SEIC Comments on the Independent Scientists Report of the Western Gray Whale Workshop

Vancouver, 17-19 September 2005

The Independent Scientists at the Vancouver workshop have produced and published their report of the Workshop. In order to provide a clear response, SEIC have taken the Independent Scientists report and used it as a model. In general, SEIC concur with the independent scientists report. SEIC have commented in only two areas of the report. The first of these is in the table of the status of issues that were discussed at the workshop, where an extra column has been added to the table clearly marked "SEIC comment". The second is in Appendix 1, where a column has been added to incorporate the SEIC comment.

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Introduction

Background

On 16 February 2005, IUCN – The World Conservation Union – released the report of an independent scientific review panel (ISRP) on the risks posed to the western population of North Pacific gray whales and associated biodiversity by the Sakhalin II Phase 2 oil and gas development. Sakhalin 2 Phase 2 is being undertaken by the Sakhalin Energy Investment Company (SEIC) on behalf of its partner organizations (Shell, Mitsui and Mitsubishi) under a production-sharing agreement with the Russian Federation. The western gray whale population, currently numbering about 100 animals with perhaps as few as 20-25 reproducing females, has limited tolerance for risk factors that would decrease survival or reproduction.

At the request of potential lenders for Sakhalin II Phase 2 development, several scientists who had served on the panel met with potential lender representatives at the U.S. Export-Import Bank in Washington, DC on 24 February 2005. The purpose of the meeting was to discuss and clarify aspects of the ISRP report. Following this meeting the potential lenders conveyed to SEIC the need to resolve remaining gray whale issues identified in the ISRP report. SEIC responded by producing a table listing their interpretation of important elements of the report and their proposed measures for addressing the identified concerns.

The ISRP report, SEIC's 2005 Marine Mammal Protection Plan, and their table of responses were then used as the basis for a meeting of stakeholders convened by IUCN in Gland, Switzerland, on 11-12 May 2005. The purpose of that meeting was "to inform decision making by SEIC and potential lenders, as related to the Project [Sakhalin II Phase 2] and the conservation of the Western Gray Whale Population." Specific objectives were to provide to SEIC a feedback on its response to the ISRP Report and contribute to the potential lenders' understanding of the SEIC's response to the ISRP Report, including, *inter alia*, SEIC revised plans for addressing threats to WGWs resulting from the Project, and of the extent to which the SEIC response does/does not address the key findings of the ISRP Report.

The Gland meeting provided an opportunity for stakeholders to share viewpoints regarding the nature and level of risks still posed to the WGW population by Sakhalin II Phase 2. A public report was issued as a result of that meeting. It did not, however, bring sufficient clarity to the issues for the decision-makers involved, and particularly for the potential lenders. Given the remaining uncertainties, the potential lenders requested another meeting with the independent scientists formerly on the ISRP (hereafter referred to as the independent scientists) to review the SEIC responses to the ISRP report and prepare a written report evaluating those responses. To that end, a *de facto* steering committee consisting of representatives of SEIC, the potential lenders, AEA Technology (a consulting firm acting on behalf of the potential lenders), and several independent scientists organized a meeting in Vancouver, Canada on 17-19 September 2005 (see Appendix 3 for meeting participants).

Vancouver Meeting Structure

In preparation for the Vancouver meeting, the steering committee prepared and agreed to a table of key issues identified in the ISRP report, SEIC's assessment of that report, and the summary document from the Gland meeting. SEIC then provided a description of their response/approach to each of those key issues. The purpose of the Vancouver meeting was to have the independent scientists review and comment on SEIC's responses and approaches. The bulk of this report is the table describing the issues, SEIC's responses and the scientists' assessment.

Western Gray Whale Advisory Panel (WGWAP)

Over the course of the year in which the above meetings occurred, considerable progress has been made by all involved in identifying threats to the western gray whale and seeking solutions to reduce those threats. At the same time, however, it has become increasingly clear that many of those issues will be pertinent to WGW conservation throughout the duration of oil and gas activities on the northeastern Sakhalin shelf. Perhaps the single most important outcome of the Vancouver meeting was agreement on the formation of a long-term Western Gray Whale Advisory Panel (WGWAP) to provide a mechanism for independent review and recommendation regarding management of those threats. We recommend the immediate formation of this panel. The over-arching objective of the WGWAP would be to create a framework for coordination and cooperation among all interested parties that would build on and expand the ISRP process, with the ultimate aim of assisting the conservation and eventual recovery of the WGW population. In particular, the aim would be to provide the best scientific and technical advice to all relevant decision makers and facilitate implementation of effective conservation measures. The WGWAP would be at the core of this framework; its terms of reference, as proposed by the independent scientists, is attached here as Appendix 2.

Importantly, SEIC embraced the formation of the WGWAP and, at the Vancouver meeting, pledged to support its formation and funding to the best of its ability. The focus of the WGWAP would be on activities on the Sakhalin shelf that may affect the survival of WGW. Although the WGWAP would focus initially on SEIC activities, every effort would be made to invite and encourage the participation of other oil and gas companies (and associated contractors) operating in the region. Further, as knowledge accumulates, resources increase, and the appropriate stakeholders become involved, this effort should broaden to include the range states of the WGW.

One of the expected benefits of the WGWAP would be enhancement of planning and review of activities potentially affecting WGWs and their habitat. A number of key activities have been identified, some of which pertain to construction activities and are relatively urgent, and others that are pertinent to long-term oil and gas development (see issues below).

Immediate priorities

The independent scientists at the Vancouver meeting identified a number of high priority issues to be addressed as soon as possible. The following items were identified as requiring immediate attention by SEIC and, in turn, the proposed WGWAP, because the activities involved are expected to occur during the 2006 field season.

1. The noise action criteria (level and duration) need to be refined, discussed and agreed upon. (See Issue 4.1)

2. The actions taken upon a breach of the noise threshold criteria need to be refined and agreed upon and should include precautionary and expeditious shutdown requirements. (See Issue 4.1)

3. Protocols for real-time concurrent monitoring of whale distribution, behavior and noise characteristics need to be designed, reviewed and agreed upon. (See Issue 4.1)

4. SEIC need to collate all WGW distribution, behavior, and acoustic data from 2005 and provide these to the WGWAP. Analysis of these data is needed to identify any distribution shifts that may be correlated with industrial activity. Methods of analysis should be reviewed as a priority and discussed with the WGWAP. (See Issue 4.1)

5. To the extent possible, noisy activities should be scheduled for non-peak seasons of gray whale occurrence, or otherwise planned in a way that minimizes the whales' exposure to noise. (See Issue 5.1)

6. Reports of gray whale observations by marine mammal observers on SEIC vessels, and actions taken, along with any related analyses, should be supplied to the WGWAP as soon as possible. (See Issue 10.1)

7. Biweekly surveys for stranded, injured or dead animals either on the beach or floating should be developed in consultation between SEIC and the WGWAP. Plans to evaluate these animals (or carcasses) to determine the circumstances surrounding their injury or death and to obtain biological data (e.g. size, sex, genetic sample regardless of condition, photographs) should be included. (See Issue 10.3)

SEIC would need to keep the WGWAP abreast of its ongoing plans and construction and operational schedules in order that future priority issues can be identified and reviewed in a timely fashion.

In view of the critical status of the WGW population and the range of threats that may impede its recovery, both on the Sakhalin shelf and throughout its range, the progressive approach being taken by SEIC and other stakeholders is both welcome and deemed essential for the long-term conservation of this population.

Vancouver WGW workshop issues table with SEIC comments.

1	**General Assessment**			
	General adequacy of Comparative Environmental Assessment (CEA)			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
1.1	The ISRP stated that the most precautionary approach would be to halt operations to allow much need refinement of the risk assessment, but if this were not possible risk management needs to be conservative. In their written response to the SEIC Issue Table some experts felt that SEIC had not addressed this central concern.	The SEIC approach (2) and thus answer to this concern is reflected in answers and management of the issues raised in this table. (REFS: 2, 29b) These high-level issues (1.1, 1.2, and 1.3) are addressed through the consideration of the sub-issues (noise, oil spill etc.) raised below rather than being treated as a separate item.	The problem of judging risk tolerance is not simple and will vary from issue to issue depending on the potential effects on gray whales. Although progress was made at the Vancouver meeting toward understanding SEIC's interpretations and decision-making processes, some of the concerns expressed in the ISRP report remain regarding the implementation of standards such as the precautionary approach and ALARP, as well as, for example, mechanisms for contractor compliance, implementation or enforcement of mitigation measures, and the need for independent monitoring of pertinent operations. The approach taken to date has not always been suitably or consistently precautionary, nor has the ALARP concept always been implemented in a manner that provides the least practicable risk to the whales. Specific examples of ongoing concerns are expressed elsewhere in this report. Although some reassurances were given at the Vancouver meeting, we are prepared to consider issues 1.1-1.3 closed in the context of the present general review. Aspects of these issues are addressed in specific areas of this review. **Status: Deferred to Western Gray Whale Advisory Panel (WWGWAP)**	**SEIC accept that the setting up of the WGWAP effectively closes these issues.**
1.2	The appropriateness and demonstrability of SEIC's use of ALARP is questioned. Some experts' written responses to the SEIC Issues Table (Gland) express concern about lack of clarity in SEIC's use of the ALARP principle.	ALARP is a term that describes management of risk in terms of safety, and practicality for implementation in terms of technical and other issues (11, 36). SEIC policy requires that operations and installations identified as critical will have a documented demonstration (an HSE Case) that risks are ALARP (11, 36). The corporate standard requires that during concept selection, front end engineering and design (FEED) and detail design stages, the design should be verified as providing risk levels that are tolerable (in relation to the SEIC risk tolerability criteria) and ALARP (22, 23, 24). This process requires Hazard and Effects Management Process (HEMP) reviews of individual elements and of	See above	See above

		the overall design together with a documented demonstration from the designers that ALARP reviews have been carried out and the appropriate options to achieve ALARP risk levels selected (1, 11). For noise impact assessment, the acceptable level is described through clear criteria (see Marine Mammal Protection Plan 2005, Annex 1 and CEA). (REFS: 1, 2, 11, 22, 23, 24, 29a, 36)		
1.3	Contractors are expected to perform 90 percent of the work associated with this project. SEIC has not established that it will be able to assert control over the quality of the work and ensure that it is conducted in compliance with SEIC's commitments.	Quality control over contractors is audited (10, 26). In particular, all offshore contractors are respected international contractors and have demonstrated performance and have undergone a pre-audit. Contractors will be required to comply with the Health, Safety, Environment and Social Action Plan, which will set out key mitigation measures, and will reference sub-plans that they are also required to comply with (10, 18, 29a,b). The HSE Management Committee defines and commissions a project-wide programme of HSE audits each year using a risk based approach (26). It then reviews, on a quarterly basis, progress against the plan. The HSE Committee has tasked the Corporate HSE Team with the development of audit checklists which include any HSESAP obligations not already incorporated in its existing checklists. SEIC conducts detailed audits of its operations and all contractor responsibilities, this includes audits at the corporate level and those conducted by each asset and project team (for example an audit was conducted of the Marine Mammal Observer Programme--see 10.1 and 10.2 below). Contract holders are required to ensure that contractors have appropriate audit strategies in place. Audit programmes are included in each asset's HSE Plan and a five-year rolling audit system is in place at the corporate level (26). All vessels undergo pre-construction audits via the Marine Department. A detailed vessel tracking system (27, 32) using PurpleFinder (information available at www.purplefinder.com), a satellite GPS system, is also in place on vessels and is used to audit vessel locations and speeds in real time. (REFS: 10, 18, 26, 29b, 32, 27)	See above	See above

2	**Noise**			
	Noise modeling uncertainties			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
2.1	Significant uncertainties have been identified with regard to modeling of received noise levels. SEIC issued a document on noise verification and made a presentation on this topic at the Gland meeting, but a formal discussion of adequacy was not held at either the Gland workshop or during the noise teleconference. Experts' written response to Marine Mammal Protection Plan 2005 includes large concern over the accuracy of SL measurements and monitoring.	Additional validation has been undertaken since the CEA (4). A presentation in Gland and explanation from JASCO demonstrated the robustness of measurements and the validity of the model. SEIC has undertaken field monitoring (19) of the LUN-A platform for extra verification of the noise footprint prediction and monitoring of the PA-B installation (July / early August). The LUN-A analyses (19) demonstrate that the model is highly accurate and slightly conservative in its predictions. All required independent expertise was not available at Gland, so discussion on this issue has proceeded with the independent scientists through a series of teleconferences. Based on all materials presented the accuracy of the model has been largely accepted. Noise monitoring during the PA-B installation (9) demonstrated that noise levels were within the levels anticipated. (REFS: 4, 19, 9) Preliminary data from the PA-B installation will be available for review in September in the form of a short summary report. A technical noise monitoring report of the CGBS installation will be finalized and distributed ASAP.	While the model appears accurate for frequencies > ~ 200Hz, it actually performs poorly for frequencies < 200 Hz (i.e., frequencies likely to be important for gray whales). For example, in the 50-500 Hz band, the model overestimates loss at frequencies between 50-200 Hz (Doc. 4; Figures 9-28), resulting in louder than predicted signals reaching the whales. This could be particularly important for future seismic surveys, which have significant energy in this band. As discussed in the ISRP report, this reflects the complex problem of modeling transmission of low frequency sound in shallow water. Issues remain unresolved with regard to the source level (SL) measurements and bottom sediment parameters used for the model. Accurate SL measurements for construction and future seismic activities are essential if the model is to provide accurate received level (RL) predictions. Also, we reiterate that sediment parameters used in the model could be improved with direct sampling. In sum, we identify the noise model as a valuable tool and encourage its continued use for any activity involving noise generation, due to its predictive capability at frequencies > ~200 Hz. However, model projections must be verified by *in situ* measurements, especially for frequencies < 200 Hz. Most importantly, model projections cannot be used to confirm 'no effect'. As stated in the ISRP report, real-time behavior observations and acoustic monitoring are required to determine noise exposure and its effects on WGW as discussed below. **Status: Deferred to WGWAP**	**SEIC agrees that it is useful to compare the measured low frequency noise with the model and has done this. Comparison of modeled and measured spectral levels from actual Lunskoye <u>2004</u> operations (Appendix 1 of model validation report) show no systematic bias toward underestimating low-frequency levels. In fact, there is actually a tendency for the model to conservatively overestimate received levels all the way down to 10Hz with remarkably good agreement between 100Hz and 200Hz. SEIC concurs that real-time behaviour observations and acoustic monitoring will continue to be required to determine noise exposure and its effects on WGWs..**
3	**Adequacy of noise impact assessment**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
3.1	Assessment of PA-B construction noise has not been substantiated. (See also Issue 5.1 below.) CGBS will be installed in 2005; noise from installation of scour protection is a particular concern. A question was raised during the Gland workshop regarding whether this work could be delayed until after the 'peak'	Noise footprint prediction of scour protection placement at the PA-B location, based on modeling results, was presented at Gland and showed low levels of noise. The LUN-A was installed in early July and noise monitoring was undertaken (19). Lessons learned from the LUN-A were applied to PA-B installation (July / early August). These results and the mitigation approach for PA-B were discussed during a noise teleconference on July 24.	The construction timeline precluded adequate review of risks and noise criteria. Mitigation measures (e.g., rescheduling of work) were not fully considered prior to installation. The level and other characteristics of noise at which gray whales are affected is not yet clear. With regard to installation of scour protection, no data were provided to explain why currents would become a factor after more than 3-days delay. Thus, the justification for proceeding immediately was	**The installation of the PA-B platform at Piltun was performed as per the plan disclosed in the CEA in November 2004. Delaying the installation would have resulted in increasing the noise exposure to the**

	season (from October to November).	Both noise measurements of the scour protection at LUN-A and PA-B CGBS showed that these are very close to modeled levels and remain below the noise levels that are considered to be a concern for the WGWs. The schedule of the PA-B platform installation late July was based on a combination of best environmental conditions (after ice season and before the stormy season) and before highest densities of whales (in August and September). Scour protection of the PA-B platform needed to start within 3 days of installation to avoid being hampered by sea current action. Delay to October was therefore not possible. SEIC has planned its construction activities in such a way as to minimise the amount of noise generated and this was confirmed during the actual installation. (REFS: 9, 19) Preliminary data from the PA-B installation will be available for review in September in the form of a short summary report. A technical noise monitoring report of the CGBS installation will be finalized and distributed ASAP.	unsubstantiated. Opportunities for learning about whale responses during CGBS installation or installation of scour protection were lost, at least to some extent, by SEIC's decision to proceed with construction activities when weather precluded monitoring of whale behavior (see Documents 9 and 19, issues 3.6 and 4.1). It cannot be concluded, in the absence of observations, that whales were not affected by construction activities. **Status: Closed Unresolved**	**whales. Visual monitoring of WGWs was carried out at all times when weather allowed, including part of the time when the 'noisiest' activities were performed.**
3.2	Impacts to WGW from noise may be determined by frequency and other features of noise as well as received levels (RL; see also issue 4.1 regarding Gland workshop and noise teleconference). Discussions suggested that action criteria based on just RL are not adequate.	Frequency has not been included in the Action Criteria. This can be discussed in the specific noise teleconferences. Action criteria and related discussions on whale behavior were discussed during the noise teleconferences and further communication with experts is in process. Frequency components of the noise will be analysed in the post-season reports.	The construction timeline precluded adequate review of risks and noise criteria for offshore construction activities in 2005, and this issue was not resolved. RL is a useful indicator of potential noise effects. However, RL alone is not a sufficient indicator inasmuch as other characteristics of the noise and the context in which the noise occurs also may be important. Similarly, analysis of the effects of frequency will be useful for investigating effects, but not sufficient to determine full impact because frequency is only one of a number of factors that must be considered. Monitoring of whale behavior and distribution and various characteristics of received sounds is still needed for the purposes of both assessing and predicting impacts. Further action involving noise should be precautionary (see 4.1). **Status: Subsumed in issue 4.1**	**SEIC agree that monitoring of whale behavior and distribution and various characteristics of received sounds is needed for purposes of both assessing and predicting impacts. Such monitoring was conducted during the 2005 construction period and is planned for 2006.**
3.3	Mechanisms are needed to address uncertainties regarding potential for: - TTS/PTS, - masking, - temporary/permanent displacement;	SEIC considers that for continuous noise sources and expected received levels in the feeding area from vessel related activities, TTS/PTS is not likely to occur because of the temporary nature of, and the noise levels generated by, the operation. SEIC's position is that we	These potential effects remain a concern and must be addressed by the WGWAP. No basis has been established for predicting with confidence when noise would result in masking, displacement, stress, or long-term or cumulative impacts. The limited monitoring during installation activities	**We accept that this issue should be deferred to the WGWAP.**

