WESTERN GRAY WHALE ADVISORY PANEL **WGWAP 4/4**

4th Meeting **22-25 April 2008**

Lausanne, Switzerland

REPORT OF THE WESTERN GRAY WHALE ADVISORY PANEL AT ITS FOURTH MEETING

CONVENED BY IUCN

CONTENTS

1 OPENING

The fourth meeting of the Western Gray Whale Advisory Panel (WGWAP-4) was held at Hotel Alpha-Palmiers, Lausanne, Switzerland, from 22-25 April 2008 under the chairmanship of R.R. Reeves.

In addition to the full panel (see Annex 1), the meeting was attended by representatives from the following organizations (also see Annex 1):

Sakhalin Energy Investment Company Ltd (SEIC)
IUCN (International Union for Conservation of Nature)
WWF-Russia
Pacific Environment
UK Department for Environment, Food and Rural Affairs (DEFRA)
AEA Group

Sarah Gotheil and Ludivine Strambini of IUCN facilitated meeting preparations and logistics. Gotheil also served as meeting rapporteur. We appreciate their efforts in support of the Panel's work.

1.1 Background

Following WGWAP-3 in late November 2007, the IUCN programme officer responsible for management and administration of the WGWAP (Julian Roberts) resigned (effective 20 February 2008) and his replacement (Finn Larsen) was appointed and attended WGWAP-4 but was not scheduled to take up the position formally until 1 May. Before leaving, Roberts assisted in development of the draft agenda and document list for this meeting, WGWAP-4. In the interim between Roberts's departure and WGWAP-4, Sarah Gotheil and Andrew Hurd facilitated the work of the Panel and the Panel's relations with the company (SEIC).

Also between WGWAP-3 and WGWAP-4, there were two changes in the composition of the Panel. Tim Ragen, who had been a member of the Independent Scientific Review Panel (ISRP) in 2004-05 as well as all subsequent western gray whale (WGW) panels including this one, resigned so that he could devote full attention to his demanding job as Executive Director of the U.S. Marine Mammal Commission. Dave Weller, who had also contributed to the work of the ISRP and subsequent panels, became a WGWAP member in February 2008.

As mentioned in the report of WGWAP-3, the Panel has increasingly sought to develop and pursue its own workplan while meeting its ongoing core responsibilities to assess and advise on SEIC's work as it relates to the western North Pacific population of gray whales (*Eschrichtius robustus*), or WGWs. Much of the intersessional work by the Panel since WGWAP-3 consisted of two carry-over tasks from that meeting, both driven by the company's immediate need for advice. One task was to review SEIC's 2007 Scope of Work as a basis for 2008 planning (see item 12.1 hereunder). The other task was to continue the work of the Seismic Task Force (see item 10).

1.2 Adoption of agenda and reporting procedures

The agenda for the present meeting consisted primarily of presentations and discussions concerning previous recommendations, WGW population assessment, photo-identification, the Marine Mammal Observer (MMO) programme, beach surveys for gray whale carcasses, multivariate analyses, monitoring and management of continuous noise, environmental

(especially benthic) monitoring, satellite tagging, seismic surveys (task force report), oil spills (task force report) and the company's future research and monitoring plans.

The final agenda (Annex 2) was adopted after a brief discussion. The list of documents for this meeting is given in Annex 3.

As has become standard practice, the Panel met to work on its report each afternoon after the plenary session. A special after-hours meeting of the Seismic Task Force was required for it to complete its report. Several Panel members remained in Lausanne for a day after the meeting (26 April) to continue drafting, editing and organizing the report, and the entire Panel continued work on the report by e-mail correspondence in the weeks immediately following the meeting.

2 REVIEW RECOMMENDATIONS FROM PREVIOUS MEETING(S)

This item was introduced from the chair with an outline of the process undertaken following WGWAP-3, at which it was agreed that a comprehensive table of all recommendations made by the various WGW panels, beginning with the Independent Scientific Review Panel (ISRP), would be prepared and made public. The table (listed for this meeting as WGWAP4/INF.1) is still under revision and will contain the text of each recommendation, the responsible action party, any formal SEIC response to the recommendation and the status of the recommendation, *e.g.*:

- Open – in progress
- Open – no action yet taken
- Open – in need of clarification/expansion.
- Closed – implemented satisfactorily
- Closed – superseded by new recommendation
- Closed – no longer relevant but had not been implemented satisfactorily at the time when it became moot

The completed table will be posted on the IUCN website and revisited and updated at each future WGWAP meeting in order to ensure appropriate follow-up of the issues identified.

3 POPULATION ASSESSMENT

3.1 Progress on update of population assessment taking into account WGWAP-3 recommendations

An updated population assessment was presented in WGWAP 4/INF. 2 based on the Russia-US photo-identification data up to and including the 2007 season. This is an update of the assessments by Reeves *et al.* (2005) and Cooke *et al.* (2006) which used data up to 2003 and 2005, respectively, fitted to the same individual-based population model. The latest assessment differs little from the one presented in 2007.

The estimated population size in 2008, excluding calves of the year, is 130 animals (90% confidence interval 120-142) animals. The latest analysis indicates that there has been a significant population increase during 1994-2007 averaging 2.5% p.a. (90% CI 1.6%-3.5%). Five gray whales (all females) have died on the Pacific coast of Japan during the past 36 months, at least four of them in fishing gear. These deaths were included in the above analysis.

Of the 169 animals in the Russia-US catalogue, an estimated 124 are still alive in 2008. In addition, an estimated 6 further individuals have not yet been catalogued (not counting calves of the year 2008).

Of the 68 calves observed to date, 59 have been biopsy sampled and had their sex determined. Of that number, 39 were males and 20 were females. This result represents a significant male bias ($p < 0.01$) for calves born during the study period. An explanation for this bias has yet to be found.

Forward projections of the population model to 2050, assuming no additional mortality or disturbance to reproduction, indicate a high probability (>99%) of population increase. However, projections of the female population incorporating the same level of extra mortality as seen off Japan in the last three years indicate a high (~25%) probability of population decline and a substantial (~10%) risk of extirpation by 2050.

WGWAP-3 had recommended (WGWAP 3/008) that a preliminary analysis be carried out by the Panel on the possible effects of disturbance on reproductive success or other aspects of demography. An analysis of another baleen whale population (southern right whales in the western South Atlantic), using photo-identification data fitted to a model similar to that used for WGWs, identified an environmental factor (global climate signals) that accounted for most of the variation in reproductive success (Leaper *et al*. 2006). A similar analysis for WGWs will be attempted but the small size of the population and the shortness of the time series may preclude conclusive results.

WGWAP-3 had also recommended (WGWAP 3/009), as suggested by the Photo-ID Task Force (WGWAP 3/INF.17), that data on body condition be incorporated into a population assessment if possible. Weller advised the rest of the Panel that the Russia-US team is nearing completion of a major analysis of data on body condition and the Panel agreed to await the results of this analysis before taking (or recommending) further action on this topic.

4 PHOTO-IDENTIFICATION

4.1 Update on Photo-ID Task Force

The Task Force report, which had only been available in draft form at WGWAP-3, has since been posted on the IUCN web site at:
www.iucn.org/themes/marine/pdf/wgwap/Photo%20ID%20Report%20-%20FINAL.pdf

It had been agreed at WGWAP-3 that the Photo-ID Task Force be continued under the terms of reference contained in Annex 4 of the WGWAP-3 report.

Although each of the two photo-ID teams has continued its work, the WGWAP Task Force has yet to make concerted progress on the joint tasks recommended in the report and included in its terms of reference. The Panel and SEIC agreed that this work remained important. In order to ensure that it is carried out, a time line for task completion is proposed by the Panel for consideration by SEIC and is given in Annex 4. Task force work is co-ordinated by the Panel.

It had been agreed at WGWAP-3 that the Task Force include: one or more representatives of each photo-ID team; one or more Panel members; one or more representatives of SEIC; and if deemed necessary, an independent expert co-opted to the Task Force by IUCN. The Panel felt that no independent expert is required at this time. An update from the Institute

of Marine Biology photo-ID project (WGWAP 4/INF.4) was presented under item 4.2, and an update from the (non-SEIC) Russia-US team was also received (WGWAP 4/INF 21).

4.2 Photo-ID of WGWs in Sakhalin and Kamchatka

The Panel welcomed the summary presentation by Tyurneva on results of the 2007 photo-identification work carried out by the Institute of Marine Biology (IMB) as part of the SEIC annual program (WGWAP 4/INF. 4). A total of 126 animals, including 6 calves and 14 previously unidentified whales, plus five 'temporary' whales (*i.e.*, no reliable right side photograph had been obtained) were recorded in 2007. Thirty-one days were dedicated to photographing whales in the Piltun, Offshore and Chaivo study areas, and opportunistic photography of gray whales took place on 62 days. A number of individuals were sighted in multiple areas, indicating a relatively high degree of exchange between the sites. The number of within-season resightings of an individual ranged between 1 and 13 with an average of about 5. Fourteen 'skinny' whales (representing 10.7% of the 131 individuals) were recorded during the course of the 2007 field season; 6 of these were nursing females. The proportion of skinny whales declined progressively through the feeding season. During the period from 10 July to 10 October, 67 whales showed improvements in their body condition. A few new cases of individuals with skin anomalies were observed in 2007.

In 2007, 37 individual gray whales were photo-identified off southeastern Kamchatka by a research group collaborating with IMB. When the images of those animals were compared to the IMB photo-id catalogue, it was determined that 12 of the 37 individuals had been photographed off Sakhalin in 2007. Additionally, 6 of the 37 whales identified off Kamchatka in 2007 had been identified in previous years off Sakhalin. Thus, a total of 18 of the 37 whales identified off Kamchatka in 2007 are part of the IMB Sakhalin gray whale catalogue. When the broader collection of photographs collected off Kamchatka between 2004 and 2007 were considered, 24 of the 44 whales identified off southeastern Kamchatka, had at some time also been identified off Sakhalin. In 2006, three whales were identified in the northern Okhotsk Sea off Magadan. Two of them have also been sighted off Kamchatka and Sakhalin while one has been identified only off Magadan thus far. Tyurneva offered the hypothesis that more whales occurred in Vestnik Bay (southeastern Kamchatka) in 2007 because of the unusually late reduction of sea ice off Sakhalin that year.

After completion of the 2007 field season, the comprehensive 2002-2007 IMB photo-ID catalogue contained 161 unique individuals, plus 11 "temporary" identifications. An additional 20 individuals were photographed only in the Kamchatka area. However, these 20 whales cannot necessarily be designated as *western* gray whales. In summary, the combined total of gray whales photo-identified off Sakhalin and Kamchatka amounts to 181 unique individuals, plus 11 'temporary' identifications.

The Panel stressed that the implications of the results of photo-identification work outside the Sakhalin feeding areas, for understanding population structure and movements of gray whales, need to be evaluated carefully. Such an evaluation should be undertaken at the forthcoming rangewide workshop.

5 MMO PROGRAMME AND CARCASS DETECTION

5.1 2007 MMO Programme close-out report

The 2007 MMO close-out report summarised the final results from the 2007 season (WGWAP 4/INF.5). This included an explicit response to recommendation WGWAP 3/005

regarding the skewed distribution of sightings among the three crew-change vessels (item 5.2).

Most of the gray whale sightings by MMOs were within or near the Piltun feeding area, with very few sightings in the navigation corridors. Most of the gray whales (19 out of 26 sighting events) were outside the 1 km 'safety distance' of the vessel when initially observed and therefore no collision avoidance action was deemed necessary in those instances. Of the seven sightings within the safety distance, only one required a change in course by the vessel.

SEIC confirmed that the recommendations from WGWAP-3 concerning the types of data that should be recorded by MMOs and reported by the MMO program (WGWAP 3/002 and 003) would be implemented fully in the 2008 season.

As already noted and recommended in the report of WGWAP-3 (recommendation 3/006), it is important that MMOs be placed on any crew change vessel operating between Nogliki and the LUN-A platform because whales are moving to and from the Piltun feeding area at the beginning and end of the season as well as moving around during the peak season. The Panel's position on this issue has not changed. SEIC has previously responded to this recommendation by saying that it "will endeavour to place MMOs on crew change vessels between Nogliki and LUN-A at all times".

Regarding offshore vessel activities upcoming in 2008, the decommissioning of the Single Anchor Leg Mooring (SALM) facility and Floating Storage and Offloading tanker at the Molikpaq (PA-A) platform was regarded as potentially significant in terms of requiring MMO support. SEIC indicated that the decommissioning was likely to occur near the end of the open-water season and would probably involve two vessels, one for diving support and one to take the SALM in tow. The Panel **reaffirmed** the importance of having MMOs placed on any vessels likely to work in areas of western gray whale feeding or transit. SEIC assured the Panel that placement of MMOs on these and other vessels in 2008 (*e.g.* that used to inspect the offshore pipelines) would be decided according to established company practice as outlined in previous WGWAP meetings.

SEIC requested the Panel's advice concerning a proposal by operators of the crew change vessels to increase their permissible speed from 17 to 21 knots in good weather conditions. This proposal was explained verbally by Bell during the meeting. It was understood that (a) the proposed change would apply only for vessels travelling within established corridors as defined in the 2006/2007 Marine Mammal Protection Plan (MMPP); and (b) there is no intention to increase the vessel speed limits (currently 10 knots in good visibility conditions and 7 in poor) within the Piltun and PA-B approach corridors, again as previously defined in the MMPP. The reasons given by the crew change operators for requesting the increase were that: (a) the optimal cruising speed of the crew change vessels is 21 knots and (b) there is often a need to shorten the trip time to account for tide conditions at the site of departure/return.

The Panel clarified that neither it nor its predecessor panels had ever endorsed the 17 knot speed limit. For example, the report of the Interim Independent Scientists Group (which immediately preceded formation of the WGWAP) stated (p. 14), '... the available (albeit inconclusive) evidence on ship strikes on large whales suggests that fatal strikes are less likely to occur when vessels are travelling at speeds less than 14 knots'. Indeed, the most recent global review of ship strikes on large whales (Jensen and Silber 2003) concludes that in the 58 cases of ship strikes where vessel speed was known, 46 (79%) occurred when the vessels were travelling at more than 12 knots. Those authors also note that the mean vessel

speed that resulted in injury or mortality was 18.6 knots. Of the 47 cases where both the speed and the apparent fate of the whale was known, 39 (83%) involved speeds greater than 10 knots and of these, 36 (92%) resulted in death or injury. Laist *et al.* (2001) inferred that collisions causing serious injury or death occur infrequently at speeds below 14 knots and rarely at speeds below 10 knots. Therefore, on the basis of the limited evidence available, a precautionary approach to vessel speed management is to ensure that speeds of large vessels do not exceed 10 knots when travelling in areas where there is a substantial probability of encountering whales.

5.2 MMO sightings analysis for crew change vessels

In its previous report the Panel had requested that SEIC investigate the skewed distribution of sightings by MMOs on crew change vessels and report back (WGWAP 3/005). The analysis in WGWAP 4/INF.5 showed this skew to be attributable to the movements by one vessel (the *Miss Sybil*) well inshore of the navigation corridor and near or into the Piltun feeding area on several occasions. Tibbles reported that the deviation from the prescribed routing reportedly was due to bad weather (according to WGWAP 4/INF.5, p. 19) or to unspecified mission needs.

