Response of the Gorgon Joint Venturers to

"*Review of Gorgon Gas Development Environmental Impact Statement and Environmental Review and Management Programme*"
(CSIRO 2006)

Introduction

The West Australian Environmental Protection Authority (EPA) engaged the Commonwealth Scientific Industrial Research Organisation (CSIRO) to review of Chapters 9, 11, and 12 of the Draft EIS/ERMP and Additional Information Package. Chevron has been provided with a copy of the report, entitled: *Review of Gorgon Gas Development Environmental Impact Statement and Environmental Review and Management Programme* by KR Hayes, FR McEnnulty and R Babcock (January 2006) referred to hereafter as "the Review". The EPA has asked the Gorgon Joint Venturers to comment on the Review.

In doing so, the Gorgon Joint Venturers noted a number of subjective statements, factual discrepancies, interpretive biases and misunderstandings not normally associated with work undertaken by CSIRO. We believe these have resulted in inappropriate conclusions and an Executive Summary that is deficient.

The Review appears to have taken an academic or theoretical approach rather than that which is consistent with widely utilised Environment Impact Assessment practices and practicable methodologies, as implemented in Western Australia pursuant to the provisions of the Environment Protection Act 1996 (WA). This fundamental difference in approach is not surprising considering the research focus of CSIRO. Furthermore, the Review does not appear to acknowledge the EPA's advice in Information Bulletin 1011 (EPA, 2003) which was instrumental in the Gorgon Joint Venturers' design of the risk assessment and quarantine process described in the Draft EIS/ERMP.

It would also appear that although the Review authors note in Section 1.2 that they reviewed "relevant additional material", they did not source, understand or utilise the full extent of the publicly available information on the quarantine and risk assessment effort undertaken by, or on behalf, of the Gorgon Joint Venturers (see Gorgon Project website: www.gorgon.com.au). In missing this opportunity, the Review authors did not adequately acknowledge the risk assessment and quarantine process – a process developed and supported by a wide range of experts, applied in a transparent and inclusive manner and in a way that is responsive to Information Bulletin 1101 (EPA, 2003).

The Gorgon Joint Ventures have included in this document comments on each of the Review's 10 recommendations. However, the principal concern centres on the comments on Chapter 12 Quarantine Risks and Assessment which is reflected in the Executive Summary. In particular, comments such as "fatally undermined by demonstrably flawed logic" and the accompanying example are made without regard to all of the available information, based on misinterpretation and are clearly incorrect.

Quarantine

Review Section 2.3.1 Methodology

The Review authors incorrectly state the Quarantine Management System (QMS) is based on three assessment techniques and lists the Infection Modes and Effects Analysis (IMEA), Preliminary Barrier Assessment (PBA) and Quarantine Hazard (QHAZ) techniques. This

reflects a shallow understanding of the components of the QMS as set out in detail by the Gorgon Joint Venturers (Draft EIS/ERMP, Section 12.6, pages 584-591). The Gorgon Joint Venturers very clearly commit to the development of the QMS under the principles of the ISO 14001 standard for Environmental Management Systems. While the QMS is informed by risk assessment as a tool for making good management decisions, it relies on a robust ISO 14001-based management system to protect the conservation values of Barrow Island. Those with experience in environmental management systems would clearly see the applicability and parallels of that process to quarantine management systems and would not confuse an assessment technique with a management system process. The Review appears to demonstrate a lack of understanding by the authors of both management systems and assessment techniques.

The Review authors refer to a seven step QMS process. This is also incorrect. The seven step process is entitled 'Step-by-step flowchart of the Quarantine Risk Assessment Method' (Draft EIS/ERMP, Figure 12-3, page 550).

Review Section 2.3.2 IMEA and QHAZ

The Review authors acknowledge the application of IMEA and Hazard and Operability (HAZOP) as well trusted hazard identification tools and recognise that the Gorgon Joint Venturers application of those tools in the quarantine risk assessment process is highly commendable. The Review authors also recognise that the Gorgon Joint Ventures have a good understanding of IMEA and HAZOP.