	- stress impacts and - long-term or cumulative effects from exposure to noise.	have designed noise levels to minimise the likelihood of stress and therefore this is inherent within our mitigation measures. Ongoing WGW monitoring will address some of the long-term issues. Is noise exposure and related potentials such as TTS/PTS, temporary or permanent displacement, or stress impacts still considered an issue?	in summer 2005 precludes assessments to address our concerns, particularly with respect to the possibility of temporary displacement. **Status: Deferred to WGWAP**	
3.4	The number of WGW affected by noise may be underestimated. Assessment of the nature of effects and the number of whales affected is necessary to determine when oil and gas-related noise is unacceptable.	This issue relates to the noise impact criterion "number of whales potentially affected", stated in the CEA. Estimates are based on a large set of data and sophisticated density calculations. These distribution data show that WGW are continuously moving within and between the feeding area. Although density calculations give a good estimate of the numbers of WGW expected in the ensonified area, it remains difficult to determine the actual numbers affected as large part of the movements is contributed to normal movement patterns. SEIC will conduct post analysis of the data collected in the field during the 2005 construction season. Behavioural observations of individual whales will be related to received noise levels at the location where the whale was observed. The acoustic model will be used to estimate noise levels at different parts in the feeding area using actual noise level measurements from the buoys.	SEIC have agreed to produce maps that overlay distribution of whales with received noise level data for review by the first meeting of the WGWAP. These distribution-noise analyses should be completed as soon as possible in as much detail as possible with regard to the number of whales affected and proportion of the feeding area ensonified above 120 dB. We believe that these analyses are critical for two reasons: 1) to demonstrate that SEIC met their own exposure criteria as defined in the CEA; and 2) to inform monitoring and mitigation efforts for future activities. **Status: Deferred to WGWAP**	**SEIC accepts that the issue should go to the WGWAP.**
3.5	Experts have questioned the utility of studies on migrating whales for protecting gray whales in their feeding grounds. They have raised concerns stemming from the nature of the noise (e.g. continuous versus pulsed or transient). They also have raised questions about the mechanism forSEIC's approach is consistent with that used by Malme, Würsig, Bird and Tyack (1986, BBN Rep. 6265), which is the best available literature on the subject for feeding gray whales. Malme et al. (1986, pages. 3-133 and 3-134) used information from migrating gray whales to make conclusions about noise impacts on feeding gray whales changing	Some literature suggests that the reactions of migrating whales to noise may be greater than that of feeding whales. This issue was discussed in the noise teleconference and the points made were considered in the noise management strategy. In the noise teleconferences, a major concern related to behavioural reaction was transient noises. This was addressed in updated noise criteria, which were emailed to experts on July 1st. The noise criteria have since been updated based on a proposed criteria submitted by one of the panel members and were further discussed during the teleconference on 24 July (8). Details on the revised action criteria are in item 4.1. Changes in mitigation measures have taken place if this was considered appropriate only after a careful review of the data available and after consultation with experts.	SEIC's use of a study of migrating gray whales as the basis for choosing an acceptable exposure level for feeding gray whales was inappropriate. We reiterate that the goal should be to keep the exposure of feeding whales below 120 dB. SEIC needs to demonstrate that, regardless of perimeter received levels, the criterion of 120 dB ensonification of fewer than 5 whales was met, as stated in the CEA; see issue 3.4. The advice provided by the experts during the teleconferences was either not heeded or altered significantly. Specifically for this issue, the noise action criteria suggested by Vedenev were significantly altered (see Appendix 1). A more detailed discussion of noise action criteria *vis a vis* acceptable exposure levels is provided in Appendix 1.	**SEIC's approach is consistent with that used by Malme, Würsig, Bird and Tyack (1986, BBN Rep. 6265), which is the best available literature on feeding gray whales. Malme et al. (1986, pages. 3-133 and 3-134) used information from migrating gray whales to make conclusions about noise impacts on feeding gray whales. SEIC agrees with the recommendation to demonstrate with 2005 data that regardless of**

	mitigation measures without more complete review.	The use of mitigation measures is closely tracked in the field and all instances of their implementation are recorded (8). SEIC receives daily reports from the field and can modify mitigation measures if necessary. (REFS: 8) The post-field season data analyses will add further to our understanding of noise and whales.	**Status: Subsumed in 4.1**	**perimeter received levels the criterion of >120dB ensonification of fewer than five whales was met.**
3.6	SEIC raised its noise threshold from 120 dB to a 4-hour average of 140 dB based on studies of migrating gray whales. Among other things, this change has not been demonstrated as consistent with ALARP. The basis for this change has not been explained and some experts raised the need for more objective, transparent risk assessment in their written response to documents received prior to Gland.	The criteria in the CEA that were used in the planning and design stage defined acceptability as <5 individual WGWs potentially avoiding the part of the feeding area ensonified by levels of >120dB. This automatically implies that the noise levels measured at the edge of the feeding area can exceed 120 dB and still be considered acceptable. The criteria proposed at Gland are action criteria to be applied in the field situation and SEIC has modified the original proposed field action criteria presented in Gland following further discussions with scientists during various teleconferences (8). The amended criteria are outlined below in 4.1. It should be noted that these noise action criteria and monitoring protocol were designed to determine if the predicted impact in terms of a noise footprint of >120 dB in the feeding area and associated potential numbers of whales avoiding were as measured. Noise monitoring results of the PA-BCGBS showed that measured noise levels were as modeled during the planning phase. (REFS: 8, 29b) The post-field season data analyses of the PA-B noise measurements combined with the distribution, abundance and behavioural data will add further to our understanding of noise disturbance and whales.	See Comment for 3.5. **Status: Partially subsumed in 4.1**	**SEIC accepts the recommendation to demonstrate that the impact criteria used were achieved in practice. See also 3.5 above.**
3.7	Need to obtain better information on WGW hearing abilities.	No changes to CEA. This is a larger issue for the IUCN and any Cooperative Review Body.	**Status: Deferred to WGWAP**	**SEIC accept that the issue will go to the WGWAP.**
3.8	It is critical to learn as much as possible from this exposure of gray whales to noise during this 2005 summer. Among other things, noise levels must be monitored continuously on the periphery of the feeding grounds, and corresponding whale behaviour must be documented. The results should be made publicly available so that the scientific value of this "experiment" can be	SEIC has developed a comprehensive monitoring programme to assess all potential impacts and will conduct a full analysis of the data following completion of the field season. Noise has been measured in real time during both the LUN-A and PA-B installations. (REFS: 8, 9, 19, 29b). Full analyses of all data collected with be conducted after the field season and the reports will be made public.	**Status: Subsumed in 3.4 and 3.6**	**SEIC accept that this issue is subsumed in 3.4 and 3.6.**

	maximized in terms of what we learn about noise impacts. At the end of the season a full report should be published on what mitigation measures, if any, were taken during the construction season in response to measured noise levels, how these were implemented and any relevant experience gained from their implementation.			
4	**Adequacy of Noise Intervention Process & Action Levels**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
4.1	Real-time monitoring of WGW behavioral and physiological response to underwater noise (p. 93) is essential to indicate when noise levels are excessive. SEIC developed further criteria in the Marine Mammal Protection Plan 2005. Nonetheless, concerns were raised during noise teleconference regarding: - appropriateness of proposed RL levels, especially 140dB shutdown criteria; - adequacy of Tyack work for identification of the level at which WGW are disturbed (e.g. feeding vs. migration and transient vs. continuous source); - lack of consideration of frequency spectra and other characteristics of the noise; - lack of use of behavioral-based criteria; and - uncertainty regarding the proposed monitoring would lead to real-time feedback and modification of project actions when necessary. An alternative proposal was developed by A. Vedenev (awaiting SEIC response plus comments of other experts) and a subsequent teleconference resulted in an agreement to investigate possible behavioral response criteria. Specific action points need to be clarified (including, as appropriate, an indication	As described in Annex 3 (8, 29b) of the Marine Mammal Protection Plan 2005 (dated 29 July 2005), noise action criteria are based on received levels at the perimeter of the feeding ground. The placement of the buoys was chosen in such a manner that it would enable calculation of the actual footprint of 120 dB in the feeding area using the acoustic model (post field season). As for the criteria that were used to enable immediate action in the field, two sets of criteria and associated actions have been defined to address respectively the high-level transient noises of a few minutes duration (1) and moderate noise levels produced by continuous operations lasting several hours to several days (2). The criteria are: 1. Three consecutive 1.0-hour intervals of average integrated noise level exceeding 130 dB will initiate action to mitigate noise emissions. Process leading to action under criterion #1: a) The first 1.0-hour average of integrated noise level exceeding 130 dB leads to an investigative action to determine the location and possible cause of the noise source that causes the 130 dB threshold to be exceeded. This is based on all available logs of SEIC operations that are being sent to field teams on a daily basis. b) If the noise level in the immediately-following (second consecutive) 1.0 hour time period continues to exceed 130 dB, and the investigative action cannot rule	The SEIC response/approach to this issue is significantly different from the Vedenev proposal and was neither vetted nor endorsed. These criteria and monitoring/mitigation protocols are unacceptable because: • The duration of exposure could actually lead to excessive sound energy exposure levels • The absolute levels to which animals could be exposed are too high • Real-time monitoring was not undertaken to detect acute responses to noisy activities • No behavioral cues were included in mitigation criteria • Pathway(s) from breach of criteria to actual mitigation action are poorly defined and cumbersome including a lack of a precautionary shutdown triggers and mechanisms. For more detailed treatment and explanation of these issues, see Appendix 1. **Although SEIC gave reassurances at the Vancouver meeting that they did not need to implement these protocols in 2005, we recommend that for the 2006 season and the future, the following be addressed through the WGWAP:** **1. The noise action criteria (level and duration) need to be refined, discussed and agreed upon,**	**SEIC accept that these issues can be addressed prior to the 2006 construction season. Field observations during 2005 have not revealed any obvious negative behavioural re-actions or changes in distribution. Further analysis is being conducted to confirm these preliminary conclusions.**

	of whether the action points are based on sound intensity levels or sound energy exposure). Written response to the Marine Mammal Protection Plan of 2005 also questions the definition of "acceptability" with respect to the level of whale response observed.	out responsibility of SEIC activities, then communications with the vessel masters will be established to request information on any unplanned operations and possible duration of those. Decision on potential mitigation measures will be made based on these discussions. c) Actions to mitigate noise emission will be taken if the third consecutive one-hour integrated noise level averages exceed 130 dB. The use of three one-hour average levels is suitable from a perspective of implementation because it provides sufficient time to adequately investigate the noise source location and to be able to effectively mitigate the noise emissions in consensus with SEIC management. 2. Five, not necessarily consecutive, 3-minute intervals exceeding 140dB within the first hour followed by three 3-minute intervals exceeding 140dB in the second hour will trigger action to mitigate the noise emission. Process leading to action under criterion #2: a) The first 3-minute interval average of 140 dB leads to an investigative response to locate the source of the noise and to determine if the noise is generated by SEIC activities. During the time that this investigation takes place it should be clear whether a total of five, not necessarily consecutive, 3-minute intervals had occurred in the previous hour. If this is the case, and if the investigation finds that SEIC activities are the source of the noise, three more 3-minute intervals exceeding 140dB will trigger action to mitigate the noise emission. This process allows SEIC time to find the actual source of the noise and to decide on the most appropriate mitigation to reduce the noise in consensus with SEIC management. The real-time received noise levels in the feeding area are considered to be reliable quantifiable parameters upon which decisions can be based, as they are independent of environmental conditions such as reduced visibility and high sea states. However, whale behaviour, distribution and abundance are also parameters for determining potential impact on the whales and because of that daily and weekly maps of	**including high-level transient noises that could elicit a startle response.** **2. The actions taken upon a breach of these criteria need to be refined and agreed upon and should include precautionary and expeditious shutdown requirements at higher levels.** **3. Protocols for real-time monitoring of whale distribution, behavior and noise characteristics need to be designed and agreed upon.** **4. SEIC need to collate all WGW distribution, behavior, and acoustic data from 2005 and provide these to the WGWAP. These data need to be analysed to identify any distribution shifts that may be correlated with industrial activity. Methods of analysis should be identified as a priority and discussed with the WGWAP.** **5. Noisy activities by operators other than those under contract to SEIC (e.g. DMNG, Exxon etc.) need to be incorporated, as possible, in these analyses.** **Status: Deferred to WGWAP**	

		whale distribution are generated and evaluated in an effort to assess real-time impacts, bearing in mind the high variability and other limitations of these data. Further expert discussion was held during a teleconference on 24 July. Dr. Vedenev's proposal was considered and SEIC's planned changes to the noise criteria discussed. New noise criteria were finalised and these criteria were used successfully during PA-B installation. The results of the noise measurements of the PA-B are being analysed and the report, once finalized, will be made available. (REFS: 8, 16, 29b)		
5	**Noise mitigation through temporal separation**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
5.1	The action criteria have not been defined with sufficient specificity and "acceptable" responses have not been adequately defined. Without such specificity regarding when actions will be taken and what types of responses are acceptable, it is not possible to judge whether the oil and gas-related activities will be sufficiently responsive to the needs of WGWs. Mitigation measures through temporal separation may not be adequate if and when "peak" seasons can be redefined without adequate justification. After the ISRP review but prior to the Gland workshop, SEIC revised their definitions of seasons used to provide the most separation in time. The revisions effectively shortened the peak season at both ends with the end result being the potential for more overlap between presence of whales and noise-generating activities. SEIC justified the change of season by referring to data on arrival and departure times of whales in the area. No actual data were provided for review, but descriptions of those data at Gland suggested that they were limited	Seasons are now defined Marine Mammal Protection Plan (2005) as follows (these are changed from previous version of WGW Protection Plan): Off season - December to April; Early season - May to June; Peak season - July to September; and Late season - October to November. During the development of the 2003 Protection Plan there was less information available regarding whale distribution and abundance. The new season definitions were updated based on continuing analysis of all presently available distribution and abundance data. (REFS: 8, 29b). For information: - the extension of the early and late season has no implication for the mitigation measures as all measures apply during the whole summer season; the extension of the seasons does not result in an increase in overlap between presence of activities and whales as the total duration of construction activities remain the same. It does, however, encourage the operators to schedule noisy activities in June or October as during these months less whales are present than during July-Sept.	The response notes that SEIC encourages operators to schedule noisy activities in June or October when fewer whales are present. If, as the SEIC response indicates, the definition of new seasons has no effect on the activities that occur, then it is not clear why such seasons have been defined. Even with the changes in seasonal definitions, SEIC still scheduled the installation of the CGBS for the peak gray whale season. Despite attempts to mitigate by design, temporal and spatial separation remains a key and perhaps the most effective mitigation measure available. We reiterate that noisy activities should be scheduled for non-peak seasons. Furthermore, the schedule for noisy activities should be submitted to the WGWAP for review. We were disappointed that SEIC decided to install the CGBS in July; this implies that the Company's commitment to temporal separation has not been taken seriously. **Status: Defer to WGWAP**	**SEIC recognises the value of temporal separation as a mitigation measure, and uses this approach when practical. SEIC accepts that further discussion on these issues should take place with the WGWAP.**

	to a single year. Such limited data are inadequate for that purpose if arrival and departure times vary considerably from year to year.	The distribution maps will be updated annually to include new data.		
6	**Other noise mitigation methods**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
6.1	Additional methods are needed to mitigate the effects of noise - e.g. avoiding critical habitats. Selection of alternative 1 pipeline route maximizes the spatial separation within the context of the 3 options assessed. The location of the PA-B location was raised as a related issue (addressed below).	Selection of Alternative 1 for the pipeline route avoids passing directly through the western gray whale feeding ground. The selection of the PA-B position is explained in two main supporting documents--see Issue 17.1 for details. (REFS: 13, 25)	Selection of alternative 1 pipeline route resolves this issue. Related concerns (e.g. timing of construction and development of sediment plume) are addressed elsewhere (issues 5.1 and 15.2). **Status: Closed Resolved**	
6.2	Additional methods are needed to mitigate the effects of noise - e.g. removal or quieting of equipment. Written response from Experts to Marine Mammal Protection Plan 2005 prior to Gland also questioned adequacy of helicopter measures - height restriction alone not enough.	The 2005 Marine Mammal Protection Plan provides guidelines for all aircraft (minimum altitude of 450 m over Piltun feeding grounds (except where safety concerns dictate otherwise). Information on the impacts of helicopters on whales suggests that it will not be a problem at these altitudes particularly since overflights will rarely occur. (REFS: 8)	Helicopter flights should avoid passage over feeding areas, particularly the nearshore areas where mothers and calves occur. Evidence regarding adverse effects from helicopter overflights should be assessed by the WGWAP. The WGWAP should continue to investigate additional noise mitigation measures, e.g. proactive design and scheduling measures to minimize noise introduced into the marine environment by the PA-B platform when operational. **Status: Deferred to WGWAP**	**SEIC accepts that this issue will go to the WGWAP.**
6.3	The effectiveness of ramp-up procedures was questioned because the benefits are hypothetical and have not been demonstrated.	Ramp-up acknowledged by SEIC as of limited applicability to construction activities	Although evidence to demonstrate the utility of ramp-up procedures is not available at present, such evidence may be forthcoming during the lifetime of Sakhalin II Phase 2. Therefore, this potential mitigation measure should be reviewed periodically by the WGWAP and may be particularly useful during seismic studies. **Status: Deferred to WGWAP**	**SEIC accepts that this issue will go to the WGWAP.**
6.4	The benefits of mitigation through use of bubble screens was questioned by the experts, who stated that bubble screens are not effective (in response to SEIC issue Table distributed prior to Gland).	No change to Gland position. (REFS: 8). Effectiveness of this technique may be assessed in the field if employed and through function of the Collaborative Review Body.	**Status: Closed Resolved**	

7	**Independent oversight of monitoring programmes**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
7.1	Observer programmes require independent oversight or verification of compliance to ensure their effectiveness. See also Issue 18.1 details. Independent monitoring is required. This might be addressed by the advisory body (issue 18.1).	Development of Terms of Reference for an advisory body are underway with an IUCN committee. Until such time as that body is established, SEIC, on an annual basis, will work with the IUCN to develop an annual workshop that will invite representatives from all of the WGW range states. The first meeting of this workshop will be in March 2006. An independent external audit (28) of the Marine Mammal Observers programme was undertaken in June 2005 and a report issued in July. SEIC has responded to the recommendations made in that audit (REFS: 28, 30). Awaiting Terms of Reference for advisory body function for discussion. SEIC has implemented recommendations that arose out of the Marine Mammal Observers Audit.	Paragraph one of the SEIC response is subsumed under issues 18 and 19. An annual workshop with representatives from all of the range states will not address the issue described here. While range-wide recovery efforts are necessary, those efforts are not a satisfactory substitute for the long-term WGWAP needed to address issues specifically related to Sakhalin II Phase 2. The external audit (Doc 28) provided a review of the MMO programme but no evaluation of its effectiveness as a mitigation measure. Its effectiveness as a mitigation measure, if any, remains unquantified, and may be marginal. The data collected under the programme to date have not been released or analysed, but could in principle be analysed to determine whether there have been any marine mammal encounters that resulted in implementation of mitigation actions (such as course or speed changes or modifications to operations). **Status: Deferred to WGWAP**	**SEIC accepts that this issue will go to the WGWAP.**
8	**Improved understanding of WGW response to noise**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
8.1	The need for real-time monitoring of whale responses to noise is addressed elsewhere. Such monitoring will not necessarily reveal the full extent of their responses, which may include behavioral and physiological changes which are too subtle to detect with existing monitoring methods over short periods of time, but still significant with regard to the well-being of the animals. In general, then, there is a need for a more comprehensive understanding of behavioral and physiological responses of WGW to noise.	This is an area of research to be covered under the range state wide advisory body as envisaged as a follow-up to the Gland workshop. In the period before this body exists SEIC intends to sponsor such a workshop on an annual basis. Need for longer-term assessment of dose-response relationship. This issue may be addressed under the function of the advisory body.	While range-wide recovery efforts are necessary, those efforts are not a satisfactory substitute for the WGWAP needed to address issues specifically related to Sakhalin II Phase 2 (see issues 18 and 19). For discussion of real-time monitoring, see Assessment of Issue 4.1. **Status: Deferred to WGWAP**	**SEIC accepts that this issue will go to the WGWAP.**

