EPA's criterion for `sensitive developments' such as hospitals, schools, child care facilities and aged care housing developments. The second, the one in a million per year risk contour, is the EPA's criterion for residential zones. The closest residential area is at Dampier, 10km away and there are no areas zoned for residential use nor `sensitive developments' in the vicinity of the site.

The proposal at Woodside's site would meet the EPA's criterion for industrial activities, such that the risk at the site boundary should not exceed fifty in a million per year.

Woodside has given a commitment that the new LPG jetty would have a similar exclusion zone to the 500m exclusion zone around the existing LNG jetty (Commitment 8.3.5). Most public activity in the area occurs at the boat ramp, which is over one kilometre away. In response to submissions, Woodside has indicated that, based on the results of its risk assessment, the present arrangements (double fences, buffer zones and buoys) which delineate the plant boundary and the off-shore exclusion zone, are sufficient to warn people who use areas adjacent to the gas plant.

In its most recent advice to the EPA on 28 July 1993, the Department of Minerals and Energy considers that the recent adjustments and corrections to the Preliminary Risk Report advised by the proponent on 22 July 1993 would not significantly alter the risk contours developed in the original risk assessment.

The EPA notes that the proponent has given a commitment that the new jetty and infrastructure would be incorporated into Woodside's emergency response plan (Commitment 8.3.4).

In conclusion, the EPA considers that the proposal meets the EPA's risk criteria. Any further developments in the vicinity of the site should take into account the EPA's risk criteria.

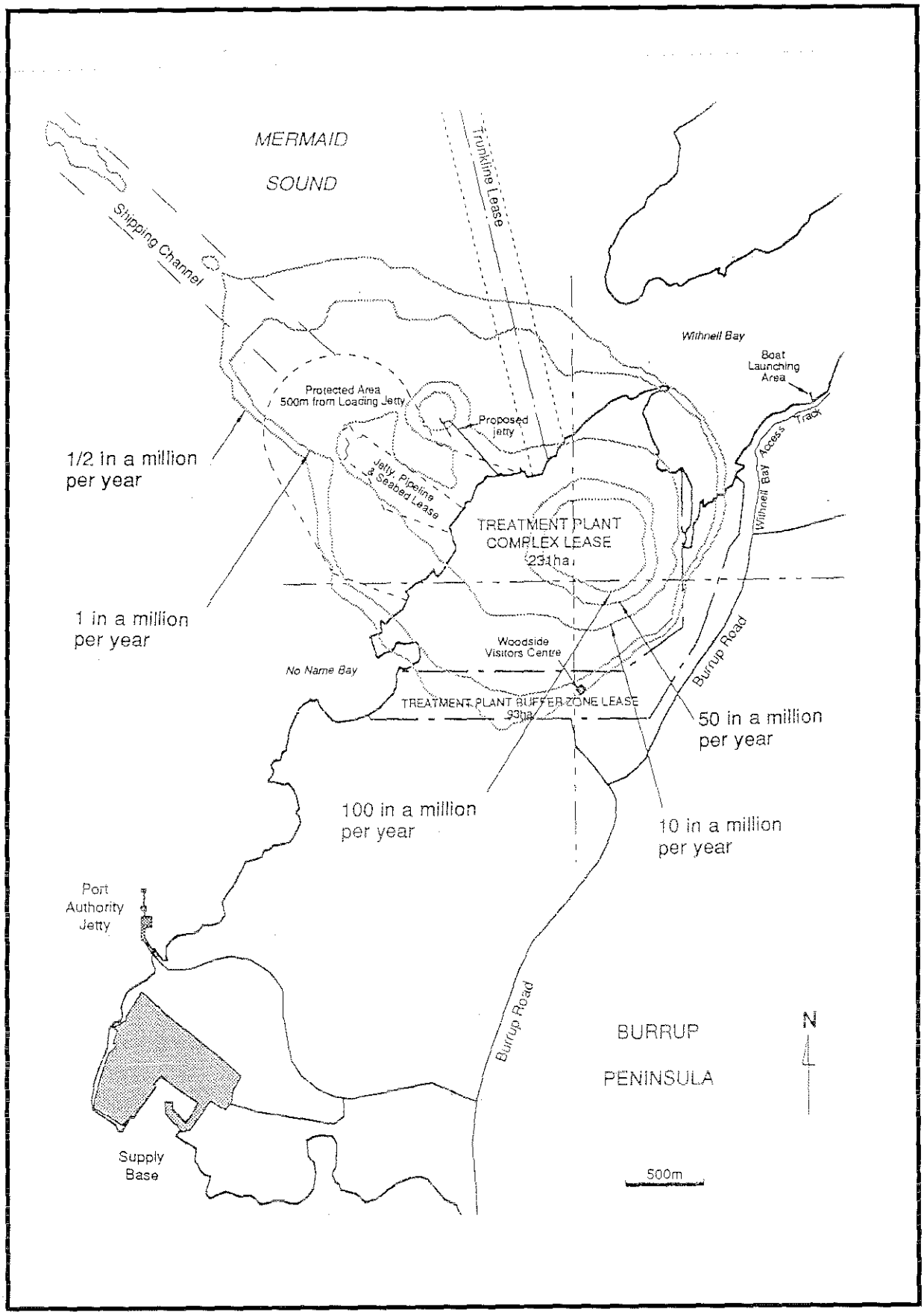


Figure 2: Cumulative quantitative risk contours for LNG and proposed LPG plants (modified from CER)

To ensure that the proposal, if implemented, continues to meet acceptable risk levels, the Environmental Protection Authority recommends that the proponent should amend the Hazards Control Plan for the existing Gas Treatment Plant facilities to incorporate the proposed liquefied petroleum gas and condensate facilities, in stages and at times to meet the requirements of the Minister for the Environment. The amendments to the Hazards Control Plan should include, but not be limited to, the following:

- **safety engineering design;**
- **a full Process Hazard Review of the facilities;**
- **implementation systems;**
- **a safety management system which includes an emergency response system, fire fighting facilities and pro-active control systems; and**
- **annual auditing, to ensure compliance with the Hazards Control Plan, and to ensure the on-going relevance of the Hazards Control Plan. The on-going results should be forwarded to Environmental Protection Authority and the Department of Minerals and Energy.**

Should the "as-built" plant be significantly different to this proposal, then a final quantitative risk assessment will be required.