The Review states that the authors were unable to verify the application of the IMEA methodology as the Draft EIS/ERMP did not contain the records or results of the IMEA workshops. It is not normal practice to produce all of the IMEA results in an environmental impact assessment document. However, in an attempt to inform the community and maintain transparency, the practice of the Gorgon Joint Venturers has been to make these workshop reports (and results) freely available to the Department of Environment (DoE)/EPA, Department of Conservation and Land Management (CALM) and interested stakeholders (Draft EIS/ERMP, page 561). There is a considerable body of information that is publicly available on request or through the Gorgon website that would fully address the author's requirement for verification. It is regrettable that these records and results (and the record of all community workshops) do not appear to have been considered in the Review, as this would have avoided speculation in Section 2.3.2 and would have provided the authors with the confidence of the rigour of the process used by the Gorgon Joint Venturers.

Review Section 2.3.3 Quarantine Barriers and community expectations

The Gorgon Joint Venturers have not in any situation used qualitative judgements of risk to represent absolute measures of risk, as suggested by the Review (page 17). The Gorgon Joint Venturers have undertaken a systematic process to identify threats of introduction on various pathways and qualitatively scored the likelihood of infection to gain an understanding of the relative severity of infection threats. In doing so, the Gorgon Joint Venturers have sought advice from independent experts to consider only effective quarantine barriers for the identified threats. The suggestion (page 18 of the Review) that the Gorgon Joint Venturers would consider ineffective quarantine barriers to prevent introductions is incorrect and irrational. Effective pre-border quarantine barriers include (but are not limited to): physical, chemical or biological treatments; visual or instrumented inspections; inspection/auditing/testing for compliance; prequalification of suppliers; training of personnel; and administrative and contractual controls. In addition to the pre-border barriers, a number of effective quarantine barriers are proposed at the border, where the Gorgon Joint Venturers will have custody and control of people and goods in an

environment where any residual organisms that might slip through pre-border barriers are contained. Post-border quarantine barriers are the surveillance and monitoring programs to provide early detection of any organisms that may be introduced and to have an effective response strategy to deal with organisms once detected.

In the Executive Summary, the Review authors are particularly critical of the quarantine risk assessment method, which is largely due to the reference of 'Decision Rules' in the Draft EIS/ERMP. The Review states: *"the quarantine risk management strategies described in Chapter 12, and the additional information package, are fatally undermined by demonstrably flawed logic."*

In Section 2.3.3, the Review authors extrapolate the concept of Decision Rules to a nonsensical conclusion. The Gorgon Joint Venturers disagree with this extreme application of Decision Rules. This type of application was not foreshadowed or intended in the Draft EIS/ERMP. All barriers considered for quarantine management must contribute to a sustained reduction in risk. If the authors had consulted with the Gorgon Joint Venturers, or other stakeholders involved in this matter, they would have learned that Decision Rules have not been used for the assessment of any pathway. The Gorgon Joint Venturers, in consultation with experts and the community, have made a commitment to drop them altogether. This outcome was recorded in the Quarantine Advisory Committee minutes and the record of the Community Consultation Meeting, 10 November 2005. Both these records are a matter of public record and are freely available on the Gorgon website. It should be noted that there was subsequently no mention or use of Decision Rules in the Additional Information Package. The Gorgon Joint Venturers found a way (post-Draft EIS/ERMP) to structure the risk assessment workshops to facilitate independent expert judgement regarding an overall pathway score for the risk of introduction without the need for Decision Rules. It appears the authors were unaware of this important fact with the result that much of the quarantine criticism of Chapter 12 of the Draft EIS/ERMP.