9	**Collision**			
	Adequacy of collision risk assessment			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
9.1	Collisions of whales with vessels may cause injury and mortality and are an issue of concern. A quantitative assessment is needed to better characterize this risk and identify sources of risk that can be reduced by mitigation measures. The assessment must include an evaluation of the expected effectiveness of the mitigation measures. The assessment should encompass construction and operation phases off northeastern Sakhalin as well as tanker vessel traffic leaving Prigorodnoye and in La Perouse Strait. This topic was addressed briefly at Gland and SEIC, where the need for and feasibility of such an assessment was discussed. Some experts raised the issue of how an ALARP determination can be made if no quantification of risks has been attempted (response to SEIC Issues table and Marine Mammal Protection Plan 2005 prior to Gland).	The MMO Programme of SEIC is based on the assumption that the collision risk is high, meaning that the effort is to minimize the risk is maximized. However, because a collision risk assessment is considered valuable SEIC has commissioned a study to assess the collision risk to WGWs (34). A model has been built and will be run using a variety of different scenarios. The model has been developed with input /advice from experts. A report is due in August 2005. This issue will continue to be addressed through modifications, as needed, to the Marine Mammal Protection Plan (8). (REFS: 8, 34) Work is ongoing. This issue will be addressed, in part, through definition of vessel corridors, speed restrictions, marine mammal observers, operating restrictions, etc. in the Marine Mammal Protection Plan 2005 - see below (issue 10).	The collision risk model developed in document 39 predicts a substantial number of potential collisions based on volumes of construction traffic. If these represented actual collisons, the consequences for the population would be serious. However, no firm conclusions can be drawn from these results because the proportion of potential collisions that result in actual collisions (e.g. because the whale fails to take avoidance action) is unknown. Indirect evidence, such as the apparently low rate of collisions in eastern gray whales as a fraction of population size (with the caveat that many incidents might go unreported) and the likelihood that project traffic represents a low fraction of the total vessel traffic to which WGWs are exposed on their migration routes and calving grounds (with the caveat that these are largely unknown), suggests that the number of actual collisons arising from project traffic is likely low. Furthermore, there have been no reports of fatal collisions. However, review of photo-identification pictures suggests at least one collision injury in the WGW population. **Status: Deferred to WGWAP**	**SEIC accepts that this issue will go to the WGWAP.**
9.2	Increased vessel traffic around Aniva Bay and the Perouse Strait will increase the risk of collision, but this increased risk was not addressed in CEA.		Document 37 suggests that project-related traffic will be a small proportion of total vessel traffic in La Perouse Strait, although the project-related vessels are large tankers and it is not clear whether the risk is negligible during the migratory seasons (see 10.2 for needed mitigation). Status: Deferred to WGWAP	**SEIC accepts that this issue will go to the WGWAP.**
9.3	Not all proposed mitigation measures appear to be thought through or to make practical sense. Others have been adopted without any assessment of their likely effectiveness. It remains unclear which measures are actually intended to be implemented and which measures have been listed only for form's sake. For each mitigation measure in the MMAP: (i) efforts should made to determine what	Vessels are under mandatory reporting of any excursions outside of approved transit areas (8). SEIC will review all such incidents and assess the causes behind them. SEIC has clearly directed vessels that entry into the feeding area must be with pre-approval and only in emergency situations. Vessels are mandated to follow speed limits unless doing so presents an unacceptable hazard to human life (8). All mitigation measures have been assessed with respect to practical implementation and with a detailed review of what limited information is available on serious whale-vessel collisions (such as	We generally concur with the mitigation measures as described as long as they are viewed as required rather than discretionary. In our view, the July 2005 Marine Mammal Protection Plan describes these measures as requirements. We understand from the SEIC response that vessels will be allowed in the feeding area only during an emergency. Except the emergency situation, no vessels should be allowed to enter the feeding ground during the feeding period. **Status: Deferred to WGWAP**	**SEIC accepts that this issue will go to the WGWAP.**

	is actually meant by the proposed measure and whether it does, in fact, make sense; and (ii) SEIC must indicate whether the measured has been implemented or whether it seriously intends to implement the measure in the future. As an example of the above problems, the proposed zoning and speed limits in the MMAP states that vessels may only enter the Piltun feeding ground in emergency situations, but that if they do, the speed limit will be 7 knots by day or 5 knots by night. This seems nonsensical in that under emergency conditions, a vessel may not be able to limit its speed to 7 or 5 knots. Therefore, it raises the concern as to whether vessels might be allowed to enter the feeding grounds under other conditions that are not clear emergencies.	vessel speed and size). All marine mammal mitigation measures are outlined in the Marine Mammal Protection Plan (8). Vessel locations are tracked in real time using the Vessel Tracking System and unauthorized incursions in prohibited areas will be documented and addressed (32). (REFS: 8, 29b, 32) All incidents are assessed and modifications made to the mitigations as necessary.		
10	**Adequacy of collision mitigation/ monitoring procedures**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
10.1	Independent monitoring and oversight is required. Monitors or observers are subject to conflicts of interest and a range of pressures that may compromise their independence and objectivity. In their written responses to documents for the Gland workshop, experts identified the need for greater information/ discussion on the MMO programme (e.g. objectives, methods, effectiveness, independent oversight), and emphasized the need to use suitably experienced MMOs. The need to avoid these problems may be addressed by the advisory body (see below).	Terms of Reference for an advisory body and associated practical monitoring advice are being developed. Marine Mammal Observers are on separate contracts to vessels to ensure that there is no conflict of interest (28, 30). SEIC commissioned an independent review/audit of the Marine Mammal Observers programme (July 2005) and has responded to the recommendations issued by that audit (28, 30). Some changes recommended by the audit are being implemented this year (see current Marine Mammal Protection Plan), while the remainder will be implemented for the 2006 season. (REFS: 28, 29b, 30) Audit recommendations on the Marine Mammal Observers programme are being implemented.	The external audit (Doc 28) did not evaluate the effectiveness of the MMO programme in preventing collisions. The data collected under the programme should be analysed to determine how many cases there have been, if any, of sightings by MMOs that resulted in actions to avoid collisions. The effective coverage of the programme (e.g. the proportion of vessels with MMOs and the proportion of time that MMOs are on duty and visibility is adequate, and their detection probability) should then be estimated to determine the fraction of potentially dangerous encounters that would be expected to be detected by the MMOs. Reports of gray whale observations by MMOs on SEIC vessels, and actions taken, along with any related analyses, should be supplied to the WGWAP as soon as possible. These data and analyses should be considered by the	**SEIC accepts that this issue will go to the WGWAP.**

			WGWAP so that it can evaluate the effectiveness of the MMO programme as a mitigation tool. The WGWAP is expected to provide guidance to SEIC on improved data collection methods and to help them formulate questions that may be addressed by such data. **Status: Deferred to WGWAP**	
10.2	The principal focus for avoiding collisions should be on spatial separation (e.g. use of vessel lanes). Greater specificity is required for vessel routes and speed restrictions (including criteria for "low visibility"), including the area between the feeding grounds during the construction period and tanker routes from Aniva Bay during operation. SEIC should not rely solely on onboard observers due to observation limits (e.g. can only see animals at the surface, visibility impaired by fog, rough seas, low light). Expert response to SEIC Issue Table and Marine Mammal Protection Plan 2005 included concerns over: - proposed vessel speed limits; - procedures when travelling parallel to WGW; - corridors for vessels leaving Aniva Bay; - definition of protection and feeding zones; - protection of transit routes between feeding grounds; and - enforcement (see also issue above). Participants at Gland discussed the possibility and importance of working with other operators in the region on this issue.	Marine Mammal Protection Plan 2005 defines the Chaivo and Piltun feeding grounds as protection zones (8, 29b) and includes a statement of all mitigation measures to be used. WGW migration routes are not sufficiently understood to define (see also oversight issue below) however the offshore navigational corridors were selected to avoid the nearshore zone that migrating whales are expected to be using; higher speed limits are used in the navigational corridors as gray whales are expected to be absent from those areas (30). Vessel navigation and construction corridors are defined between the LNG/OET site, the 3 offshore platforms and along the offshore pipeline route (Alternative 1). The MMPP 2005 defines speed limits as follows: **Visibility >1km:** 17kts (navigational corridors), 10kts (construction corridors), 7kts (feeding areas) **Visibility <1km/nighttime:** 17kts (navigational corridors), 7kts (construction corridors), 5kts (feeding areas) All vessels are tracked using the Vessel Tracking System (27, 32) that allows real time position and speed to be audited. Few vessels used by SEIC will be travelling at above 15 knots. The average speed of vessels (based on their economical speed) is 11.5 knots (34). (REFS: 8, 27, 29b, 30, 32, 34) Further expert opinion/discussion required - including sharing of Marine Mammal Observer data collected to date.	The mitigation measures, as described, appear to be appropriate if they include vessel corridors, speed limits, and reporting requirements for any incidents involving vessels moving into and out of Aniva Bay and in or near the gray whale migration route(s). The mitigation measures in the Marine Mammal Protection Plan must be treated as required rather than discretionary. Changes to mitigation measures must be reviewed by the WGWAP. A caveat is that the 17kts speed limit for navigational corridors is not really a mitigation measure: the mitigation is achieved by the location of the corridors away from the known areas of gray whale occurrence. The risks from crew change vessels (17kts through areas between the two known feeding grounds) were not previously highlighted by SEIC or brought tothe attention of the ISRP. This concern should be addressed by SEIC in consultation with the WGWAP. We recommend that the east/west navigation corridors to/from the platforms should be treated as equivalent to construction corridors. **Status: Unresolved until above measure agreed. Issue of crew change vessel deferred to SEIC and WGWAP review.**	**SEIC accepts to review these concerns in consultation with the WGWAP.**
10.3	Due to the potential for collisions, there is a need for recording and monitoring of whale/ship encounters (including strikes,	The Vessel Tracking System (27, 32) used by SEIC provides real time vessel location data.	Sighting information should be summarized and presented to the WGWAP for consideration of possible adjustments to mitigation measures. Any collision events should be	**SEIC accepts that this issue will go to the WGWAP.**

	near misses, and safe avoidance) to determine if adjustments are needed to vessel traffic based on ship size, location, speed, daylight, or other pertinent variables. (Subsumed to 10.1) There is a need for real-time surveillance to keep track of the distribution of gray whales and to make this information available to vessels traversing the area. SEIC will make communication of realtime observations to vessel traffic explicit in MMPP (**Closed)** In addition, surveys are needed at regular intervals during the open-water season along the eastern Sakhalin coast to detect stranded gray whales (or floating carcasses), coupled with a serious effort to investigate cause of death whenever a dead gray whale is found. Opportunistic surveys (Confirm every good weather flights from Okha to Piltun??) – is this OK?? If found need to identify if WGW, photo and genetic sample.	The reporting of all incidents of whale-vessel encounters is mandatory (8). Marine Mammal Observers on vessels report sightings daily and communicate with other vessels if needed (8, 30). Marine Mammal Observers report all instances of mitigation measures begin used and this information is reviewed and the mitigation measures are adapted if needed (30). All floating or stranded gray whales in the SEIC project area are reported and SEIC will cooperate with the relevant Russian agencies to respond if requested (8, 30). (REFS: 8, 27, 30, 32)	investigated immediately and a report prepared for review by the WGWAP. Active surveillance of the whales and reporting of such information to vessels in the region provides a means to alert vessel operators of the associated risk of collision and is a proactive, precautionary measure that is used for other whale species (e.g. North Atlantic right whale) and potentially even more feasible and important for western gray whales, as their feeding distribution is more restricted. Biweekly surveys for stranded, injured, or dead animals either on the beach or floating could provide useful information on possible interactions between gray whales and oil- and gas-related activities, most obviously collisions. Should such an event occur, every effort should be made to evaluate these animals (or carcasses) to determine the circumstances surrounding their injury or death and to obtain biological data (e.g. size, sex, genetic sample regardless of condition, photographs). Potential ship-strike injuries that are observed on living whales should be reported and appropriately photographed to the extent possible. **Status: Deferred to WGWAP**	
10.4	Sighting information services for vessels is recommended.	SEIC is currently using an online Vessel Tracking System (27, 32) that allows position tracking of vessels by satellite (8). (REFS: 8, 27, 32)	**Status: Resolved**	
11	**Oil Spill**			
	Adequacy of the Oil Spill Impact Assessment			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
11.1	Further work is required to demonstrate that impacts are ALARP. CEA risk assessment does not assess the actual risks of oil spills (i.e. frequency and impact) but only provides estimates of frequency, volume, and selected excursion envelopes. The ISRP report estimates a 24% probability of a pipeline spill and a 3% likelihood of a platform blowout over the project's 40-year lifecycle. Impacts on feeding grounds (e.g. portion affected, prey lost) have not	Future analytical work will be carried out on persistence times, etc., for Oil Spill Response Plans (OSRPs) (21). SEIC notes that excursion envelopes are based on conservative assumptions about persistence. Work has been commissioned to assess the characteristics of Vityaz oil including mixing realistic energies for emulsification. These studies are ongoing (21). Oil spill response planning assumes damage/harm on impact and does not require detailed toxicological or other work designed to quantify potential damage.	In preparation for and during the Vancouver meeting, SEIC provided considerable additional information related to the probability and risks associated with oil spills. Key elements of this information included potential sources of spills, the expected likelihood of spills of different sizes, dispersion of the oil based on its characteristics and local oceanography, and its probability of being incorporated into bottom sediments or having toxic effects on the benthic community or the gray whales directly. SEIC concluded that the risk of such effects was very low, based particularly on the density, viscosity and volatility of the oil and the likelihood that many of the volatile components would evaporate prior to contact	**SEIC accepts that this issue will go to the WGWAP.**

	been quantitatively assessed. Persistence, emulsification effects, etc. are not adequately described, confounding attempts to link changes in oil condition to impacts on benthos. Existing documents lack information regarding toxic effects on prey and prey food chain. A Lender review noted that a more detailed risk assessment (impact and frequency) is required to demonstrate risks are ALARP. The CEA does not define risk acceptability for oil spills as required under ALARP demonstration. The need to assess oil impacts on benthos/prey was re-iterated by experts' written responses to the SEIC Issue Table for the Gland workshop.	SEIC maintains that the spill frequencies and volumes stand up well against what could be expected industry-wide (although comparisons are difficult as there are far fewer oil spill QRAs than ones for personnel risk). The maximum credible spill sizes, even taking a 10,000 year return period, are less than the RF figures for a Platform "design" spill (21, 35). Detected pipeline release volumes are also less than this figure. Undetected rates can be larger, but these relate to long term low leak rate spills below the Atmos system detection threshold. At sea, these look very likely to weather faster than the leak rate. The spill probability and volumes from the new platforms are relatively low (35). SEIC has commissioned a full event tree analysis, and demonstrated that protection against spills has been built in to an ALARP level - increasing protection against spills could only be done with significant detriment to risk to life (e.g. by enclosed wellbays which would increase the explosion risk). SEIC has analysed the pollution potential from blowouts using data in the unpublished section of the SINTEF database (35). We have analysed the full database held by SGS, and it shows that significant pollution from blowouts is unusual - all the blowouts in the database that caused a medium level of pollution (around 2-4000m^3) related to hurricane damage. The database does only include events from certain parts of the world (US GOM, Europe and some other events) but it does relate to those areas where well engineering controls are to a high standard, as they will be in Sakhalin. SEIC has a good argument for demonstrating that the probability of pollution resulting from a blowout is substantially less (at least one order of magnitude) than the SINTEF based blowout probability itself. QRA is used as a comparative rather than absolute tool in order to select from alternatives (35). It is likely to over-estimate risks due to conservatisms in the assumptions. SEIC has included controls in place within the QRA frequency and consequence assessments, and believes that a strong case for ALARP in leak	with the sediments. The type of preliminary study conducted is potentially useful for projecting risks associated with an oil spill. Further work of this type is necessary before it can be considered to provide a reliable basis for forming conclusions about the level of risk. Such additional studies should be conducted with oversight from the WGWAP and with independent review. The screening study provides a useful initial study and preliminary estimate of the residual risk. However, further review and assessment by the WGWAP will be necessary. In particular, it will be necessary to review the precautionary nature of the study; issues include proportion of feeding ground affected and impacts on larvae. Other impact routes, including baleen contamination/ingestion, skin contamination and inhalation are difficult to address with the current state of knowledge and so are deferred to the WGWAP to develop appropriate studies. It is also necessary to ensure post-spill monitoring of impacts, and this monitoring effort needs to be independent from spill response/clean-up. **Status: Deferred to WGWAP**	

		prevention has been built. (REFS: 20, 21, 29a, 35, 38) SEIC has developed a scope of work to examine the potential effects of an oil spill on western gray whale feeding habitat. This study will examine the probability of a spill of varying sizes reaching the feeding area and what impacts, if any, it is likely to have in that area (38). SEIC has also commissioned D. Bonsall of Risktec to provide a comprehensive review of engineering design that will fully demonstrate the minimization of spill risk (20).		
11.2	Sakhalin Island and surrounding waters are subject to considerable seismic activity. It is unclear whether estimated spill frequencies and platform/pipeline designs adequately reflect and take account of the region's seismic activity. AEA QRA experts have identified the spill frequencies for pipelines as being within expected range, but it is not clear that the estimated spill frequencies take into account the extraordinary seismic activity in this region.	This issue has been addressed in the QRA (6, 7). The assessment found no significant difference between the three PA pipeline routes in terms of release frequency, maximum credible spill volume, or oil spill risk; seismic risk factors were incorporated into the assessment. (REFS: 6, 7, 29a) Lender expert consultants could assist with a review of the QRA and offshore seismic risks.	The information provided to us regarding additional risk from seismic activity indicated that neither the platform nor the buried portion of the pipelines cross or are located over active faults, which indicates the risk of fault-related displacement is negligible. Damage during a seismic event could result from shaking of the platform or pipelines. An independent report indicated that the risk of shaking from seismic events was low compared to the maximum credible event projected for this region, which is based on a period of 3000 years. Therefore, it appears this issue can be considered closed. **Status: Closed**	
11.3	The region in question is under ice for about half of the year. Successful mechanisms for responding to oil spills under ice have not been identified and it is not clear that SEIC has a plan and can respond to such a spill.	Oil spill trajectory modelling in winter/ice conditions has been conducted for some areas and will be undertaken in all areas as part of the development of the OSRP (21). A three volume report on Oil Spill Behavior and Oil Spill Response in Ice Conditions is now available (33). This review estimates ice conditions in the area of SEIC operations, compares ice conditions with other areas, establishes appropriate strategies for oil spill response in accordance with ice conditions, evaluates different response equipment effectiveness, and provides an estimate of the equipment required. A number of oil recovery systems are known to work in ice conditions (e.g. rope mops) and these are being assessed (21, 33). (REFS: 21, 29a, 33) SEIC continues to develop its winter spill response plans through industry workshops, equipment assessment programmes, and additional commissioned studies.	The information provided prior to and at the Vancouver meeting indicated that extensive research has been and is being conducted on detection, removal, and recovery of oil spilled in icy conditions. In view of the fact that the NE Sakhalin region is covered with ice for about half of the year, use of the best available technology for oil detection and removal or recovery is essential for protecting gray whale habitat. Current research should be continued and new developments implemented to minimize the risk of oil spills in ice. **Status: Deferred to the SEIC and the WGWAP**	**SEIC accepts that this issue will go to the WGWAP.**
11.4	The CEA did not assess the risks of	Blowouts have been considered in the QRAs undertaken	In response to comments in the ISRP report and discussions	**SEIC note that the QRA**