5.2 Marine impacts

5.2.1 Dredging and jetty construction

The proponent proposes to remove approximately 700,000m^3 of sediment for the preparation of the berthing pocket at the end of the proposed LPG jetty.

The EPA is concerned about the disturbance to corals and other biotic assemblages as a result of increased sediment deposition from this dredging and jetty construction.

The proponent has indicated that disturbance in the vicinity of the jetty would be confined to a narrow zone, less than 100m wide, immediately adjacent to the shore. The proponent acknowledges that physical disturbance to corals is unavoidable but would be minimised through the selection of a piled jetty over other types of construction, such as a solid limestone causeway.

The major assemblage that would be impacted by dredging operations are the mollusc-echinoderm assemblage. Impacts centre on the physical removal of substrate and the continued reworking of the top layer of sediment as a result of shipping activities. This assemblage dominates the project area and Mermaid Sound. The proponent considers that the localised loss of a small portion of this assemblage would be minor in ecological terms.

The proposed dredging programme would occur over a period of approximately 12 weeks. The proponent indicates that studies conducted in association with past dredging operations have shown that sedimentation has a relatively minor effect on coral numbers and percentage cover. Effects are thought to be temporary and restricted to a radius of 1.5km from the point of operation. The proponent would monitor the temporary increase in suspended sediment load as part of the Chemical and Ecological Monitoring of Mermaid Sound (CHEMMS) programme.

The EPA is concerned that the proponent's timing for proposed dredging operations (December to April) coincides with the critical time for coral reproduction. This timing also coincides with natural factors such as a higher water temperature, which cause stress to invertebrate communities in the Dampier Archipelago. Circumstantial evidence from previous EPA monitoring studies has shown that high sediment depositional rates in the area in 1982 and 1983 may have been due to dredging activities some 7.5km away, and that high mortality rates of the corals at this time was a result of these dredging activities. The EPA considers that all proposals that involve dredging activities should give due regard to the sensitivities of the marine environment when project timelines are planned.

The EPA acknowledges that the proponent has made specific commitments to manage the impacts of dredging and jetty operations on the marine environment. These include conducting dredging operations at all times to the satisfaction of the Dampier Harbour Master and the EPA (Commitment 8.1.5), monitoring the environmental impacts of the proposed dredging operation to the satisfaction of the EPA through the existing CHEMMS programme (Commitment 8.2.1), and forwarding results of the CHEMMS programme for review to the EPA in accordance with existing reporting procedures (Commitment 8.3.1).

The Environmental Protection Authority recommends that the proponent should minimise the impacts of dredging on the marine environment. In particular, dredging should be undertaken at an appropriate time and in such a manner that there is no significant impact on coral spawning in the area. The timing of actual dredging should meet the requirements of the Minister for the Environment.

5.2.2 Disposal of dredge spoil

The proponent proposes to dispose of approximately 700,000m^3 of dredged spoil on shore in an area adjacent to No Name Creek. This is the same area that was used to receive the dredge spoil from the construction of the LNG shipping channel.

The dredge spoil is a useful commodity as clean inert fill for construction purposes. Woodside proposes to store the dredge spoil in the No Name Creek area and reclaim clean fill from this stockpile as required, thus eliminating the need to disturb sensitive habitats in other areas.

The proponent reports that, during dredging and spoil dumping operations for the LNG shipping channel between October 1986 and June 1987, approximately 1.65 million m^3 of dredge spoil was pumped to the No Name Creek reclamation area. As a consequence of this operation, about 15% of this spoil was unintentionally deposited into No Name Bay. The suspended sediment caused a build up of sediment over an area of about 16 hectares in No Name Bay.

Monitoring by Woodside showed that the dredging and dumping operations resulted in a minor reduction in coral numbers and percentage cover of live corals within a 1.5km radius of dredging activities. However recolonisation of spoil grounds by benthic biota occurred within a few months of completion of dredging.

Approximately 30% of the mangroves in the affected area died due to sediment covering the breathing roots. Woodside's CER indicates that natural regeneration of mangroves is occurring and this is being augmented with a rehabilitation programme involving the planting of Rhizophora propagules.

Woodside expect that spoil disposal from this proposal would not exacerbate the previously incurred impacts. The proponent has indicated that experience from previous dredging operations would be taken into account in the design of the spoil settling ponds. The volume of spoil to be handled is significantly lower than the previous operations.

During 1988 and early 1989 cyclonic activity caused localised collapse of the shipping channel which required maintenance dredging during August and September 1989. This dredge spoil was disposed offshore. During the period of maintenance dredging and dumping, no sedimentation on corals or coral mortality was observed by Woodside at any of the monitored sites.

In regard to concerns raised in submissions about dredging impacts on Flying Foam Passage, specifically pearling operations, Woodside has responded that increased sedimentation is not expected to occur in this area as result of the dredging operation. This is based on monitoring of previous dredging activities.

Woodside is committed to developing and implementing a dredge spoil management plan in consultation with the EPA. The dredge spoil management plan to be prepared by Woodside would address the causes for the escape of fines that occurred from the impoundment area

during the dredging for the LNG jetty and propose methods to assure that a similar accident does not occur during the dredging for the LPG jetty (Commitment 8.1.1).

5.2.3 Ballast disposal

The proponent estimates an additional 20 shipments per year would be associated with this proposal. A general concern of the EPA is the transport into Western Australian waters of marine organisms from others areas of the world in water taken on board as ballast by ships for their voyage.

At least fourteen exotic species, including fish, crustaceans, polychaete worms, a seaweed and a toxic dinoflagellate, have been reported as having established in Australian waters through the ballast water of ships (Jones, 1991). Other micro-organisms, including viruses, proterozoans and many bacteria may have been introduced in the same way. These exotic species can spread due to coastal shipping or currents into areas beyond the initial point of introduction. The impacts of the exotic species can be upon human health, commercial fisheries including marine aquaculture, and the natural environment. Tasmanian authorities have been forced to implement expensive monitoring controls, and to close down shellfish harvesting in the Huon River several times in recent years, due to the presence of toxic dinoflagellates.

In 1990 the Scientific Working Group, which was established by the Australian Quarantine and Inspection Service of the Commonwealth Department of Primary Industries and Energy, developed the position that "the risks associated with ballast water discharge in Australian Ports are significant, the means of reducing the risks to acceptable levels are not yet established, and further research and development of techniques for minimising introductions is required".