The Gorgon Joint Venturers have also developed a qualitative risk assessment methodology as a legitimate means of estimating the risk of introduction. This process was developed after extensive consultation in response to the EPA Bulletin 1011 (2003). It has been supported and endorsed by experts, accepted by the community and the EPA, and documented in the Draft EIS/ERMP. The Review, however, calls for quantitative assessment methods, quantitative estimates of quarantine barrier efficiency and statistical models which have not been tested with independent experts or stakeholders. Given the narrow database, nationally or internationally for the types of breaches of quarantine barriers might apply to the Gorgon Development, the Gorgon Joint Venturers do not support replacing the well considered and accepted qualitative process with a theoretical and untested quantitative approach, as proposed by the Review authors.

Review Section 2.3.4 Marine quarantine threats

The Review authors assert that Gorgon Joint Venturers' "assessment of marine quarantine is poor." This statement reflects a lack of recognition of the significant progress being made on the marine pathway (Draft EIS/ERMP, Section 12.4.4, page 561). The Gorgon Joint Venturers reject this value judgement of the assessment of marine quarantine risk.

Marine quarantine threats to Barrow Island have progressed through PBA workshops in most cases (Draft EIS/ERMP, Table 12-3, page 561). To date, two IMEA, two PBA and one QHAZ workshop have been undertaken for marine vessels, involving six independent marine experts. The assessment of marine quarantine risk is subject to the same rigorous methods as demonstrated for the three priority pathways described in the Additional Information Package and it is progressing toward completion.

The Review suggests that the Gorgon Joint Venturers have proposed a rationale to ignore the sources of marine non-indigenous species (NIS) that are directly associated with the

proposed development (page 19). This is not the case. The authors have misinterpreted and misapplied the Gorgon Joint Venturers' statement (Draft EIS/ERMP, Section 12.4.3, page 558) with regard to the discussion of standards for acceptable risk in the marine environment compared to the standards being developed for the terrestrial environment:

> *"Community expectations for acceptable risk, based on terrestrial flora and fauna, were recognised to be problematic for the waters surrounding Barrow Island when non-indigenous species could arrive quite independently of proposed development activities. Expert advice indicated that the risk standards were impractical for the prevention of introducing marine organisms."*

It would appear that the Review authors have confused the setting of standards for acceptable risk as required by EPA Bulletin 1101 (EPA, 2003) with the commitments of the Gorgon Joint Venturers to comprehensive risk management for all pathways of introduction (Draft EIS/ERMP, page 593). The Gorgon Joint Venturers are committed to comprehensive risk management for all pathways of introduction including those associated with the marine environment.

The Review notes that the proposed development will entail weekly visits by LNG ships to Barrow Island (page 19), and states that it is not possible to complete a risk assessment without knowledge of the ports of departure and trading routes of these vessels. The Gorgon Joint Venturers have acknowledged that some pathways, such as international LNG shipping routes, are not yet defined and could not be fully described at the time of the publication of the Draft EIS/ERMP. These pathways will be subject to the same rigorous risk assessment process to develop effective quarantine barriers. The Review author's comments regarding the use of the "potential next pest list" (page 19) have been considered by the Gorgon Joint Venturers and are included in current thinking.

The Review notes that the baseline survey work conducted in the waters around Barrow Island (Draft EIS/ERMP, Technical Appendix D7) is incomplete. It is also portrayed as "cursory" and "poorly described", which does not recognise its stated purpose (Draft EIS/ERMP, page 547). The work described in Technical Appendix D7 is not the marine baseline survey for Barrow Island. Rather, it is an important first step recommended by marine experts from the Western Australian Museum, the Western Australian Department of Fisheries, the University of Western Australia and other independent specialists. This was a targeted survey of areas at Barrow Island where species were most likely to have been introduced and it represented a preliminary baseline of possible introductions of declared marine pest species. This targeted survey provided useful information for subsequent detailed survey efforts. The Draft EIS/ERMP clearly stated that a broader scope baseline survey of Barrow Island marine introductions would be undertaken and that focused inspections of mainland ports of origin would be conducted.