	platform blowout. At the least, these risks should be assessed by review of the company's historical record and experience with blowouts. In addition, SEIC could have provided a description of the operations that occur on or under the platform and the steps taken to avoid blowout at each operational stage.	to date and are being reconsidered in QRAs for OSRPs (REFS: 20)	at the Gland meeting, SEIC produced a quantitative risk analysis for platform blowouts. The analysis identified potential sources of failure that could result in a blowout and provide information on the expected frequencies of such events based on a database of oil industry records. An independent review has been commissioned to assess the risks but the results were not available at the time of the Vancouver meeting. If the review does not reveal significant shortcomings in the analysis, then the analysis appears to provide a reasonable basis for estimating the probability of a platform blowout. **Status: Deferred to independent review**	**was produced for the basic platform design in 2003. The independent assessment referred to by the panel is an assessment of the QRA process, rather than the risks associated with design and operations.**
11.5	Risk associated with spills from the construction and operation of the Tanker Loading Unit have not been adequately assessed and described. Similarly, tanker risks have not properly assessed. Some experts identified these risks as significant and stated that further analysis of possible risk scenarios is required.	A QRA update (35) has been commissioned for Tanker Loading Unit risks (all operations are being reassessed for OSRPs). A tanker risk assessment is being commissioned (37). Trajectory studies for a range of tanker spills have been undertaken and probabilities of shoreline impacts have been calculated for OSR planning purposes. This issue is not considered relevant to WGW except perhaps during migration. (REFS: 35, 37) Although not relevant to the WGW, an assessment is to be initiated on sensitivity mapping available on Hokkaido.	When completed, the QRA for the Tanker Loading Unit should be reviewed by the WGWAP and should undergo independent review. SEIC did respond to requests for oil spill trajectory modeling, those results were available for the Vancouver meeting, and they provide a better basis for predicting the effects of an oil spill. **Status: Deferred to the WGWAP**	**SEIC accepts that this issue will go to the WGWAP.**
11.6	Further investigation of the ocean dynamics and ecology in and around Piltun lagoon is required to better assess risks to WGW and support route selection. Experts written response to SEIC document prior to Gland stated that adequate protection of Piltun lagoon still not clear because the region is still threatened by the risks of a spill from the platforms, as well as the pipelines. Oil spill response documents indicate that spill responses will be guided, in part, by trajectory modeling. The ocean dynamics in the region of the PA-A and PA-B platforms and the Piltun Lagoon will be critical determinants of the impact of spilled oil. Understanding these dynamics prior to a spill is essential for	SEIC questions the value of the studies suggested by the ISRP and notes that selection of Alternative 1 provides greater spatial separation of the pipeline and Piltun Lagoon. In the unlikely event of a spill, there are identified strategies (such as booms, deflection and collection) that can be used to protect the lagoon entry. The trajectory modeling capability of SEIC will be continuously improved. The new model will draw on regional oceanographic data and from SEIC's own database.	We continue to consider protection of Piltun Lagoon a very significant issue. SEIC indicated that various studies involving oceanography, ecology, and dynamics of the region have been or are being conducted, but to our knowledge this work has been offshore rather than inside the lagoon. Studies of the entire lagoon system are essential and such studies should be reviewed by the WGWAP for general direction. In addition, and in view of the importance of the Piltun Lagoon and the Piltun feeding area, both of them should be designated as Areas of Special Value and protected accordingly. Specifically, we believe this means protecting these areas is a priority in the event of an oil spill. Such measures need to be pursued in cooperation with other operators in and near the lagoon system (e.g. Exxon is planning to build a pipeline across the lagoon) including the Piltun feeding area. **Status: Deferred**	**Piltun Lagoon ecology studies have been conducted on behalf of SEIC and can be forwarded to the WGWAP. The Piltun Lagoon and the adjacent feeding areas are and will continue to be priority areas for oil spill response.**

	such modeling and to improve the chances of successfully protecting the Lagoon should a spill occur.			
11.7	Risk associated with gas releases requires greater consideration/ evaluation. Some experts at Gland re-iterated ongoing concern on this matter. Some experts' written responses to SEIC Issue Table noted that SEIC claim that gas or gas-related accidents would not affect the WGW is unsubstantiated. There are two issues here: 1) potential impact of direct contact of whales or their prey/habitat with gas, and 2) what risks are associated with gas accidents at the platform or pipeline. Even if the former is not a significant risk, it is not clear that the latter risks have been addressed in assessments of oil-spills and blowouts.	SEIC believes there to be no possible effects on WGW from gas releases. Frequencies/volumes of gas releases are being assessed for Lunskoye. The need for gas plume modelling for environmental assessment purposes will be reassessed. Gas release is not an OSR issue. This is no longer an issue with the selection of Alternative 1. (REF: 6)	Upon further review and consideration, there does not appear to be a significant direct risk to gray whales from exposure to gas. Discussions with SEIC indicated that risks from gas-related oil spills were considered in their quantitative risk analysis. Therefore, this issue is closed. **Status: Closed**	
11.8	The CEA did not assess in detail the relative consequences of spills associated with the pipeline alternatives.	The CEA provided a comparative risk assessment not a quantitative environmental risk assessment. Alternative 1 has also now been selected.	SEIC conducted a comparative risk assessment of the pipelines and concluded that there is no significant difference in the level of risk. The ISRP report provided a basis for concluding that Alternative 1, which has been adopted by SEIC, is the least risky for gray whales. This issue can be considered closed. **Status: Closed**	
12	**Adequacy of the spill prevention controls**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
12.1	Information was requested by the ISRP but not received regarding specifications for tankers to be used to transport oil and gas from the Vityaz complex (until it is closed) and from Prigorodnoye. SEIC stated in Gland that they are committed to double-hulled tankers.	SEIC has committed to double-hulled tankers year round (21). A tanker vetting procedure in place, which is described in the EIA Addendum on Oil Spill Response (21). SEIC discuss with experts what else, if anything, is required. (REF: 21, 29a) Lenders' independent consultant has reviewed SEIC's tanker vetting procedure and this may help close-out the issue.	It is important to recognize that continued operation of the Vityaz complex leads to a high spill risk for 2-3 more years. In addition, tanker traffic will increase markedly due to the shift from Phase 1 to Phase 2 operations. At the meeting in Gland, the company committed to the use of double-hulled tankers to help minimize the risks associated with tanker-based transport. **Status: Closed**	
12.2	Pipelines contain leak detection systems that may not detect leakage of hundreds of barrels of oil per day, which in turn may pose a significant risk to the whales and their habitat. The ISRP questioned	Leak detection for SEIC pipelines will use a variety of strategies (15, 21). Stated detection level of the proposed SEIC leak detection system is 1% of daily flow (*cf* 0.4% claimed on TAPS; [17]). SEIC will assess systems to verify ALARP. ATMOS system meets	The ATMOS leak detection system was described in detail in a report provided for the Vancouver meeting. In addition, SEIC provided an independent review of this system and its efficacy. Nonetheless, the limits of detection indicate that it is possible for a considerable amount of oil (i.e., on the order	

	whether the existing leak detection system is the best available. In addition, the ISRP raised questions about the ability to detect leaked oil given ice coverage during half the year, darkness, fog, and rough seas. Scientists' written response to SEIC Issue Table (provided at Gland) noted that the SEIC response was unclear on this and greater detailed is required to demonstrate ALARP.	detection criteria. A study of system sensitivity has been completed and is in review (17). Relocation of the pipeline to Alternative 1 has also lessened the risk to the feeding area (15). The EIA Addendum (21) provides additional information on leak detection systems to be employed. (REFS: 15, 17, 21, 29a)	of 0.6 to 1.0%) to leak from the pipelines without detection. For that reason, additional monitoring systems are needed. At the Vancouver meeting, the company described a set of monitoring methods that would be used to detect leaked oil. These include opportunistic daily crew-change flights, dedicated weekly flights of the whole pipeline, annual assessment using a subsurface remotely operated vehicle (ROV), ROV assessment after major storm or other events, monthly cleaning pigging and 5-year intelligent pigging of the pipelines. As long as the agreed inspection regime is followed and meets the highest industry standards according to independent review, and environmental monitoring is conducted (see issue 14.1), this issue is closed. **Status: Closed by deferral independent review**	
13	**Adequacy of spill response approach**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
13.1	Information is required on the oil spill response plans in order for comprehensive assessment to be made. This includes recovery under ice conditions.	SEIC is preparing, developing, researching and implementing a comprehensive OSR strategy as part of the overall management of OSR risk issues (3, 13, 31). Research into oil recovery in ice conditions ongoing by SEIC and in July 2005 a three-volume Oil in Ice project was completed (33). The EIA Addendum provides extensive detail on OSR issues (21). The EIA Addendum includes a table (Table 2.10) that provides a summary of the main study projects for OSRP development and related activities. (REFS: 3, 13, 21, 29a, 31, 33) SEIC has a number of OSRP in development: Corporate Operations OSRP, OPF, LUN, PA, OET/LNG-Onshore, Aniva Bay Marine, and Pipeline (Onshore). Further discussion required, can this be addressed in the future by the advisory body?	Oil spill response is a challenging task. SEIC is preparing complex response plans that are based on multiple levels of organization, depending on the extent of the spill and the resources required to respond. Although considerable efforts have been directed to development of response strategies and purchase of equipment, the conditions under which such responses could take place (e.g., remoteness of area, rough sea state, winter climate) indicate that immediate responses are limited in their expected success. Therefore, prevention remains the key element in protecting gray whales and their habitat. In this regard, SEIC confirmed that they will make protection of the Piltun feeding area and Piltun Lagoon a priority. At the same time, responses are important to minimize damage and clean up the effects of oil spills. Here again, SEIC confirmed that they will conduct beach clean-ups along the inshore feeding ground as a priority. Continued development of response strategies (preferably in coordination with other operators in the region) is essential, as well as continuing to conduct drills to test the response systems before they are required in actual emergencies. General aspects of oil spill response planning must be approved by the Russian Federation. In addition, planning that may pertain to gray whales and their habitat should be reviewed by the WGWAP. Finally, SEIC agreed to provide additional excursion curves, including winter season trajectory maps for Piltun region. SEIC noted that annual field exercises are undertaken. Oil spill response plans	**SEIC accepts that this issue will go to the WGWAP.**

			should be fully in place prior to the drilling of first oil. The need remains to ensure that post-spill monitoring of impacts occurs, and this needs to be dedicated and independent from the spill response/clean-up. Post-spill monitoring strategies should be developed by SEIC in consultation with the WGWAP. **Status: Deferred to SEIC & WGWAP**	
13.2	Use and effects of dispersants require further discussion and evaluation, including investigation of the potential toxic effects of dispersants.	SEIC has no intention to use dispersants near the WGW feeding area. OSRPs being developed and will include development of protocols for use of dispersants. A risk assessment relating to dispersant use is being conducted. (REF: 29a)	Discussions with SEIC at the Vancouver meeting led to the conclusion, confirmed by SEIC, that dispersants will not be used in the gray whale feeding areas or in any location where it might affect the feeding areas. Dispersants may be considered in areas where they would not affect gray whales or their prey. SEIC is conducting a study to review dispersant usage in the latter areas. **Status: Closed**	
14	**Adequacy of monitoring (also addressed under Issue 18.2)**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
14.1	Monitoring requirements should include a permanent array of monitoring sites and assess benthos/prey, as well as physical and chemical changes over time.	SEIC questions the need for permanent stations as the base pipeline route case was not selected. SEIC does not believe prey and physical studies of this nature will have significant value. However SEIC is currently commissioning background hydrocarbon monitoring (2005) and this will continue through operations phase and post spill. SEIC is currently developing spill and post-spill monitoring plans and procedures (29a,b). (REF: 29a,b) This requires further discussion to establish monitoring requirements. This issue may be addressed under the Terms of Reference of the proposed advisory body.	Section 3.4 of the ISRP report provides a framework for the kind of monitoring program that is needed. Such monitoring is essential to ensure that long-term undetected leaks do not lead to eventual contamination of the gray whale feeding areas. At the Vancouver meeting, SEIC agreed to a monitoring program, as outlined in Section 3.4 of the ISRP report. Such a program should be reviewed by the WGWAP. **Status: Closed (but WGWAP needs to help with precise definitions of questions and protocols)**	**SEIC accepts the independent scientists have closed this issue subject to definitions of protocols.**
14.2	In the event of a spill, investigations will be required to assess direct acute and chronic effects on WGW.		In the event of a spill, every effort should be made to assess the acute and chronic effects of the spill on the whales and their habitat. This issue must be addressed by the WGWAP, and will require collection of essential baseline data for comparative studies. **Status: Unresolved until plans have been reviewed by the WGWAP**	**SEIC accepts that this issue will go to the WGWAP.**

15	**Adequacy of Habitat Impact Assessment**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
15.1	Artificial reef affects of PA-B installation have not been addressed.	SEIC will undertake post-construction ecological monitoring around the platform. Reef effects are likely to be over small spatial scale and probably will not affect (or: are very likely not to affect) the feeding ground. Further discussion required to see if this is a live issue.	Remains low priority. WGWAP may wish to consider. **Status: Deferred to WGWAP**	**SEIC accepts that this issue will go to the WGWAP.**
15.2	Sedimentation effects, including proportion of feeding ground affected by sedimentation have not been assessed. Construction of pipelines from platforms to shore may still result in sediment plume that pose some short-term risk to feeding areas.	Selection of the Alternative 1 pipeline route provides sufficient spatial separation to negate impacts from sedimentation and modelling in the TEOC suggests that there will be no impact on the feeding ground. A sediment transport study was conducted in 2003 to identify areas of sediment movements along then-proposed pipeline routes (14). No additional studies are believed necessary for Alternative 1. (REF: 14) Further discussion required to see if this is a live issue.	SEIC reported that the plume resulting from dredging in the Lunskoye area did not extend beyond 600 m. They concluded, therefore, that sedimentation from pipeline construction in the vicinity of the PA platforms does not pose a major risk to the feeding grounds, as suspended sediment is likely to settle to the bottom before it reaches the feeding grounds or currents are likely to carry the sediment in another direction. SEIC indicated prior to the Vancouver meeting that they are required by the Russian Federation to monitor the plume. Hence, this issue can be considered closed as long as suitable monitoring is conducted and appropriate actions are taken should feeding grounds be threatened. **Status: Closed**	
15.3	Cofferdam could have significant effects if it is a permanent structure.	Confirmed as a temporary structure.	**Status: Closed**	
16	**Cumulative effects**			
	Adequacy of assessment of cumulative impacts			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
16.1	A rigorous assessment of cumulative impacts is essential (e.g. combined effects of noise, pollution, collisions, habitat disturbance, plus effects of oil and gas-related activities adjacent to Sakhalin II, plus range-wide risk factors. Some experts commented on MMPP 2005 and concluded that assessment of cumulative impacts has been too superficial, both in terms interactions between risk factors arising from Sakhalin II and aggregation	This area of research is to be covered under the proposed industry and range state wide advisory body (a cooperative review body) as envisaged as a follow-up to the Gland workshop. In the period before this body exists, SEIC intends to convene a workshop to discuss all aspects of gray whale conservation on an annual basis. Terms of Reference for the cooperative review body are under development. Terms of Reference for the cooperative review body are under development.	Assessment of such effects cannot be contingent upon establishment of a range-wide recovery effort. An annual workshop of scientists, conservationists, and industry representatives is also not sufficient to address this need for assessment and management of range-wide cumulative impacts. Effective annual population monitoring needs to be supported to assess cumulative effects. The status of the WGW population must be evaluated annually by the WGWAP. This body shall make recommendations to ensure that all	**See issues 18.1 to 18.4.**

	of Sakhalin II impacts and wider-ranging impacts. The need to address cumulative effects also was identified at Gland, but was not discussed in detail. Cumulative impacts must be assessed and addressed through comprehensive, continued population monitoring, population modeling and review by the independent advisory body's work. The results of this work must be available for independent analysis of population status and trends, or whenever there is an indication that the population's status may have declined, whether or not the decline can be directly attributed to project activities or associated developments. Managing cumulative impacts will require a precautionary approach, as it may not be feasible to separate the influence of a single factor when multiple factors are operating.		monitoring activities provide results that contribute to this process. Efforts must be made to secure the cooperation of other oil companies in the WGWAP and in the process of assessing and managing cumulative threats to the maximum extent possible. SEIC confirmed in Vancouver that they will assist in seeking such cooperation. Because there is little or no safety margin with respect to the recovery prospects of the WGW population (see ISRP report, Ch. VII), the working principle should be that any residual negative effects of project activities, even if small, will be balanced by positive measures to help reduce other threats to the WGW population, such that cumulative threats are reduced at each step. **Status: Subsumed in issues 18.1-18.4**	
17	**Justification for PA-B location**			
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
17.1	Need ALARP demonstration for PA-B location. A position paper was disseminated prior to Gland by SEIC, but some experts found that paper provided insufficient information and others questioned shallow gas risks based on review of position paper. This issue was further discussed at Gland with additional detail presented by SEIC. Some experts requested an independent appraisal and the lenders noted that an independent review of the PA-B site selection has been undertaken by consultants on behalf of the potential lenders. The rationale for the chosen location needs to be fully documented, as this decision is a key determinant of the level of risk to gray whales and their Piltun foraging area.	The PA-B position paper issued prior to Gland (12). The main issues relate to shallow gas risks, seabed integrity and reservoir access within technical constraints. The GCA report provides independent technical confirmation of the suitability of the site (25). (REFS: 12, 25) Final views/discussions still required to confirm that this is a closed issue and provide clear documentation for the chosen site. Review of location justification by lenders' independent expert may help resolve this issue.	Issue addressed in Document 25, and not subject to further review by the independent scientists. **Status: Moot**	
17.2	HSE Case for PA-B not provided.	HSE case planned for 2005. Need to discuss what of significance may be presented in the HSE Case?	**Status: Subsumed under oil spill risk impact assessment (issue 11.1 and 11.4).**	**See issues 11.1 and 11.4.**

18 Oversight and Forward-Looking Studies				
Need for independent oversight of ongoing and future works				
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
18.1 **18.2**	An independent advisory body is needed to review ongoing and future works, monitoring, mitigation, and research (written response by some experts to SEIC documentation prior to Gland Workshop). The advisory body should consider wider aspects of protection, including cumulative and range-wide impacts and management. It was agreed at Gland that the ToR for such a body be developed. The terms of reference for this independent advisory body must include mechanisms to address declines in the population even when they cannot be attributed directly to project activities. The terms of reference also must address issues related to composition of the body, timetable for establishment and operations, provision of resources to support the body, and agreement in principle for industry cooperation, including access to data and project sites. Need for oversight of observer programmes. Observer programmes require independent oversight or verification of compliance to ensure their effectiveness. It is feasible that such oversight/verification might be a function of the advisory body being planned to address long-term issues. The ToR for such a group are being developed.	SEIC supports the development of a cooperative review body that will in the short-term bring together representatives from SEIC and the scientific community at an annual meeting held under the auspices of the IUCN. Awaiting Terms of Reference for the advisory body. Authority levels, independence, power of enforcement are all key issues.	Establishment of a long-term independent panel of scientists is absolutely essential. A recommended way forward that details the nature, scope and modus operandi of such a panel is appended as Appendix 2. It will address, *inter alia*, all of the remaining issues identified under Item 18 here. This panel should be established and meet as soon as possible to address the high-priority outstanding issues identified in this report, particularly with respect to reviewing the results of the 2005 season and developing recommendations for the 2006 season. The need for such a body has been recognized by SEIC. **Status: Almost resolved**	**SEIC will endeavour to progress the formation of the WGWAP with immediate effect.**

18.3	Future monitoring requirements are generally identified as follows: - monitoring of WGW population parameters; - monitoring of WGW foraging and habitat use; - real-time monitoring of behavioral responses during periods of increased noise (e.g. construction, major changes to platform structure or operations, or seismic surveys); - recording and monitoring of vessel encounters; - assessment of ocean dynamics and ecology of feeding grounds and Piltun lagoon; - contaminant levels in habitats; and - periodic surveys to detect stranded WGW. These monitoring and assessment tasks should be addressed by the Marine Mammal Protection Plan 2005 and the advisory body.			
18.4	General areas of future research requirements are identified as follows: - Distribution (wintering regions, migration routes); - Ecosystems (dynamics, anthropogenic impacts, predation); - Population properties; - Skinny whale phenomenon; - Communication systems and alarm calls; - Contamination (tissue levels). Research is also needed into the long-term response to increasing, constant noise in feeding areas. These research needs should be incorporated into the advisory body remit.			See above
19 Need for a long-term, comprehensive, international conservation strategy				
ID	**Issue**	**SEIC Response/Approach**	**Assessment**	**SEIC comment**
19.1	In addition to the independent advisory body described above, there is an additional need for a long-term, comprehensive, international strategy for the recovery and conservation of the WGW. This strategy should incorporate oil and gas operations, but also other factors that threaten the long-term persistence of this population. Such an effort is particularly important for addressing the cumulative effects of all these risk factors. Because the oil and gas industry poses significant risks to the WGW population, it should provide	SEIC supports the development of a cooperative review body that will in the short-term bring together representatives from SEIC and the scientific community at an annual meeting held under the auspices of the IUCN. Over the long-term, SEIC supports the development of an International Forum for the Conservation of the Gray Whale that will bring together representatives from all of the range states as well as broad industry-wide participation.	The terms of reference for the long-term advisory body envisage a broadening to cover all aspects of the recovery of western gray whales, not simply those in the Sakhalin region. This will involve contact and collaboration with all range states, appropriate intergovernmental organizations including IWC, IUCN and others. SEIC, the long-term advisory body and other stakeholders must co-operate in this initiative (which has also been recommended by the IWC and its Scientific Committee) as a matter of urgency. **Status: Unresolved**	**SEIC accepts to co-operate in the WGWAP and will encourage others to do so.**

	significant, ongoing support for this comprehensive strategy. Resolution of this issue should include agreements in principle regarding provision of support for the comprehensive strategy and an outline of arrangements for developing and implementing it.	Terms of Reference for the advisory body are under development.		