To prevent the spread of dinoflagellates and other exotic organisms, the Australian Quarantine and Inspection Service recently introduced guidelines for the management of ballast, including:

- measures on route, including reballasting at sea, or in-hold treatment;
- measures on arrival, including a commitment not to discharge ballast, on-shore ballast treatment, and discharge of sediment into approved areas.

The potentially significant environmental issue of ballast water disposal was not addressed by the proponent in the CER. However, in response to submissions (Appendix 1), the proponent has indicated that the ballast from LPG and condensate vessels is discharged over board in accordance with International Marine Pollution Regulations.

The Environmental Protection Authority recommends that, prior to the commencement of ship loading operations for this proposal, the proponent should prepare a report to the Environmental Protection Authority on the environmental impacts of ballast water disposal by ships loading LPG and condensate.

5.2.4 Pickle liquors

Small diameter piping on and around the compressor units requires 'pickling' before being placed in service. The pickle solution is envisaged to be ammoniated citric acid.

During the previous Phase III construction, disposal of undiluted spent pickle liquors directly into the environment is reported to have caused a fish kill. In recognition of past problems Woodside favours the recycling of pickle liquors where possible. If this is not feasible or practical the liquors would be pretreated in a manner which makes them suitable for disposal.

Woodside has developed a procedure to dispose of spent pickle liquor for the LNG plant. This procedure specifies that, prior to disposal, the spent liquor is neutralised to pH limits specified by the EPA, diluted and regularly sampled to ensure other criteria are satisfied. The procedure also specifies that the spent liquor is discharged to the sea prior to high tide, to allow the maximum dispersion into the ocean.

Woodside is committed to work with its subcontractors to assure that spent pickle liquor is either recycled or disposed of in an environmentally friendly manner. This would be conducted to the satisfaction of the EPA (Commitment 8.2.8).

5.2.5 Hydrostatic test fluids

The proponent is not certain if the storage tanks would be hydrostatically tested with potable or sea water, nor is it clear if the water would require treatment with corrosion inhibitors to protect the tanks.

Woodside is committed to develop a plan, in consultation with the EPA, for treatment (if required) and disposal of the hydrostatic test water. Upon acceptance of this plan, Woodside would seek authorisation from EPA for the one time discharge of these waters (Commitments 8.1.3 and 8.2.7).

The disposal plan is envisaged by Woodside to be similar to the plan executed during the hydrostatic testing of the LNG tanks constructed during Phase III.

5.2.6 External leakage of hydrocarbons

An issue not specifically addressed in the CER but raised in submissions relates to measures to be undertaken by the proponent to prevent hydrocarbons from leaking into the marine environment.

In response, Woodside has indicated that the stormwater drainage system would be designed in line with the existing facility, to prevent hydrocarbons from equipment, vessels or overhead pipelines from entering the system and into the marine environment. This would include the use of bunding, oil catch trays, sumps and an oil treatment system in the proposed LPG facility. The LPG loading area and the condensate loading area would be separately kerbed and drained to separate sumps, which would be kept clean in case a storm should fill and overflow the sump.

The current CHEMMS programme monitors corals, rocky shore animals, trace metals and hydrocarbons in rock oysters, trace metals in sediments, and hydrocarbons and nutrients in sea water. Woodside has given a commitment to continue the monitoring programme to assess the impact of its activities in Mermaid Sound (Commitment 8.3.3) and to forward the results to EPA in accordance with existing reporting procedures (Commitment 8.3.1).

5.3 Gaseous emissions

The proposed LPG facility would not require the installation of any new electrical power generation facilities. There would however be an increased load on the existing electricity generation facilities. This increased load represents a 1% increase on the present total plant power demand. Consequently, there would be an incremental increase of approximately 1% in the generation of greenhouse gas emissions.

In response to submissions regarding the use of chloro-fluoro carbons (CFCs), including Halons, the proponent has indicated that it has a policy to minimise and phase out the use of non-essential Halons. All Halon recovered would be stored in a recognised Halon bank and ultimately disposed of in an approved manner. The proponent has made a commitment to specify insulating materials that do not use CFCs as the foaming agent at the pre-construction stage (Commitment 8.1.2).

6. Conclusion

The proponent has identified the major potential environmental impacts of its proposal and provided commitments to address these issues.

The EPA has assessed the potential environmental impacts of the proposal, as described in the Consultative Environmental Review, and utilised additional information supplied by other Government agencies, the public and the proponent in response to issues raised in submissions. Additionally, an officer of the EPA has carried out a site inspection and discussed environmental issues with members of the public and relevant Government authorities.

The Authority considers that it could be necessary or desirable to make minor and non-substantial changes to the designs and specifications of the proposal which were examined as part of the EPA's assessment. Accordingly, the EPA considers that subsequent statutory approvals for this proposal could make provision for such changes, where it can be shown that the changes are not likely to have a significant effect on the environment.

Furthermore, the Authority believes that any approval for the proposal based on this assessment should be limited to five years. Accordingly, if the proposal has not been substantially commenced within five years of the date of this report, then such approval should lapse. After that time, further consideration of the proposal should occur only following a new referral to the EPA.

The EPA notes that during the detailed implementation of proposals, it is often necessary to make minor and non-substantial changes to the designs and specification which have been examined as part of the EPA's assessment. The EPA considers that subsequent statutory approvals for this proposal could make provision for such changes, where it can be shown that the changes are not likely to have a significant effect on the environment.

Finally, the EPA points out that the proponent's compliance with Environmental Conditions and any conditions of Works Approval and Licence will be periodically audited. Pollution control limits and other conditions will be periodically reviewed and may be modified by the EPA in the light of operating experience.

The Environmental Protection Authority concludes that the proposal to establish additional facilities for liquefied petroleum gas extraction and export within the existing onshore treatment plant at the Burrup Peninsula is environmentally acceptable.

This decision is based on consideration of the proponent's Consultative Environmental Review, the Preliminary Risk Assessment, submissions received from the public and other Government agencies, responses to issues raised in submissions during the assessment (Appendix 2) and the proponent's commitments (Attachment 1 to Section 7).

In reaching this conclusion, the Environmental Protection Authority identified the main environmental factors requiring consideration to be:

- **identification of hazards and management of risk;**
- **potential marine impacts from dredging for shipping and spoil disposal;**
- **shipping ballast water disposal;**
- **disposal of construction liquids;**
- **escape of hydrocarbons; and**
- **gaseous emissions.**

The Authority considers that these issues have been adequately addressed and that this proposal could proceed subject to its recommendations in this report

7. Recommended Environmental Conditions

Based on its assessment of this proposal and recommendations in this report, the Environmental Protection Authority considers that the following Recommended Environmental Conditions are appropriate.