The Review also states that "the efficacy and practicality of the suggested management measures for hull fouling threats are dubious" (page 19). The Gorgon Joint Venturers reject this claim. The Gorgon Joint Venturers are in the process of developing detailed quarantine barriers for hull fouling organisms, with advice from marine pest experts from the Western Australian Museum, the Western Australian Department of Fisheries, the University of Western Australia and other independent specialists. The Draft EIS/ERMP contains no detailed discussion of quarantine barriers for hull fouling, but does state that the cleaning of wetted surfaces is feasible from the experience of experts undertaking such cleaning in Western Australian waters and that cleaning will be confirmed by qualified inspectors.

Proposed barriers for hull fouling have now been tested for domestic vessels on the logistic supply chain in a QHAZ workshop. Notwithstanding the opinion of experts that the marine pathways can be approached differently from the material pathways, due to the

contiguous nature of the water column between the mainland and the island (compared to the long period of isolation of the two associated terrestrial habitats), the Gorgon Joint Venturers developed a set of barriers that were tested in a QHAZ for hull fouling of localised domestic shipping. The outcome of this assessment recorded risk scores that match the expectations of the community in terms of the three scenarios which represent the set of standards for acceptable risk. The Gorgon Joint Venturers recognise that such a judgement is made cognisant of the conditions set for detection and eradication as shared activities in the standards for acceptable risk.

Review Section 2.3.5 Detailed pathway assessments

The Review acknowledges the Additional Information Package provides comprehensive descriptions of the infection pathways and potential quarantine barriers. But the Review authors discount the detailed pathway assessments on the basis of the criticism in Section 2.3.3 of the Review. As stated in the Gorgon Joint Venturers' response to Section 2.3.3, the Decision Rules were not utilised for any of the assessments including those published in the Additional Information Package. Much of the critical comment by the Review authors on the detailed pathway assessment is hence meaningless.

The Review also raises the concern that the residual introduction risks of some pathways/biological group combinations exceed the community expectations. This is a concern that could have been dealt with appropriately if all the records of the community workshops and consultation (as mentioned above) had been considered. The Gorgon Joint Venturers have addressed this matter with the EPA in the accompanying letter.

Response to Recommendations

The following are the Gorgon Joint Venturers' replies to each of the recommendations in the Review.

Recommendation 1

In collaboration with stakeholders, augment the current risk assessment with a formalised, systematic and transparent hazard analysis that addresses and prioritises all potential threats to the marine (and terrestrial) environment.

To date, 29 QHAZ Workshops, 10 IMEAs and eight PBAs have been completed with the express objective of formally conducting an analysis of hazards and associated risks in a systematic and transparent manner. This work has involved the community and independent experts to identify the associated hazards and risks, to develop conceptual barriers that effectively manage the hazard and associated risk and then to tests such preliminary barrier designs against the "best available" knowledge as presented in a formal quarantine hazard workshop (QHAZ). The Gorgon Joint Venturers are confident in the ability of the independent experts to evaluate and judge the proposed barriers in each of the identified material pathways and has no reason to demonstrate a lack of confidence in the outcomes of the workshops. These are well-documented and will be used to continuously improve the performance of the system in terms of effectiveness and efficiency.

With reference to the criticism in the Review on the Gorgon Joint Venturers' focus on marine turtles and coral assemblages in the Draft EIS/ERMP without a formalised hazard identification process, such criticism highlights the reviewers' focus on process rather than outcome. Historically, the marine areas around Barrow Island have been little studied. Marine biota within the region, especially the invertebrates and plants that comprise a large proportion of the marine biodiversity, have received little attention from scientific

institutions. Despite their regional biodiversity significance, many of the smaller marine species of northern Australia have not yet been named and the supporting ecological processes poorly understood. The Gorgon Joint Venturers recognise the relatively small spatial scale of the proposed marine infrastructure, the constraints associated with limited comparative data and the poor level of taxonomic resolution for many marine groups. It is the opinion of the Gorgon Joint Venturers that the recommendation to augment the existing program by further collaboration with stakeholders and have yet another formalised, systematic and transparent process to identify hazards is unwarranted.