SEIC Comments on Appendix 1.

Independent Scientists Appendix 1	SEIC comment
Appendix 1. Noise Modeling, Monitoring and Mitigation **Additional Assessment for 3.5 and 3.6:** The SEIC stated position was that no whale was to be exposed to noise above 120 dB, and no matter what the models show the best way to ensure that they are not is with real time monitoring. Vedenev did indeed propose revised criteria, but a critical change was made by SEIC over the advice of teleconference experts. Specifically, Vedenev proposed 3 criteria that would be used to trigger mitigation and called for a 'diagnostic halt' if any of these 3 criteria were breached. His first proposed criterion was, for the band from 5 Hz – 8 kHz, if "…two or three consecutive 0.5 hours intervals average Integral Noise Level exceeds 130 dB". SEIC increased this criterion to **3 consecutive 1-hour averages**. In the 24 July teleconference, Tyack advised the group that the best data available for feeding gray whales indicated a 50% response threshold to continuous noise at 120 dB. SEIC rationalizes these integration times by stating that (document #16, pg. 8) '…potential behavioral reactions of the whales are thought to be dependent on the duration of noise exposure.' They do not, however, cite a reference for this statement, nor do they give any indication that their integration periods are consistent with this 'thought'. It may be instructive to consider the standards set for humans. The U.S. Agency for Occupational Safety and Health (OSHA) provides the following table for allowable exposure for humans in the workplace (Table 1). One must bear in mind that the actual dB levels are not directly applicable to the levels we are discussing for WGW; these figures are for in-air exposure. What we can take from this, however, is that exposure at relatively low levels for long periods is equally as dangerous as short exposure at higher intensity levels. So, to draw a comparison for WGW, a whale exposed to 130 dB for 1 hour is equivalent to being exposed to 120 dB for 4 hours. Given SEIC's adaptation of Vedenev's proposed criteria, whales within the feeding grounds could easily be exposed to 125 dB for the 3 1-hour integrated periods before any mitigation is seriously considered. Technically speaking, we should also consider the amount of energy (E) to which the whales are exposed. To do this we consider the power level (P) and the duration of exposure in seconds (Es) according to the equation $E = P + 10*\log_{10}(Es)$. For example, for exposure to a power of 130 dB for one hour, the energy exposure is $E = 130 + 10*\log_{10}(3600) = 165.5$ dB re: 1µPa²-sec, for 3 hours the energy exposure is 170.3 dB re: 1µPa²-sec (joules/m²). Considering an exposure to 126 dB, which, according to SEIC's noise action criteria, could go on indefinitely, in 7 hours the whales would be exposed to the same amount of overall energy, not to mention being exposed that entire time to 2X the power (i.e., 6 dB) levels known to result in 50% avoidance response in feeding gray whales. TABLE 1 (OSHA Table G-16) - PERMISSIBLE NOISE EXPOSURES (1) Duration per day, hours | Sound level dBA slow response 8 — 90 6 — 92 4 — 95 3 — 97 2 — 100 1.5 — 102 1 — 105 0.5 — 110 0.25 or less — 115 Footnote(1) When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C(1)/T(1) + C(2)/T(2) C(n)/T(n) exceeds unity, then, the mixed exposure should be considered to exceed the limit value. Cn indicates the total time of exposure at a specified noise level, and Tn indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.	**The SEIC noise impact criteria are stated in Annex 1 of the 2005 Mammal Protection Plan and are phrased in terms of impact to whales, not in terms of absolute sound levels at the edge of the feeding ground.** **SEIC also notes that due to the additional knowledge gained during the Lunskoye Concrete Gravity Base installation, SEIC were confidant that planned sound levels (and impact criteria for whales) would not be exceeded during the Piltun Concrete Gravity Base installation. During installation, proactive investigation of noise levels occurred earlier and at lower levels than the stated criteria, and that at no time during the operation were threshold criteria reached.**

Appendix 2. Co-Operative Framework for the WGWAP

BACKGROUND

1. The critical status of the western North Pacific gray whale (WGW) population is well known. The total population numbers only around 100 individuals and may include only 20-25 reproductive females. Little is known about its breeding grounds or migration routes; its only known feeding grounds lie along the coast of north-eastern Sakhalin Island. These feeding grounds are occupied typically from late May/early June until November. Existing and planned large-scale gas and oil activities occur in this region and may pose a serious threat to its survival. Threats also occur from other human activities (e.g. fishing) and in other areas of its range (e.g. the coastal waters of Japan where three deaths were recorded in 2005 alone).

2. A positive aspect of the oil and gas activities off Sakhalin Island is that they have facilitated an unprecedented effort to study and monitor the WGW population. As a result, this population has changed from being one that was almost completely unknown prior to the 1990s to one now that is among the better-studied baleen whale populations in the world. Moreover, world attention has been brought to its conservation status and the threats it faces. As part of an effort to minimise or eliminate the potential effects of oil and gas developments on the WGW population while in their feeding grounds, an independent scientific review panel (ISRP) was established in 2004 under the auspices of IUCN at the request of and in cooperation with Sakhalin Energy Investment Company (SEIC), responsible for the Sakhalin II oil and gas development. Among other things, members of the ISRP, Sakhalin Energy, potential international lending institutions, and some nongovernmental organisations (NGOs) have agreed that a framework is needed for provision of expert scientific and technical advice pertaining to Sakhalin II Phase 2 and its potential effects on the WGW population, in addition to that which Sakhalin Energy already uses with respect to WGW conservation.

   The purpose of this document is to specify the terms of reference and general working methods for an independent panel of scientists, hereafter referred to as the Western Gray Whale Advisory Panel (WGWAP), that will provide such a framework.

OBJECTIVES

3. The over-arching objective is to create a framework for coordination and cooperation between all interested parties that builds upon and expands the ISRP process, with the ultimate aim of assisting the conservation and eventual recovery of the WGW population. In particular, the aim is to provide the best scientific and technical advice to all relevant decision makers as well as the wider community, and to facilitate implementation of effective conservation measures by providing independent, scientifically-based advice and recommendations with respect to human activities and the conservation of the WGW. The independent WGWAP will be at the core of this framework.

4. The initial focus of the WGWAP will be on activities on the Sakhalin shelf that may impact upon the potential survival of WGW. However, as knowledge accumulates, resources increase, and the appropriate stakeholders from across the range of the WGW become involved, this should broaden to include the whole range of the WGW.

PRINCIPLES

5. In the relationship between conservation and development, every effort must be made to ensure that development activities are risk-averse and minimise negative impacts on biodiversity. It is important that conservation recommendations are made and management decisions are taken with openness and transparency; it is also important to recognise that the consequences of any decisions must be monitored and, if necessary, decisions must be modified over time.

6. The recommendations, advice and guidance regarding WGW conservation provided by the WGWAP shall:

   (1) involve the best local, national and international scientific expertise;
   (2) be derived from the best scientific methods, data and information available;
   (3) be both impartial and seen to be impartial; and
   (4) be developed and shared in a transparent manner.

   To ensure conservation of the WGW population, it is important that the oil and gas companies and other parties and stakeholders participating in the WGWAP process agree to implement its recommendations to the fullest extent possible. Furthermore, all parties should encourage all oil and gas companies, other industries and all researchers active on the Sakhalin Shelf area to participate in the WGWAP process, especially where the sharing of data and information would make a significant contribution to the work of the WGWAP.

TERMS OF REFERENCE

7. To provide the best recommendations, advice and guidance in the future, in a transparent manner, and to ensure that this input results in meaningful change, it is important that the WGWAP is not merely a review body but one that is pro-active as described below.

8. Using the best available data and information, and taking into account whether the project studies, assessments and proposed mitigation plans (1) take account of the best available scientific knowledge, identify information gaps, and treat both existing knowledge and information gaps in a manner that reflects an appropriate precautionary approach and (2) are adequate for the proposed activities not to have significant impacts on WGW, the WGWAP will:

   (i) provide recommendations for establishing new, coordinated and focussed research programmes (including reviewing existing programmes) on matters relating to the biology and status of the WGW and associated biodiversity, in the context of trying to ensure the ultimate recovery of this population;

   (ii) review existing and new research and monitoring programmes and their results and provide recommendations and advice when necessary;

   (iii) review the effectiveness of (a) existing mitigation measures as determined from associated monitoring programme results, and (b) the likely effectiveness of proposed mitigation measures and provide recommendations regarding modifications, alternatives or the development of new measures;

   (iv) play a role in co-ordinating research in order to:
   - achieve synergies between multidisciplinary field studies;
   - reduce disturbance to WGW due to overlapping of field research programmes;
   - identify and mitigate potential risks associated with scientific research activities; and
   - maximise the contribution of research activities to the understanding of the status and conservation needs of the WGW population.

   (v) provide scientific, technical and operational recommendations it believes are necessary for conserving the WGW population.

   In carrying out its functions, the WGWAP will recognise the role of the Russian Government and relevant regulatory agencies with regard to project development and WGW conservation.

MODUS OPERANDI

Composition

9. The WGWAP needs to bring together the best scientific and technical knowledge in a way that is impartial and transparent, and that ensures the independence of its participants. Efficiency also dictates that the size of the WGWAP should be limited. To obtain the best scientific advice requires input from the most appropriate scientists, including those working in the field, irrespective of their sources of funding. However, it is important to ensure that any impressions of possible conflicts of interest are dispelled. In order to achieve this the WGWAP shall:

   (i) be established under the auspices of an appropriate Convening Body (see section on Convening Body below);

   (ii) comprise an accredited independent core group whose members, individually or collectively may resign at any time (if they wish, a statement of reasons will be made public) by notifying the Convening Body, and

   (iii) include invited participants (see below) at its meetings and / or workshops or other intersessional activities, as appropriate.

   Invited participants must have the necessary scientific expertise to contribute to the work of the WGWAP. They can be nominated by any of the relevant stakeholders (e.g. industry, lenders, local or national governments, local, national or international NGOs, or national groups of experts that oversee the WGW monitoring, research and conservation programmes in the range countries) or by the WGWAP itself. Invited participants can participate fully in the discussions of the WGWAP (but see below with respect to differences of opinion on recommendations). The final decision on the suitability of invited participants rests with the Convening Body and the core group.

Meetings and Reports

10. The WGWAP should meet at least once a year and, to the extent possible, the report of its deliberations should be finalised at the meeting and made public via the Convening Body (through its website) as soon as reasonable afterwards. It may also hold workshops or form working groups on specific topics from time to time as necessary. The timing of such meetings should be such to ensure that a full review of results and mitigation measures occurs sufficiently in advance to influence planning, procedures and activities.

11. Where possible, recommendations should be developed by consensus among WGWAP core members and invited participants. If there is a division of opinion, the official recommendations will be those developed by the WGWAP core group. Differences of opinion will be reported. If these differences are the views of invited participants they will be included as authored annexes to the main WGWAP report. Documents submitted to the WGWAP should normally be made publicly available at the same time as the report of the WGWAP unless exemption is requested.

Information Availability

12. In order to provide the best scientific and technical recommendations, advice and guidance, it is necessary to have access to all of the relevant information, whatever its source – industry, academic, contractor, NGO etc. This will require the cooperation of those collecting and generating relevant information and data. It is essential that the rights of those involved in the collection of data are respected (e.g. to first publication and with respect to commercial and legal sensitivity). To achieve this, a set of rules on information and data availability are required . These shall be based on the following principles:

    (1) Data represent a significant temporal and financial investment – use of data by others than those who originated the data should be accompanied by appropriate safeguards,

    (2) The right of first publication is a generally accepted scientific norm,

(3) If recommendations are to be made that have important implications for both conservation of WGW and industry, they should be based on a full scientific review of both data quality and analysis that can be independently verified.

13. Whilst the results of analyses of the data and broad summaries of the data may be included in WGWAP reports if required to explain the rationale for recommendations, the raw data themselves will remain confidential and the property of the data collectors. The information and level of resolution of the data to be made available to the WGWAP should be determined by the WGWAP and will depend on the analysis required. All pertinent data and information will be made available to all WGWAP participants – core group members and invited participants (under appropriate conditions – see 15 below). This will ensure full transparency and accountability.

14. Data may be subjected to quality assurance by the WGWAP if otherwise it might be excluded from consideration on these grounds alone.

15. Members will be bound by a confidentiality agreement that ensures inter alia that confidential commercial information is kept within the group and that rights to first publication in the literature are respected; however, the agreement will not preclude the WGWAP from reporting any conclusions relevant to the review that it may draw from such information, providing none of the commercially sensitive or proprietary information is disclosed in such conclusions, whether they be oral or written.

Sustainable and Transparent Funding

16. The WGWAP's objectives require sustained and transparent funding. Funding commitments, preferably medium to long term, need to reflect this. Whilst there are many interested parties in the WGW issue, there are few able to commit substantial funds for the establishment and running of the WGWAP. It is important to try to ensure that funding for the WGWAP comes from more than one source.

17. To preserve impartiality, a similar process to that developed for the ISRP should be followed, i.e. a special fund established to which stakeholders contribute. Allocation of those funds is the responsibility of the Convening Body in consultation with the WGWAP.

Convening Body

18. The WGWAP should be convened by an organisation with the following credentials:

- International standing,
- Scientific and technical credibility,
- Capacity to effectively link to the range of relevant stakeholders including the public,
- Ability to establish and guard the independence of the group,
- Capable of convening parties throughout WGW range states, and
- History of working on the issue.

Although it is recognised that IUCN has diverse sources of funding, including industry (including Shell, the operator of SEIC), NGOs and government agencies, it is recommend that IUCN be asked to assume the role of Convening Body.

CONCLUDING REMARKS

19. It is essential to try to obtain the co-operation of all stakeholders in this process. It is especially important to try to ensure the participation of all relevant oil and gas industry companies, not just Sakhalin Energy. However, if this is not initially possible, then it is important that the process begins and the precedent for best practice be set. The WGWAP

should be seen as a long-term process, and established for as long as it deems necessary to promote conservation and recovery of the WGW population, i.e. for as long as threats remain.

20. The WGWAP must meet in time to review the results of the 2005 Sakhalin Energy season so that any recommendations can be made in a sufficiently timely fashion to influence the 2006 operational season.

Appendix 3. Participants List

Independent Scientists

Bob Brownell	
Justin Cooke	
Jim Darling	
Greg Donovan	
Sue Moore	
Doug Nowacek	
Tim Ragen	*Co-Chair*
Randy Reeves	*Co-Chair*
Alexander Vedenev	
Dave Weller	

Lenders

Alistair Clark	*EBRD*
Jeff Jeter	*EBRD*
Martin McKee	*ECGD*
Yukihisa Hayakawa	*JBIC*
Takeshi Tada	*JBIC*
Hirobumi Takaoka	*JBIC*
Tiffin Caverly	*US Exim*
Jon Hancox	*AEAT, Consultant to Lenders*
Bruce Mate	*Scientific Consultant to AEAT*
Helen Lawrence	*AEAT, Rapporteur*

Sakhalin Energy Investment Company

Lisanne Aerts	*Marine Mammal Specialist*
Tatyana Konovalova	*Environmental Specialist*
Michael Macrander	*Business Team Manager, Environmental Ecology & Response, Shell Global Solutions*
Andy Pearce	*HSES General Manager*
Jamie Robinson	*HSES Corporate Environment Manager*
John Wardrop	*HSES Oil Spill Response Manager*
David Bonsall	*Risktec, Consultant to SEIC*
David Dickens	*Consultant to SEIC*
Glenn Gailey	*Consultant to LGL*
Michelle Gilders	*LGL, Consultant to SEIC*
Steve Johnson	*LGL, Consultant to SEIC*
Jerry Neff	*Consultant to SEIC*
Roberto Racca	*Acoustician, Jasco Research Ltd, Consultant to SEIC*
John Richardson	*LGL, Consultant to SEIC*
Bernd Wursig	*Consultant to LGL*
Jeremy Young	*Consultant to SEIC*

Observers

Matt Bateson	*EA General Manager, SEIC*
Michael Clark	*Project Finance Manager, SEIC*
Alex Elson	*HSE/SD Lender Interface Manager, SEIC*
David Greer	*Deputy CEO and Sakhalin II Project Director, SEIC*
James Leaton	*WWF*

Deric Quaile *IUCN*

Appendix 4. Reference Documents

Some documents are marked 'CONFIDENTIAL'. The reason for this is that they contain information that may have business sensitive information. Should members of the panel wish to quote directly from these documents, SEIC must first grant approval.

(1)
0000-S-90-04-0-0006-00
Corporate Standard for Hazards & Effects Management Process (HEMP)
February 2005
26 pp

This document defines Sakhalin Energy's minimum requirements for use of the Hazards and Effects Management Process (HEMP). It requires that the hazards associated with all activities be properly identified and controlled in a manner that reduces risks to people, assets and the environment to a level that is as low as reasonably practicable (ALARP) in conformance with the HSE Commitment & Policy.

