

EXTERNAL PEER REVIEW REPORT: Department of Environmental Protection, WA

REPORT TITLE: Gorgon Development – Quarantine Risk Assessment

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TASK FOR REVIEWER

Our main questions are;

1. Are the approaches used those that would normally be required for a rigorous assessment of the issues?
2. Are the assumptions used, particularly those in Table 5-4 describing likelihoods, usual in this type of analysis? I note that there is a compression in the probability scale in this table between "likely" and "virtually certain". A normal log scale of probabilities would require the insertion of another Likelihood category ("highly likely" for example). This may be important in that it could change the descriptive outcome from "likely" to "highly likely".
3. As a specific question, I note that the fifth dot point on page 18 says "...the likelihood of quarantine breach ...is assigned a likely rating". This is based on the historic data. Is it valid then to conclude, for the projected future activity set out in Table 5-5 that 12 breaches (noting the correction mentioned above) over the construction period of 39 months means that there is expected to be more than one breach a year, which based on the Qualitative Description in Table 5-4 means that this future likelihood should be described as "virtually certain"?
4. To decide whether the likelihood of quarantine breaches and the subsequent risk to the terrestrial values of Barrow Island were acceptable or not, what steps should we as an Environmental Protection Authority be taking to help inform our decision?
5. I imagine some sort of process to decide what "acceptable" means should be undertaken. Are you able to comment, in a generic way, on this point?

REVIEW

Overall impression

The report provides very little evidence of best practise for quarantine risk assessment. There is no systematic hazard identification or analysis of uncertainty. The likelihood assessment is only acceptable so long as conditions on the island and at mainland/overseas supply bases do not change substantially during the proposed development – this is unlikely to be true. The consequence assessment is subjective and likely to prove contentious given the high conservation status of Barrow Island. There is no analysis of the Type II error rate of existing or proposed monitoring and surveillance protocols. The risk assessment, as currently proposed, provides no mechanism to include the opinions or values of stakeholder and interest groups.

Reply to specific questions

1. Chevron Texaco use a deductive “accident statistic” approach to the quarantine risk assessment – i.e. they predict future event frequency based on past event frequency. This is a common approach in industrial health and safety risk assessments and in import risk assessments. This is an acceptable approach so long as past system conditions are not substantially different from future conditions. The document, however, does not provide any evidence that specifically supports this assumption. Indeed in this context it is quite possible (even likely) that future conditions will be quite different from past conditions, for example if:

- a) the distribution and/or abundance of pests/weeds in the locality of the supply bases, and along existing transport routes changes and thereby increases (or decreases) the likelihood of material/equipment contamination;
- b) material/equipments are sourced from new regions in Australia or overseas thereby exposing Barrow Island to a new set of potential pests/weeds in the new source localities and along the new transport routes;
- c) the increased disturbance associated with construction and/or operation activities increases the likelihood that pest/weeds that arrive on the island will persist and become established.

Under these circumstances it would not be acceptable to estimate the past event frequency and simply apply this to the (scaled up) future activity. Furthermore a rigorous quarantine risk assessment would also include the following items that are not included within the document:

- a) a rigorous and systematic hazard analysis identifying all potential vectors and pest/weed species, in all biological groups, that may threaten the conservation status of barrow island;
 - b) an uncertainty analysis that at least investigates the effects of parameter uncertainty – for example changes to expected number of people landings or barge visits, and ideally the effects of epistemic uncertainty – for example assumptions about invisibility and impact of non-indigenous species on the island ecosystem;
 - c) a statistically robust monitoring strategy that explicitly calculates the probability of Type II error – i.e. false negatives such as the absence of non-indigenous species in, for example, aggregate material following the inspection protocols that Chevron Texaco intends to employ during the construction phase of the development;
 - d) a mechanism to include the experience, knowledge, values and opinions of stakeholders. Stakeholder groups can often provide a deeper and richer appreciation of the problem in hand. Including these groups within the hazard analysis stage for example often provides better understanding of potential vectors and at the same time provides them with an opportunity to raise awareness of the risk assessment approach to environmental management.
2. The likelihood tables for barges (Table 5-4) and people landings (Table 5-6) are biased and inconsistent. The approach adopted by Chevron Texaco suggests a linear log-scale. Figures 1 and 2 show the event frequency suggested by Chevron Texaco based on such a scale. Here the event is defined as the contamination of people or equipment with non-indigenous species. When plotted in this fashion it is clear that the same event descriptors (likely, unlikely, etc.) do not refer to the same event frequency (inconsistent) and do not encompass the same range on the log scale (biased). An alternative approach that is consistent and unbiased is shown in Figure 3.