With regard to the recommendation to address and prioritise all potential threats to the marine (and terrestrial) environment, the Gorgon Joint Venturers are of the opinion that , in practical scientific terms, biological systems are never fully inventoried nor all processes that support them fully understood. Therefore, attempting to address all potential threats is not a sustainable scientific position given the paucity of the knowledge available to science, and can not be supported or justified by the Gorgon Joint Venturers.

Recommendation 2

Conduct quantitative surveys of all relevant (impact and control) subtidal and intertidal habitats.

The marine technical appendices were criticised by the Review authors on the basis of lack of comprehensive inventory data and fine scale distributional data for all marine species. As noted in response to 1 above, historically, the marine areas around Barrow Island had been little studied. Marine biota within the region, especially the invertebrates and plants that comprise a large proportion of the marine biodiversity, have received little attention from scientific institutions. Despite their regional biodiversity significance, many of the smaller marine species of northern Australia have not yet been named. Further, detailed inventory studies are only relevant over small spatial scales which, combined with the limited size of the proposed marine infrastructure, the constraints in sampling a remote marine area for which there are little comparative data, and the poor level of taxonomic resolution for many marine groups necessitated, in the opinion of the Gorgon Joint Venturers, justifies a habitat-based approach. Detailed inventory data are of little use without regional comparisons and this needs significant advances in taxonomic resolution of northern Western Australia's marine environment. Recognising this, and the fact that the proponent cannot be expected to resolve all of the shortfalls of current scientific knowledge in the area and the region, the Gorgon Joint Venturers have adopted a more realistic approach to the assessment. This approach relies on characterising marine benthic habitats to facilitate protection of rare or structurally diverse habitats in facility planning. These habitats are likely to be important to maintaining local and regional biodiversity.

The habitat-based assessment follows the assumption that protecting the full range of physical and biotic habitats on which the biotic diversity is dependent will protect the whole ecosystem. This is the basis of most impact assessments and is also used extensively in identifying important conservation areas, including the establishing marine and terrestrial protected areas. Marine reserves are generally designed on the basis of a broad habitat map – not on the distribution of individual taxa or known pockets of biodiversity based on site specific and comprehensive inventories of all taxonomic groups.

Although, the nearshore facilities proposed for the Gorgon Development are almost wholly within the Montebello/Barrow Island Marine Conservation Reserve, there is no development planned for high conservation areas, for example Marine Parks or benthic habitat protection areas. This indicates that the widespread marine assemblages in the area are of lower level of conservation significance than both the areas gazetted for Marine Parks and protection areas and the terrestrial environment of Barrow Island.

Habitat-based assessments tend to be more conservative than the inventory-based approaches. The Gorgon Joint Venturers have accommodated the shortfalls in knowledge, such as the current lack of taxonomically specific inventories for all the relevant marine ecosystem components and lack of data on fine-scale distribution of even the more important (listed threatened) marine taxa by following the precautionary principle. The risk assessment criteria and information gaps were treated very conservatively. This approach tends to increase false positive errors, therefore acting in favour of environmental conservation. For example, sygnathids (pipefish) are discussed at length in the Review and criticism is levelled due to the absence of survey data of the development areas. Although sygnathids have not been specifically targeted in sampling at Town Point, or included in an exhaustive inventory for the intertidal and subtidal reef area, they are assumed to be present in the area for the purposes of the risk assessment. The actual distribution of sygnathids is likely to be temporally dynamic, depending on population fluxes in the general area. Inventory surveys of the reefs at Town Point may fail to collect specimens of sygnathids, despite a series of surveys, but cannot conclude they do not occur there due to uncertainty in sampling efficiency and temporal representativeness. Destructive sampling, for example using rotenone poison, would be necessary and would have a similar impact to the development, thus negating any potential benefits of confirming the presence of the fish. The habitat-based assessment followed in the Draft EIS/ERMP recognised the potential for sygnathid use of the intertidal and subtidal habitats that are present that Town Point and concluded that they may be present at some time.