The Panel noted that the relatively high MMO sighting rate inshore of the navigation corridor, as shown in WGWAP 4/INF.5 (p. 30, Fig. 5.10), **reinforced** the requirement for crew change vessels to adhere to the navigation corridors. The Panel **requests** that SEIC provide clear explanations for *Miss Sybil's* inshore movements on 6 and 21 September, 1 and 13 October and 2, 3 and 5 November 2007 (to be provided by 1 August 2008). Also, the Panel **requests** that SEIC continue to document vessel deviations from the navigation corridors towards a WGW feeding area and make this information available in its annual MMO reports.

5.3 Necropsy guidelines

The recently published necropsy manual by Pugliares *et al.* (2007), provided as background to this meeting (WGWAP 4/INF.6), contains comprehensive guidance on how to handle, examine and report on stranded cetaceans. Section 5 of the manual (pp. 91-97) deals specifically with baleen whales and therefore would be useful in the context of western gray whales off Sakhalin. The Panel **recommends** that SEIC arrange for this section to be translated into Russian and made available to any company staff and others in the region who are likely to be involved in response to strandings along the Sakhalin coast.

SEIC confirmed that it had made a formal request to Russian authorities for permission to collect tissue samples from stranded whales for genetic analyses. To date, no answer has been received so a follow-up request is necessary. The Panel again noted the importance of collecting a tissue sample (for individual identification purposes) from any dead gray whale found either on the beach or floating in the water off Sakhalin. The Panel **requests** that SEIC report back at the next WGWAP meeting on the outcome of its request for authorisation.

The Panel **recommends** that SEIC obtain three necropsy kits and ensure their availability at strategic points on Sakhalin Island. The Panel **agreed** to provide additional information to SEIC as required.

SEIC confirmed its plans in 2008 to conduct dedicated monthly aerial surveys for carcasses, plus opportunistic searches, during the open-water season. The Panel confirmed that the prescribed flight altitude and other specifications for the dedicated surveys are unchanged from its previous recommendation (WGWAP 2/004).

6 MULTIVARIATE ANALYSIS

6.1 Update on MVA progress

The Panel has recognised the value of the SEIC-sponsored work of Gailey and colleagues (WGWAP 2/INF.8) in examining the complex problem of using an MVA approach to relate behavioural responses and anthropogenic sound with data from the 2005 season. This topic is discussed further under Item 6.3. The Panel also has noted the inherent difficulties of analysing such data and incorporating consideration of other relevant data, *e.g.* data from benthic sampling. No agreed analytical framework exists for such integrated studies and for this reason the Panel developed what was termed a 'concept document' aimed at developing such a framework (WGWAP-2 report, Appendix 4).

At WGWAP-3, the Panel considered this matter further. It recognised that the issue was not only relevant to WGWs and the Sakhalin region but had wider implications. For this reason and noting the need to involve data owners and others not currently involved directly with the WGWAP, the Panel concluded that it was appropriate for progress to be made outside the WGWAP context.

Donovan reported on informal discussions held at the recent biennial conference of the Society for Marine Mammalogy (Cape Town, November 2007) between several Panel members and representatives from SEIC and Exxon. It was agreed by all that the concept was valuable and worth moving forward. Especially given the broader implications, it was agreed that a scientific workshop (or indeed a series of workshops as more than one will be required) may be the sort of project that can gain support from the Joint Industry Program (JIP), which is operated and supported by the International Association of Oil and Gas Producers (OGP). It was emphasised that this project would not be associated with the WGWAP and that it might best be coordinated through a relevant academic institution or research institute. Donovan is revising the original concept document for circulation to Exxon and to obtain feedback concerning the project's suitability for a proposal to JIP.

The Panel encouraged this initiative and reaffirmed that for a number of reasons it should progress outside the WGWAP process.

6.2 Data availability protocol

In response to a request made at WGWAP-3, Donovan and Bell produced a draft data availability agreement (WGWAP 4/INF.8) based on the one used by the IWC Scientific Committee. In developing the draft, the following three principles were taken into account:

(1) data represent a significant temporal and financial investment by scientists and research institutes and appropriate safeguards should accompany the use of their data by others;

(2) the right of first publication is the generally accepted scientific norm;

(3) important management decisions made with respect to the conservation of western gray whales should be based on a full scientific review of data quality and on analyses that can be independently verified.

The WGWAP agreed that the approach recommended in WGWAP 4/INF.8 (and reproduced as Annex 5) seemed appropriate and agreed to use this draft as an interim procedure prior to final discussion and adoption of a protocol at WGWAP-5.

6.3 Way forward/next steps

Gailey provided the Panel with an update on progress with respect to the combined analyses of the 2006 behaviour, distribution and noise data. The data from 2006 are particularly important as they relate to the season of pipeline construction. Recognising that results from the proposed international workshop referred to above (item 6.1) will likely not be available until 2010, Gailey advised that the intention was to proceed with multivariate analyses (MVA) similar to that undertaken with the 2005 data (WGWAP 2/INF.8), taking into account previous Panel recommendations. This work should be completed in time to be discussed at WGWAP-5.

The analysis of the 2005 data (WGWAP 2/INF.8) had been considered at WGWAP-2. During that discussion, the Panel had identified additional factors that should either be incorporated into the MVA or, if that proved infeasible, examined in one or more separate analyses. These factors included:

(1) treating mother-calf pairs separately from other individuals;

(2) considering the potential deflection of animals approaching the offshore pipeline landfall during pipeline installation;

(3) stratifying disturbance effects on the basis of distance from noise sources;

(4) characterising noise in different ways, *e.g.* composition of spectrum, ratio of peak to average level;

(5) using the number of weeks from start of construction in a given season as a proxy for auditory fatigue or annoyance from prolonged exposure to construction noise.

The Panel has previously emphasised that the available data on behaviour, distribution and noise provide an important opportunity not only to evaluate the potential effects of noise and vessel activity, but also to better understand the natural history of gray whales and their interactions with the environment in the Sakhalin region. However, the results of the MVAs undertaken to date have not allowed firm conclusions to be drawn on the effects of construction noise, given the potential confounding factors such as proximity to construction, natural patterns of whale distribution (*e.g.* related to benthic conditions or food availability) and the possible effects of other sound sources including research vessels.

To further address the question of the potential effects of construction noise, additional analyses of the available data are needed. This will require exploration of different models and/or scenarios as alternatives to those previously considered. It will also require power analyses to determine the capability of the different models to assess potential impacts given the sample sizes of the data. Plausible models that are not rejected by the data will warrant further investigation. These analyses are complex and statistically demanding. Both the Panel and Gailey have recognised and acknowledged the great value of the independent review of Gailey's earlier analyses (WGWAP 1/INF.2). Given this, the Panel **recommends:**

(1) that analyses of the 2006 data fully consider the earlier comments made in WGWAP 1/INF.2 and by the Panel (Annex 8); and

(2) that SEIC engage the assistance of the experts involved in the aforementioned independent review to work in a pro-active collaboration with Gailey and colleagues from the outset (rather than simply in a reviewer capacity), including at the variable-selection and treatment design stage as well as at the analytical modelling stage, to ensure a comprehensive analysis and interpretation of the 2006 data.

7 MONITORING AND MANAGEMENT OF CONTINUOUS NOISE

7.1 Full consideration of results from SEIC's 2007 noise and whale monitoring programme

At WGWAP-3, the Panel had requested a full report on the acoustic and density/distribution data recorded during the entire 2007 construction season. Between WGWAP-3 and WGWAP-4 Panel members and the company had agreed that a subset of the acoustic and density/distribution data would be prepared in detail for WGWAP-4 (*i.e.*, WGWAP 4/INF.10), specifically two weeks before, during, and two weeks after the PA-B topsides installation. Although this detailed analysis of data from the one time period had been agreed, the Panel was also expecting that the fully treated acoustic data would be presented at this meeting. The '2007 Noise Close-out Report' (WGWAP 4/INF.9) was not available at the meeting as it was still being finalized by the scientists for submission to the Russian authorities, so the acoustic results for the full season could not be discussed.

To begin discussion of WGWAP 4/INF.10, Muir presented three maps with shore-based sightings and densities and a comparison between them. As discussed in section 10.2.1 (below), the Panel urged that all sightings data for which effort can be estimated (*e.g.*, sightings from *Academik Oparin* or *R/V Bogorov*) should be included in these analyses. For the shore-based data, the Panel understands that whale sightings recorded at reticles ≥0.1 are retained in the density analysis. These correspond to distances of approximately 4.5 km to 8 km, depending on the height of the observation station, with the upper limit set by the calibration experiments led by the group from the University of St. Andrews. The density analysis excludes sightings at reticle 0.0 because of the large error associated with the estimation of whale locations at such a distance from a given station. During construction activities and seismic surveys, an increased ability to record the presence and positions of whales more than 4 km offshore is critically important as those whales are likely to be exposed to higher levels of noise.

In discussion, the Panel asked whether the data from Gailey's team and those from the vehicle team were comparable. While there are slight methodological differences between the two teams, Muir believed that the data were comparable. The Panel **agreed** with a proposal from Gailey that a comparison be conducted between the methods used by the behavioural team (*i.e.*, that led by Gailey) and the distribution team (*i.e.*, that led by Muir) to scan for and count whales. Additionally, the analytical approaches used to calculate distance for data from the two teams should be included in this comparison. Such comparative analyses would be a valuable contribution to proper integration of the distribution and behaviour data sets. The Panel **recommends** that such an analysis be provided for its review at WGWAP-5.

Returning to WGWAP 4/INF.10, the Panel concluded that the density/distribution data presented by Muir were too sparse during the June-July 2007 period of interest to draw any conclusions. Shore-based sightings surveys were impossible for several days during the period due to weather, and on other days only a subset of the stations were sampled, also due to the poor weather conditions. Unfortunately, the stations directly shoreward of the PA-B platform (*i.e.* those with a view to the areas of highest noise levels) were sampled only two or three times during the entire construction period, though the Panel was informed that the behavioural team's efforts were focused entirely at the two stations closest to the platform. Muir explained that the shore-based distribution observers (2 teams) start at the extreme northern and southern stations and work towards each other. At least in theory, stations 8 and 9 (just across the Piltun lagoon mouth from each another) are sampled

at the same time; this pattern was set some years ago in an attempt to address double-counting issues. While recognising the logistical constraints (*e.g.* driving time between stations), the Panel noted that although it had not made a specific recommendation on this issue, it is regrettable that the stations directly shoreward of the noise-generating activities were not sampled more frequently during this period. The behaviour team reportedly conducted observations at these stations on every good weather day during the topside installation, though these data were not included in the analysis in WGWAP 4/INF.10.

The Panel noted that the 'opportunistic' observations of WGWs by MMOs (particularly near the outer edges of the Piltun feeding area) had been plotted in WGWAP 4/INF.10 but not used in the daily average estimated whale densities for the period from 21 June–24 July 2007. It **recommends** that such inclusion be attempted following the same principles as discussed under Item 10.2.1 (below) and that the results be made available for Panel review at WGWAP-5.

With regard to the acoustic data, Racca provided the requested analyses for three buoys that were in good positions to record the noise generated by the topsides installation. However, until 3 July acoustic monitoring was conducted only by radio buoys; no archival data were recorded. This is unfortunate because of the limited dynamic range of the radio system. Furthermore, the Odoptu-PA-B buoy did not provide archival data until 10 July, when most of the noise-generating activities were already over. Despite several previous recommendations that acoustic monitoring equipment should be in place prior to the commencement of noisy activities, the Panel was **concerned** that deployment of equipment needed to obtain high-quality recordings was again delayed.

During discussion, the Panel expressed its wish to examine the data from the buoys placed along the 10m isobath. However, as has often been the case, SEIC stated that these data were collected as part of the SEIC-ENL joint research program and ENL had not yet granted permission to release them for Panel review. The data should be included in the full POI acoustics report to be submitted to the Russian authorities within the next few months, after which it will also be made available to the Panel. SEIC confirmed at the meeting that these buoys were only installed on 10, 23 and 29 July for the PA-B-10, Odoptu-n-10 and Odoptu-S-10, respectively. The Panel **stressed** that its main concern is that estimates of noise levels are based on recordings from only three buoys, all of them sited well away from the area that was monitored for the density/distribution of whales. As a consequence, estimates of noise levels impinging on the main part of the near-shore feeding area that is visually monitored are derived from interpolation.

The Panel noted that it was important for all acoustic data to be made available for the multivariate analysis (see Item 6.3). Racca indicated that he understood the data holders were willing to support the MVA process and make the data available for that effort.

As the preliminary data presented at WGWAP-3 had indicated (WGWAP 3/INF.8) and as WGWAP 4/INF.10 confirmed, noise levels recorded at PAB-20 in 2007 exceeded the Panel's continuous dose-based noise exposure criteria. However, the levels at Piltun and Odoptu PA-B were within acceptable limits, and this is likely due at least in part to mitigation planning on the part of SEIC.

At the conclusion of this item, SEIC expressed doubt that the resources required to compile WGWAP 4/INF.10 for the Panel's scrutiny had been well invested as these data had been presented previously, albeit in a different format. In response, the Panel **stressed** that this is an important approach for assessing the potential effects of noise on the distribution and behaviour of gray whales and that it should be used in the future. It had not been possible to

determine, in advance, whether there were sufficient data (on distribution and acoustics) to examine the issue fully with this approach. In fact, the analysis served to re-emphasise the importance of adequate monitoring.

7.2 Review of transmission loss experiments

The Panel was informed of SEIC's plans to conduct additional transmission loss (TL) experiments (WGWAP 4/INF.11). The objective of these experiments is to obtain information that can be used for various types of modelling work, and in particular to improve the accuracy of models in predicting noise propagation. Data from the TL experiments have been used by JASCO in its acoustic propagation modelling work and by both JASCO and the Russian team (Vedenev and Avilov) to carry out their work within the Seismic Survey Task Force. Racca explained that only the data from the 2004 experiments were provided to the Russian team because JASCO had participated in the planning phase for these experiments and considered them to be the most relevant to the model verification in terms of placement and orientation of the transects. Bell reported that between SEIC and ENL, some 15 TL profiles are still to be obtained over the next two years, probably about half in 2009 and the other half in 2010 The experiments are conducted on an opportunistic basis, *i.e.* when the research vessels are not involved in other tasks such as photo-ID. No TL experiments will be conducted during the proposed 2009 seismic survey. All information from the TL experiments will be in the annual acoustics report; full spectra data will be included on a CD.

Some doubt was expressed about the necessity of additional TL experiments, particularly since the construction work for Sakhalin II Phase 2 is essentially complete. However, with additional construction planned by ENL and future seismic surveys to be conducted by SEIC in the Sakhalin II project area, having a full complement of TL data could be valuable for planning to minimize noise impacts on WGWs. With regard to the planned experiments, those of most concern would be any in which the source is located within (or a traverse crosses) the feeding area. SEIC confirmed, however, that none would involve such a scenario; the only activity within the feeding area would be the deployment of receivers. SEIC also confirmed that the safety measures for operating the source (reiterated in WGWAP 4/INF.11) would be followed. Given this information, the Panel **agreed** that the proposed TL experiments are unlikely to cause any significant disturbance to the whales as long as the research vessels operate outside the feeding areas. However, to minimize the risk of effects on the whales, the Panel **recommends** that: (i) the TL experiments be conducted as expeditiously as possible, preferably in a single year; and (ii) the vessels used to deploy and pick up receivers within the feeding areas be the smallest practicable (*e.g.* rigid-hull inflatables) and be operated slowly and cautiously in order to reduce the risk of disturbance or collisions with whales.