Figure 1 Event frequencies drawn from Table 5-4

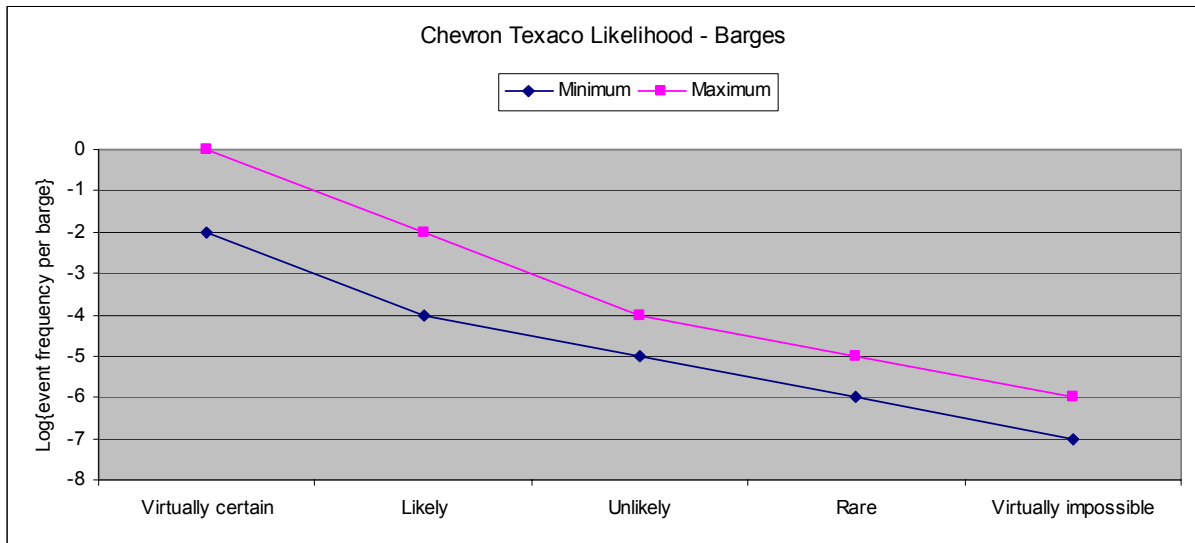


Figure 2 Event frequencies drawn from Table 5-6

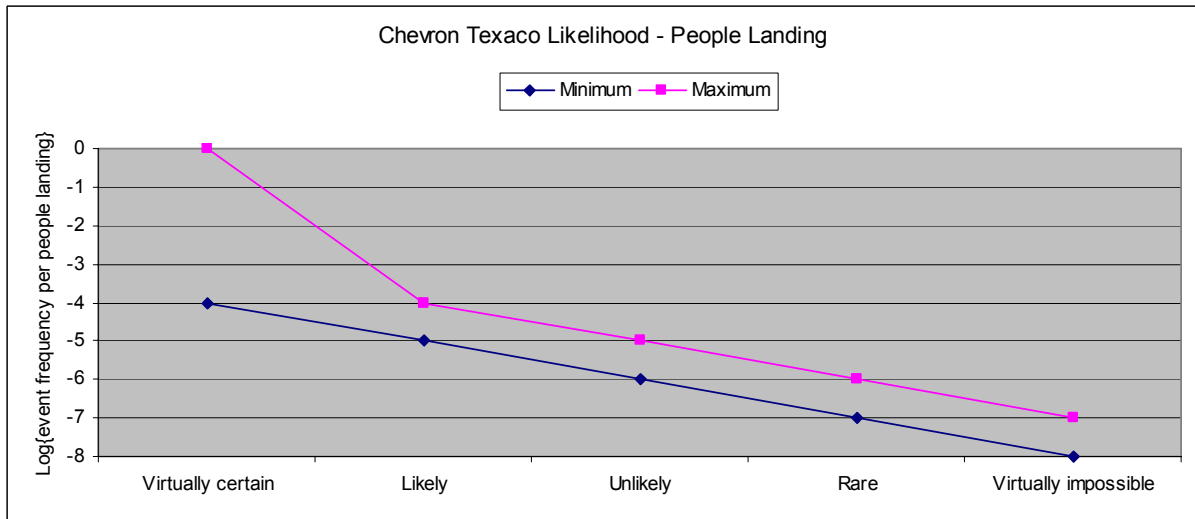
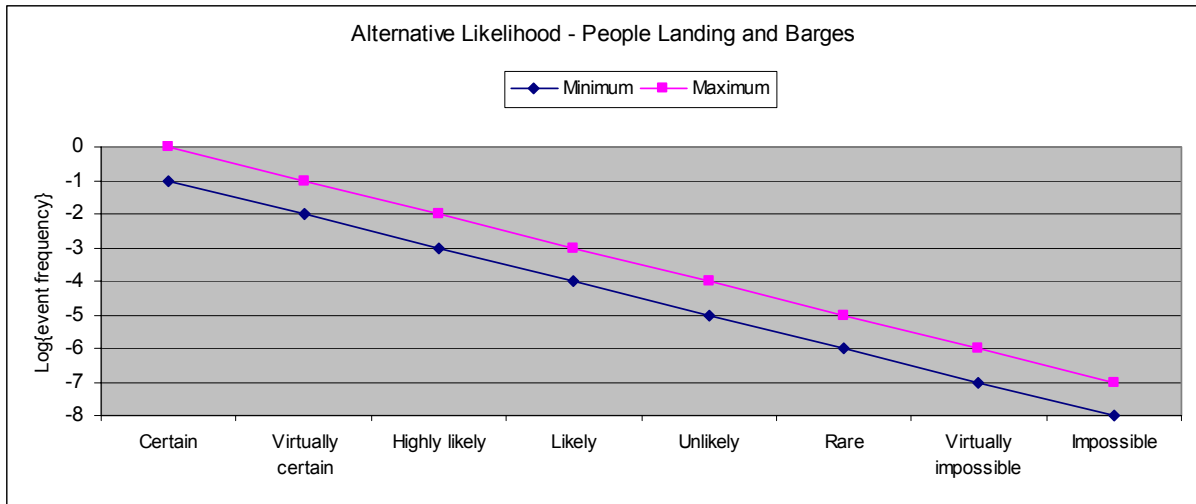
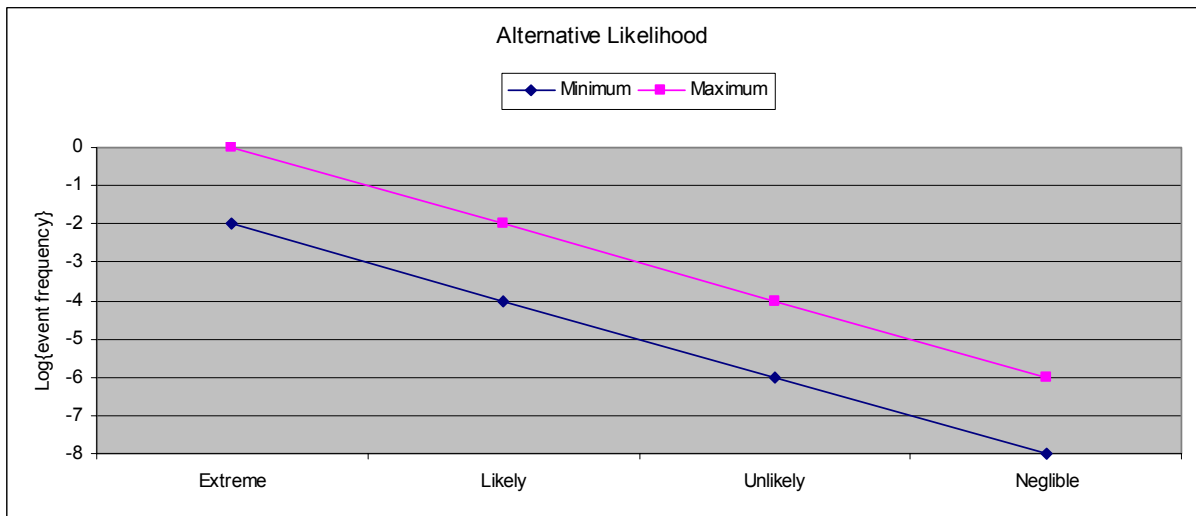


Figure 3 An alternative event frequency classification based on Tables 5-4 and 5-6



This alternative approach requires the insertion of three new likelihood categories: “certain”, “impossible” and “highly likely”. It is important to note, however, that the choice of categories and bin widths is subjective and largely arbitrary. For example the report’s authors could have also used the four categories shown in Figure 4. In an “accident statistic” approach the choice of likelihood categories has no bearing on the estimated frequency of events but it does have important implications for risk communication and stakeholder perception of the potential threat posed by the new activity. In this example the number of quarantine incidents associated with barge landings ($4/902 = 0.0044$) which is “highly likely” on Figure 3 but could equally be described as “likely” on Figure 4.