(2)
0000-S-90-04-P-0027-00-E
HSE Commitment & Policy
July 2003
5 pp

In 2001, Sakhalin Energy introduced a new HSE Policy and Commitment as a part of an HSE Management System. The main purpose of the document is to demonstrate that HSE does play one of the leading roles in the Company's business. We want to emphasize that we are very serious about the positive approach to environment protection and health and safety of our staff and contractors.

(3) CONFIDENTIAL
0000-S-90-04-P-7049-00-E
SEIC Unified OSR Response System (OSR Strategy Document)
June 2004
9 pp

The OSR System encompasses, and is to be applied to, all the SEIC facilities and assets at both the construction and operation phases. The OSR System ensures compliance with the statutory requirements of the Russian Federation and the Sakhalin Region, international conventions in force within the RF and application of best international practice with regard to OSR. The SEIC OSR System ensures that all oil spill response organizations, plans and procedures comply with *the Russian System of Prevention and Response to Emergencies (RSChS*). This applies to all supervisory bodies and oil companies functioning in the territory of the Sakhalin Region, international resource centres and specialized OSR companies. The OSR System combines the OSR management bodies and resources of all SEIC facilities. The OSR System maintains preparedness of the management bodies, equipment and personnel of the Company to respond to potential oil spills and ensures efficient response actions in case of a real oil spill.

(4)
0000-S-90-05-T-7006-00-rev02
Acoustic Model Validation
February 18, 2005
35 pp

This report describes the Parabolic Equation (PE) acoustic model used in Sakhalin Energy's 2004 noise programs and presents the validation work that was performed to choose geoacoustic parameters so that model predictions agreed with transmission loss measurements made in the Piltun environment offshore Sakhalin Island. The acoustic propagation model is based on a 2-D (range and depth) split-step PE algorithm (Collins, 1993) which treats compressional wave propagation in both the water and seabed. Collins' model has been extended for this work to include shear wave losses in reflections from the seabed using a complex density approach. The model results have been fit with transmission loss data collected at Piltun in 2004 over several propagation tracks leading from locations on proposed pipeline routes and ending at test locations within and near the whale feeding area.

The model engine has been incorporated in an automated software package that predicts cumulative spatial distributions of underwater noise produced by multiple sources operating simultaneously. An integrated source level database contains the 1/3-octave source levels for a large number of vessels and platforms. This overall package, including the source level database and computational model engine, has been validated through a comparison of model predictions against measurements taken in 2004 in the vicinity of pipelaying and dredging operations at Lunskoye. The validations of the underlying model and of the integrated model software package establish confidence in the results of predictive modelling at Piltun.

(5)
1000-S-90-04-P-7057-00-01
Construction Oil Spill Response Guidance
August 2003
11 pp

During the construction of Phase II assets in the marine environment [offshore pipelines, TLU, PA-A, LUN-A] there will be a number of vessels operating within a relatively confined area of open water. There is potential for marine accidents, including vessel collisions, interactions with deployed equipment, vessel grounding, and chronic oil and fuel spills, and unless carefully managed may lead to adverse environmental impacts.

Contractors must ensure that all marine-based activities are carried out in compliance with the highest standards of safety and industry association guidelines. As part of this compliance, detailed written oil spill response plans and training programmes must be established and tested in advance of any activity taking place within the marine environment. These plans will be appraised and must be approved by SEIC prior to their implementation. The Contractor must be aware of current Russian Federation legislation on oil spill response, particularly Regulations 613 and 240, and any legal implications and response requirements this conveys.

This document outlines the risk assessment, oil spill response organization, incident response strategy, OSR equipment and resources, waste management etc. that need to be addressed by contractors.

(6) CONFIDENTIAL
0000-S-90-04-T-7446-00-P1

Comparative Quantitative Risk Assessment of Piltun Alternative Offshore Pipeline Routes
November 27, 2004
85 pp

The scope for this risk assessment was to compare oil spill risk from current operations (Phase I) with proposed operations (Phase II), and to compare the oil spill risk from the three PA pipeline options against one another. A Quantitative Risk Assessment (QRA) has been undertaken to achieve this aim. The consequences of oil spills to sea on the environment are addressed by others. The QRA identified hazards and causes of hazard releases for:

- Phase I assets including the Piltun-Astokh (PA) A platform, the PA-A platform to SALM pipeline, the Floating Storage and Offtake vessel (FSO), and shuttle tankers operating within 150km of PA-A; and
- Phase II assets limited to the PA-A and PA-B 14" offshore oil pipelines.

The assessment finding included that:

- There is no significant difference between the three PA pipeline routes in terms of release frequency, maximum credible spill volume, or oil spill risk.
- The offshore release frequencies for Phase II are an order of magnitude lower than for Phase I.

(7) CONFIDENTIAL
1000-S-90-01-S-1502-00-01
Project Specific Technical Specifications (PSTS) for Sakhalin II Offshore Pipeline Design
May 2002
43 pp

The objective of the PSTS is to establish norms, rules and design methods, which shall ensure construction and operation safety of offshore pipelines for the Sakhalin II Project.

The PSTS is intended for:
- accounting for specific natural conditions of the Sakhalin Island shelf;
- use of contemporary international achievements in design, construction and operation of offshore pipelines;

The field of the PSTS application is offshore pipelines manufactured of steel pipes and components. The PSTS covers the following offshore facilities:

- pipelines for the transportation of gaseous hydrocarbons;
- pipelines for the transportation of liquid hydrocarbons with the exception of liquefied natural gas;
- pipelines for the transportation of mixtures of gaseous and liquid hydrocarbons;
- pipelines for the transportation of mono-ethylene-glycol;
- pipelines for the transportation of non-flammable liquids
- power and communication cables;
- units for launching and receiving of pipeline cleaning and diagnostic pigs;
- valves and fittings located on connections of pipelines with other equipment as well as on tie-ins.

(8)
1000-S-90-04-P-0048-00-E-03

Marine Mammal Protection Plan
July 29, 2005
58 pp

Sakhalin Energy considers marine mammal protection an important issue that will remain relevant for the full duration of the Sakhalin offshore oil and gas development (predicted as approximately 50 years). It is of particular relevance during the planning and full-scale field development stage over the next 5 to 10 years.

The focus of this marine mammal protection plan is primarily on the critically endangered Okhotsk-Korean or Western North Pacific (western) population of gray whales (Hilton-Taylor 2000). The reason for this is that the only two currently known feeding areas of this critically endangered species are located along the NE coast of Sakhalin Island close to Sakhalin Energy's planned oil and gas developments.

Sakhalin Energy developed the first protection plan in 2001 in analogue to a "habitat conservation plan" as defined by the U.S. Fish and Wildlife Service (USFWS) and the U.S. National Marine Fisheries Service (NMFS) (USFWS and NMFS 1996). A "habitat conservation plan" is a requirement of the U.S. Endangered Species Act when a proposed activity may have impacts on an endangered species in the United States or in International Waters by a United States entity. Although there is no regulatory requirement to develop a "habitat conservation plan" or similar plan in Russian waters, Sakhalin Energy has agreed to develop this marine mammal protection plan and to implement mitigation strategies, protection measures and continued monitoring programs to reduce the possibility that its activities may cause harm to the critically endangered western gray whale. Since 2001 the protection plan has been updated in 2002, 2003 and, in 2004, two separate activity specific protection plans were developed for offshore construction at Lunskoye. The current 2005 marine mammal protection plan incorporates new information from the 2003 and 2004 data of the western gray whale research and monitoring programme, data from the extensive 2004 acoustic programme, technical developments of offshore activities and evaluation of 2004 mitigation measures applied during Lunskoye construction.

This version of the protection plan is updated with the recommendations of mitigation measures following an independent review-audit of the marine mammal observers programme. It also includes SEIC's Noise mitigation approach specified for the CGBS installation in a separate annex. The purpose of this annex is to specify SEIC's approach to managing noise levels during Piltun 2005 construction activities and to inform those directly involved in implementing the response actions established in this procedure. This chapter describes in detail the action criteria that will be used at the construction and monitoring stage during Sakhalin Energy's 2005 Piltun construction operations. These action criteria that will be applied in the field on a real time basis have been developed as a control mechanism to meet the impact assessment criteria that have been used at the design / planning stage.

(9)
Piltun CGBS Install Noise Monitoring Summary Report
September 3, 2005
22 pp + 44 pp appendices

This report presents noise level measurements acquired during Sakhalin Energy's installation of the Concrete Gravity Based Structure (CGBS) for the Piltun-Astokh B (PA-B) platform. This platform is located approximately 7 km East of the Western Gray Whale feeding area offshore Piltun Bay, Sakhalin Island. An acoustics team from the Pacific Oceanological Institute,

Vladivostok, and from JASCO Research Ltd, Canada, has acquired and documented the field measurements in accordance with Sakhalin Energy's noise management strategy (Noise Management Strategy, SEIC 2004_0000-S-90-04-T-7058-00-rev01) and 2005 Noise monitoring plan (2005 Offshore Construction Noise Monitoring Plan, SEIC 2005_0000-S-90-04-P-7057-00 rev 02). The Piltun acoustics monitoring project commenced July 8, 2005 prior to the start of construction activities associated with installing the Concrete Gravity Based Structure (CGBS). It has been successful at obtaining high quality measurements of the underwater noise produced by several specific offshore construction activities. The primary goals of this monitoring operation are:

1) To measure in real time the noise levels inside the WGW feeding area generated by CGBS installation, so that mitigation procedures could be implemented if levels exceeded predefined action criteria (Annex 3 of Marine Mammal Protection Plan). The criteria were based on sound level thresholds proposed by IUCN scientific panel member Dr. A.I. Vedenev, exposure time periods proposed by SEIC's scientific consultants and discussions with bioacoustics and whale specialists during separate teleconferences.
2) 2) To verify that the received noise levels at the outer edge of the Piltun feeding area are in accordance with the noise predictions generated by the acoustic noise model, applied during the design and planning phases for construction activities.
3) To acquire a record of noise level data through all operations associated with CGBS installation. These data are to be analysed in a post-field assessment, in conjunction with analyses of concurrent biological whale behavioural and distribution studies, to assist in planning and design of future offshore operations.

The present report provides an overview of the noise monitoring programme and presents results obtained between July 21 and August 22, 2005. Most construction activities were completed by August 8, with the exception of scour protection installation which is still in progress as of August 29. Acoustic monitoring of this operation is ongoing.

(10)
1000-S-90-04-P-7000-00-E
SEIC Corporate HSE Plan for 2005-2009 HSES Strategy
30 pp

In 2005, Sakhalin Energy will continue to be fully engaged in managing and supporting the main construction effort required to deliver the landmark Sakhalin II Phase 2 project whilst continuing to operate the Phase 1 facilities safely and efficiently. With tight design, construction and installation deadlines, efforts need to be made to ensure HSES discipline is maintained to prevent incidents, protect the Company's reputation and maintain SEIC's licence to operate. The 2005 Health, Safety, Environment and Security Plan and Strategy have been developed to ensure that the Company's HSES objectives and targets are achieved in 2005 and beyond.

Health, Safety, Environment and Security are key elements of SEIC's business objectives and those of the Sakhalin II Phase 2 Project. The Company's HSES objectives and targets are aimed at ensuring that a robust HSES Management System is working effectively with continuous improvement. In order to achieve the HSES Objectives and Targets, working level HSES plans will be developed within SEIC to complement the Objectives and Targets and to define how these will be managed. These HSES Plans, along with individual HSES Tasks and Targets will provide the basis against which Company, Asset, Project, Contractor and individual HSES performance will be measured.

Throughout 2005, there will be continued focus on the labour intensive construction work in a physically and environmentally challenging arena. This HSES Plan reflects this focus on these potentially hazardous activities. The use of the SEIC HSES-MS and Project Management Controls are the fundamental bases for managing these hazards. The successful implementation of this plan will require visible and effective engagement between HSES staff at all levels in SEIC, contractors and subcontractors in order to support their respective line managements in improving HSES performance.

(11)
1000-S-90-04-T-7052-00
Operational HSE Cases – Demonstration of ALARP
June 2, 2003
8 pp

EP95-0310 requires that operations and installations identified as critical will have a documented demonstration (an HSE Case) that risks are as low as reasonably practicable (ALARP). This requirement is set out for Sakhalin Energy in 0000-S-90-04-O-0006-00, Corporate Standard for Hazard and Effects Management Process (HEMP)

This requires activities as follows:

1. During concept selection, FEED and detail design stages, the design should be verified as providing risk levels that are tolerable (in relation to the SEIC risk tolerability criteria) and ALARP. This requires HEMP reviews of individual elements and of the overall design, together with a documented demonstration from the designers that ALARP reviews have been carried out and the appropriate options to achieve ALARP risk levels selected.
2. Operating philosophy and procedures should be reviewed to ensure that risks from operational issues are also tolerable and ALARP.
3. The HSE Case shall then document the processes and results of these HEMP studies and ALARP reviews to provide the formal demonstration of ALARP.

This document provides guidance over the process to be adopted in creating the HSE Case to demonstrate that risks are tolerable and ALARP.

(12) CONFIDENTIAL
3100-S-00-02-T-0001-00-01
PA-B Platform Location and Shallow Hazards Review
February 28, 2005
34 pp

The purpose of this note is to bring together and summarize the work done to review the shallow hazards impacting on the selection of location for the PA-B platform, and the case that was made to demonstrate the absence of shallow gas at the selected location.

The work summarized here took place during 2001 prior to final selection of the PA-B location for the Basis of Design (BoD). No relevant new data has been acquired since this work was completed. An evaluation of additional risk reduction measures is included to demonstrate that remaining risks are ALARP, in line with the SEIC HSE Management System (Part1, Chapter 4 on Hazard and Effects Management).

The PA-B location has been selected taking account of a range of considerations, specifically;

- subsurface aspects
    - minimum total well length for development drilling
    - maximum feasible drilling reach
    - uncertainty in reserves distribution
    - shallow gas hazards
    - shallow faulting
- surface aspects
    - rigidity of sea bottom; avoid palaeo-channels filled with soft clay
    - presence of loose Quaternary cover prone to liquefaction during earthquake

The selected location avoids all seismically visible shallow hazards (faulting and shallow gas) and the residual risk of encountering shallow gas is considered very low (<3%). The drilling of a pilot hole as the first shallow section on the platform ensures that remaining risks are as low as reasonably practicable (ALARP).

(13)
5025-E-90-04-P-7018-00-03
Sakhalin II Phase 2 Development Project, Offshore Pipelines and Cables
May 2005
76 pp

This Oil Spill Prevention and Response Plan (OSRP) describes how CONTRACTOR will manage oil spill prevention and response during the construction and pre-commissioning phases of the offshore components (pipelines and cables) of the Sakhalin II, Phase 2 Development Project.

The OSRP includes a review of oil spill risks, identifies the sensitive receiving environments, as well as describing the organisation, communication, response equipment, procedures and actions that will be implemented in the event of an oil spill.

The CONTRACTOR scope of work consists mainly of the tasks listed below:

- Performing the shore approaches and the shore crossings of the pipelines and cables;
- Laying / burying the offshore pipelines and cables according to the required "cover thickness"
- and stabilising them;
- Connecting the different pipelines and cables to the offshore platforms;
- Installing on the offshore platforms the associated (temporary) pig traps and piping; and
- Pre-commissioning / testing the pipelines and cables.

This plan is structured as follows:

- Chapter 1 describes the scope of the OSRP and provides a project overview.
- Chapter 2 describes the responsibility and authority related to this document.
- Chapter 3 lists abbreviations and definitions used in the present document in order to clarify all the terms reported in the OSRP.
- Chapter 4 describes the reference sources upon which the OSRP has been based
- Chapter 5 describes the activities in order to properly manage all the aspects associated with oil spill prevention and response.

(14)

5025-S-90-01-T-0046-01-01
Offshore Pipelines 2003 Sediment Transport Study
February 2, 2004
60 pp

The purpose of this study is to identify areas of sediment movements - if any - and estimate the associated relative seabed level changes in such areas identified over parts of the PA-A lateral, PA-A to PA-B and Lunskoye pipeline routes in water depths in excess of approximately 10m. In order to investigate the possible movement of these sediments a comparison of SEIC multibeam bathymetry has been undertaken. In addition, a comparison of side scan sonar data was made along the PA-A lateral route.

(15)
5025-E-90-01-T-6730-00-P1
Sakhalin II Phase 2 Development Project, Offshore Pipelines and Cables, Piltun Offshore Pipelines Evaluation, Phase II – Alternative Routes
November 25, 2004
66 pp

In this report are reported the findings of a series of engineering analysis carried out to document the ability of bottom roughness and, where and if needed, purpose made “sumps” to stop oil spill caused by incidental rupture of the Piltun oil pipelines.

The engineering analysis includes:

- calculation of Late Time Loss rate from an horizontal pipe length;
- calculation of critical slopes of seabed profile between crests and adjacent filling
- troughs of seabed undulations, where oil outflow is stopped by seawater intrusion
- filling the pipe section;
- calculation of the lowerability of the Piltun oil pipeline into a post-trench to be built on
- the bottom of the pre dredged trench, below the burial depth form ice design, in order
- to make an artificial “sump”;
- calculation of the response of the oil “rod” inside the pipe under the cyclic variation of
- seabed pressure caused by surface waves.

(16)
5052-S-90-04-T-0020-00-E
Noise Mitigation Strategy Relevant to Sakhalin II Construction and Operations (JASCO)
October 5, 2004
39 pp

This report provides a portfolio of noise control strategies that may be pertinent to mitigating noise from offshore activities planned as part of Phase 2 of the Sakhalin II project. The sources of potential impacts on western gray whales of greatest concern are the presence and movement of numerous vessels and underwater noise generated during construction and operations phases of the project. Noise will be generated by the following sources:

- installation of pipelines and cables, which will involve numerous vessels, operating continuously during the open water seasons of 2004 and 2005;
- construction of a temporary landing facility at Lunskoye in 2003, which will involve dredging and pile driving;

- towing and installation of the PA-B and LUN-A platforms and the TLU in Aniva Bay;
- construction of a jetty in Aniva Bay, which will involve dredging;
- noise generated on platforms, by drilling and other sources;
- tanker traffic in the PA field until 2006, and in Aniva Bay for the duration of the project;
- supply vessels and auxiliary vessels for undersea inspections, maintenance operations, diving
- operations, and towing LNG carriers and crude oil tankers; and
- air traffic, most notably helicopters to transport personnel to and from the platforms.

If results from the 2004 Noise Monitoring and Noise Scenario Modeling Programs determine that the noise characteristics of the planned operations under "normal" operating conditions will be marginal or incompatible with the environmental restrictions they may not go ahead unmitigated. This portfolio will be used as a guide to develop practical noise control solutions to mitigate predicted adverse noise impacts to as low as reasonably practicable (ALARP) levels.

This report does not address specific sources of noise as the 2004 monitoring and scenario modeling programs were not available at the time of its issue. As such no specific adverse impacts have yet been identified. Once potential adverse impacts are identified, the process outlined in Appendix A will be activated to design and introduce specific reduction or mitigation controls to improve environmental noise to ALARP levels.