7.3 Documenting the evolution of SEIC's noise management and mitigation programme – lessons learned

WGWAP 4/INF.12 reviewed the history of discussions of noise (recommendations, equipment, modelling etc.) in order to identify lessons learned that could be applied in future operations by SEIC as well as by other oil and gas companies.

Some examples of recommendations and good practice include:

- Ensure that acoustic data are acquired in a way that allows for the calculation of exposure dose

- Ensure that during industrial activities, appropriate data to investigate effects are collected in order to obtain as much information as possible both to test for effects and to improve the planning of future activities
- Ensure that the best equipment available is used
- Use independently validated acoustic modelling to assist planning
- Plan industrial activities to minimize the exposure of animals to disturbing or otherwise harmful noise (*e.g.*, timing, coordination of schedules, vessels and other equipment used).

It was agreed that the Panel process, including SEIC's implementation of advice, provided solid evidence of the efficacy of the last of those listed examples. WGWAP 4/INF.12 was a work in progress and meeting participants were encouraged to provide their comments and suggestions directly to Nowacek. The Panel agreed that a full paper on the topic (expanded from the present extended outline) would be most useful if it were published in a peer-reviewed journal, *e.g. Environmental Monitoring and Assessment*, *Environmental Management.*

From the Independent Scientific Review Panel (ISRP) through the Interim Independent Scientists Group (IISG) to the current WGWAP process, there has been an ongoing discussion about the adequacy of the acoustic monitoring equipment used by SEIC in its noise monitoring and mitigation programme. Two specific recommendations from previous meetings remain open – Item 3 under 'Real-time behavioural-acoustic monitoring' (IISG report, p. 22) and Recommendation WGWAP 3/031. This issue of equipment is particularly important given the proposed 2009 seismic survey (see item 10) and the potential dynamic range of airgun signals at the perimeter monitoring line and the frequency range that those signals may span, *i.e.*, 0.3 – 3 kHz, as documented by Madsen *et al.* (2006). Therefore, the Panel remains concerned that the existing equipment may not be adequate. It **recommends** that equipment with the following specifications be used: (i) recording stations with analog-to-digital (A/D) converters of ≥16 bits, (ii) the real-time acoustic data be transmitted at this bit-depth (*i.e.* ~72 dB dynamic range) in the frequency range of 1 Hz–3 kHz; and (iii) a sampling rate (Fs) of ≥20 kHz for the archival buoys. The Fs ≥20 kHz specification applies more to continuous noise from construction and/or platform operations, which can reach 10 kHz (Richardson *et al.* 1995), although signals from seismic airguns can reach 3 kHz (Madsen *et al.* 2006).

8 BENTHIC MONITORING

8.1 2007 benthic monitoring close-out report

Fadeev presented a summary of benthic monitoring work carried out in gray whale feeding areas in the vicinity of the Sakhalin II project area in 2007. The presentation included:

- a review of sampled locations and brief video segments showing benthic habitat characteristics
- temporal and spatial variation in summed amphipod and sand lance biomass[1]

[1] Benthic gammaridean amphipods are recognized as the primary prey of gray whales in the Sakhalin II project area, and sand lance are also thought to be significant prey for the whales.

- information on the possible role of effluent waters from Piltun Lagoon in facilitating high benthic productivity rates in the feeding areas
- data on concentrations of halogenated hydrocarbon pollutants in whale prey species in the feeding areas.

A brief summary of the presentation is given below.

Biomass density estimates summed across all amphipod species were reviewed for three feeding areas: Piltun (2002, 2006, 2007), offshore (2002, 2006, 2007), and Chaivo (2001, 2006, 2007). Data from specific sites ("feeding points") at which foraging dives by gray whales have been directly observed, were also reviewed. Statistical analyses were not presented, but inspection of error bars in data plots suggested no significant interannual differences in biomass density of amphipods for any of the feeding areas or for feeding point samples. Annual mean amphipod density ranges were approximately 30-120 g/m^2 in the Piltun feeding area, 730-860 in the offshore area, and 35-50 at Chaivo. Density ranges in feeding point samples were 60-70 at Piltun and 330-530 in the offshore area. A summary plot of annual mean amphipod density for all years in two depth strata (<20 m and >20 m), 2002 through 2007, was also presented. The plot suggested a long-term maximum density in 2002 (~85 gm/m^2) and a minimum in 2006 (~30 g/m^2) for the shallow stratum; interannual differences in summed amphipod biomass density did not appear to be statistically significant for the shallow stratum. Mean biomass densities for the deep stratum were near 20 g/m^2 for the time period, with low variance and no indication of an interannual trend.

Annual mean biomass density maps were shown for sand lance in the Piltun feeding area for 2004 through 2007. Maps indicated an area of high biomass density in 2004 and 2005 in the northern part of the Piltun feeding area. It was noted that the area was also used heavily for foraging by whales in 2004 and 2005. Sand lance density and whale use dropped to lower levels in 2006 and 2007. The noted changes correlated with lower sea bottom water temperatures and higher ice cover in the feeding area in 2006 and 2007 as compared to 2004 and 2005.

Stable carbon and nitrogen isotope data from samples of whale prey species collected from the Piltun feeding area were discussed in the context of the hypothesis that export of terriginous detritus from Piltun Lagoon contributes to productivity of benthic prey species used by whales in the feeding area. It was noted that the isotope signatures were better matched to marine phytoplankton sources than to terriginous sources, not what one might expect given the hypothesis. However, during discussion following the presentation it was noted that trophic subsidies to the feeding areas from the Lagoon could take the form of exported phytoplankton or phytoplankton-derived detritus, or biologically significant inorganic nutrients such as nitrate or phosphate. Such subsidies would be consistent with reported stable isotope signatures, and could provide a functional link between biological productivity in the Lagoon and in the whale feeding areas.

Fadeev presented preliminary information suggesting that whales foraging in the Piltun feeding area are found relatively close to shore early in the season, and progressively farther offshore later in the season. This would be consistent with a model in which whales will select areas to forage where the costs of obtaining prey are least, and move to progressively more costly portions of the feeding areas as prey availability is depleted in the least costly areas (assuming the cost of foraging is primarily a direct function of water depth).

Contaminant levels found in prey species in the feeding areas were very low, in some cases approaching minimum detection limits. The data were compared with samples collected from other benthic habitats closer to industrialized regions. For all data categories the latter samples indicated much higher contaminant concentrations.

The Panel expressed appreciation to Fadeev for the interesting and informative presentation.

Discussion focused on several high-priority recommendations from previous Panel meetings that related to benthic monitoring activities. With regard to statistical power for temporal trend detection in benthic data, the Panel had previously suggested that benthic sampling effort should be adequate to detect changes as small as 25%, between successive years, in summed biomass density of benthic amphipods, and 50% in individual densities (animals per unit of sediment surface area) of the most abundant amphipod species. SEIC reported that sampling work to support power analyses had been undertaken and that the analyses themselves were in progress. Progress is also being made towards importation of data into geospatially explicit data management tools for the purpose of integrating benthic data with analyses of other aspects of gray whale biology in the feeding areas. Issues concerning the trophic significance of Piltun Lagoon to gray whale feeding ecology are described in more detail below. The Panel concluded that the benthic survey work by Fadeev's team is of high quality and directly relevant to central issues of gray whale conservation. The Panel supports the continuation of the benthic surveys and associated work, taking into account the results of the power analyses referred to above.

The Panel continues to attach great significance to an improved understanding of trophic linkages between Piltun Lagoon and whale feeding areas near Sakhalin II development and hydrocarbon production activities. The Sakhalin II project is undergoing the transition to fully operational production, with extraction and transport of high product volumes on decadal time scales. A commitment to environmental monitoring is essential for detecting potentially chronic impacts of production and other aspects of the project, with the ultimate purpose of preventing the degradation or loss of foraging habitat for gray whales. Further, as data accumulate on the ecology of WGWs, data management and analytical methods must be kept current in order to allow quantitative assessment of linkages among the various relevant data categories. Finally, a properly designed and maintained environmental monitoring program will facilitate detection of development-related damage to specific habitat attributes, such as the hypothesized trophic subsidies from lagoon effluent waters to whale feeding areas.

It therefore was agreed to establish an Environmental Monitoring Task Force (EMTF) to review the current state of Sakhalin Energy's environmental monitoring program, with particular attention to understanding ecological linkages important to western gray whale foraging habitat, and to provide advice and guidance with regard to future environmental monitoring. The terms of reference for such a task force are given in Annex 6.

8.2 Outstanding recommendations regarding environmental monitoring

This item was addressed through the establishment of the aforementioned Task Force (Annex 6) as well as through the comprehensive list of recommendations discussed under Item 2. Moreover, as discussed under Item 14.1 (below), the Panel undertook to prepare a public statement concerning the potential importance of Piltun Lagoon in maintaining benthic productivity of the Piltun feeding area. The statement includes an appendix summarizing previous recommendations related to this topic.

9 SATELLITE TAGGING

9.1 Weller report

Weller presented an update on the jointly funded U.S. Marine Mammal Commission (MMC)-IUCN satellite tagging report (see previous WGWAP reports for background). His draft report acknowledged the benefits of tagging in terms of greater understanding of whale behaviour, movements and habitat use, while recognizing the associated fundamental gaps in knowledge regarding potential negative effects of tagging (*e.g.* wounds, stress, health, condition, reproduction). These gaps are of special concern when dealing with endangered species or populations, where the balance of benefit versus risk needs to be carefully evaluated to ensure the health of tagged individuals (and potentially the fitness of the population as a whole). To address some of these concerns, in 2005 the MMC and U.S. National Marine Fisheries Service (NMFS) convened a workshop to summarize the benefits, review the risks, and evaluate the state of follow-up studies to assess such things as the condition, survival and reproductive performance of large whales after tagging. This workshop served as the general focus of Weller's report.

Although annual monitoring and research on western gray whales in their summer feeding areas off Sakhalin have been ongoing since 1995, little is known about this population's migratory routes and wintering areas. Thus, the possibility of using satellite tags to obtain such information has been under discussion for a number of years, as have concerns about whether the risks associated with tagging individuals from this critically endangered population are warranted. Western gray whales were used as a case study in the report by Weller and the report therefore was expected to provide the WGWAP with the information needed to develop new recommendations on the issue.

WGWAP 4/INF.14 represented the penultimate draft report as submitted to the MCC and IUCN in March 2008. One further round of revision by Weller is expected, pending his receipt of review comments from workshop participants as well as from the Panel. It is expected that the report will be completed by late May, in time to be included as a paper for discussion at the June 2008 meeting of the IWC Scientific Committee in Santiago, Chile.

In discussion of INF.14, the Panel requested clarification of several points, but no new items of substantial concern were identified. SEIC, conscious of the risks of tagging WGW, reiterated that it had not made any final decision about funding a satellite tagging study.

Donovan summarized the recommendations of the IWC Scientific Committee at its 2007 annual meeting with regard to satellite tagging of western gray whales. The Committee recommended that the IWC act as a co-ordinator for a tagging/telemetry project *inter alia* to ensure that it is carried out in a risk-averse manner and to enable potential sponsors to contribute financially without necessarily assuming any responsibility for the programme's design, conduct or results. A co-ordination group had been established, consisting of Brownell, Donovan, Gales, Reeves and Weller, to ensure consistency between the IWC Scientific Committee's recommendations and those of the Panel. Donovan reported that no publicity had yet been given to the tagging fund, pending discussion of the Weller report at the 2008 annual meeting of the IWC Scientific Committee.

9.2 Development/refinement of recommendations on WGW satellite tagging

In light of the information presented in WGWAP 4/INF.14 and provided by Donovan in regard to the IWC Scientific Committee co-ordination group, the Panel agreed that, in principle, tagging/telemetry work on western gray whales should be carried out. Moreover,

the Panel agreed that all of its previous recommendations concerning satellite tagging would be superseded by the following single recommendation:

The Panel **concludes** that telemetry work on western gray whales should be carried out provided that such work is guided by a co-ordination group within the IWC Scientific Committee. This guidance would include specific advice on experimental protocols, study design and measures to be taken to minimise the risk of negative impacts on the whales or the population as a whole. The co-ordination group will take into account all previous recommendations of the Panel.

10 4-D SEISMIC SURVEY

10.1 Report of the Seismic Survey Task Force (WGWAP 4/INF.15)

At WGWAP-3, SEIC had indicated that for safety reasons (see Item 2.1) the seismic work originally planned for 2008 was to be postponed until 2009. This meant that matters raised at the first Task Force workshop held in June 2007 (WGWAP 3/INF.9) but not addressed thoroughly because of time constraints could be examined in greater depth. The Panel had agreed with the overall approach and mitigation measures recommended by the Task Force, but concluded that further work was required *inter alia* on the quantitative aspects of the work, especially those related to threshold levels. In summary, the Panel had agreed that the following items merited further discussion: whether to use a dose-based approach; the threshold levels themselves; estimation of doses received; effectiveness of the proposed mitigation measures; estimation of transmission loss and calibration of model predictions; adequacy and reliability of sound monitoring equipment; and monitoring of possible whale responses. It had agreed that the best way to address these issues was by continuation of the Task Force.

As a consequence, the Seismic Survey Task Force held its second workshop from 13-16 March 2008 in Lausanne and completed its business at an evening session during WGWAP-4. The report of the Workshop is given as WGWAP 4/INF.15. Donovan introduced the report to the Panel in some detail during the WGWAP-4 meeting. Given the complexity of the subject and the availability of the full report, only a short chairman's summary of the conclusions is given here. For the detailed conclusions and recommendations, interested readers are referred to WGWAP 4/INF.15.

The primary objective of the March 2008 workshop was not to reopen all previous discussions but rather to build upon the work undertaken at the June 2007 workshop in order to review and analyse the noise associated with the proposed 2009 Astokh seismic operations in the light of its possible effects on gray whales, and make recommendations on mitigation and monitoring.

A substantial amount of work was carried out by the Task Force at both workshops, particularly with respect to the analyses incorporating the whale density data (WGWAP 4/INF.15, Item 4) and the acoustic modelling (WGWAP 4/INF.15, Item 5). It was agreed that the fundamental difficulty facing the Task Force was not analytical. Rather, it was the lack of appropriate data, primarily with respect to the short-, medium- and long-term effects of noise (in this case, from seismic surveys) on gray whales (or indeed any large baleen whales), especially on their feeding grounds. Thus, even though it was reaffirmed that a dose-based approach was desirable (WGWAP 4/INF.15, Item 6), in the absence of suitable data, the Workshop had to base its mitigation measures on use of the widely accepted standard of 163dB$_{RMS}$ as a behavioural disturbance threshold (WGWAP 4/INF.15, Item 6.2).

Given that further seismic surveys will have to be undertaken during the lifetime of the field, it is essential that every effort be made to ensure that there are considerably more appropriate data and analyses available in the future. This is highlighted in the Task Force's discussions and recommendations on monitoring (WGWAP 4/INF.15, Item 7.5) and the need to establish an expert group to ensure that full advantage is taken of the opportunity offered by the 2009 survey. This latter point is discussed under Item 10.2 below.