As a result of confidence in the habitat-based assessment and in recognition of the shortcomings in qualitative inventory surveys, the Gorgon Joint Venturers rejected the notion of conduct quantitative surveys of subtidal and intertidal habitats that may be impacted by the proposed marine infrastructure in the development footprint.

Recommendation 3

Conduct a much more thorough investigation of the distribution, abundance and behaviour of protected marine species in each of the proposed development areas. This is particularly pertinent to the endangered species of loggerhead turtles and olive ridley sea turtle.

The Gorgon Joint Venturers remain committed to an iterative process in managing the identified impacts as well as the unintended consequences of the proposed project. The Gorgon Joint Venturers are of the opinion that a blanket approach to the distribution, abundance and behaviour of protected marine species in each of the proposed development areas is adding no incremental value to the management of biodiversity within and around the development footprint. This commitment includes a monitoring and surveillance program to detect any environmental change that may occur as a result of the proposed development. Should loggerhead turtles and Olive Ridley sea turtles emerge as species of interest, the Gorgon Joint Venturers would, in conjunction with all relevant stakeholders, collaborate in developing a species action plan which may incorporate investigations into the distribution, abundance and behaviour of such species marine species, protected or otherwise.

Recommendation 4

Extend quantitative turtle surveys to fully include the nesting season of green, flatback and hawksbill turtles.

The Gorgon Joint Venturers are conducting tracking studies of flatback turtles to determine their foraging and inter-nesting habitats. The presence of resident and possible hibernating flatback turtles will be investigated in the winter of 2006. The results of these surveys will influence the management plans, but not the assessment of impacts, as a very conservative approach has been followed in assessing risks.

A tagging and monitoring program for adult turtles and sea-finding success for hatchlings on the beaches most likely to suffer impacts due to the development will be undertaken during construction and for least three years post-construction. This includes the continuation of the current program of tagging turtles and track counts on appropriate beaches.

The Gorgon Joint Venturers are committed to ensuring that flatback turtle breeding success is maintained on Barrow Island. This commitment will be reinforced by the monitoring and surveillance program which informs the conservation management of the species. It is not intended to extend this commitment to other turtle species as there is no information to indicate other turtle species, such as the hawksbill turtle, require the same degree of scientific endeavour. However, in time, should newly acquired knowledge indicate otherwise, the Gorgon Joint Venturers will adapt the prevailing management to account for this information.

Recommendation 5

Develop a management and monitoring strategy for all ecosystem components/ process identified in the EIS/ ERMP as threatened by the proposed development. Each of these strategies, including the current strategy, should be formally evaluated.

The Draft EIS/ERMP sets out the preliminary management measures that will form the backbone of detailed Environmental Management Plans (EMP). These EMPs will follow the published framework (Appendix A). The completion of the EMPs is held in abeyance pending the outcome of the environmental approval process. Once the project has certainty, it can progress to the level of finalising the EMPs.

Additional detail on specific monitoring programs, including additional baseline sampling in and around the development footprint, the detection, monitoring and surveillance programs designed to detect incursions of marine pests and record possible changes in the environment, will be provided in the final EMPs. These will be formulated in consultation with, and to the satisfaction of, the regulatory agencies with sufficient opportunity for other stakeholder to actively participate in their preparation.

Recommendation 6

Incorporate all new and existing bio-physical models into the formal management strategy evaluation recommended above, for all measurement endpoints, as soon as possible.

The Gorgon Joint Venturers are developing a set of EMPs which will be to the satisfaction of the regulatory agencies and other stakeholders. Stakeholder will have sufficient opportunity to actively participate in their preparation.

The Gorgon Joint Venturers accept that such an approach may result in the inclusion of bio-physical modelling, but question the necessity and feasibility of the recommendation to "incorporate all new and existing bio-physical models into the formal management strategy evaluation". This recommendation is not accepted.