(17) CONFIDENTIAL & DRAFT
ATMOS Pipe Leak Detect System Evaluation
September 5, 2005
7 pp

This report, prepared specifically for Sakhalin Energy Investment Company, Ltd. (SEIC), is intended to present an evaluation of the ATMOS PIPE leak detection technology and its applicability to the SEIC pipelines in contrast with other leak detection technologies used in similar pipeline environments. The technology has been evaluated with regard to its applicability on the pipelines interconnecting the PA-A, PA-B and LUN-A platforms (including the Mono Ethylene Glycol [MEG] line) with the Oil Production Facility (OPF) located on-shore. Additionally, the 24" Southern Oil Line connecting the OPF and the Oil Export Terminal (OET) facilities, as well as the OET to Tanker Loading Unit (TLU), has also been considered. This report contains the professional opinion of UTSI International Corporation pertaining to the applicability of ATMOS International's approach to leak detection on these lines, and compares the proposed solution with leak detection methodologies implemented on other similar pipelines. The opinions presented herein are based upon UTSI's extensive background and experience with leak detection systems applied to liquid, gas and multiphase transmission pipelines along with information presented in the ATMOS International Functional Design Specification (FDS) for the Northern Gas Pipeline (R03-22-37-FDS-001)1, dated 26 April 2005, and its Leak Sensitivity Study (5000-Z-74-71-T- 5406-00-P3)2, dated 18 June 2004. These documents have been used to provide an understanding of the proposed capabilities of the ATMOS PIPE leak detection application as applied to these lines. Descriptions of the ATMOS technology presented herein have been adapted from general technical documents produced by ATMOS International.

UTSI's finds nothing to suggest the solution proposed by ATMOS will not work as specified in the previously referenced Functional Design Specification and the corresponding Leak Sensitivity Study documents. The ATMOS technique is well suited for the subject pipelines and presents a performance advantage over other techniques (i.e., real-time models, compensated volume/mass balance, etc.) for the multiphase lines due to its statistical nature, and the fact that it should not be significantly affected by multiphase flow characteristics that can be very difficult to manage, even with a real-time model. The ATMOS technique is expected to provide sensitivity comparable to that of a model-based technique in the very low ranges of detectability (i.e., at or near the minimum detectable limit and also at the upper ranges corresponding to a large leak); however, in the mid-range, its detection times will likely be longer compared with non-statistical based leak detection techniques, particularly real-time model compensated mass balance techniques due to the goal of maintaining a very low false alarm rate. This is particularly apparent in the time to detect leaks in the range of 5% to 20% of nominal flow, and possibly extending into the 2% range as well. With most real-time model based techniques we are familiar with, one would expect detection time in this intermediate range to be shorter than the time projected by ATMOS in the referenced documents. However, the sensitivity study performed by ATMOS was based on an aggressive limit of no more than two (2) false alarms per year, and therefore, the calculated persistence at mid-range sensitivities needed to achieve this false alarm level would necessarily appear long in order to accommodate expected transients on the pipeline whose hydraulic disturbances would likely appear in this range. As experience is gained, and the system learns the behavior of the line, it is expected that the detection times can be reduced to achieve more rapid detection along with an acceptable false alarm rate. The ATMOS client reference list includes several long haul transmission pipelines which indicate there is sufficient industry experience to support the position that the ATMOS PIPE leak detection system can perform as indicated.

(18) CONFIDENTIAL

SEIC comments on the Independent Scientists Report of the Western Gray Whale Workshop – Vancouver, 17 – 19 Sept, 2005

5600-S-90-04-P-7601-00
2005 HSES Management Plan Pipelines Project
December 15, 2004
25 pp

This document defines the HSE work plan for SEIC Pipelines Project Team (onshore and offshore) for all activities during 2005. This document links to the SEIC Corporate HSE Plan for 2005 [1000-S-90-04-P-7086] and as such forms part of the supporting documentation to steer the overall performance of Sakhalin Energy in 2004.

The Pipeline Group's contractors will be required to align their own HSE plans with this plan.

The purpose of this 2005 HSE Management Plan is to:

- Document the HSE objectives and targets of the Pipelines group;
- Translate the objectives and targets into an HSE work programme for each Pipelines team;
- Ensure that HSE risks are managed;
- Enable the effective implementation of the HSE Management System into the Pipelines Project; and,
- Enable the Pipeline Project to meet SEIC Corporate HSE objectives and targets.

(19)
0000-S-90-04-T-7931-00-E-01
Acoustic Monitoring of LUN-A CGBS Installation
July 22, 2005
22 pp

This report presents underwater noise levels measured during the 2005 installation of the LUN-A Concrete Gravity Based Structure (CGBS) at Lunskoye. The objectives of this study were as follows:

1. To quantify received noise levels, at various distances from the source, produced by the CGBS install as outlined in the operation manual, i.e., without additional noise mitigation.
2. To validate modelled predictions of noise levels from representative installation activities.
3. To provide a direct indication of the decay with distance of the noise from the specific activities related to CGBS installation, enabling immediate conclusions to be drawn about noise levels that would be generated in a similar operation scheduled to take place at Piltun.

To achieve these objectives continuous acoustic recordings were taken along an 8-km line of sonobuoys oriented along a south-west track near the LUN-A site, for the duration of the install. The acoustic data were collected and processed by a scientific team from the Pacific Oceanological Institute, Russian Academy of Sciences Vladivostok (POI-RAS) aboard the oceanographic vessel Akademik M.A. Lavrentyev. The acoustic data were correlated to offshore construction activities, compared with model predictions and prepared for presentation by JASCO Research personnel on field assignment in Yuzhno-Sakhalinsk.

(20) CONFIDENTIAL

Risks and Controls of Oil Spills with Potential for Impact on Western Gray Whale Feeding Grounds
September 5, 2005
47 pp

This report is concerned with oil spills to the sea from Piltun-Astokhoye (PA) operations, including PA-A and PA-B platforms, pipelines and attendant vessels. Lunskoye operations, including LUN-A platform, pipelines and attendant vessels are specifically excluded. This platform is situated further from the feeding grounds and is primarily a gas/condensate producer (with a small oil rim planned for production some years into field life).

Aniva Bay Phase II Operations Liquefied Natural Gas (LNG) Plant, Oil Export Terminal (OET), Tanker Loading Unit (TLU) and associated pipeline infrastructure and Prigorodnoye bunkering activities are also excluded. This is because of their distance from the western gray whale feeding grounds. Leaks or tanker impacts in the Aniva Bay area have been assessed in the Oil Spill QRA report [ref. 1], but are not included in this report, which concentrates on potential impacts in feeding ground areas, whilst Aniva Bay is only used as part of the whales' migratory journey.

Consistent with the Oil Spill QRA report [ref. 1], the assessment has been based on the following assumptions:

• The review will not include onshore pipelines;
• Probability of pipeline release will be related to pipeline construction and types of threat, and not to release probability at specific geographical locations; and
• Winter and summer effects have been taken into account where they create basic differences between operations, or where differences appear in existing QRAs.
• Construction vessels and mobile drilling rigs have been excluded.

The potential for oil spills that could impact the Western Gray Whale feeding grounds has been assessed. Whilst it is always possible in oilfield operations for leaks to occur, leak frequency is dominated by small leaks, of the order of 1kg.

The report indicates that substantial design controls have been put in place to minimise the frequency of leaks to the sea. The potential frequency of very large leaks in platform and pipeline operations is very low.

(21) CONFIDENTIAL
EIA Addendum Chapter 2 Oil Spill Response (and Appendix of Figures)
June 13, 2005
69 pp

The risk of oil spills and potential consequential environmental damage is a major public and Government agency concern and this is shared by Sakhalin Energy Investment Company (SEIC), Shareholders and other stakeholders to the Project. The management of potential hydrocarbon spills is and will be an integral part of the detailed design of all facilities, which incorporate measures to minimise the likelihood and severity of a spill. Whilst the risk of spills is low, high performance in oil spill response (OSR) is essential for SEIC to maintain an efficient project and company reputation. To this end, SEIC has and is preparing, developing, researching and implementing a comprehensive OSR strategy as part of the overall management of OSR risk issues in the Sakhalin II Project.

Key OSR work initiatives commenced in 1999 and are anticipated to finish in 2007. OSR work is contained in a wide variety of documents including the international-style Environmental Impact Assessment (EIA), EIA-Addendum chapters, conceptual OSR planning document and TEO-C. Since the international-style EIA was prepared in 2003, the OSR planning process has been significantly developed. As well as providing supplementary information to the original international-style EIA, this chapter sets out the context of Phase 2 OSR planning and provides an update of progress in a number of areas, describes future plans and studies and serves as a useful summary of the various key work initiatives. This is therefore a complete response to concerns or requests for clarifications raised by stakeholders and interested parties during the review process.

More specifically, the chapter provides information relating to the following specific issues:

- Transboundary oil spill issues including:
    - The risk of oils spills passing from Russian into Japanese waters. This has been investigated thoroughly using computer-based oil spill trajectory modelling. Year-round risks were also investigated, including the potential transboundary transport of oil in ice;
    - The response implications of oil spills passing into Japanese waters or adverse effects on shorelines, particularly those of Hokkaido, northern Japan.
- Onshore and offshore oil spill response planning including:
    - Oil spill trajectory modelling;
    - The identification of sensitive areas;
    - The planned level of resources for oil spill response;
    - Future oil spill response related work programme.
- Risks of spills from tankers moving to and from the Aniva Bay facilities, including risks associated with tanker traffic during ice conditions;
- Leak detection in both onshore and offshore pipelines.

(22)
EP 95-0352
Quantitative Risk Assessment HSE Manual
October 20, 1995
110 pp

There are a number of different tools and techniques available within the Hazards and Effects Management Process (HEMP) for the assessment and control of industrial risk. They are not mutually exclusive, each having appropriate applications. One of these, Quantitative Risk Assessment (QRA), is a powerful decision-making tool which can assist in the selection of acceptable solutions to safety problems. This technique can be defined as the formal and systematic approach to identifying hazards, potentially hazardous events, and estimating likelihood and consequences to people, environment and assets, of incidents developing from these events. The total process of risk analysis, interpretation of results and recommendations of corrective actions is usually called 'Risk Assessment'.

In the last few years, QRA has gained a wide acceptance as a powerful tool to identify and assess the significant sources of risk and evaluate alternative risk control measures in Shell's EP business. Extensive use has been made of quantification methods such as Fault Tree Analysis and Event Tree Analysis. Physical effects modelling has also been applied extensively to estimate the severity and consequences of specific incident scenarios. Much experience has been

gained in presenting the results of all this work in a consistent and understandable format, providing interpretations of the results and recommending the most appropriate improvements.

QRA is considered a valuable tool in the decision making processes, to communicate among the experts involved, to quantify opinions and to combine these effectively with available statistical data. A properly performed risk analysis documents the best knowledge of the company's technical experts. The application of QRA has contributed not only to increased safety but also to improved cost effectiveness in many areas.

With the introduction of safety (HSE) management systems and Safety (HSE) Cases, the role of QRA in the HEMP has become more clearly defined. Few major projects are now contemplated without the risks first being quantified. This trend is expected to continue in the future with QRAs being carried out at all phases of projects from feasibility studies to refurbishment of ageing facilities, both on- and offshore.

This manual builds on the experience gained to date and provides an outline of QRA techniques and its utility in EP. The objectives of the manual are:

- to increase the awareness of the benefits, shortcomings and applicability of QRA
- to reduce misuse of the technique
- to enable setting of a scope of work for a QRA study, estimating required resources and assessing the most suitable timing
- to provide essential information to review QRA studies and interpret its results.

(23)
EP 95-0370
Integrated Impact Assessment, Environmental Impact Assessment Module
February 27, 2003
87 pp

This Environmental Impact Assessment (EIA) Guide is aimed at providing structured guidance to Shell personnel and contractors involved in the execution of an EIA, and should be viewed in the context of the Integrated Impact Assessment Guide (EP95-0378). The EIA Guide is one of three supporting modules to EP95-0378, the others being for Social and Health Impact Assessment. Supporting the EIA Module is a 'toolbox' of checklists, questionnaires, work scopes and other items of use in the planning and management of an EIA.

The requirement for EIA is implicitly affirmed in the Shell Statement of General Business Principles and explicitly affirmed in the mandatory Group Procedure for an HSE Management System (HSE-MS) which makes reference to EIA: '*Environmental (impact) Assessment …. shall be conducted prior to all new activities and facility developments, or significant modifications of existing ones'*. Furthermore, Shell has made an explicit commitment to address biodiversity in impact assessments in the Group Biodiversity Standard (established in May 2001).

By doing EIA, Shell demonstrates its commitment to the Hazard and Effects Management Process (HEMP) leading to a documented demonstration that environmental impacts and risks have been reduced to a level that is as low as is reasonably practicable (ALARP). It is also a demonstration of Shell's commitment to contributing to sustainable development, since EIA requires a systematic process for analysing and proposing measures to address the positive and negative environmental consequences of a project. The EIA should include stakeholder

engagement throughout the process, based on a well thought out stakeholder identification and engagement plan. Other key themes in undertaking EIA include:

- Key environmental sensitivities, particularly biodiversity and protected areas, should be identified in the Environment Profile undertaken at the 'Identify' phase in the Opportunity Realisation Process.

- The EIA should include a rigorous Scoping exercise, involving appropriate specialists, stakeholder consultation and culminating in a Scoping Report that ensures there is a wide consensus on the eventual shape and emphasis of the EIA.

- Baseline data collection should be on a 'fit-for-purpose' basis and the data should be interpreted in terms of their relevance to the project, future trends and general context.

- EIA process execution should include provision for the iterative interaction with project design, on the examination of alternatives and the development of mitigation to minimise negative impact and enhance positive benefit.

- The prediction and evaluation of the significance of impact should be founded on clear and transparent evaluation criteria, for the dual benefits of the project design team during the EIA and the stakeholders when the EIA findings are reported.

- The EIA should clearly set out how the commitments that the project has made (i.e. mitigation, enhancement, monitoring measures etc.) will be delivered.

- The EIA should include provisions for checking actual performance against the predictions in the EIA, through monitoring and audit programmes.

(24)
EP 95-0378
Impact Assessment, Guidance on Integrated Impact Assessment
December 2002
53 pp

This document provides guidance to Shell personnel on Integrated Impact Assessment (IA). It contains a description of the IA process; how it is aligned with the business process, starting when an opportunity is identified through to decommissioning and abandonment. Guidance is also provided to managers and engineers on their roles in the IA process. The guide is aimed at business/project managers, their advisers and IA managers, who have a business management/ scientific/ engineering background and who are familiar with the E&P industry, but do not have extensive knowledge of the main components, Environment, Social and Health, that make up IA.

The SIEP Guidance on IA comprises five parts: Integrated Impact Assessment (of which this is a summary), together with three modules for Environment, Social and Health. Further specific guidance is provided in a 'Toolbox' that supports the modules. Together these make up Shell's guidance on an integrated approach to Impact Assessment.

(25) CONFIDENTIAL
GCA Report PA-B Location Opinion Letter
May 24, 2005
10 pp

This shortform opinion letters has been prepared in response to a request from Lenders for Gaffney, Cline & Associates' (GCA)'s opinion on the subsurface issues involved in the Piltun Platform B location selection process.

GCA was requested by the Lenders to review the latest SEIC briefing paper (April 2005) on the selection of the PA-B platform location. The scope for this opinion letter was defined as follows:

- Confirm that the current proposed location is appropriate,
- Define whether alternate locations east of the current site are/are not feasible for a single additional platform development scheme and document any technical restrictions,
- Review the site selection process and incremental studies employed to move the platform away from the previously proposed site.

(26) CONFIDENTIAL
HSE 5-year Audit Plan
January 20, 2005
Spreadsheet

Spreadsheet showing 5-year Audit Plan.

(27)
Merchant Marine e-Fleet Management Purplefinder
January 2001
3 pp

PurpleFinder® is used by the merchant shipping industry to locate and communicate with ships throughout the world in a reliable manner.

(28)
0000-S-90-04-T-7927-00 Rev 01
Review/Audit of Marine Mammal Observer Programme
July 2005
67 pp

SEIC have introduced mitigation measures to reduce the impact of their activities on the western gray whale. One of the key components of the mitigation strategy is the use of Marine Mammal Observers (MMOs). The scope of this document is to review SEIC's Marine Mammal Observer Programme, providing an independent audit with recommendations for improvements where this is felt necessary.

(29a,b) CONFIDENTIAL
HSEHAP (Health, Safety, Environment and Social Action Plan) Part 2 Hydrocarbon Spill Prevention (a) and Offshore Biodiversity (b) April/July 2005
17 pp (a), 15 pp (b)

This Health, Safety, Environmental and Social Action Plan (HSESAP) has been developed for the Sakhalin II Phase 2 Project (the Project) by Sakhalin Energy Investment Company Ltd (Sakhalin Energy or the Company or SEIC).

The management of health, safety and environmental (HSE) and social issues in the Project is an integral part of the management of the Company. Throughout all phases of the Project, Sakhalin Energy aims to minimise adverse health, safety, environmental and social impacts of the Project and to maximise its benefits to the inhabitants of Sakhalin Island and other key stakeholders.

The HSESAP consolidates the commitments from the EIA, HIA, SIA and supporting documentation including the Addenda to the impact assessments, and is presented in three parts (part 1, part 2 and the annexes described below). The documents included here are Hydrocarbon spill prevention, preparedness and response and Offshore Biodiversity. Each table fully documents actions and commitments on the part of SEIC.

(30)
0000-S-90-04-T-7928-00 Rev 01
Marine Mammal Observers Programme Review/Audit Sakhalin Energy Actions
July 20, 2005
10 pp

This document provides a detailed point-by-point response to the recommendations from the independent MMO Audit.

(31)
Synopsis of the Vityaz Oil Spill Response Plan. Piltun-Astokhskoye Permit Area "Vityaz Complex"
2004
60 pp

The complete OSRP contains Procedures, Guidelines, Checklists and other information that enables SEIC to initiate and manage a response to spills from the Piltun-Astokhskoye "Vityaz" production complex. The objectives of the OSRP are to:

- Protect the health and safety of SEIC, Contractors, and public during the response.
- Minimise environmental damage.
- Ensure that response operations are undertaken in compliance with Russian law and Russian Federal and Sakhalin Oblast government authorities.
- Ensure an effective, efficient, and justifiable response to oil spills.
- Facilitate cooperation between SEIC, Government agencies, and other Companies.
- Ensure that information is properly communicated to the appropriate agencies, and
- Protect the interests of SEIC and its stakeholders.

(32)
Vessel Tracking
July 29-30, 2005

Graphics and spreadsheets documenting the vessel tracking (Purplefinder) system.

(33)
0000-S-90-04-T-7924-00
Oil Spill Behavior and Oil Spill Response in Ice Conditions: A Review, Volume 1-2
July 2005
Volume 1: Sakhalin Shelf Ice Conditions
42 pp

The current review was written in accordance with SEIC HSES OSR Project 33. The purpose for this project is to:

- Estimate ice conditions in the area of SEIC operations.
- Make a comparison with ice conditions in other areas, like Beaufort Sea.
- On the basis of this comparison to establish appropriate strategies for oil spill response in accordance with ice conditions.
- To develop appropriate techniques for oil spill response in ice infested waters respective guidelines, manuals, etc are to be in place.
- To evaluate different response equipment effectiveness relating to ice conditions at SEIC license / permit areas.
- To estimate the need in equipment required.

The present report concerns the definition of sea ice conditions for oil spill response measures. Three different areas offshore the Sakhalin island are relevant for the Project:

- The Piltun Astokhskoye area, in North East Sakhalin island.
- The Lunskoye area, in North East Sakhalin island.
- The Aniva Bay zone, in the southern extreme of Sakhalin Area.