These recommended environmental conditions apply to the proposal for additional facilities for liquefied petroleum gas extraction and export within the existing onshore treatment plant at the Burrup Peninsula.

1. Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 In implementing the proposal, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made in the Consultative Environmental Review and included in the Environmental Protection Authority's Bulletin 694. (see Attachment 1 to this Statement)

2 Implementation

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

2-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

3. Hazards Control Plan

3-1 The proponent shall amend the Hazards Control Plan for the existing Gas Treatment Plant facilities to incorporate the proposed liquefied petroleum gas and condensate facilities, in stages and at times to meet the requirements of the Minister for the Environment. The amendments to the Hazards Control Plan shall include, but not be limited to, the following:

1 safety engineering design;

2 a full Process Hazard Review of the facilities;

3 implementation systems;

4 a safety management system which includes an emergency response system, fire fighting facilities and pro-active control systems; and

5 annual auditing, to ensure compliance with the Hazards Control Plan, and to ensure the on-going relevance of the Hazards Control Plan.

3-2 The on-going results required by condition 3-2 shall be forwarded to Environmental Protection Authority and the Department of Minerals and Energy.

3-2 Should the "as-built" plant be significantly different to this proposal, then a final quantitative risk assessment will be required.

4 Dredging

4-1 The proponent shall minimise the impacts of dredging on the marine environment.

4-2 Dredging shall be undertaken at an appropriate time and in such a manner that there is no significant impact on coral spawning in the area.

4-3 The timing of dredging for this proposal shall meet the requirements of the Minister for the Environment.

5. Ballast disposal

5-1 Prior to the commencement of ship loading operations for this proposal, the proponent shall prepare a report to the Environmental Protection Authority on environmental impacts of the disposal of ballast water by ships loading LPG and condensate.

6. Subsequent Proposals

Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment.

6-1 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the Environmental Protection Authority with the proposal. Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that the Minister for the Environment determines on the advice of the Environmental Protection Authority, is not substantial, those changes may be effected.

7. Proponent

These conditions legally apply to the nominated proponent.

7-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Minister shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

8. Time Limit on Approval

The environmental approval for this proposal is limited.

8-1 If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for the Environment shall determine any question as to whether the project has been substantially commenced. Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period, to the Minister for the Environment by way of a request for a change in the condition under Section 46 of the Environmental Protection Act. (On expiration of the five year period, further consideration of the proposal can only occur following a new referral to the Environmental Protection Authority.)

9. Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

9-1 The proponent shall prepare periodic "Progress and Compliance Reports", to help verify the environmental performance of this project, in consultation with the Environmental Protection Authority.

Procedure

The Environmental Protection Authority is responsible for verifying compliance with the conditions contained in this statement, with the exception of conditions stating that the proponent shall meet the requirements of either the Minister for the Environment or any other government agency.

If the Environmental Protection Authority or proponent is in dispute concerning compliance with the conditions contained in this statement, that dispute will be determined by the Minister for the Environment.

Note

Where required, the Environmental Protection Authority will address issues such noise, dust, odour and, solid and liquid waste management, associated with the construction and operation of additional facilities for liquefied petroleum gas extraction and export through, for example, Works Approvals and/or Licence conditions set under Part V of the Environmental Protection Act.

Attachment 1

Woodside Offshore Petroleum Pty Ltd's consolidated list of environmental management commitments

8. COMMITMENTS

The following commitments are made by Woodside with respect to this project:

8.1 PRECONSTRUCTION

8.1.1 Develop and implement a dredge spoil management plan in consultation with EPA. The dredge spoil management plan will address the causes for the escape of fines that occurred from the impoundment area in No Name Creek during the dredging for the LNG shipping channel and propose methods to assure that a similar accident does not occur during the dredging for the LPG jetty.

8.1.2 Specify insulating materials that do not use CFCs as the foaming agent.

8.1.3 Develop a plan in consultation with the EPA for treatment (if required) and disposal of the hydrostatic test water.

8.1.4 Jetty design will be in accordance with Department of Marine and Harbours regulations.

8.1.5 Dredging operations will be conducted at all times to the satisfaction of the Dampier Harbour Master and the EPA.

8.2 DURING CONSTRUCTION

8.2.1 Monitor the environmental impacts of the proposed dredging operation to the satisfaction of the EPA through the existing CHEMMS programme.

8.2.2 Exercise due care in planning the site layout and during construction to preserve the archaeological sites in the development area and to consult with the Western Australian Museum and appropriate Aboriginal custodians should site disturbance be required or new sites identified.

8.2.3 If the construction noise levels prove to be a problem to the adjacent residential areas, Woodside recognises its obligation to devise corrective action under the noise abatement statutes of Western Australia. This will be to the satisfaction of the EPA.

8.2.4 Consult with the local authorities and follow local guidelines in the landfill disposal of inert construction waste.

8.2.5 Consult with local authorities and follow local guidelines in the disposal of insulating waste.

8.2.6 Work with its suppliers and subcontractors to minimise the quantity of waste and assure that the wastes generated are disposed of in an environmentally friendly manner.

8.2.7 Upon acceptance of the hydrostatic test water disposal plan, Woodside will seek authorisation from EPA for the discharge of these waters.

8.2.8 Work with its subcontractors to assure that spent pickle liquor is either recycled or disposed of in an environmentally friendly manner. This will be conducted to the satisfaction of the EPA.

8.3 POST CONSTRUCTION

8.3.1 Results of the CHEMMS programme will be forwarded for review to EPA in accordance with existing reporting procedures.

8.3.2 Operate the new equipment using established practices and procedures including those for environmental management and safety to the satisfaction of the Department of Minerals and Energy and the EPA.