Particularly with so little known about potential effects and noise levels, the best mitigation measures are those that minimise (or eliminate) the exposure of whales to noise. The most effective mitigation measure currently available, by far, is to ensure that the seismic survey is completed as early in the season as possible. This was illustrated clearly in Table 7.1 of WGWAP 4/INF.15 which showed that the number of whales that might be found within the $163dB_{RMS}$ sound contour was 6-8 times higher in August-September than June-July. The Task Force therefore strongly recommended that every effort be made to ensure that this occurs. It further stressed the importance for the future of undertaking the work discussed in WGWAP 4/INF.15, Item 3.3, to: (a) minimise the sound levels required if a survey is carried out when whales are present; and (b) develop methods that allow the needed information to be acquired outside times when the whales are present.

For the 2009 seismic survey, the Task Force made a number of recommendations with respect to both monitoring (WGWAP 4/INF.15, Item 7.5) and mitigation (WGWAP 4/INF.15, Item 7.6). It emphasised that the proposed monitoring measures are not an optional extra – they are integrally related to the mitigation measures proposed or likely to be proposed for future seismic surveys. Indeed, most of the recommended monitoring measures are essential for implementation of the mitigation measures recommended for the 2009 survey.

An important component of these measures relates to the determination of the overlap between the 95% kernel lines and the modelled 156[2] dB SEL sound contour with respect to defining the A and B zones (see WGWAP 4/INF.15, Item 7.4.2). Given the importance of the modelling approach in this, the Task Force reiterated the importance of (1) real-time calibration (WGWAP 4/INF.15, Item 5.5), (2) completion of the validation of the JASCO modelling work (WGWAP 4/INF.15, Item 5.3.2) and (3) completion of the updated 95% kernel analysis (WGWAP 4/INF.15, Item 4.1).

As can be seen from the above summary, there were a limited number of areas where the Task Force indicated further work in small groups was necessary. These are considered further below.

10.2 Discussion and future work

The Panel welcomed the report of the Task Force, noting that not only had a considerable amount of work been undertaken but that this probably represented the most thorough work with respect to seismic surveys and cetaceans, *in advance of the seismic field operations*, yet undertaken anywhere. After some discussion and clarifications, the Panel **agreed** that the Task Force as a body had completed its work and endorsed WGWAP 4/INF.15 and its recommendations. Those recommendations directly related to mitigation and monitoring for the 2009 survey are repeated here as Annex 7. In endorsing the report, the Panel expanded

[2] Used as a proxy for 163 dB RMS

upon the recommendations for short-term future work made in WGWAP 4/INF.15 – these are discussed directly below.

SEIC confirmed that the monitoring and mitigation measures recommended in the Task Force report would be incorporated into the EIA (Environmental Impact Assessment) currently being prepared for disclosure in September/October 2008. The EIA is a public document that will be translated into Russian for approval by the authorities, who are likely to make comments and recommendations on it. A public consultation probably will occur around January 2009 (about six months before the start of operations to allow SEIC enough time to obtain the necessary permits).

In discussion, the Panel noted that for the sake of transparency, there would be value in having an independent observer nominated by the Panel present on the seismic vessel during the survey. While recognising that there may be logistical difficulties, the Panel **recommends** that SEIC investigate this possibility and report back to the Panel by WGWAP-5.

10.2.1 Inclusion of non-systematic sightings into the density analyses and specifically in the estimation of the perimeter monitoring line for the 2009 seismic survey.

This issue is discussed under Item 4.1 of WGWAP 4/INF.15. In summary (details can be found in WGWAP 4/INF.15, Items 4.1 and 7.4.1), the Task Force had agreed a conservative (risk-averse from the whales' perspective) process for determining the perimeter monitoring line:

(1) for two time periods (1 June–31 July and 1 August–30 September) calculate the composite maximum estimated density by 1 km^2 grid over the years 2005–2007 (*i.e.* for each grid cell, the highest estimated density in any of the years 2005, 2006 and 2007 is used);

(2) determine the 95% kernel density contour for the two time periods to obtain the perimeter monitoring line that is used to determine zone A (*i.e.* the zone with the most stringent mitigation measures) as discussed in Annex 7;

(3) the perimeter monitoring line used during the seismic survey will correspond to the time period in which the survey begins.

While the Task Force itself was able to carry out this work using the density data obtained from the systematic surveys only, it recognised that, from the perspective of examining the potential effects from seismic surveys, it was important to try to incorporate as much data as possible from areas further offshore, even though the estimation of appropriate effort is not simple. The primary data sources that fall into this category are: data associated with the photo-identification work and research vessels (in non-systematic survey mode); and data from the MMO programme.

Given the complexity of incorporating these data, the Task Force had agreed that it was not possible to incorporate these data before or during WGWAP-4.

The Panel concurred with this view and **agreed** to establish an advisory group to assist Muir in this analysis comprising Donovan, Cooke and Gailey. Priority will be given to obtaining information for squares (grid cells) for which the present analysis has zero or low effort.

Muir informed the Panel that she should be able to complete the revised analyses, in consultation with the advisory group, by the end of July 2008. The Panel **agreed** that the revised maps and perimeter monitoring line should be circulated as soon as possible for

comment. The final co-ordinates for the monitoring line will be made public once they have been agreed.

10.2.2 Detailed specifications for the monitoring segment of work for the 2009 seismic survey

The Panel noted that one of the major difficulties faced by the Task Force in assessing the risk to western gray whales from seismic surveys (and indeed any anthropogenic noise) was the shortage of applicable data on effects of sound on baleen whales. Given that regular (4-5 year intervals) seismic surveys are expected for the lifetime of the field, the Panel **agreed** with the Task Force that it is essential that every effort be made to ensure that the WGWAP (or any other body) does not find itself in the same position the next time a seismic survey is proposed. It is thus of great importance that a sufficient monitoring effort is in place to maximise the collection of relevant data to allow a better analysis of the problem and thus develop more effective mitigation measures for the future.

The Panel noted that the Task Force had neither the time nor the necessary analytical expertise available to develop a detailed monitoring plan (that included in WGWAP 4/INF.15 and repeated in Annex 7 represents an outline). It **concurs** with the Task Force that a suitable group of experts should be asked to work with SEIC scientists to develop a fully specified field plan and proposed analysis, well before the final plans for monitoring in 2009 are completed. There was insufficient time at the present meeting to develop a detailed Terms of Reference or to finalise the composition of such a group. The Panel therefore **agreed** that Donovan, Bell, Cooke, Gailey, Nowacek and Weller should work to develop draft Terms of Reference and suggested participants for this expert group, for circulation to the Panel by 1 September 2008.

10.2.3 Field calibration for the 2009 seismic survey

The question of field calibration was covered extensively in WGWAP 4/INF.15, Item 5.5, and details of the acoustic monitoring are given in Annex 7.

SEIC confirmed that normal practice was to go into the field with a conservative or 'worst case scenario' model for noise levels, undertake the calibration exercise using field measurements and examine whether the results are consistent with the model or not. In the present instance, it would then be necessary to consider any implications for the extent of the A zone and thus the designation of A lines as well as the radius of the safety buffer zone around the seismic source. The calibration exercise may take up to 72 hours (the 'window') and involves examining predicted levels at the perimeter monitoring line (see above) with the actual levels measured at the (at least) nine receivers stationed there. Given the importance of completing the survey as early in the season and as quickly as possible as a mitigation measure, lines can continue to be shot while the calibration is carried out. If conditions permit, *e.g.* excellent visibility and acceptable sea state, A lines (as determined from the modelling exercise) can be shot before the calibration is completed, with, of course, the additional safeguards established for such lines (see Annex 7).

The Panel **agreed** that there was merit (both for 'transparency' and to build upon the co-operative approach already evident in the work of the Task Force) in the idea that a small group, including Racca, Nowacek and Vedenev, would jointly consider the result of the calibration exercise during the 'window'. It was further **agreed** that any details of how this might be undertaken in practice could be discussed at WGWAP-5 and the Panel **requested** that those individuals provide a discussion document for consideration at that meeting.

The Panel also noted that the perimeter monitoring line is some 20 km long (the shot lines are about 11 km). While this line will be carefully monitored during the seismic survey, there may be insufficient buoys to monitor the mouth of Piltun lagoon (*i.e.* much further to the north, well outside the area likely to be disturbed by the seismic survey). It noted that this might be an appropriate site for other monitoring teams (*e.g.* IFAW) to position their equipment.

10.2.4 Acoustic modelling work by the Russian Team

The Task Force had stressed the importance of the acoustic modelling to the overall process (including the initial designation of the A zone) and had noted the value of the comparison of results from alternative methods (*e.g.* JASCO and the Russian Team). The Panel **agreed** that there was merit in the Russian Team continuing its work to improve understanding of sound levels likely to reach whales in the near-shore feeding area. It therefore **recommends** that Constantin Avilov be asked to perform further work according to the following rationale and specifications:

(a) Avilov was originally contracted by IUCN to model the proposed 2009 seismic survey, specifically to assist the Seismic Survey Task Force in its efforts to develop monitoring and mitigation plans. Due to a miscommunication regarding the data needed, however, his initial work had not been completed by the time of the Task Force meeting in March 2008. Since then, the data have been provided and Avilov should now have what he needs to complete the originally agreed work.

(b) On a separate matter, during its March 2008 meeting the Seismic Task Force considered data recorded by the Russia-US research team during the 1997 seismic survey on the Astokh field as reported by Würsig *et al.* (1999). Given the discrepancies between the 1997 data and JASCO's attempts to model those pulses, it was deemed important to request that Avilov carry out an independent, alternative modelling exercise to explore this issue further.

(c) The two tasks are worthwhile for several reasons. Firstly, it is important to continue to explore the disturbance that may be caused by the 2009 survey. Secondly, the 1997 recordings are the only data available representing the actual transmission characteristics of seismic survey pulses in the Astokh area that would impinge on the whale feeding area. As such, they provide a valuable opportunity to test different modelling approaches. Finally, Avilov has advised the Panel that the additional time required to complete his modelling of the 1997 data would be less than one day, and that it could be done in parallel with the 2009 full source and transmission loss modelling work.

In summary, then, the Panel identified two distinct areas of analysis that would benefit from Avilov's input: (1) the originally requested independent modelling exercise for comparison to the JASCO model and (2) the validation exercise using the 1997 recordings. Avilov now has all of the necessary information and data to model the noise footprints for both the 1997 survey and the proposed 2009 survey, except perhaps the point source equivalent spectral source-level values in frequency increments of 1Hz and azimuth increments of 1 degree between 5Hz and 2 kHz (JASCO has promised to provide these without delay). Moreover, there is still a need to better understand the potential impacts of noise on gray whales during the proposed 2009 seismic survey.

The Seismic Survey Task Force has taken the approach of using acoustic models to explore the uncertainty about the potential for disturbance during the proposed 2009 survey. In terms of meeting its goal of ensuring minimal risk to gray whales, the Panel **concludes** that the proper order of work is for Avilov to focus initially on full source and transmission loss

modelling of the 2009 surveys and then to complete work on the 1997 data and recordings (ideally, as indicated above, it will be feasible to conduct the two tasks in parallel). For the 1997 data, Avilov should: (a) perform full-spectrum transmission loss modelling for the traverse corresponding to the above-mentioned measurement over a frequency range of 5Hz to 2 kHz, and (b) report his results both as transmission loss values and as received levels per frequency based on the source properties provided.

11 OIL SPILL PREVENTION, PREPAREDNESS AND RESPONSE

11.1 Final report of the Oil Spill Task Force

The report of the Oil Spill Task Force had been presented in draft at WGWAP-3 and it was agreed that the final report of the Task Force (WGWAP 4/INF.16) would not be considered in detail at this meeting. However, WGWAP 4/INF.17 had been prepared to identify and highlight relevant action items outstanding from WGWAP 4/INF.16 and to revisit WGWAP-3 recommendations regarding oil spills.

11.2 SEIC's response to oil spill recommendations

Dicks briefly introduced WGWAP 4/INF.17, noting that a total of 19 items in 11 categories had been identified for follow-up by SEIC, plus an additional seven items, with links to oil spills, that were to be dealt with under other agenda items. SEIC was invited to respond.

SEIC explained that only a few of the listed action items and recommendations had been pursued actively since WGWAP-3 because the company's focus in the interim had been on completion of the two remaining Oil Spill Response (OSR) plans for its land-based operations (the LNG terminal and onshore pipelines). The following explanations were given by SEIC for what had been set out in WGWAP 4/INF.17:

Oil Characteristics, Biodegradation, Oil Spill Trajectory Modelling and Use of Support Vessels in Spill Response: The nine items in this section were in progress and SEIC **agreed** to provide details to WGWAP-5 later this year. Further information from the Leeder Group was already available on aromatic hydrocarbons in Vityaz crude. The Panel **recommends** that it be provided with this information on aromatic hydrocarbons by 1 July 2008. Further, the Panel **recommends** that updated information on aromatic content, emulsification properties, wave tank or at-sea experiments, in-situ burning and biodegradability, as well as updates on any relevant ongoing studies and their expected completion times, be provided for review at WGWAP-5.

With regard to spill trajectory modelling, SEIC acknowledged that none of the three issues raised had been addressed since WGWAP-3. The Panel **recommends** that SEIC provide for WGWAP-5 an update on: modelling of spills in the Aniva Bay area (including by vessels approaching from the east) in relation to (a) the WGW feeding areas and (b) the presumed WGW migration route, and (c) the potential for increased risks associated with any predicted changes in ship traffic patterns.

SEIC reported that arrangements were already in place to use supply vessels and other workboats in spill response as required, but no specific training or equipment had been provided for them. The Panel therefore **recommends** that formal arrangements to use other vessels and provide relevant training for their crews be put in place by SEIC.

Exercising Under Realistic Conditions: Two exercises had been conducted in severe winter conditions since WGWAP-3, one in December 2007 and the other in March 2008. SEIC made a brief presentation showing vessels making openings in the ice and deploying oil

recovery systems. The exercises reportedly had provided an excellent opportunity to familiarise responders with severe winter conditions and to test and improve response and communications. The Panel **requested** that further information on exercises be provided prior to WGWAP-5, including a list of those remaining in 2008 and planned for 2009 along with brief written reports on the completed exercises identifying lessons learned.

Differences between OSR Plans and Practical Planning Documents and Response Options: SEIC took the opportunity to explain that all of the recommendations from WGWAP-3 regarding boom deployments, prop-washing, surf-washing, use of dispersants in shallow waters and in-situ burning had been addressed and incorporated into the OSR plans. Revised versions of the plans had been provided for comment recently to the advisers for potential lenders (PCCI) and the Panel **recommends** that these be provided to the Panel by 1 July 2008 for its review and comment. Further work was needed to make the handbooks consistent with the plans but some of the handbooks were already available on SEIC's web site. It was **agreed** that these would be reviewed by Panel members to confirm consistency, with report back from the Panel at WGWAP-5.

Sensitive Areas/Sites: Recommendations regarding Piltun Lagoon reportedly have already been incorporated into OSR plans and these would be subject to further revision by the Environmental Monitoring Task Force proposed by the Panel at this meeting (Item 8.2).

Pre- and Post-spill Monitoring: Components related to benthic monitoring and monitoring in Piltun Lagoon also would be subject to review and revision by the proposed Environmental Monitoring Task Force. Issues related directly to studies of western gray whales, including necropsy, are dealt with in the Oil Spill Task Force report.