Recommendation 7

Undertake a much more thorough uncertainty analysis, ideally within the risk management framework recommended above.

The Review authors may not agree with the approach to the impact assessment, notwithstanding the Gorgon Joint Venturers' response to the recommendations made above. However, the Review made no specific criticisms of risk rankings provided in the Draft EIS/ERMP. The Gorgon Joint Venturers maintain that the information the Draft EIS/ERMP provides sufficient basis for assessment, given the highly conservative (precautionary) nature of the risk assessment process.

For example, the assertion made in the Review that: "The revised estimates of personnel landings from 170,000 (ChevronTexaco Australia 2003) to 94,000 (Chevron Australia 2005), for example, are indicative of the uncertainty that arises as major developments are planned and progress" (page 7). Such a statement demonstrates a lack of understanding of project development and the precautionary approach taken toward assessing the impacts of development. The fact that the estimate of personnel landings has been reduced as the basis for the impact assessment has no correlation with uncertainty. The reduction in personnel landings reflects management decisions on how to execute the development of the proposed gas plant. The impacts are assessed on the basis of the maximum number of personnel landings foreseen with good engineering analysis. The impact assessment uses conservative judgments of the consequences and likelihood of impacts, to categorise risk in a precautionary manner and propose appropriate management strategies.

The Review reports (page 15) that "In Chapter 9 of the EIS/ERMP the joint venturers state that they have adopted a worst case approach to uncertainty." In fact, the term "worst case" does not appear anywhere in Chapter 9. In other Chapters of the Draft EIS/ERMP, the term is used in the context of a very severe, but credible hazard scenario. The Review also states that the only source of uncertainty considered was "variability", which arises from natural stochasticity of living systems. The criticism that other sources of uncertainty have been "unwittingly ignored" is unfounded. Another very important source of uncertainty, "incertitude", or incomplete knowledge, was recognised in the assessment methodology, and dealt with in the process of making conservative judgments of consequences and likelihood in the absence of empirical data.

The Gorgon Joint Venturers do not support the recommendation, as the foundations for it is questionable due to the incorrect interpretation or lack of understanding of the work completed to date.

Recommendation 8

Discard the current qualitative decision rules for quarantine barrier selection and replace them with quantitative estimates of efficiency.

The Decision Rules were discarded in October 2005; a decision openly communicated to the Quarantine Advisory Committee in October 2005 and community stakeholders in November 2005, some two months prior to publication of the Review.

The purpose of the Decision Rules was to assist in the synthesis of an overall pathway score for the likelihood of introduction, from the scores recorded at all of the intermediate pathway steps. They were proposed in the Draft EIS/ERMP as a heuristic technique for combining infection scores for barriers proposed at a number of pathway steps (Draft EIS/ERMP, pages 564-566).

In practice, when undertaking QHAZ workshops for the first time (after publication of the Draft EIS/ERMP), the facilitator of the workshops proposed an alternative that proved to be more acceptable to independent experts:

- Workshop participants were asked to score the likelihood of infection at the first pathway step, as a result of the suite of prescriptive quarantine barriers proposed at the first pathway step.
- Workshop participants also scored the likelihood of infection at the first pathway step, if all of the recommendations in the QHAZ for the first pathway step were adopted ('treated' risk score). Generally, the treated risk score is lower than the score for the barriers as proposed in the Barrier Selection Document presented as the basis for the workshop.

- At each subsequent pathway step, the scores from the previous step were taken to be the starting point for infection. A new score for the likelihood of infection was recorded at each subsequent pathway step, incorporating the starting point from the previous step and considering the next set of barriers and any threats of re-infection of cargoes. Thus, the infection score at each intermediate step of the pathway represents the likelihood of infection as a result of all of the prescriptive barriers proposed from the source of the cargo up to that point on the pathway.
- Following this approach, the scores at the last pathway step (arrival of the cargoes at Barrow Island) represent the overall likelihood of introduction for the pathway, taking into account all of the pathway steps and the prescriptive quarantine barriers presented to workshop participants.