8.3.3 Continue the monitoring programme (CHEMMS) to assess the impact of Woodside's activities in Mermaid Sound.

8.3.4 The new jetty and infrastructure will be incorporated into Woodside's emergency response plan.

8.3.5 The exclusion zone around the existing LNG jetty is 500m and the new LPG jetty will have a similar exclusion zone.

Appendix 1

List of Government agencies and members of the public who made submissions

Commonwealth Environment Protection Agency

Department of Minerals and Energy
Department of Aboriginal Sites
Department of Resources Development
Pilbara Development Commission

Pilbara Environment Group

Appendix 2

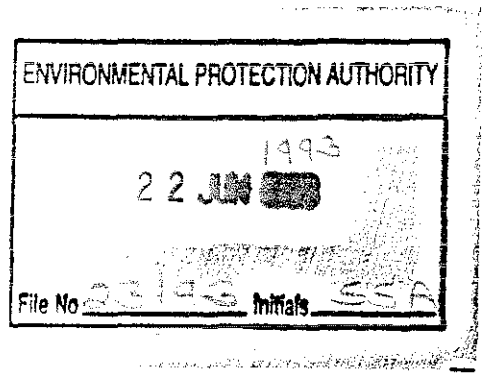
Proponent's response to public submissions

WOODSIDE
AUSTRALIAN ENERGY

Our reference: DE3:KC1-0003 6.9.1

Your reference: 23/93

21 June 1993



Mr C J Murray
A/Director, Evaluation Division
Environmental Protection Authority
Westralia Square
141 St Georges Terrace
PERTH WA 6000

Dear Sir

CONSULTATIVE ENVIRONMENTAL REVIEW
FOR PROPOSED LPG EXTRACTION FACILITIES
ON THE BURRUP PENINSULA - RESPONSE TO SUBMISSIONS

Further to your letter dated 10th June 1993, on this subject please find attached Woodside's responses to the questions raised.

Should you have any queries regarding our responses, please contact the undersigned.

Yours faithfully
WOODSIDE OFFSHORE PETROLEUM PTY LTD

R A D WRIGHT
Environment Manager

67109 ENV

CC: E Ryan (WOP)

1 JUSTIFICATION FOR ADDITIONAL JETTY

1.1 Why is it not possible to accommodate the 20 extra ship movements for which the new jetty is proposed with the existing facilities? ie could the additional infrastructure be placed on the existing jetty?

Response: Due to the staged increase in production from Woodside's facilities, (ie Phase I North Rankin 'A' platform (NRA) and Domestic Gas Plant (Domgas), Phase II Liquefied Natural Gas (LNG) trains 1 and 2, Phase III LNG train 3 and Goodwyn platform (GWA)) there has been a scheduled, orderly increase in the number of shipments of LNG and condensate from the existing jetty. The estimated additional 20 shipments per year by the LPG project will exceed the operability limit of the existing jetty.

2 SHIPPING

2.1 How is it proposed to dispose of ballast from the ships during the loading phase?

Response: LPG vessels are constructed with segregated ballast tanks with dedicated pipework. As this ballast is clean it will be discharged over board in accordance with International Marine Pollution Regulations (MARPOL).

For Condensate shipments, clean ballast vessels or vessels with segregated ballast only are presently allowed to load at the Withnell Bay Terminal. These vessels already discharge over board in accordance with MARPOL.

If, in the unlikely event, ballast is found to be contaminated the vessel will either be transferred to the LNG jetty to utilise the existing dirty ballast reception facilities or the quantity to be loaded would be restricted to retain the ballast onboard.

2.2 What is Woodside's policy in regard to the standard of tankers it will load with condensate or LPG?

Response: Woodside has taken a very conservative approach with regard to ensuring a high standard of tankers. This policy will apply to both Condensate and LPG vessels at the new facility.

No tanker is nominated to load at Withnell Bay unless it has been vetted by the Projects Marine subsidiary, Mermaid Sound Port & Marine Services, (MSPMS) and approved.

MSPMS has access to a vessel standard data base which includes some 4000 vessels. The criteria for accepting a tanker includes the requirement that it has passed inspection within the previous 12 months. These inspections are to maintain the database and are in addition to statutory and Port State Inspections. Other criteria utilised by the Project in their assessment includes the age of the vessel and knowledge of the Operator/Management.

3 DREDGING AND SPOIL DUMPING

3.1 What is the likely impact if increased sedimentation associated with the establishment of the new jetty and dredging increases in Flying Foam Passage, particularly to the pearling operation?

Response: Increased sedimentation is not expected to occur in Flying Foam Passage with the establishment of the new jetty and dredging operations associated with the proposed LPG project. Monitoring of previous dredging operations showed that sediment does not remain suspended for sufficient time for currents to carry it as far as Flying Foam Passage. Under these circumstances the pearling operation will not be affected.

3.2 What monitoring of the Flying Foam Passage environment would be carried out?

Response: Woodside has established monitoring sites under its Chemical and Ecological Monitoring of Mermaid Sound (ChEMMS) programme in the northern areas of the Burrup Peninsula. This programme has been established since 1985 and includes 7 sites. Specifically ChEMMS sites 3 and 5 bracket the entrance to Flying Foam Passage. There has been no evidence to date from any of the monitoring around Flying Foam Passage to suggest any adverse impact from Woodside's operations involving dredging.

3.3 To what extent did dredged spoil and tail water enter No Name Bay during previous dredging operations?

Response: All tail water, which is only seawater, was returned to No Name Bay during previous dredging operations. The tail water contained larger amounts of suspended sediments than was originally anticipated. Woodside estimates that during these dredging operations about 15% of the total quantity of dredged material was discharged into No Name Bay.

3.4 What has been the effect on the environment of No Name Bay by the previous spoil dumping operations and is this likely to be exacerbated by this proposal?

Response: The previous spoil disposal operation in 1986/87 resulted in suspended sediment being carried over into the bay causing a build up of sediment in an area of approximately 16 hectares of No Name Bay.

Woodside estimates approximately 30% of the mangroves in this section of No Name Bay died due to sediment covering the air breathing roots. It is not expected that spoil disposal from the proposed dredging operations will exacerbate these effects. Experience from previous dredging operations will be taken into account in the design of the dredge spoil settling ponds. Also the volume of dredge spoil to be handled is much lower than in previous dredging operations.

3.5 **To what extent has environmental damage from previous dumping operations been remediated?**

Response: Woodside has assessed the degree of sedimentation and the mangrove density and has undertaken field planting trials to establish the right conditions for mangrove replanting. These trials show that mangroves can be re-established with about a 10% success rate which approximates the natural rate. Monitoring has shown that mangroves are, in any case, naturally re-establishing in the area. Further planting is being considered where this may usefully accelerate the natural process.

3.6 **What will be done differently with this proposal to ensure similar environmental damage does not occur?**

Response: As stated in 3.4 above Woodside will use the experience gained from previous dredging operations in designing the dredge spoil settling ponds. As stated in the CER (item 8.1, page 29) a dredge spoil disposal programme will be prepared by Woodside for EPA approval with the aim of preventing significant discharges of suspended sediments to No Name Bay.