Waste Disposal: SEIC reported that waste-disposal issues were being negotiated with Sakhalin Oblast. The proposed site at Smyrnik has been established; it is designed to accommodate 50,000m³ of oily waste. The site is located between Yuzhno and Nogliki. A second site in the southern part of the island is currently under negotiation with Sakhalin Oblast. The Panel welcomed these developments and **requests** that regular updates be provided at future Panel meetings.

11.3 Panel response to letter from Pacific Environment and WWF-Russia

A letter raising issues from the Oil Spill Task Force (OSTF) report (WGWAP 4/INF.16) was submitted by NGOs for consideration at this meeting (WGWAP 4/INF.16b). The issues raised fell into eight categories, seven of which were considered under this agenda item. The eighth point related to Exxon Neftegas Limited's proposed pipeline across Piltun Lagoon and it was considered under agenda item 14. The Panel's responses to the seven other issues were as follows:

Lack of Recommendations in the OSTF Report: This issue arose from a misunderstanding. Task forces are not necessarily expected to make recommendations, and those they do make are directed to the Panel, which can then endorse, modify, or decide not to adopt them. Responsibility for formal recommendations is the reserve of the Panel, which is meant to develop them with the guidance and input from task forces. In this instance, recommendations related to oil spill response had been included in the WGWAP-3 report. Further, the other main action items arising from the OSTF report had been synthesised in WGWAP 4/INF.17 and were considered by the Panel under item 11.2.

Violation of International Compensation Conventions by SEIC: Dicks explained that there had been no violation of conventions. Although the conventions are in force in Russia, they cannot be applied to vessels carrying Vityaz crude oil because they apply only to

'persistent' oils. The properties of Vityaz crude clearly define it as 'non-persistent'. In spite of this, tankers carrying the crude are covered by pollution insurance. SEIC stressed that the company would meet all of its pollution responsibilities regardless of the non-applicability of the conventions. The company's pollution insurance coverage had been specified in the OSR plans and the Panel **confirmed** that it would examine this during its anticipated review of the revised versions of the plans (item 11.2). However, the Panel also clarified that it considered the task of reviewing the 'adequacy' of the company's pollution insurances to be outside its remit.

Properties of Vityaz Crude: The Panel **confirmed** that it had been provided with substantial amounts of information on crude oil properties. As noted in WGWAP 4/INF.17, the Panel expected that more information would be provided by SEIC as it became available from studies in progress. The Panel clarified that it did not plan to solicit independent verification of the data on crude oil properties provided by SEIC because the information provided to date had come from reputable analytical laboratories and there was no reason to doubt its veracity. The Panel also clarified that data provided by the company to the Panel task forces would not necessarily be made public as such release must be at the discretion of the data owner.

No Approved Plans for LNG Terminal and Onshore Pipelines: This issue arose from a misreading of the OSTF report. SEIC confirmed that such plans had been prepared and were in the process of approval by the Russian authorities. In any case, these specific plans were outside the Panel's remit as they apply only to facilities on land.

Emergency Response Exercises: SEIC reported on the 2007/2008 exercises to this meeting and the Panel has requested formal reports of the exercises from the company (Item 11.2).

Oil Spills by Contractors and Subcontractors: The NGOs had requested that the Panel consider the SEIC response to the *Cristoforo Colombo* spill in 2004, which they regarded as inadequate given that the vessel was understood to have been under contract to SEIC. SEIC reported that the vessel was not under contract to the company at the time of the spill though it had been prior to the spill; the contract had terminated and the vessel was in port after demobilisation. SEIC had voluntarily assisted with the spill response at the request of local authorities. It also stated that there were many factual inaccuracies in the reports of the circumstances of the spill and also regarding the conduct and effectiveness of the clean-up. The Panel noted that it had not undertaken a detailed review of the spill. Given that it occurred three and a half years ago and with very different plans and resources available compared to the present, the Panel **concluded** that there would be little benefit from reviewing the incident in detail at this point.

With regard to SEIC and its responsibilities for spills by contractors/subcontractors, the company responded as follows: SEIC accepts responsibility for all activities of its clean-up contractors, spill responders and working vessels. Responsibility for other contractors/subcontractors will depend on details of the contracts, but in practice, SEIC would likely end up assuming responsibility for and responding to contractor spills if for no other reason than pressure from the local administration. The Panel welcomes the assurance that SEIC is prepared to respond but considers that it (the Panel) has no practical role in ensuring that the company does so. The Panel noted that SEIC has a responsibility for vetting the quality of its contractors/subcontractors with a view to minimising the risk of spills.

Pipeline Leak Detection: SEIC confirmed that the current automatic leak-detection system is 'state of the art' and reiterated its commitment to implement the Panel's earlier

recommendation (WGWAP 3/016) concerning supplementation of the automatic system with visual inspection back-up. A key component of minimising the risk of pipeline spills is the company's regime of pipeline inspection, regular pigging and audits. The Panel saw no need for it to review all of the inspection reports.

11.4 SEIC's report on oil spill incident from SALM

Bell provided a brief summary of the 2007 incident as follows:

At 09:10 on 25 November 2007 the Single Anchor Leg Mooring (SALM) at the Molikpaq (PA-A platform) separated from its seabed mooring pad and floated to the surface, breaking the subsea oil line connection pipe in the process. The subsea line to the SALM had been shut down four days previously as a result of severe weather conditions occurring at that time, so the amount of oil released into the marine environment was minimal. At the time of the incident the swell was reported as 1.5m with 15 m/s winds. The rough sea conditions made estimation of spill volume difficult as the oil was dissipated rapidly by evaporation in the strong winds and by natural dispersion in waves. Based on areas of sheen seen around the SALM, the company estimated the spill at 3 litres. Some 150m^3 of oil remained within the subsea line but favourable hydrostatic pressure and low temperatures ensured that none of it was spilled.

An emergency response team was set up within 30 minutes of the incident and two response vessels were mobilised to the site. All necessary notifications were made to relevant authorities. Ecoshelf, the local OSR contractor, was alerted to prepare response equipment for deployment. However, the adverse weather conditions and rapid natural dissipation of the spill meant that none of the spill was recoverable and no further resources were mobilised.

Following the breakaway, the Floating Storage and Offloading (FSO) tanker was de-berthed from the SALM and the SALM was picked up by vessels for repairs on 25 November at 13:20. The following day the pipe-ends on the SALM, which was pitching in the swell due to the seas having picked up, were flanged and during this operation a further 40 liters of oil was released from the SALM pipework. This also was reported to have dissipated naturally in the rough seas. Aerial surveys were conducted to track the spill and monitor its natural dispersal. Divers inspected the damage at the seabed on 8 December.

Vessels were subsequently mobilised on the 26th to take 20 water samples along the spill trajectory and on 1 December, the seabed. Analysis revealed no detectable amounts of oil in the water column or in the seabed.

Overall, according to SEIC the incident provided a valuable opportunity to test spill response and communications, and it considered all systems to have worked well. Questions were raised as to why the company had failed to control and contain the spill within four hours as required by Russian law and why satellite images did not detect the spill. SEIC's response to both questions was that a combination of rough sea conditions and rapid natural dissipation made it infeasible and unnecessary to do either. Within one hour no sheen could be detected as it had all dispersed and evaporated. When asked if such a scenario and the potential effects of low temperatures on oil properties and behaviour had been considered during planning, SEIC responded that this specific scenario had not been considered but that other similar ones of SALM spills had been, and that the effects of low temperatures had been considered.

12 FUTURE SEIC PLANS FOR WGW MONITORING AND RESEARCH

12.1 SEIC's 2008 – 2010 Scope of Work

As part of its development of oil and gas reserves on the northeastern Sakhalin Shelf, SEIC undertakes a western gray whale research and monitoring programme. At WGWAP-3, as summarised under Item 12.2 in the report of that meeting, SEIC had expressed a desire to receive input from the Panel on various aspects of its programme and to spend substantial time discussing this topic at WGWAP-4. Specifically in response to a request by SEIC for intersessional input, the Panel provided a set of comments in January 2008 on the 2007 Scope of Work, on the understanding that this would help inform the company's planning efforts later in the winter. In addition, Julian Roberts of IUCN, Reeves and Bell met by teleconference in January/February to discuss a way forward for dealing further with the SEIC work plans at this meeting. The result was WGWAP 4/INF.19, which describes the 2008-2010 programme jointly funded by SEIC and Exxon Neftegas Limited (ENL).

The 2008-2010 work programme for western gray whale monitoring and research is stated to be in accordance with the recommendations of the State Environmental Expert Review on the ENL Sakhalin-1 (2002 and 2003) and SEIC Sakhalin-2 (1998 and 2003) projects. The scope of the 2008-2010 program continues and extends the studies conducted from 2002 to 2007 and includes the following components: (1) vessel surveys, (2) shore-based distribution surveys, (3) photo-identification surveys, (4) benthic surveys, (5) behaviour monitoring, and (6) acoustic monitoring. In concept and design, no major change in the programme is envisaged.

During the discussion of WGWAP 4/INF.19, frustration was expressed by both SEIC and the Panel. It was clear to everyone that the expectations arising from WGWAP-3, on both sides, had not been met and that a *modus operandi* for meaningful input by the Panel to SEIC's future research and monitoring plans was not yet in place. The Panel had expected to have a more detailed research and monitoring programme available for review, and that this programme would be linked explicitly to operations on a yearly basis (***e.g.*** seismic surveys, drilling, maintenance of infrastructure). For its part, SEIC had hoped to receive advice from the Panel on how to improve data collection and analysis.

Some Panel members had understood from their reading of WGWAP 4/INF.19 that annual reporting procedures, including timelines, were to be abandoned in favour of the companies submitting a single 3-year report, perhaps with annual 'progress' in the interim. SEIC confirmed, however, that the annual reporting schedule and related timelines were to be maintained for the foreseeable future. The Panel acknowledged the significant amount of time and effort put into the annual reports. However, it **recommends** that more programme resources be devoted to the development and completion of integrated multi-year analyses.

The Panel confirmed that, in principle, it endorses the approach proposed by SEIC/ENL for 2008-2010. However, the following caveats were noted with regard to the content of WGWAP 4/INF.19:

- There is concern about the temporal and spatial standardisation of some studies. For example, the benthic monitoring component in 2008 is planned for June, a period that does not overlap with past sampling periods and this may confound inter-year comparisons. Nonetheless, it was recognized that there could be a sound scientific basis for some degree of temporal variability in sampling. What is important is that in each instance the benefits and drawbacks be identified and carefully considered. The Panel **agreed** that this matter should be considered by the EMTF (see Item 8).

- The Panel emphasized the importance of knowing the intended start and end dates for each of the programme components and how these relate to any proposed industrial activities. Such information was missing from WGWAP 4/INF.19. In this regard, SEIC confirmed (as stated at WGWAP-3) that the field research season would be cut back from 90 to 75 days pear year, similar to the level before Phase 2 construction began in 2005.

In conclusion, although the research and monitoring programme outlined in WGWAP 4/INF.19 appears ambitious, it lacks the necessary technical detail on how the data and information will be collected, analysed and integrated. Some of this detail may be included, explicitly or implicitly, in previous annual reports but it needs to be drawn together in a single document. The Panel **reiterates** its support for a comprehensive, well-designed research and monitoring programme and its willingness to advise on its design. However, for this to be an efficient process, it is essential that a better-developed draft programme that contains the necessary detail on objectives, data collection protocols and analytical techniques (for both individual components and integrated analyses) be made available for review. Therefore, the Panel **recommends** that Larsen, in cooperation with the Panel and SEIC, co-ordinates the development of a proposal as to how such a review can be undertaken, to be presented at WGWAP-5.

12.2 Elaboration of the concept of controlled exposure experiment(s)

WGWAP4/INF.20 Nowacek described the Controlled Exposure Experiment (CEE) paradigm, juxtaposing it with observational experiments that represent an alternative method of investigating the responses of animals to acoustic stimuli. The two methods have their respective strengths and weaknesses, but one major strength of CEEs is that they give researchers the ability to control the source and thus the signal characteristics, amplitude and dose. CEEs that involve tags attached to the subject animals can measure the dose accurately and precisely.

The issue was raised of conducting some of these experiments with eastern gray whales. Nowacek and colleagues have submitted a proposal to the Joint Industry Program (JIP) of the Sound and Marine Life Program, which is operated and supported by the International Association of Oil and Gas Producers (OGP). The proposed study is intended to measure the response of eastern gray whales to a research seismic array, equivalent to an industry array. In discussion (and in WGWAP 4/INF.20), the importance of understanding the hearing range of CEE subjects, and specifically in this instance obtaining an audiogram for gray whales, was also noted.

An example of a CEE involving free-ranging large whales exposed to a measured cumulative dose of noise is the study of sperm whales by Madsen *et al.* (2006). Their results showed that in deep water, the proximity of the animal to the source (airgun) is not always a good predictor of received level (RL). In at least one instance, a whale relatively far from the source experienced a higher RL than a whale closer to the source. Conditions off Sakhalin (*i.e.*, shallow water and sloping bottom), however, make such an occurrence there unlikely.

As the Seismic Survey Task Force concluded, existing data documenting the response of gray whales to seismic airgun pulses are sparse and come from a single set of experiments in the 1980s. Given that more seismic surveys will be conducted off Sakhalin in years to come, the need will remain for better-informed mitigation strategies to protect WGWs from disturbance. The Panel therefore **recommends** that SEIC provides support (*e.g.* financial,

logistical), through a well-established program such as the JIP, for one or more CEEs involving airgun noise and eastern gray whales in a feeding area. Although it was recognised that SEIC has no authority to decide how JIP funds are spent, this should not prevent the company from expressing its interest in seeing that specific kinds of research are carried out.

13 NON-SEIC GROUPS MONITORING

13.1 Russia-US Team

A summary of results from the 2007 Russia-US photo-identification program was provided in document WGWAP 4/INF.21 and there was no discussion of this agenda item during the meeting.

13.2 WWF, IFAW

WWF: WWF-Russia reported that it had no field monitoring plans for 2008. Its work over the coming months was expected to focus on monitoring oil projects and engaging in active dialogue with the oil companies working on Sakhalin, including SEIC, Exxon, Rosneft and BP. Also, WWF is working to complete a document on the proposed Piltun Protected Area, which is expected to be submitted to the authorities at the beginning of May. Knizhnikov indicated that a copy (in Russian) would be sent to the Panel at the same time.

IFAW: Tsidulko reported that IFAW was not currently aware of any significant industrial activity on the Sakhalin shelf in 2008 that might affect whales, and therefore it has no specific plans for field monitoring. However, if it turns out that a seismic survey is to be undertaken near or adjacent to the WGW feeding area in 2008, IFAW will at least conduct land-based visual monitoring of gray whales at the time of the survey.

13.3 Independent monitoring of third party activities (*e.g.* seismic)

According to Tsidulko, IFAW has already started preparations for a monitoring programme linked to SEIC's proposed 2009 seismic survey and the planned Lebedenskoye seismic survey. The programme will include shore-based monitoring and the deployment of acoustic buoys to record and archive sound levels in the near-shore whale feeding area.

14 ACTIVITY BY OTHER COMPANIES

14.1 Update on proposed activity on Sakhalin Shelf

WGWAP 4/INF.22 contained copies of letters exchanged between the IUCN Marine Programme and two Russian agencies – the Federal Subsoil Resources Management Agency and the Supervisory Natural Resources Management Service (Rozprirodnadzor). The only new information obtained through these exchanges was that an exploratory well is to be drilled in 2008 in Veninsky block by Veninneft Ltd.