The scoring in the QHAZ workshops was witnessed by observers from the Department of Environment/EPA Service Unit and the Department of Conservation and Land Management.

The Decision Rules cannot be replaced with quantitative estimates of efficiency, as recommended by the Review authors. Consultation with experts consistently reinforced the view that quantitative judgments of barrier effectiveness (efficiency) were not possible without data to underpin the estimates. The qualitative likelihood of introduction for the overall pathway were based on precautionary judgments by independent experts in the absence of data, noting that the recorded scores may be overstated in some cases, e.g. there could be opportunities to realise a lower score if some data were available. Under no circumstances did the recorded scores underestimate the likelihood of introduction in the opinion of workshop participants.

Recommendation 9

Use the IMEA to prioritise potential quarantine hazards and then use relevant statistical models, in a quantitative risk management analysis, to demonstrate compliance with community expectations.

The Review appears to have been prepared without reviewing all of the publicly available workshop records, including the reports for 10 IMEA workshops. All of the workshop reports were provided to the Department of Environment, the Department of Conservation and Land Management, and other stakeholder observers (as well as all workshop participants). All of the workshop reports have been published on the Gorgon Project website: www.gorgon.com.au.

The IMEA workshops assisted the Gorgon Joint Venturers and stakeholders prioritise potential quarantine hazards, leading to the identification of the three 'priority' pathways for early assessment that were published in the Additional Information Package. The IMEA workshops more broadly identified the greatest threats of infection for the Gorgon Joint Venturers to focus resources on in developing effective quarantine barriers.

The recommendation to use "relevant statistical models" does not add value to a qualitative risk assessment, where the risk scores (1 to 10) should not be given any more significance than a convenient shorthand for qualitative definitions of likelihood. Nor would such a suggestion facilitate the comparisons with community expectations for risk.

It is essential to note that the qualitative risk scores are not an end in themselves. Rather, they are a mechanism for understanding risk and taking appropriate management actions. The suggestion of risk scores demonstrating "compliance" with community expectations would fall short of the overall goal of protecting the conservation values of Barrow Island and the surrounding waters. Without trivialising the substantial effort undertaken to perform risk assessments of all of the pathways, it is only one (important) element of a

robust Quarantine Management System, developed under the principles of ISO 14001 and ISO 9001 management system standards.

Recommendation 10

Augment the proposed marine environmental-match assessment with a species-specific assessment.

There is benefit in species-specific assessments of potential threats of introduction for marine pests. These types of assessments can be undertaken to augment environmental matching assessments for vessels that visit ports where surveys have been completed to identify potential pest species of concern. For the majority of ports where such rigorous surveys have not been completed, it is impossible to use a species-specific assessment.

The Gorgon Joint Venturers do not propose to conduct port surveys of any ports where cargoes are loaded. Instead, the Gorgon Project will take a precautionary approach for vessels making up the majority of visits to Barrow Island on the logistics supply pathway, and has proposed effective quarantine barriers which have been tested in a QHAZ workshop. Although the Gorgon Joint Venturers have stated their support for a collaborative baseline survey of the Port of Dampier (Draft EIS/ERMP, page 547), in the absence of such data the proposed quarantine barriers would effectively prevent introductions for organisms that might be present in the Port.

Allowing for the lack of a baseline survey of the Port of Dampier, the workshop participants have noted that the likelihood of introduction cannot be reduced any further on this pathway, regardless of any specific marine organisms which may have been introduced to this mainland Port.

Other examples of precautionary quarantine measures are the slipping, inspection and cleaning of jack-up rigs and dredge vessels during construction, and recognition of the new IMO performance standards for ballast water treatment systems which will apply to LNG carriers and other vessels following commencement of operation of the proposed gas plant in 2010, and beyond.