3.7 **How long does Woodside intend to use the No Name Creek area for the storage of dredged spoil and what plans are there for the rehabilitation of the area?**

Response: Woodside intends to use the No Name Creek area, presently used and proposed to be used again for dredge spoil storage, for the life of the project. This area is an integral part of the gas plant lease and so there are no plans to treat this area separately from the rest of the plant with regard to rehabilitation.

4 EXTERNAL LEAKAGE AND LIQUID WASTE DISPOSAL

4.1 **What measures are to be undertaken to prevent hydrocarbons or effluent containing hydrocarbons from leaking into Mermaid Sound and Withnell Bay from the proposed LPG project?**

Response: The stormwater drainage system of the proposed LPG facility shall be designed in line with the existing facility. This will prevent hydrocarbons from equipment, vessels or overhead pipelines entering the system and escaping directly into the marine environment.

In the proposed LPG facility hydraulic packages, pumps, compressors, etc will be bunded for oil containment or provided with oil catch trays to contain any oil spillage. Bunding and catch trays are extensively used for these types of equipment in the existing plant. Any oil contaminated water will be collected in sumps and pumped to the existing OCW system for treatment.

The LPG loading area and condensate loading area will be separately kerbed and drained to separate sumps. These sumps will be similar to the sumps presently installed on the existing jetty. These are treated like bunded areas so are kept clean in case a storm should fill and overflow the sump.

4.2 To what extend can pickle liquors be recycled?

Response: The pickle liquor expected to be used during the construction and pre-commissioning of the proposed LPG plant is the same as that used in 1992 for the Phase III facilities. This pickle liquor cannot be recycled. The pickling process used by Woodside involves using ammoniated citric acid which is citric acid and ammonia in solution. These chemicals are used because they are much safer than mineral acids/alkalis. They are also relatively environmentally innocuous. Neither citric acid nor ammonia are persistent chemicals; both biodegrade easily with ammonia occurring naturally at low levels in Mermaid Sound. To assist with natural degradation of the chemicals and to further reduce any possible harmful effects, the dilute (approx 3.5%) citric acid solution will typically be diluted to less than 1% prior to discharge. The liquor remaining after the pickling process is a neutralised solution which cannot be separated into components.

4.3 If the pickle liquors are to be disposed of, how could this be done in a manner that causes no significant environmental impact?

Response: The type of pickle liquor expected to be used during the LPG plant commissioning has been used recently in the commissioning of the LNG plant and other Phase III related facilities. A procedure was developed and approved by the EPA for the LNG plant to allow the spent pickle liquors to be disposed in a manner that causes no significant environmental impact. This procedure and other disposal options will be reviewed by the LPG Project Team to ensure the disposal of spent pickle liquor will be achieved in a manner that causes no significant environmental impact.

The existing procedure specifies that prior to disposal, the spent liquor is neutralised to within EPA specified pH limits, diluted and regularly sampled to ensure other criteria are satisfied, such as the concentration of iron, dissolved oxygen, ammonia/nitrate/nitrite, etc.

The existing procedure also specifies that the spent pickle liquor is discharged to sea prior to high tide to allow the maximum dispersion into the ocean.

5 GREENHOUSE GAS EMISSIONS

5.1 What is the Woodside policy on the use of CFCs, including Halons?

Response: Woodside has a policy on Ozone Depleting Substances (Procedure DE-06) which is in line with the Montreal Protocol and subsequent amendments and the EPA Environmental (Ozone Protection) Policy. Procedure DE-06 is broken into two key areas: a Halon policy and a CFC policy.

The Halon policy states that Woodside will phase-out the existing use of Halon unless it can be justified as an "essential" use. All Halon recovered will be stored in a recognised Halon bank and ultimately disposed in an approved manner.

The CFC policy states that the use of CFC will be minimised and phased out as substitutes become available. All CFC recovered will be ultimately disposed in an approved manner.

Woodside's commitment to the protection of the ozone layer is highlighted in this ozone protection policy as well as in the CER as a commitment under Section 8.1.2.

5.2 **What plans does Woodside have to use CFCs, including Halons, in the proposed LPG project?**

Response: It is not anticipated that any CFC or Halon will be required in any part of the LPG facilities.

5.3 **Would seal oils be used in the LPG plant and, if this is the case, how much process gas would escape to the atmosphere from the seal oil and what would be the environmental impact?**

Response: It is presently envisaged that all compressors required for the proposed LPG facility will be of the reciprocating type. This type of compressor does not require a seal oil system as would centrifugal compressors. By using reciprocating compressors there will be no hydrocarbon emissions commonly associated with seal oil systems.

6 RISK

6.1 **Does Woodside consider it appropriate to warn people who use adjacent areas of the site of the potential risk of being in the vicinity?**

Response: Woodside does not consider it appropriate to warn people who use areas adjacent to the gas plant. A risk assessment, Appendix III of the CER, was commissioned for this CER to assess any additional risk to the public from the proposed LPG facility. This risk assessment specifically focussed on the offsite impact. The results of this risk assessment show that the inclusion of the proposed LPG facility does not significantly increase the risk to the public outside the plant boundary.

This risk assessment shows that the risk contours associated with the proposed LPG facility combined with the existing plant meet all EPA criteria. It is not envisaged that any alterations will be required to the present arrangements which delineate the plant boundary and offshore exclusion zone.

7 ABORIGINAL SITES

7.1 **Why was there no ethnographic component to the site survey?**

Response: The survey conducted for the proposed LPG project CER was to confirm work previously carried out by the WA Museum which found sites near the proposed project area. It was also carried out to ensure that no sites had been missed and which might have been disturbed during construction. No additional sites were found. The earlier report for Woodside on the "Dampier Archaeological Project" edited by P. Vinnicombe contained a section on the ethnography of the area.

As no additional sites were found and none of the existing ones were to be disturbed it was considered that no further ethnographic studies were required.

7.2 **What consultation was carried out with the aboriginal groups that have custodial responsibility for the Burrup Peninsula?**

Response: The confirmatory survey for the proposed LPG project CER was conducted by consultants previously recommended by the WA Museum. They were considered to be sufficiently experienced in the identification of aboriginal sites that consultation with aboriginal groups was not necessary.

As indicated in 7.1, the project will not disturb any recognised aboriginal sites and hence it was considered that consultation was also not required for this reason.