Observers to the meeting provided additional information. WWF-Russia reported that it had sent a letter to the local branch of Rosneft on Sakhalin to request information on that company's planned activities. This inquiry was then referred to Rosneft's headquarters in Moscow and the possibility of joint Rosneft – BP activities in 2008 was noted. WWF then sent a letter to BP requesting further details of such work but a response had not yet been received at the time of WGWAP-4. WWF offered to provide copies of relevant correspondence to IUCN and this offer was gratefully accepted.

The Panel had received no confirmation concerning the dates of the proposed Lebedenskoye seismic survey (see WGWAP-3 report). SEIC was asked, should that survey be planned for 2009, whether it would impinge upon SEIC's plans for the Sakhalin II Astokh seismic survey in summer 2009 (see item 10, above). Angelatos explained that two surveys in such close proximity would not normally be conducted simultaneously due to the potential for signal interference. He also stated that Rosneft (or the contractor for the Lebedenskoye survey) likely would not use the same vessel as commissioned by SEIC because it would involve different techniques (the Lebedenskoye block is in much shallower, near-shore waters). Representatives of SEIC stated that they had no details whatsoever concerning Rosneft's plans or survey dates. SEIC's plans are based on the assumption that it will be able to conduct its seismic survey at a time of its own choosing, and the company relies on its specialist seismic contractors to arrange the survey details and timing. SEIC intends to contact the relevant companies in the near future to ensure it gets first choice of contractor and a suitable time window. When asked whether a vessel like the *Nordic Explorer* might be used for the Lebedenskoye survey, SEIC indicated this was unlikely because such vessels have too deep a draught to operate in such shallow water.

As indicated under Item 11.3 (above) information was provided in WGWAP 4/INF.16b, and verbally during the meeting by representatives of WWF-Russia and Pacific Environment, concerning a proposal by ENL to construct a pipeline across Piltun Lagoon. Work on the proposed pipeline would be carried out in the winter of 2008-09. During the meeting there was considerable discussion of this proposal and the ongoing public consultation and hearing processes surrounding it. The Panel decided to prepare a statement for submission to the public process, spelling out its views regarding the potential significance of the lagoon to the food base of gray whales. A set of excerpts from previous panel reports would be included as an appendix to the statement.

It was noted that ENL apparently has plans to install onshore oil rigs at the northern end of Piltun Lagoon in summer 2008. There was some discussion of how the necessary equipment would reach the site, as concern had been expressed previously over the possibility that it would be brought ashore via barges passing through or even docking in the Piltun feeding area that is so important to females and calves. Tsidulko stated that he had seen considerable road building at the northern end of the lagoon in 2007, and it was his understanding that all access for the Odoptu (Sakhalin I) oil field would be overland. Vedenev confirmed that ENL had decided not to build a pier in the area that had been proposed some years ago.

The Panel reiterated its frustration at not having access to timely, authoritative information on the activities of other companies involved in oil and gas development on the northeastern Sakhalin Shelf. This situation has not improved over the years.

15 ANY OTHER BUSINESS

It was tentatively agreed that WGWAP-5 would take place in the first week of December 2008, probably in Lausanne.

REFERENCES

Cooke, J.G., Weller, D.W., Bradford, A.L., Burdin, A.M. and Brownell, R.L. 2006. Population assessment of western gray whales in 2006. Paper SC/58/BRG30 presented to IWC Scientific Committee, June 2006.

Jensen, A.S. and Silber, G.K. 2003. Large whale ship strike database. U.S. Department of Commerce, NOAA, NMFS, Office of Protected Resources. NOAA Technical Memorandum NMFS-OPR-25, 37 pp.

Laist, D.W., Knowlton, A.R., Mead, J.G., Collet, A.S. and Podesta, M. 2001. Collisions between ships and whales. Marine Mammal Science 17:35-75.

Leaper R., Cooke J., Trathan P., Reid K. and Rowntree, V. 2006. Global climate change drives southern right whale (*Eubalaena australis*) population dynamics. Biology Letters 2:289-292.

Madsen, P.T., Johnson, M., Miller, P.J.O., Aguilar Soto, N., Lynch, J. and Tyack, P.L. 2006. Quantitative measures of air-gun pulses recorded on sperm whales (*Physeter macrocephalus*) using acoustic tags during controlled exposure experiments. The Journal of the Acoustical Society of America 120 (4): 2366-2379.

Pugliares, K.R., Bogomolni, A., Touhey, K.M., Herzig, S.M., Harry, C.T. and Moore, M.J. 2007. Marine mammal necropsy: an introductory guide for stranding responders and field biologists. Woods Hole Oceanographic Institution Technical Report WHOI-2007-06.

Reeves, R.R., Brownell, R.L., Burdin, A., Cooke, J.G., Darling, J.D., Donovan, G.P., Gulland, F., Moore, S.E., Nowacek, D.P., Ragen, T.J., Steiner, R., VanBlaricom, G., Vedenev, A. and Yablokov, A.V. 2005. Report of the Independent Scientific Review Panel on the impacts of Sakhalin II Phase 2 on western North Pacific gray whales and related biodiversity. IUCN – The World Conservation Union, Gland, Switzerland and Cambridge, UK. iv + 123 pp.

Würsig, B., Weller, D.W., Burdin, A.M., Blokhin, S.A., Reeve, S.H., Bradford, A.L. and Brownell, R.L., Jr. 1999. Gray whales summering off Sakhalin Island, Far East Russia: July-October 1997; A joint U.S.-Russian scientific investigation. Final contract report to Sakhalin Energy Investment Company and Exxon Neftegas. 101 pp.

SUMMARY OF RECOMMENDATIONS FROM THE 4TH MEETING OF THE WGWAP 2008

Reference	Cross-Reference	WGWAP Recommendation & Requests	Responsible Party	Target Completion Date	SEIC Response
ITEM 5: MMO PROGRAMME AND CARCASS DETECTION					
WGWAP 4/001	WGWAP 4/4 Section 5.2	The Panel **requests** that SEIC provide clear explanations for *Miss Sybil's* inshore movements on 6 and 21 September, 1 and 13 October and 2, 3 and 5 November 2007.	SEIC	Aug 2008	
WGWAP 4/002	WGWAP 4/4 Section 5.2	The Panel **requests** that SEIC continue to document vessel deviations from the navigation corridors towards a WGW feeding area and make this information available in its annual MMO reports	SEIC		
WGWAP 4/003	WGWAP 4/4 Section 5.3	The Panel **recommends** that SEIC arrange for section 5 of the Pugliares *et al.* (2007) necropsy manual to be translated into Russian and made available to any company staff and others in the region who are likely to be involved in response to strandings along the Sakhalin coast.	SEIC	July 2008	
WGWAP 4/004	WGWAP 4/4 Section 5.3	The Panel **requests** that SEIC report back at the next WGWAP meeting on the outcome of its request to Russian authorities for authorisation to collect tissue samples from stranded whales.	SEIC	Dec 2008	
WGWAP 4/005	WGWAP 4/4 Section 5.3	The Panel **recommends** that SEIC obtain three necropsy kits and ensure their availability at strategic points on Sakhalin Island.	SEIC	May 2009	
ITEM 6: MULTIVARIATE ANALYSIS					
WGWAP 4/006	WGWAP 4/4 Section 6.3	The Panel **recommends** (1) that analyses of the 2006 data fully consider the earlier comments made in WGWAP 1/INF.2 and by the Panel (Annex 8).	SEIC	Dec 2008	
WGWAP 4/007	WGWAP 4/4 Section 6.3	The Panel **recommends** (2) that SEIC engage the assistance of the experts involved in the aforementioned independent review to work in a pro-active collaboration with Gailey and colleagues from the outset (rather than simply in a reviewer capacity), including at the variable-selection and treatment design stage as well as at the analytical modelling stage, to ensure a comprehensive analysis and interpretation of the 2006 data.	SEIC	July 2008	

ITEM 7: MONITORING AND MANAGEMENT OF CONTINUOUS NOISE					
WGWAP 4/008	WGWAP 4/4 Section 7.1	The Panel **agreed** with a proposal from Gailey that a dedicated comparison of scan and count methods as well as the analytical approaches used to calculate distance for data from the two teams would be a valuable contribution to proper integration of the distribution and behaviour data sets. The Panel **recommends** that such an analysis be provided for its review at WGWAP-5.	SEIC	Dec 2008	
WGWAP 4/009	WGWAP 4/4 Section 7.1	The Panel noted that the 'opportunistic' observations of WGWs by MMOs (particularly near the outer edges of the Piltun feeding area) had been plotted in WGWAP 4/INF.10 but not used in the daily average estimated whale densities for the period from 21 June–24 July 2007. It **recommends** that such inclusion be attempted following the same principles as discussed under Item 10.2.1 and that the results be made available for Panel review at WGWAP-5.	SEIC	Dec 2008	
WGWAP 4/010	WGWAP 4/4 Section 7.2	The Panel **recommends** that (i) the TL experiments be conducted as expeditiously as possible, preferably in a single year.	SEIC		
WGWAP 4/011	WGWAP 4/4 Section 7.2	The Panel **recommends** that (ii) the vessels used to deploy and pick up receivers within the feeding areas be the smallest practicable (*e.g.* rigid-hull inflatables) and be operated slowly and cautiously in order to reduce the risk of disturbance or collisions with whales.	SEIC	July 2008	
WGWAP 4/012	WGWAP 4/4 Section 7.3	The Panel **recommends** that equipment with the following specifications be used: (i) recording stations with analog-to-digital (A/D) converters of ≥16 bits, (ii) the real-time acoustic data be transmitted at this bit-depth (*i.e.* ~72 dB dynamic range) in the frequency range of 1 Hz–3 kHz; and (iii) a sampling rate (Fs) of ≥20 kHz for the archival buoys. The Fs ≥20 kHz specification applies more to continuous noise from construction and/or platform operations, which can reach 10 kHz (Richardson *et al.* 1995), although signals from seismic airguns can reach 3 kHz (Madsen *et al.* 2006).	SEIC	Dec 2008	

ITEM 10: 4-D SEISMIC SURVEY					
WGWAP 4/013	WGWAP 4/4 Section 10.2	In discussion, the Panel noted that for the sake of transparency, there would be value in having an independent observer nominated by the Panel present on the seismic vessel during the survey. While recognising that there may be logistical difficulties, the Panel **recommends** that SEIC investigate this possibility and report back to the Panel by WGWAP-5.	SEIC	Dec 2008	
WGWAP 4/014	WGWAP 4/4 Section 10.2.3	The Panel **agreed** that there was merit in the idea that a small group, including Racca, Nowacek and Vedenev, would jointly consider the result of the calibration exercise during the 'window'. It was further **agreed** that any details of how this might be undertaken in practice could be discussed at WGWAP-5 and the Panel **requested** that those individuals provide a discussion document for consideration at that meeting.	SEIC/ WGWAP	Dec 2008	
WGWAP 4/015	WGWAP 4/4 Section 10.2.4	The Panel **recommends** that Constantin Avilov be asked to perform further work according to the rationale and specifications detailed in the report.	IUCN/ The Russian team	September 2008	
ITEM 11: OIL SPILL PREVENTION, PREPAREDNESS AND RESPONSE					
WGWAP 4/016	WGWAP 4/4 Section 11.2	The Panel **recommends** that it be provided with the information on aromatic hydrocarbons detailed in the report (Section 11.2).	SEIC	August 2008	
WGWAP 4/017	WGWAP 4/4 Section 11.2	The Panel **recommends** that updated information on aromatic content, emulsification properties, wave tank or at-sea experiments, in-situ burning and biodegradability, as well as updates on any relevant ongoing studies and their expected completion times, be provided for review at WGWAP-5.	SEIC	August 2008	
WGWAP 4/018	WGWAP 4/4 Section 11.2	The Panel **recommends** that SEIC provide for WGWAP-5 an update on: modelling of spills in the Aniva Bay area (including by vessels approaching from the east) in relation to (a) the WGW feeding areas and (b) plausible WGW migration routes, and (c) the potential for increased risks associated with any predicted changes in ship traffic patterns.	SEIC	Dec 2008	

WGWAP 4/019	WGWAP 4/4 Section 11.2	The Panel therefore **recommends** that formal arrangements to use other vessels and provide relevant training for their crews be put in place by SEIC.	SEIC	Dec 2008	
WGWAP 4/020	WGWAP 4/4 Section 11.2	The Panel **requested** that further information on exercises be provided prior to WGWAP-5, including a list of those remaining in 2008 and planned for 2009 along with brief written reports on the completed exercises identifying lessons learned.	SEIC	Dec 2008	
WGWAP 4/021	WGWAP 4/4 Section 11.2	Revised versions of the plans had been provided for comment recently to the advisers for potential lenders (PCCI) and the Panel **recommends** that these be provided to the Panel for its review and comment.	SEIC	July 2008	
WGWAP 4/022	WGWAP 4/4 Section 11.2	SEIC reported that waste-disposal issues were being negotiated with Sakhalin Oblast. The proposed site at Smyrnik has been established; it is designed to accommodate 50,000m³ of oily waste. The site is located between Yuzhno and Nogliki. A second site in the southern part of the island is currently under negotiation with Sakhalin Oblast. The Panel welcomed these developments and **requests** that regular updates be provided at future Panel meetings.	SEIC		
ITEM 12: FUTURE SEIC PLANS FOR WGW MONITORING AND RESEARCH					
WGWAP 4/023	WGWAP 4/4 Section 12.1	The Panel **recommends** that more programme resources be devoted to the development and completion of integrated multi-year analyses.	SEIC		
WGWAP 4/024	WGWAP 4/4 Section 12.1	The Panel **recommends** that Larsen, in cooperation with the Panel and SEIC, co-ordinates the development of a proposal as to how such a review can be undertaken, to be presented at WGWAP-5.	SEIC		
WGWAP 4/025	WGWAP 4/4 Section 12.2	The Panel therefore **recommends** that SEIC provide support (*e.g.* financial, logistical), through a well-established program such as the JIP, for one or more CEEs involving airgun noise and eastern gray whales in a feeding area.	SEIC		

ANNEX 1 – LIST OF PARTICIPANTS

List of Panel Members

Robert L. BROWNELL Jr.
Senior Scientist
Southwest Fisheries Center
National Marine Fisheries Service
1352 Lighthouse Ave.
Pacific Grove
California 93950
USA

Justin G. COOKE
Centre for Ecosystem Management Studies
Alexanderstrasse 10
79261 Gutach
Germany

Brian DICKS
7 High Street
Hadleigh IP7 5AH
Suffolk
UK

Greg DONOVAN
Head of Science
International Whaling Commission
The Red House, 135 Station Road
Impington, Cambridge CB4 9NP
UK

Douglas Paul NOWACEK
Assistant Professor, Dept. of Oceanography
Florida State University
509 OSB, West Call St.
Tallahassee, FL 32306-4320
USA

Randall R. REEVES (Chairman)
Okapi Wildlife Associates
27 Chandler Lane
Hudson
Québec JOP 1HO
Canada

Grisha TSIDULKO
Marine Mammal Programs Coordinator
IFAW
19B Khlebny pereulok
121069 Moscow
Russia

Glenn R. VANBLARICOM
School of Aquatic and Fishery Sciences
Fishery Sciences Building, rm 116,
1122 NE Boat Street
Seattle
Washington 98105
USA

Alexander I. VEDENEV
Head of Noise in Ocean Laboratory
PP Shirshov Institute of Oceanology
Russian Academy of Sciences
Nakhimovskiy Ave, 36
Moscow 117997
Russia

David WELLER
Southwest Fisheries Science Center
National Marine Fisheries Service
8604 La Jolla Shores Drive
La Jolla, CA 92037
USA

Alexey V. YABLOKOV
President
Center for Russian Environmental Policy
Vavilova St. 26
Moscow
119991
Russia

Sakhalin Energy Investment Company Ltd.