The information given here derive from a considerable amount of data obtained about sea ice conditions that are found off Sakhalin island over many years, and from reports and documents that have been reviewed.

The specific characteristics of the ice cover are of most interest for operational planning purposes, and are treated in this report for each area as follow:

- Types of ice forms and features, their geometries and components.
- Freeze-up and break-up dates probability distributions.
- Ice and open water season length probability distributions.
- Ice zone: land fast ice, flaw lead, pack ice.
- Ice concentrations and their variations in time.
- Drifting ice floes parameters.

This document is mostly based on data and analysis performed by Company and is not meant to overrule any of the referenced company document.

This report does not deal with operations in ice conditions. This aspect is out of the scope of work for the present activity and supposed to be covered in future works. In this respect also the information about different OSR equipment availability and usability will also be discussed in future documents.

Volume II: Technical and Operational Review of Offshore Oil-in-Ice Response Strategies
24 pp

The objective of this study is to provide a concise, operationally oriented summary of what is known in the field of arctic spill response. Material presented in this report can be used in the development of future tactical response guides, as background to a comprehensive Offshore Oil Spill Response Plan, and as background to the development of credible spill scenarios for offshore installations.

Oil in ice response options are discussed under the headings of Freeze-up Transition and Winter, and Break-up Transition. The break-up transition season is discussed mainly in terms of the differences in ice conditions and oil behavior, and factors that enhance certain response options later in the ice season (April to June) as compared to the freeze-up and winter period (December to March). The focus of this report is on response to spills in pack ice offshore, but issues relating to the potential need to respond to spills in landfast (shore) ice are also covered briefly as they arise in the discussion.

Compared to conventional response in open water, operations in ice are largely driven by the limited availability of mechanical containment (booms) and in-situ burning contained within a fire boom. On the other hand, burning small pockets of oil naturally contained by the ice is a valid option during the winter, which is not available in open water. Should oil move near shore and become a part of the landfast ice, or should oil be released beneath an existing landfast ice zone, it may be possible to use certain solid-ice recovery techniques.

In addition to the technical and safety issues involved with offshore and nearshore response under freezing conditions, limited daylight in combination with poor visibility could prove to be among the most important limitations for any offshore operation attempting to locate and recover oil in ice.

(34) CONFIDENTIAL
DRAFT Analysis of Risk to Western Gray Whales (*Eschrictius robustus*) from Shipping Traffic Associated with the Sakhalin II Development, Sakhalin Island, Russia
September 9, 2005
42 pp

In an effort to provide a baseline assessment of risk to western gray whales from collisions with shipping traffic along the eastern coast of Sakhalin Island, Russia, during the construction phase of the Sakhalin II development, a simple two-dimensional model was constructed to estimate the expected number of ship-whale encounters based on western gray whale density estimates and ship traffic data. Western gray whale density data were obtained from various aerial, shore-based, and vessel-based surveys conducted since 2001. Very limited density data were available for the transit routes outside of the feeding areas. Therefore, it was necessary to extrapolate conservative density estimates for each of the months, May-November, in the area close to the Sakhalin II development and along the offshore shipping lanes connecting development locations to ports in the south. Vessel data for the same periods were obtained from Sakhalin Energy Investment Company (SEIC) for vessels using the shipping lanes; only SEIC vessel data are incorporated. The data set includes vessels that range in length from 32 m to 300 m of the following types: crew change vessels, tugs/supply vessels, anchor handling tugs, rock dumpers, diving support vessels, cable layers, dredges, icebreakers, oil spill response vessels, and export tankers. Vessel data typically included vessel length, beam, draft, engines, propeller type, propeller diameter,

activity, distance traveled in Sakhalin Island waters, estimated number of monthly transects, departure and destination points, expected operating period, and economical speed.

Data on a total of 42 vessels were collected, including information on some vessels that do not operate on their own power and were therefore combined with tugs or other vessels. The expected number of ship/whale encounters was estimated using a simple, two dimensional model (based after Tregenza et al. 2000) that used vessel width, whale length, distance traveled, monthly transects, whale vulnerability, population density, whale avoidance, observer success, and a proximity factor which considers whether whales and vessels co-occur in space and time. Due to the lack of specific data, certain conservative assumptions were used for some of these variables (whale vulnerability and whale population density) while others (such as whale avoidance and observer success) were run in various increments to allow for varying responses or conditions such as high observer success in sea states 0-1 and low observer success at conditions above sea state 4.

The model "base" case estimated 38.9 ship/whale encounters with SEIC vessels in Sakhalin Island waters each year. However, this "base" estimate assumes that neither whales nor vessels make any effort to avoid encounters. This base case is considered unrealistically high. The model runs using different avoidance scenarios gave an average of 10.3 expected ship/whale encounters with SEIC vessels in Sakhalin Island waters each year with a range of 1.9 to 19.5 expected encounters per year. To translate expected encounters into expected ship strikes, it is necessary to adjust for evasive action taken by whales and/or vessels prior to a possible encounter. While the calculations have made some attempt to do this by adjusting the avoidance and observer variables in certain scenarios, the data are not available to make definitive estimates of ship strikes. To date, no ship strikes associated with industrial activity have been reported in Sakhalin Island waters and mitigation measures implemented by SEIC (SEIC 2005) and detailed in SEIC's Marine Mammal Protection Plan appear to have been effective at minimizing risk.

Ship strike data are available from other regions and for other species i.e., eastern gray whales in the eastern Pacific and North Atlantic right whales. The minimum estimate of gray whale mortality in eastern gray whales due to ship strikes is 1.2 per year (0.007% of the estimated population of 17,000), while for North Atlantic right whales it is 0.8 per year (0.27% of the estimated population of 295). While both of these estimates are likely underestimates of true mortality levels, they do suggest that the risk of ship strikes is relatively low even in areas with extremely high levels of vessel traffic.

(35) CONFIDENTIAL
SEIC 23-R-01
Sakhalin II Phase 2 Marine Oil Spill QRA
July 7, 2005
220 pp

The purpose of this QRA is to determine the frequency and potential size of oil spills to the sea, using techniques consistent with the SEIC PSTS on Quantitative Risk Assessment. The report addresses oil spills to the sea from:

- Piltun-Astokhoye (PA) operations, including PA-A and PA-B platforms, pipelines and attendant vessels;
- Lunskoye operations, including LUN-A platform, pipelines and attendant vessels;
- Aniva Bay Operations Liquefied Natural Gas (LNG) Plant, Oil Export Terminal (OET), Tanker Loading Unit (TLU) and associated pipeline infrastructure; and
- Prigorodnoye bunkering activities.

The objectives of the study are:

- Determine sources of liquid hydrocarbon spill risk to the marine environment associated with Sakhalin II Phase 2 operations, maintenance / intervention activities, and recovery actions;
- Calculate credible and worst case scenario liquid hydrocarbon spill volumes;
- Calculate the potential frequencies and consequences of liquid hydrocarbon spill events;
- Analyse sensitivity of results to input values.

(36)
0000-S-90-04-O-0279-00-D
SEIC HSE Case Standard
February 2005
51 pp

This Standard defines Sakhalin Energy's minimum mandatory requirements for the initiation, completion and documentation of HSE Cases prepared for the Company. HSE Cases are the means by which Sakhalin Energy **demonstrates** that the 'major accident hazards' associated with its assets and activities are properly identified, assessed and controlled in a manner that reduces risks to people, assets and the environment to a level that is tolerable and as low as reasonably practicable (ALARP).

A secondary purpose of this Standard is to ensure that HSE Cases developed for Sakhalin Energy are documented in such a way that they complement and facilitate efficient development of documentation required to complete an Industrial Safety Declaration (ISD) as required by Russian Federation Law.

This Standard applies to all assets and activities operated by Sakhalin Energy. HSE Cases shall be developed for all assets and operations involving hazards with the potential for level 5 consequences in the RAM, and other selected High Risk hazards. Specifically, this Standard covers the following types of HSE Cases:

- Design HSE Cases at the concept, front end engineering and detailed design phases

- Operational HSE Cases for assets and activities

This Standard applies to activities that are the subject of Sakhalin Energy contracts where it is specified in contract documents.

(37) CONFIDENTIAL

Anatech UK Limited
November 15, 2004
39 pp

Sakhalin Energy Investment Company Ltd are developing an LNG Jetty and Oil Export Terminal (OET) in Aniva Bay on the south coast of Sakhalin Island. As part of this project Anatec were commissioned to undertake an assessment to investigate the change in shipping risk resulting from the increased tanker traffic to and from the LNG/OET.

The initial stage of the work was the development of a local shipping database providing details of:

- Merchant shipping mean route positions and widths
- Annual number of vessels per year per route
- Vessel size distribution
- Vessel type distribution
- Vessel densities within a detailed grid of cells

This allowed assessment of the existing shipping activities in the area in order to calculate the baseline risk of shipping accidents (pre-development). Following this, the anticipated levels of Oil and LNG tankers arriving and departing the terminal were incorporated into the database and the shipping risks reassessed to determine the change in risk resulting from the increases shipping levels. The results are presented in terms of accident frequency distributed amongst the various accident scenarios.

All the risk assessment work for this study was carried out using the COLLRISK model, which was calibrated for the area being considered based on 10 years accident data.

(38) CONFIDENTIAL DRAFT
Screening Assessment of Potential Oil Spill Impacts on the Food Resources of Western Gray Whales Feeding near Sakhalin Island, Russia
September 2, 2005
63 pp

In 2004 Sakhalin Energy Investment Company (SEIC, 2005) commissioned the International Union for the Conservation of Nature and Natural Resources (IUCN) to convene an Independent Scientific Review Panel (ISPR) to evaluate SEIC plans, procedures, and operations for developing oil and gas production and transportation in the Sea of Okhotsk off the northeast coast of Sakhalin Island in the Russian Far East. The ISPR review was primarily centered around an evaluation of the potential for SEIC operations to impact the Western Gray Whale (*Eschrichtius robustus*) (WGW), a critically endangered population that is known to feed in at least two critical feeding areas of the waters around Sakhalin Island during the summer an autumn.

Among the findings of the ISPR was a recommendation for further analysis of the potential for spills from SEIC operations to impact WGW directly or indirectly through impacts to the benthic communities upon which they forage within the two feeding areas. It is this latter recommendation that is the subject of this report.

This report utilizes the findings of previous modeling efforts, which: 1) evaluate the potential for spills to occur as a result of SEIC development and operation (Risktec, 2005) and 2) evaluate the likelihood of spills resulting from different scenarios reaching the WGW feeding grounds (REA, 2005). Building upon these results, an additional model (SIMAP) (French et al., 1996) is utilized in this report to predict potential water column and sediment concentrations and areal extent of petroleum hydrocarbons that could occur, if spills occur under the specific conditions that would have the potential to impact the feeding areas. A review of literature related to the behaviour and toxicity of petroleum hydrocarbons in marine systems was conducted to establish levels of concentration at which impacts to the benthic community might be anticipated. Descriptions of eastern gray whale feeding behaviour and requirements are utilized in combination with evaluations of benthic communities within the WGW feeding areas to produce an understanding of available resource utilization. The results of these assessments are characterized in a screening risk assessment format by comparing potential concentrations and distribution of petroleum hydrocarbons to toxicity reference values and by expressing potential impacts as a portion of the available feeding resource.

Findings

For crude oil releases in seawater, wind and wave action contribute significantly to the natural removal processes. Crude oil spreads as a film on the surface of water, facilitating the loss by volatilization of its lighter components. The water solubility of crude oil is low, only the lower molecular weight aromatic hydrocarbons and some polar compounds showing low, but significant solubilities. The dissolved constituents gradually biodegrade in water. Some of the higher molecular weight compounds are removed by emulsification and these also slowly biodegrade; others adsorb to sediment and sink. A further removal process from the water column, involving the heavier fraction is agglomeration to form tars, some of which are heavier than water and hence, sink.

The most conservative benchmark values that could be applied to the screening level risk assessment of oil impacts on water column organisms inhabiting the Piltun area off Sakhalin are 10,000-100,000 µg/L total oil and 300 µg/L total polycyclic aromatic hydrocarbons (PAH). Water concentrations below these levels are not expected to cause adverse effects to biota over a short duration (<=4days) of exposure. For benthic communities, sediments with total PAHs concentrations below 4.0 µg/g can be considered non-toxic, while sediment with total PAHs levels greater than 45 µg/g are likely to be toxic.

Under existing conditions (i.e. sandy sediments) the modeling effort indicates that the sediment of the feeding areas would not be prone to incorporate toxic levels of the Vitayaz oil and would not be expected to experience smothering, either of which could result in the reduction of food resources in affected areas for a long period of time. The model does indicate, however, that water column concentrations of total oil and PAH that exceed screening ecological acute toxicity benchmarks could reach the seafloor of the Piltun feeding area, if released from the PA-B platform. The area of seafloor that could be thus impacted would represent approximately 0.3 % of the available feeding area and would not be expected to have an impact upon WGWs.

Despite the finding that, under existing conditions, chronically toxic levels of oil and its constituents would not accumulate in the sediments of the feeding areas, a model run was conducted utilizing artificial conditions that would favour the incorporation of oil into sediments.

Even under this hypothetical scenario, model projections indicate that less than 0.1% of the Piltun feeding area would be impacted.

Using estimated feeding rates for the total population of WGW estimated to be 100 individuals they are expected to use approximately 10% of the Piltun feeding ground or 0.8% of the offshore feeding ground. Oil spill models suggest that 0.1 – 0.3% of the entire feeding area could be affected by a spill. These levels of potential disturbance are negligible, given the high degree of seasonal disturbance these benthic areas receive from a combination of ice scour, storm events, and whale feeding. The benthic community is made up of species that are quick to recruit and recover from disturbance. These calculations indicate that a "worst-case" spill would have minimal effect on WGW feeding resources.

(39) CONFIDENTIAL
Phase 2 Oil Spill Response Organisation
May 2005
52 pp

This document details the Oil Spill Response (OSR) organization within Sakhalin Energy Investment Company (SEIC). It contains SEIC-wide Procedures, Guidelines, Checklists and other information that enables SEIC to initiate and manage a response to spills emanating from SEIC operations as well as providing support to the contract and construction activities.

It sits under the crisis and emergency response system and procedures for SEIC and forms part of the overall strategy for emergency and spill response.

The objectives of this document are to:

- Provide a framework and guidance document for all SEIC operations to enable a consistent approach to oil spill response.
- Provide a framework to enable easy access to equipment in an oil spill response across SEIC operations and activities.
- Ensure the protection of the health and safety of SEIC staff, Contractors and the public during any response.
- Minimise environmental damage through:
    - Ensuring the rapid control of the spill source and to maintenance of site or facility integrity.
    - Containing released oil to prevent further spreading and to maximize the efficiency of recovery operations;
    - Protecting environmentally sensitive resources
    - Cleaning oil-impacted areas, ensuring a net benefit to the environment.
- Ensure that response operations are undertaken in compliance with Russian law and in cooperation with Russian Federal and Sakhalin Oblast authorities.
- Ensure an effective, efficient and justifiable response to oil spills.
- Facilitate cooperation between SEIC, Government agencies and other Companies.
- Ensure that information is promptly communicated to the appropriate agencies.
- Protect the interests of SEIC and its stakeholders.

(40) CONFIDENTIAL
Seismic Design for Sakhalin Offshore Installation-Seismic Task Force Report

EP2004-5230
July 2004
66 pp

This report describes the work carried out by the Seismic Design Task Force set up in October 2003, at the request of SEIC, aimed at **steering the earthquake design of the Sakhalin offshore structures to a solution which is technically defendable and which would minimise the impact on project schedule and project cost.** The Task Force comprised engineers from EP Projects and SEIC Project Teams for the Gravity Base Structure (GBS) and Topsides. The activities of the Task Force included:

(a) steering the work of AMEC and Aker (and other sub-contractors e.g. NGI, EPS and MMI) towards achieving the above objective,
(b) establishing an agreed seismic design methodology which **eliminates conservatism** and
(c) carrying out **independent verification** of the seismic design work by EP Projects and using it to align the seismic numerical models of AMEC and Aker-Kvaerner and confirm the validity of the design.

The key problem which led to the setting up of this Task Force was concern about the validity of the seismic design criteria for the Lunskoye A (Lun-A) and Piltun (PA-B) installations. The Project Specific Technical Specification (PSTS 3 & 12) for the design of the offshore Platforms specifies use of seismic criteria developed by EQE in 1996. The Project started with these criteria but later adopted less severe criteria, referred to as ABS 2002. The justification for this change was considered defendable at the time because the 2002 criteria were based on data provided by IMGG (Russian Inst. of Marine Geology and Geophysics) but it became questionable when viewed from the perspective of the Neftegorsk earthquake which struck the area in 1995. Some other concerns regarding the 2002 criteria surfaced in 2003, including that an independent evaluation of the criteria by MMI Engineering concluded that the ABS 2002 criteria are not supported and may err on the unconservative side. The Seismic Design Task Force was set up as soon as these concerns became known because a significant design change at this late stage in the project (fabrication of the LUN-A topsides started in November 2003) could have a major impact on the project cost and schedule.

The main results and conclusions of the work carried out by the Task Force have been presented at a Workshop held in Amec's offices on March 5th 2004. A key conclusion is that it has been demonstrated that the **consequences of adopting the 1996 EQE criteria as a basis for the seismic design can be easily managed both in terms of schedule and cost impact.** Even though some responses increased by a factor of 2 or more, these could be accommodated either within the existing design (no hardware change) or by relatively minor modifications. **The decision was, therefore, taken to adopt the 1996 EQE criteria as a basis for design for both Lun-A and PA-B**.

(41)
DRAFT Oil Spill Response in Ice Conditions
September, 2005
10 pp

As part of the Phase 2 development, SEIC will start to operate all-year offshore oil and gas production off Sakhalin Island. Russian Federation and Sakhalin Oblast Regulations require SEIC to have Oil Spill Response Plans (OSRPs) approved and in place before then. These must contain appropriate measures to provide oil spill response in the open sea and also in ice conditions.

This Position Paper outlines SEIC's current plans with regards oil spill response in ice conditions, plans to refine these strategies and to obtain adequate resources for spill response. Reference is made to the HSES OSR Work Plan, Background Papers and other documents, which provide detailed information in support of this document.

SEIC does not assume that marine oil spill response is impossible in ice but accepts that it does present a set of difficulties different from open sea response. These need to be considered in the development of spill response plans, resource acquisition and training.

The presence of ice does not alter the overall objectives or priorities of marine response, nor does it reduce the need for continuous aerial surveillance and modification of strategies and methods throughout the response.

SEIC is committed to applying best available technology to oil spill response in ice and has implemented an ongoing programme for assessing new technologies and procedures and for ensuring the commitment of resources to the development of these.

(42)
Oil Spill Trajectory Modeling in Aniva Bay and Adjacent Waters
April 4, 2005
37 pp

<u>The main goal:</u> is to simulate oil behavior in seawater in case of hypothetical emergency oil spills in Aniva Bay and adjacent seawater areas, tanker emergencies and emergencies at the tanker loading unit (TLU) near Prigorodnoe village.

<u>The main objectives are to:</u>

- assess spatial transport of oil and oil products;
- assess probable oil location after the spill;
- reveal typical oil transport trajectories;
- reveal shoreline areas subject to oil impact;
- assess the probability of shoreline impact;
- assess the minimum time of shoreline impact;
- assess the change of physical and chemical oil properties in seawater;
- model oil behavior for four seasons, five points of oil release, two types and five volumes of spilled oil.