Consultation with aboriginal groups with interest in the Burrup Peninsula has taken place in the past and will take place in the future as considered necessary.

8 SOCIAL IMPACT

8.1 **What consideration would be given by Woodside to maximise employment opportunities by the local workforce during the construction phase?**

Response: Woodside has a standard tender document in which it states.....

"Tenderer shall endeavour to maximise the Western Australian and Australian content of its Tender commensurate with the maintenance of competitive cost, quality, delivery and service. Schedule 15 of the Form of Tender enables Tenderer to indicate its intentions in this regard.

Should Tenderer wish to offer an option with greater content of technically acceptable Australian supply, such offer shall list specific additional MATERIALS and/or equipment to be sourced from within Australia together with the price variation caused by such sourcing."

Appendix 3

Proponent's advice of changes to Preliminary Risk Assessment
(received 22 July 1993)

WOODSIDE
AUSTRALIAN ENERGY

Our reference: DE1:AC-986 6.9.1 20 July 1993

Your reference:

Mr S Sadlier
Environmental Officer - Industrial Development
Environmental Protection Authority
Westralia Square
141 St Georges Terrace
PERTH WA 6000

Dear Mr Sadlier

CONSULTATIVE ENVIRONMENTAL REVIEW FOR PROPOSED LPG EXTRACTION FACILITIES ON THE BURRUP PENINSULA: APPENDIX 3: PRELIMINARY RISK ASSESSMENT

Following further review of the Risk Assessment we have identified two inaccuracies in the report concerning the risk from shipping. Neither has a significant impact on the offsite risk contours, but we nevertheless wish to bring them to your notice.

The first is a minor mistake in the application of historical data to estimate the risk due to grounding of the gas and condensate carriers in the approach to the jetties. Our Consultant, Technica, have revised the estimates (see attachment 1).

The second inaccuracy is the assumption made in the Preliminary Risk Assessment that only one ship will be present at the loading jetties at any time. This is not the intent of the operating philosophy once the second jetty is commissioned. It is the intention that ships will, from time to time, be present and loading at both jetties simultaneously. Movement of shipping will be restricted, however, by the following measures:

1. Only one ship will be permitted to manoeuvre in the channel and turning basin at any one time.

2. If another ship is berthed at the jetties during manoeuvring, ship loading will cease until the manoeuvring ship is fully secured or has departed.

3. The existing weather limitations on ship berthing will continue to apply.

.../2

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WOODSIDE OFFSHORE PETROLEUM PTY. LTD.
A.C.N. 008 945 097
Registered Office: No. 1 Adelaide Terrace, Perth, Western Australia, 6000.
Box D188 G.P.O. Perth, Western Australia, 6001. Telephone: (09) 224 4111. Cables: Woodev. Telex: AA92326. Facsimile: (09) 325 8178.
(Incorporated in Western Australia)

We have reviewed the effect of these changes on the Preliminary Risk Assessment and have concluded that it has no significant impact on the risk contours.

We have sent a preliminary report to the Department of Minerals of Energy Explosives and Dangerous Goods Division and will forward our final report to them and to yourselves within seven days.

Yours sincerely

A CHEGWIDDEN
PRINCIPAL ENVIRONMENTAL SCIENTIST

Attach.
CC: Mr M Wylie - Dept Minerals & Energy

ATTACHMENT 1

TECHNICA MEMORANDUM

DATE:	8 July 1993	REF:93/20/AS/DM/032-M
TO:	*WOODSIDE OFFSHORE PETROLEUM PTY LTD*	
ATTN:	*JERRY STOCKLEY*	
FROM:	*ASLE STROMSVAG*	
CC:		
		PAGES: 6
RE:	*SHIP FAILURE FREQUENCIES*	

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SUMMARY

We apologise for the error in Table VI.6.1 in the final report of "Quantitative Risk Assessment for the Proposed LPG Extraction Facilities on the Burrup Peninsula". The figures in that table were changed due to more correct information received from our London Office. In the rush to get the report finalised the text and figures in Section VI.6 were unfortunately not corrected.

The figures used in the SAFETI modelling were not those listed in Table VI.6.1 in the final report. The failure frequencies used in SAFETI were amended following receival of information from our London office.

Following your question regarding the ship failure frequencies, we have recalculated the failure frequencies using a more detailed approach. The approach takes some local conditions into consideration in order to estimate a more representative failure frequency.

Table 1 below shows the numbers listed in Table VI.6.1 in the report, the numbers used in the modelling and the numbers from the detailed calculation shown on the following pages. As can be seen the values used in the original study and those calculated on the following pages are of a similar order. The new calculations are more robust than those in the original study.

TABLE 1 COMPARISON OF FAILURE FREQUENCIES (per year km)

SHIP TYPE	LARGE LEAK			CATASTROPHIC FAILURE		
	From Table VI.6.1	Used in SAFETI modelling	New Figures	From Table VI.6.1	Used in SAFETI modelling	New Figures
LNG	8.8×10^{-6}	3.5×10^{-7}	6.6×10^{-7}	5.0×10^{-6}	2.0×10^{-7}	3.8×10^{-7}
LPG	1.4×10^{-6}	3.5×10^{-7}	1.1×10^{-7}	8.0×10^{-7}	2.0×10^{-7}	6.0×10^{-8}
Total for gas carriers	1.0×10^{-5}	7.0×10^{-7}	7.7×10^{-7}	5.8×10^{-6}	4.0×10^{-7}	4.4×10^{-7}
Condensate	2.8×10^{-5}	7.0×10^{-7}	2.5×10^{-6}	1.6×10^{-5}	4.0×10^{-7}	1.4×10^{-6}

RELEASES FOLLOWING GROUNDING OF SHIPS

The failure rate data for ship transport is based on data from a wide variety of port areas. The "port" at WOP's plant on Burrup Peninsula can not in any way be regarded as busy. The channel from open sea to the jetty is therefore regarded as restricted waters (see Appendix V of the original report).

In this original study it was assumed that only one ship is allowed into the channel at any time. A collision between a tug boat and a ship is assumed not to cause enough damage. Based on these assumptions and the fact that tug boats have a high degree of manoeuvrability and therefore much more likely to avoid a collision in the first place, the possibility of collision, causing a hazardous event, and striking was therefore assumed to be negligible.