Matt ANGELATOS	Doug BELL
Mark DOWNES	Valeriy FADEEV
Glen GAILEY	Judith MUIR
Roberto RACCA	Brian TIBBLES
Christina TOMBACH-WRIGHT	Olga TYURNEVA

IUCN

Sarah GOTHEIL	Andrew HURD
Finn LARSEN	Ludivine STRAMBINI

Observer NGOs

Doug NORLEN	Pacific Environment
Aleksey KNIZHNIKOV	WWF-Russia

Observer Potential Lenders

Helen LAWRENCE	AEA Group
Luke WARWICK	DEFRA

Observer External Evaluator

Stephen TURNER

ANNEX 2 - FINAL MEETING AGENDA

22 April 2008			**Documents**
(1)	**09:00 – 09:15**	**Opening**	
		– Introductions and logistics	
		– Adoption of agenda	WGWAP 4/1
		– Documents	WGWAP 4/2
		– Report drafting procedures	
(2)	**09:15 – 10:15**	**Review recommendations from previous meetings**	WGWAP 4/INF.1
	10:15 – 10:30	**Break**	
(3)	**10:30 – 11:15**	**Population assessment**	
		– Progress on update of population assessment taking into account WGWAP 3 recommendations	WGWAP 4/INF.2
(4)	**11:15 – 12:00**	**Photo-ID**	
		– Progress report from Photo-ID Task Force	WGWAP 4/INF.3
		– Photo-ID of WGWs in Sakhalin and Kamchatka	WGWAP 4/INF.4
	12:00 – 13:00	**Lunch**	
(5)	**13:00 – 14:00**	**MMO programme and carcass detection**	
		– 2007 MMO programme close out report	WGWAP 4/INF.5
		– MMO sightings analysis for crew change vessels (included in WGWAP 3/005)	
		– Necropsy guidelines – WHOI report	WGWAP 4/INF.6
(6)	**14:00 – 15:00**	**Multivariate analysis**	
		– Update on MVA progress	
		– Data availability protocol	WGWAP 4/INF.8
		– Way forward/next steps	
	15:00	**Adjourn for the day**	

23 April 2008

(7)	**09:00-10:30**	**Monitoring and management of continuous noise**	
		– Full consideration of results from SEIC's 2007 noise and whale monitoring programme – to include both noise and whale behaviour/distribution/density data	WGWAP 4/INF.9 WGWAP 4/INF.10
		– Review of transmission loss experiments – completed and planned	WGWAP 4/INF.11
		– Documenting the evolution of SEIC's noise management and mitigation programme – lessons learned	WGWAP 4/INF.12
	10:30-10:45	**Break**	
	10:45-11:30	**Continuous noise contd.**	
(8)	**11:30-12:30**	**Benthic monitoring**	
		– 2007 benthic monitoring close out report	WGWAP 4/INF.13
		– Outstanding recommendations re environmental monitoring	
	12:30-13:30	**Lunch**	
(9)	**13:30-15:00**	**Satellite tagging**	
		– Weller report	WGWAP 4/INF.14
		– Development/refinement of recommendations on WGW satellite tagging	
	15:00	**Adjourn for the day**	

24 April 2008

(10)	**09:00-10:30**	**4-D seismic survey**	
		– Report from Seismic Surveys Task Force	WGWAP 4/INF.15
		– Application to future seismic surveys on Sakhalin Shelf and elsewhere	
	10:30-10:45	**Break**	
	10:45-12:00	**4-D seismic survey contd.**	
	12:00-13:00	**Lunch**	
(11)	**13:00-15:00**	**Oil spill prevention, preparedness and response**	

		– Final report of the Oil Spills Task Force	WGWAP 4/INF.16
		– SEIC response to TF recommendations (specifically update on studies of oil in ice, properties of Vityaz crude etc.)	WGWAP 4/INF.16.b WGWAP 4/INF.17
		– SEIC report on oil spill incident from SALM	
	15:00	**Adjourn for the day**	

25 April 2008

(12)	**09:00-10:15**	**Future SEIC plans for WGW monitoring and research**	
		– SEIC's 2008-2010 plans for WGW research and monitoring, placed in the context of the company's plans for further development of the Sakhalin II project area	WGWAP 4/INF.19
		– Elaboration of the concept of controlled exposure experiment(s) to assess responses to acoustic disturbance, using eastern gray whales or a surrogate species	WGWAP 4/INF.20
	10:15-10:30	**Break**	
	10:30-12:30	**WGW monitoring and research contd.**	
	12:30 – 13:30	**Lunch**	
(13)	**13:30-14:15**	**Non-SEIC groups monitoring**	
		– Russia-US Team	WGWAP 4/INF.21
		– WWF, IFAW,	
		– Independent monitoring of third party activities (*e.g.* seismic)	
(14)	**14:15-14:45**	**Activity by other companies**	
		– Update on proposed activity on Sakhalin shelf	WGWAP 4/INF.22
(15)	**14:45-15:00**	**Any other business**	
	15:00	**ENDS**	

	Deliverables	**Deliverable Dates**
(1)	Completion of the report of the Western Gray Whale Advisory Panel at its fourth meeting and associated recommendations	31 May 2008
(2)	Detailed response from SEIC to individual recommendations made in the report of the Western Gray Whale Advisory Panel at its fourth meeting	15 June 2008

ANNEX 3 – FINAL LIST OF DOCUMENTS

Document Ref.	Document Title	Status	Notes
WGWAP 4/1	Provisional agenda	Public	
WGWAP 4/1-R	Provisional agenda (Russian)	Public	
WGWAP 4/2	List of documents distributed in connection with the 4th meeting of the WGWAP	Public	
WGWAP 4/INF.1	Status of recommendations from previous meetings	Public	Not available – under revision
WGWAP 4/INF.2	Updated population assessment - taking into account WGWAP 3 recommendations	Public	
WGWAP 4/INF.3	Progress report on Photo-ID TF	Public	
WGWAP 4/INF.4	Photo-ID of WGWs in Sakhalin and Kamchatka in 2007	Confidential	
WGWAP 4/INF.5	2007 MMO close-out report – including SEIC MMO sightings analysis for crew change vessels (WGWAP 3/005)	Confidential	Final report will be made public
WGWAP 4/INF.6	Marine Mammal Necropsy: An introductory guide for stranding responders and field biologists	Public	
WGWAP 4/INF.7	Progress report on MVA process		Oral statement only
WGWAP 4/INF.8	Data availability protocol	Public	
WGWAP 4/INF.9	2007 Noise monitoring close-out report - Full consideration of results from SEIC's 2007 noise and whale monitoring program	Confidential	Final report will be made public
WGWAP 4/INF.10	SEIC's response to recommendation WGWAP 3/032 on noise and whale behaviour/distribution/density data	Confidential	
WGWAP 4/INF.11	Review of transmission loss experiments – completed and planned	Confidential	
WGWAP 4/INF.12	Documenting the evolution of SEIC's noise management and mitigation programme – lessons learned	Public	
WGWAP 4/INF.13	Benthic monitoring close-out report	Confidential	Final report will be made public
WGWAP 4/INF.14	Satellite tagging report	Confidential	Final report will be made public
WGWAP 4/INF.15	Report from Seismic Surveys Task Force	Public	Will be released when finalised
WGWAP 4/INF.16	Final report of the Oil Spill Task Force (OSTF)	Public	
WGWAP 4/INF.16b	Input and questions on the OSTF Report and on the Sakhalin I project	Public	
WGWAP 4/INF.17	Summary of recommendations from OSTF	Public	
WGWAP 4/INF.18	Report on the oil spill incident from the SALM	Confidential	Not available
WGWAP 4/INF.19	SEIC's 2008-2010 plans for WGW research and monitoring	Confidential	
WGWAP 4/INF.20	Elaboration of the concept of controlled exposure experiment(s)	Public	
WGWAP 4/INF.21	Russia-US 2007 interim report	Public	
WGWAP 4/INF.22	Update on proposed activity on Sakhalin shelf	Public	
WGWAP 4/INF.23	Overview of the external review	Public	

ANNEX 4 – WORK PLAN FOR THE PHOTO-ID TASK FORCE

Background

The report of the Photo-Identification Task Force (WGWAP 3/INF.17) presented at the WGWAP-3 meeting contained a number of consensus recommendations calling for the completion of additional work. The Terms of Reference of the Task Force are given in Annex 4 of the report of WGWAP-3.

While the Task Force has yet to make concerted progress on these recommendations, the Panel and SEIC consider it important not to lose momentum generated by the first Task Force meeting. Thus, the Panel recommended that the Work Plan and time lines herein, be drafted and adopted to ensure that the aforementioned recommendations, over which there was consensus, are pursued in a timely manner.

This following work plan lists the recommendations made by the Photo-Identification Task Force and proposes a time line for implementation and/or completion of each corresponding action item. The proposed time line takes account of the fact that most of those involved with the work of the Task force will be in the field and unavailable from about the end of June to the middle of October.

Work plan and time lines

(1) Update of the cross-matching of the catalogues

(a) Each team should send Finn Larsen at IUCN either of the following:

(i) an updated catalogue covering field seasons up to and including 2007; or

(ii) a supplement to the 2005 catalogue, containing new entries from 2006 and 2007, and any revisions to previous entries.

Time line. ***31 July 2008.***

(b) Each team should attempt to match the new entries from the other team and report their results.

Time line. ***31 October 2008.***

(2) Design and undertake a comparison exercise on a subset of the annual sighting histories.

Time line.

(i) Proposal to be prepared by Cooke and Donovan and circulated by Larsen to Task Force for comments by ***31 July 2008.***

(ii) Comments to be received by ***15 August 2008*** and final proposal circulated by Larsen.

(iii) Data required to put into practice the terms of the proposal be sent by each team to Finn Larsen at IUCN by ***31 October 2008***.

(iv) Results of comparison exercise to be circulated by ***15 December 2008***.

(3) Protocols for ID-photos from dead animals and whale-watching vessels

(a) Advisory protocol to help ensure that identifiable photos are obtained from any dead whales found anywhere in the range.

(b) Protocol for obtaining ID-quality photos, for circulation to whale-watching vessels within the range.

Time line.

(i) Draft protocols to be developed by Weller and circulated by Larsen to Task Force by ***1 August 2008***.

(ii) Comments to be received by ***1 September 2008***.

(iii) Revised protocols to be submitted to Larsen by ***7 September 2008*** for translation by IUCN into Russian and Japanese

(4) Review the criteria for judging mother-calf pairs, and, if appropriate, develop a scoring system (*e.g.* as used for southern right whales)

(5) Review the criteria for identifying unaccompanied calves, and, if appropriate, develop revised criteria for use by each team

Time line. It makes sense to treat these two items together. A proposal should be elaborated by Cooke and Donovan when results of the comparison exercise under (2) are available. This should be circulated by Larsen to the Task Force by ***15 January 2009***, with comments due by ***15 February 2009***. A revised proposal shall then be developed by Cooke and Donovan and circulated by Larsen, with a view to application to the 2008 season data, and retrospective application to previous years' data with a view to reports being available to the next WGWAP meeting.

(6) Compare the criteria used by each team for recording body condition ("skinny whales"), and agree on a coding system that would allow analyses of the combined datasets.

Time line. Work on this task will await the availability of the major body condition analysis that is nearing completion by the Russia-US team. Based upon this analysis, Cooke and Donovan will develop an initial proposal to be circulated to the Task Force by Larsen by ***15 January 2009***. Comments on the draft proposal should be sent to Larsen by ***15 February 2009*** for incorporation by Cooke and Donovan. The agreed common Task force protocol for scoring body condition should be available by ***15 March 2009***.

(7) Draw up specifications for population analyses using the combined data (on annual sighting histories), and seek permission from the relevant parties to enable these to be conducted.

Time line. Proposals for analysis to be elaborated and circulated to the Task Force by ***31 August 2008***, with comments to be received by ***30 September 2008***. A finalised proposal will be agreed by the Task Force and submitted to decision makers (*e.g.*, data owners) by ***15 November 2008*** with a request for a decision by the ***end of 2008***. The analysis itself will occur after Items (4) and (5) have been completed.

(8) Evaluate the potential for analyses using photo-ID and other data that could help measure the effects of anthropogenic disturbance on the whales.

> *Time line.* An initial analysis of the potential for this type of work based on the Russia-US time series should be conducted by Cooke and circulated by Larsen by ***31 August 2008*** to the Task Force for comment and further ideas. Cooke will incorporate these comments in to a final Task Force proposal for further analyses using both data sets.

(9) Examine the extent of overlap in the research effort in time and space. This should initially be based on a broad graphical summary provided by each team of their hours of photo-ID research effort by square and time period. Based on this, the need for a more extensive analysis can be assessed.

> *Time line*. Cooke will develop a template for data tabulation to be circulated to the Task Force by Larsen by ***31 July 2008*** with a request for the completed tabulation by ***31 October 2008***. An analysis of the overlap will be prepared by Cooke and circulated by Larsen by ***15 November 2008*** with a view to initiating discussion as to how field effort might be better co-ordinated from 2009 onwards.

Data safeguards

To ensure that IUCN retains an overview of the collaboration between the teams, material should be exchanged by sending it to Finn Larsen at IUCN, for forwarding to those appointed to perform the corresponding analysis.

All data exchanged between the teams shall be treated as strictly confidential, unless or until they have been published by the submitting team. No confidential data may be included in a Task Force report or other public document without agreement of the submitting team.

Confidential data shall only be used for conducting analyses agreed to by the entire Task Force. Any results of analyses remain confidential within the Task Force until the Task Force agrees what to do with them.

ANNEX 5 – DATA AVAILABILITY PROTOCOL – RECOMMENDED APPROACH

This approach applies to data that are considered by the Panel to be important for the provision of management advice directly related to the conservation of western gray whales. Requests of a more academic or general scientific nature will be dealt with on a bilateral basis.

The Panel will establish a Data Group to oversee the process, comprising: the Chair of the Panel and two additional panel members, assisted by the IUCN Programme Officer.

Procedure

Data owners (*e.g.* SEIC, others) who have agreed to participate in this process, in principle, shall produce, in consultation with the Data Group, a protocol (or protocols) for data access that applies to requests generated by the WGWAP, to ensure clarity and a mutual understanding of the process.

(1) During the meeting at which the recommendation for work is made, the WGWAP shall specify to the fullest extent possible:

  (a) the objective(s) of the work

  (b) proposed analytical techniques

  (c) data required and data owners

  (d) scientists to undertake the work (collaborative studies are encouraged)

  (e) a proposed time line.

(2) Applications to the data owners following the published protocol referred to above should be submitted by the Data Group assisted by the scientists named in 1(d) above, and, where appropriate, the data owners.

(3) If the above process is followed, then the data owners will normally approve the applications within a specified time period in accordance with the published protocol.

(4) Applications shall only be granted under conditions given below.