Figure 4 Alternative event frequency classification



3. The quoted event frequency for quarantine incursions associated with barge landings is $4/902 = 0.0044$ and for people landings is $1/31575 = 0.000032$. If construction takes 39 months and during this period there are 2800 barge landings and 170,000 people landings then the expected number of quarantine breaches (as defined by the report – see below – and assuming system conditions do not change – see above) at the island are 12.32 by barge and 5.38 by people giving a total of approximately 0.45 per month, or 5.4 per year – which would be described as “virtually certain” under the definition of Table 5-1.

4. Steps that the Department of Environmental Protection could take to inform its decision in this regard include:

- a) compilation of baseline data regarding the abundance and distribution of species of high conservation value on Barrow Island;
 - b) compilation of baseline data regarding the distribution and abundance of known pests and weeds (terrestrial and marine) in and around the existing supply bases and transport routes; and the new supply bases and/or transport routes both in Barrow Island, Australia and overseas;
 - c) require a quarantine risk assessment that is consistent with best practise. Liaise with Biosecurity Australia and other relevant groups to determine best practise standards;
 - d) facilitate stakeholder and interest group participation in the risk assessment process
5. The acceptability of risk, or otherwise, is properly addressed outside of the risk assessment process, in conjunction with all stakeholders and interest groups. I am unaware, however, of any specific procedure – Biosecurity Australia may be able to assist. The acceptance criteria must be stated in a manner which allows compliance with them to be easily measured with a specified error rate.

Other comments

6. The report does not adequately cover the following biological groups: marine species, terrestrial invertebrates, micro fauna and flora. The absence of any mention of marine invasives is particularly worrisome giving the potential for translocation of established marine pests from the Australian mainland to Barrow Island.
7. The report does not provide an adequate assessment of potential vectors and the means by which non-indigenous species may arrive at Barrow Island. This is in part due to the inadequate coverage of biological groups (for example no mention of potential hull fouling species), and in part due to an assumption that the future development is not substantially different from existing practise (for example no mention of quarantine breaches associated with imported raw materials).
8. The report does not examine the effects of changes to the expected number of people landings and barge landings – construction activities rarely proceed exactly as planned – some provision for variation around expected landings, at the very least, is warranted.
9. The report does not address the efficacy of Chevron Texaco’s monitoring programme (i.e. the rate of Type II error) and does not discuss baseline conditions for the marine environment. Ideally the report would include a good description of baseline conditions (for example those existing to date) and a statistically robust description of the efficacy of the monitoring and surveillance protocols in both the terrestrial and marine environment.
10. The report mixes two endpoints when discussing quarantine breaches. In some circumstances quarantine breaches are defined as presence of non-indigenous species on a vector (e.g. vermin discovered in a stone tray of a vehicle arrived from Thevenard Island) and in other circumstances as presence of non-indigenous species on the island (e.g. Kapok weed located at airport). The two endpoints are very different. Survival and persistence in a new location is an important hurdle to invasive species – i.e. many more species arrive at a new location than survive and persist. Hence the presence of weed species on the island suggests that seeds (or other propagules) on vectors are a) arriving more frequently than suggested in the report; and, b) are not being intercepted by the monitoring and surveillance procedures that are in place. Again a more systematic exploration of the Type II error rates for the surveillance and monitoring activities is probably warranted.
11. The estimate of the environmental consequences of the establishment and persistence of non-indigenous species on Barrow Island is subjective and unlikely to be accepted by interest groups given the high conservation status of the island. Note for example that the Australian/New Zealand guide for environmental risk management (HB 203: 2000), that is designed to complement AS/NZS 4360: 1999, defines a low severity of environmental impact on a land based ecosystem as, “limited damage to a minimal areas of land of no significant value (i.e. no nature reserves, parks or

unique habitats)". Under this definition it would be very difficult to define any impact on Barrow Island as anything less than moderate.

REVIEWER'S SIGNATURE

DATE 20th May 2003