A review of historic ship incidents at jetties (Technica 1991) showed that all significant impacts with jetties have occurred on arrival of the vessel rather than departure. This is assumed to apply also to the operation at WOP's jetties. Given that the tankers will only be loaded on departure, the probability of spill arising from an impact is considered to be negligible. The only incident considering in this study is therefore grounding. The failure frequency for grounding in restricted waters is 5.0×10^{-5} per ship km.

Number of Ships

The number of gas and product tankers visiting the jetties at Burrup Peninsula are shown below.

SHIP TYPE	VISITS (per year)
LNG	125
LPG	20
Condensate	80

Grounding Frequency

Historical data for groundings show that the probability of a leak, following a grounding, is low (Technica, 1991). The table below lists the probabilities for product tankers and refrigerated gas tankers. The figure for gas tankers is based on statistics while the one for product tankers is based on engineering judgement and comparison with leak probabilities of similar ships.

SHIP TYPE	RELEASE (per grounding)
Product Tanker	9.0×10^{-2}
Refrigerated Gas	1.5×10^{-2}

Reduction for Tug Boats

Until a few years ago it was not common for tankers to be escorted by tug boats in port areas. It was up to the ship master to request this service where necessary and the tugs were rarely towing the ship but used as standby vessels, following the ships up/down the channel, in case of emergencies.

The gas tankers travelling between buoys 10 and the jetties are escorted, with the tug lines fastened and secured on all vessels, by three tug boats while the condensate tankers are under guidance by two tug boats. Between Mark 1000 and the jetties the tankers are followed by two additional tug boats to support in case of an emergency or potential breakdown of one of the tug boats.

It is DNV Technica's experience that the number of tug boats used during an operation by WOP is high compared to the average numbers for the historic data. So it is considered that the likelihood of a grounding is lower than shown in the historic data. It is therefore assumed that the probability, of the tug boats not being able to avoid a grounding of the ship, is 0.1. This number was arrived at after discussion with a naval engineer in DNV Technica who did most of the work on the HSE report (Technica 1991).

Reduction for Sandy Bottom

The coastal water consists of both sand and rock bottom. The worldwide average conditions are unknown. The HSE report assumed the average degree of "rockiness" in British ports which is 40%, to be the average for the historic data. In these calculations no allowance for the site being more or less rocky than "average" has been made. It can be assumed that a grounding on a sandbank will be significantly less likely to lead to a leak of product than a grounding on a rocky bottom.

Reduction for Radar-Based VTS

A reduction in the failure frequency, where the port have a radar-based VTS, is suggested in the HSE report (Technica 1991). For ports without this equipment no reduction is used. No adjustment has been made in this case.

Leak Sizes

Following a failure it is assumed that the severity of the leak will follow the same leak distribution as for pressure vessels (small/large/very large/catastrophic = 54%/35%/7%/4%). The failure frequencies are shown in Table 2. Only large (100 mm) leaks and catastrophic failure were considered in the original study.

Discussion

Historical failure rate data is mostly based on incidents where the vessel is travelling without help of external engines (tug boats) since tug boats were not frequently used until recently. A ship travelling under the guidance of tug boats is moving at a lower speed than by means of its own engines. This means that if a grounding does happen, with guidance of tug boats, a potential leak can be expected to be smaller due to a small impact speed (less energy). The figures used in this analysis may therefore be considered to be conservative.

The figures used in this analysis (except the reduction for tug boats) are based on the report done for the Health and Safety Executive in the UK (Technica, 1991). External comments on this report said that failure frequencies were high. This analysis uses figures from that report so some people would consider the results to be conservative.

The failure frequencies used in this study for the gas tankers and product tankers are shown below and are calculated based on the above information/assumptions. The failure frequencies are listed in Table 2, and based on the grounding frequency listed in Appendix V of the original study (5.0×10^{-5} per ship km).

TABLE 2 SHIP FAILURE FREQUENCIES IN RESTRICTED WATERS

SHIP TYPE	NO. OF SHIPS	GROUNDING FREQUENCY (per ship km)	RELEASE PER GROUNDING	REDUCTION FOR TUG BOATS	REDUCTION FOR SAND	REDUCTION FOR RADAR-BASED VTS	LARGE LEAK (10⅜ mm)	CATASTROPHIC FAILURE	FAILURE FREQUENCY	
									LARGE LEAK	CATASTROPHIC FAILURE
LNG	125	$5x10^{-4}$	0.015	0.1	1.0	1.0	0.07	0.04	$6.6x10^{-7}$	3.8×10^{-7}
LPG	20	$5x10^{-4}$	0.015	0.1	1.0	1.0	0.07	0.04	$1.1x10^{-7}$	6.0×10^{-8}
CONDENSATE	80	$5x10^{-4}$	0.09	0.1	1.0	1.0	0.07	0.04	$2.5x10^{-6}$	1.4×10^{-6}

Appendix 4

Advice from Department of Minerals and Energy on changes to Preliminary Risk Assessment (received 28 July 1993)

DEPARTMENT OF
MINERALS AND ENERGY
WESTERN AUSTRALIA

EXPLOSIVES AND
DANGEROUS GOODS
DIVISION

MINERAL HOUSE
100 PLAIN STREET (CNR ADELAIDE TCE)
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Our Ref: 273/92 MW:MW
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Chairman
Environmental Protection Authority
Westralia Square
38 Mounts Bay Rd
PERTH WA 6000

Attention: Mr S Sadleir

Dear Shane,

ADDENDUM TO THE QRA FOR THE PROPOSED LPG EXTRACTION FACILITIES ON THE BURRUP PENINSULA - WOODSIDE OFFSHORE PETROLEUM

This Division has reviewed the addendum to the QRA for Woodside Offshore Petroleum's Proposed LPG Extraction Facilities on the Burrup Peninsula. The following information is supplied in response to your facsimile, dated 26 July 1993, regarding this addendum.

The addendum indicates that the adjustments and corrections to the risks associated with the shipping of LNG, LPG and Condensate will have only a minor effect on the overall risk to the public. It is not believed, that these adjustments will significantly alter the risk contours proposed in the original risk assessment due to the limits of uncertainty within such assessments. Therefore, it is not considered necessary to required that Woodside provide updated risk contours. Further, it is unlikely these changes will to cause the EPA criteria as established in Bulletin 611 to be exceeded.

Should you have any queries regarding the above please contact M Wylie on 222 3256.

Yours faithfully

K Price
CHIEF INSPECTOR

28 July 1993
cc A Chegwidden -WOP

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