(5) Whilst the conditions for data recipients remain as below, more flexibility under items (1) – (3) is granted to any Task Forces established. These should be determined by the Task Forces themselves when agreeing their Terms of Reference; additional collaborative analyses are also likely to occur during and between Task Force meetings – this is to be encouraged.

Conditions for data recipients

Accepted applications will be granted under the following conditions:

(1) data shall not be transmitted to third parties;

(2) papers may only be submitted to a WGWAP meeting or task force in accordance with the time restrictions given below - such papers must not include the raw data or a presentation of the data in more detail than is necessary to understand the analysis;

(3) papers must carry a restriction on citation except in the context of WGWAP meetings;

(4) data owners are offered co-authorship;

(5) publication rights remain strictly with the data owner;

(6) data shall be returned to the data owner immediately after the meeting at which the paper is submitted and any copies destroyed, unless an extension is granted;

(7) agreement forms signed by the data requesters and IUCN (who will sign the agreement on the WGWAP's behalf) will be held by the data owner and IUCN.

ANNEX 6 - DRAFT TERMS OF REFERENCE FOR ENVIRONMENTAL MONITORING TASK FORCE

To review the current state of Sakhalin Energy's environmental monitoring program, with particular attention devoted to understanding ecological linkages important to western gray whale foraging habitat, and to provide advice and guidance with regard to future environmental monitoring, an Environmental Monitoring Task Force is established with the following terms of reference:

(1) The task force will consist of several panelists (VanBlaricom [Chair], Dicks, Tsidulko, Weller and possibly others), designated Sakhalin Energy representatives (to be decided by SEIC) and selected experts if and as agreed by the Panel and SEIC.

(2) In collaboration with IUCN and SEIC, Task Force members (VanBlaricom, Dicks, Tsidulko and possibly others as designated) will conduct a site visit to the Sakhalin II Project Area and environs, including Piltun and Chaivo Lagoons, and to SEIC facilities at which primary environmental data management and analyses occur. The site visit will include observations of habitats and field sampling methods, and meetings with data managers and analysts to discuss methods and approaches. The site visit should take place in September 2008 if feasible.

(3) Sakhalin Energy will provide the documents needed for the review to IUCN by 1 August 2008 (excepting those provided previously for purposes of consideration at WGWAP meetings). The Task Force will also seek relevant background or historical documents written in Russian or Japanese, independently and with assistance from SEIC. IUCN will distribute the documents to the Task Force. The required documentation (additional documents may be identified and requested by Task Force members) consists of the following:

- Annual reports, and summary reports synthesising data from multiple years, on surveys of benthic biota in the known gray whale feeding areas or nearby areas of the Sakhalin II Project Area;

- Reports on the following topics:

    1) attributes of habitats associated with the whale feeding areas in or near the Sakhalin II Project Area such as:

        a) benthic sediment grain size distributions and concentrations of organic carbon and contaminants in sediments;

        b) physical and biological oceanographic attributes of the nearshore ocean, including current and upwelling patterns and known seasonal and interannual patterns of water column temperatures and phytoplankton productivity;
        c) ice conditions and ice movement, including available information on ice grounding and disturbance by ice gouging to benthic habitats.

2) ecological attributes of Piltun and Chaivo Lagoons, including but not limited to surveys of benthic biota, surveys of major emergent plant communities, patterns of phytoplankton productivity in the lagoons, and information on patterns of export of phytoplankton, dissolved and particulate organic detritus, and inorganic nutrients known to be important to ocean primary production such as nitrate or phosphate.

The Task Force will complete and distribute a progress report to the WGWAP prior to WGWAP-5. A Final Task Force Report will be completed and distributed to the WGWAP following WGWAP-5 but prior to the subsequent WGWAP meeting.

ANNEX 7 - MONITORING AND MITIGATION MEASURES FOR THE 2009 SEISMIC SURVEY

MONITORING (NUMBER, DISTRIBUTION, BEHAVIOUR)

The monitoring measures proposed here are *integrally related* to the mitigation measures proposed or likely to be proposed for future surveys. Indeed, most of the monitoring measures provided below are essential for implementation of the mitigation measures proposed for the 2009 seismic survey.

The monitoring measures fall into two categories:

(1) real-time (or near real-time) monitoring required to trigger appropriate action where sound levels approach or exceed defined thresholds (*i.e.* ***essential*** for mitigation);

(2) additional monitoring (involving the collection of some data that do not need to be analysed in real time) to obtain data on the effects of the seismic survey on whales, especially western gray whales, to add to the existing knowledge base, and to contribute to the design of mitigation strategies for future seismic surveys.

As noted under Item 10.2, the Panel **recommends** that a suitable group of experts work with SEIC scientists to develop a fully specified field plan and proposed analysis, well before the final plans for monitoring in 2009 are completed.

Acoustic monitoring (perimeter and within area)

ALONG THE PERIMETER OF THE FEEDING AREA (THE PERIMETER MONITORING LINE)

(1) Real-time monitoring of acoustic levels using sea-bottom receivers will be undertaken during all periods of seismic source activity.

(2) A total of at least nine receivers will be positioned at 2500m intervals along the edge of the feeding area to ensure adequate redundancy. There will thus never be more than 5000m between active buoys (considered the range of reliable model-based interpolation of recorded sound levels).

(3) Receivers will be in place and verified to be functioning properly before activity starts and for the duration of the survey.

(4) There will be a direct radio link between the real-time monitoring acoustician and the Senior MMO on the active seismic vessel.

ON THE COASTAL SIDE OF THE PERIMETER MONITORING LINE

(1) All necessary efforts will be made to obtain archival acoustic data within the feeding area using bottom-mounted receivers.

(2) During the seismic survey, ≥3 acoustic monitoring buoys will be deployed in the feeding area on or near the 10m isobaths and near the centre of the field of view of the shore stations. Verification that these buoys are operational during the survey should be undertaken, at least at the start of the survey.

General visual monitoring (shore-based and vessel-based)

Note that whilst the monitoring below focuses on the area within the feeding area (*i.e.* on the coastal side of the perimeter monitoring line) near to the seismic operations, it is also important to maintain the observation effort throughout the rest of the area as in previous

years. This is important for analysing and interpreting the data with respect to actual or potential effects of seismic surveys on the whales, and for maintaining the longer-term monitoring data series that will be a valuable resource when future seismic operations occur.

ON THE COASTAL SIDE OF THE PERIMETER MONITORING LINE (SHORE-BASED)

(1) Shore-based scan surveys will be undertaken by two teams at the five pre-existing vehicle scan observation points south of the mouth of the Piltun lagoon (*i.e.*, vehicle scan survey observation stations 9 to 13) to enhance the resolution of potential changes in whale density and distribution. The timing of scans will be scheduled to ensure the monitoring of whales pre-, during and post seismic line acquisition. Pre- and post surveys will be conducted 1 hour prior/post of the acquisition whilst 'during' scans will be conducted 1 hour from the onset of line acquisition. A third team will conduct daily surveys, weather permitting, at the eight pre-existing vehicle scan observation stations (numbers 1 to 8) using the same survey protocols as in previous years.

(2) Behaviour will be monitored by two behavioural monitoring teams. The location of behavioural platforms will be directly inshore of the seismic activity in areas that are expected to have the highest exposure levels. Scans conducted by behavioural monitoring teams will augment information on whale numbers collected by the shore-based distribution surveys.

ON THE COASTAL SIDE OF THE PERIMETER MONITORING LINE (VESSEL-BASED)

(1) Behaviour will also be monitored from a vessel platform. This will cover whales that may occur near or slightly outside the defined feeding habitat that are not being monitored effectively by shore-based teams (*e.g.* due to low station heights, onshore fog etc). The monitoring location will be within regions of maximum predicted ensonification. The vessel type should be selected based on requirements of minimal sound output with an effective observation height (5-10m) to increase the range of whale observations. Focal follow observations will be conducted from this platform to monitor respiration patterns and the general movement of the whales in the specified region. Extended focal follows should be conducted on whales displaying aberrant movements and/or behaviour to monitor potential long-term responses. The vessel will maintain a distance of at least 1 km from the whale being observed.

(2) Gray whale distribution will also be monitored from a vessel platform in the event of inclement weather (*e.g.* onshore fog) that prevents the monitoring described in section 7.5.2.1.

(3) The observation vessel will have a direct radio link to the Senior MMO on the active seismic vessel.

WITHIN THE PROXIMITY OF THE SEISMIC RELATED VESSEL(S)

(1) Experienced MMOs will be stationed on all vessels (*i.e.* seismic, scout and supply vessels) for the duration of the survey.

(2) MMOs will be limited to a maximum 2-hour continuous shift with a minimum of 1 hour between shifts.

(3) Single-point authority for operational shutdown will lie with the on-shift Senior MMO on the seismic vessel.

(4) All vessels and real-time acousticians will have direct radio access to the on-shift Senior MMO.

(5) MMO observation platforms should be located at the highest elevation available on each vessel with the maximum viewable range from the bow to 90˚ port/starboard of the vessel. Optimal locations might be on the 'flying bridge'. Use of the bridge should be avoided due to obscured views and potential distractions.

(6) An extended visual search (20 minutes) will be conducted prior to start-up of the seismic source.

(7) There will be a minimum of two MMOs on watch on the seismic vessel at any given time during ramp-up, shooting and for the 20 minutes before start of ramp-up.

(8) Occurrence and behaviour of whales will be documented in accordance with existing MMPP (Marine Mammal Protection Plan) and MMO procedures.

MITIGATION MEASURES

Timing of surveys

(1) The seismic survey will commence and be completed as early in the season as logistically possible. Logistics include ensuring that all mitigation and monitoring procedures are in place.

(2) The duration of the seismic survey will be as short as technically and logistically feasible. Logistics includes ensuring that all mitigation and monitoring procedures are implemented fully.

(3) Lines in Zone A (see definition below) should be acquired at the earliest possible opportunity given visibility, mitigation and monitoring requirements.

General design and conduct of surveys

The most stringent mitigation measures should be applied in Zone A as defined below. The monitoring measures defined above **must** be in place and operational for the acquisition of lines.

DEFINITION AND UPDATING OF A AND B ZONES

(1) Initially, the survey area for which the additional mitigation measures are in effect (A zones) will be defined by the overlap of the 'feeding area' and the maximum shoreward extent of the 163 dB_{RMS} isopleth for that particular shot line.

(2) Before any lines are shot within the range currently predicted to exceed 156 dB_{SEL} at the perimeter monitoring line, received sound levels at the line will be compared with model predictions. If received sound levels exceed model predictions, then the model shall be retuned to match the observed levels. Based on the updated model predictions, shot lines for which an overlap is predicted between the 163 dB_{RMS} contour and the monitoring line will be reclassified as A lines, for which the additional mitigation measures specified below apply.

(3) The comparison between observed and expected sound levels at the perimeter monitoring line, and, where indicated, retuning of the acoustic model, shall be repeated at regular intervals during the survey.

(4) In the event that the 163 dB_{RMS} threshold is exceeded at any receiver on the edge of the feeding ground while shooting a B line, operations shall be suspended

immediately or shifted away from the feeding ground until a recalibration exercise has been conducted as described above, and the lines have been reclassified accordingly.

MEASURES WITHIN THE PROXIMITY OF THE SEISMIC VESSEL – ENTIRE SURVEY

(1) After more than 20 minutes of inactive source, ramp-up procedures will be adopted such that the individual air guns will be activated in a progressively larger combination over a period of several minutes (6 db increments every 5 minutes over 20 minutes).

(2) The Senior MMO will initiate source shutdown if a gray whale is observed within defined exclusion radius of the source array.

(3) The Senior MMO will initiate a precautionary shutdown if a gray whale is observed to be on a course that will result in its entering the shut down zone.

(4) Low level single (smallest) gun operations will be conducted during line changes. Ramp-up procedures will furthermore be implemented 20 minutes prior to the sequential line acquisition. As long as the single gun operation is uninterrupted during the line change, this period will not be interpreted as 'source inactivity' for the purposes of clause (5) below.

(5) For operations in conditions that preclude effective visual monitoring of the defined exclusion radius of the source array (*e.g.* night, fog, poor visibility[3])

(a) Prior to a seismic acquisition, the line of interest will have been surveyed (if necessary using a second vessel) at least 6 hours preceding the start time of acquisition of the line to ensure that no gray whales have been sighted in the vicinity of the line. If poor visibility hampers survey of the entire line, then the line will not be acquired.

(b) Operations will shut down for the night period if whales are sighted in the pre-dusk scan.

(c) After more than 20 minutes of source inactivity, operations will not be re-commenced, due to the inability to conduct an adequate visual scan.

ADDITIONAL RESTRICTIONS FOR ZONE A

(1) No acquisition during periods of poor visibility[3] or at night

---

[3] "Poor visibility" means any conditions under which the estimated distance at which a gray whale can be reliably sighted is less than the defined exclusion radius. A prohibition on night shooting could increase the survey duration by up to 50%, which would be undesirable, both in terms of increased costs and in terms of extending the duration of the seismic survey into the period of peak whale abundance. The Workshop therefore agreed that night shooting or shooting during fog or poor light should only be conducted when the line has been surveyed (either by a separate "scout" vessel or while shooting an adjacent line) in good conditions during the preceding six hours and no gray whales have been sighted within this period. This would be the first time such a measure has been tried: the period of 6 hours, while considered practical to implement, remains, in the absence an analysis of the effectiveness of the measure for different choices of period, arbitrary.

(2) No acquisition unless the feeding area perimeter line is within the effective sighting distance of a shore station or an additional vessel.

(3) No acquisition if any gray whales have been observed in Zone A over the preceding 6 hours.

(4) No acquisition if mother-calf pairs have been observed in Zone A in the preceding 12 hours.

ANNEX 8 - SECTION ON MULTIVARIATE ANALYSIS FROM REPORT OF WGWAP-1

The following text is directly quoted, without modification, from the final report of WGWAP-1:

At its April 2006 meeting, the IISG [Interim Independent Scientists Group] discussed a study by Gailey *et al.* of the potential effects of 2005 construction activities on WGWs. In the authors' presentation of that study they concluded, *inter alia,* that no detectable effects on whale behaviour or distribution had occurred. However, they properly acknowledged that that finding had been based on univariate analyses that did not incorporate data on environmental factors including underwater sound from the construction activities. Accordingly, the IISG considered the no-effects result to be inconclusive and deferred any judgement until a more detailed multivariate analysis, incorporating data on noise and other environmental parameters, had been completed.

In preparation for the present meeting, the Panel considered two documents on this topic. The first (WGWAP 1/INF.1) presented the preliminary results of the multivariate analysis undertaken by Gailey *et al.* on data from the 2005 construction season. The second (WGWAP 1/INF.2) summarized a technical review of that same preliminary multivariate analysis by Gailey *et al*. The review had been commissioned by AEAT, a consultant for the potential lenders, and had taken place in the summer of 2006. The final analysis by Gailey *et al*. is expected to be completed this winter.

The analysis in document WGWAP 1/INF.1 focussed on whale behaviour, including data on surface-dive-respiration parameters, movement patterns and overall distribution and numbers, in relation to modelled estimates of sound levels produced by construction activities during installation of the PA-B platform's concrete gravity-based structure (CGBS). The analysis was intended to contrast whale behaviour before, during and after the CGBS construction period. However, the authors acknowledged that limited data were collected during the pre-construction period and no behavioural data were collected (due to weather) during two of the four phases of construction – tow-in and positioning of the CGBS. Unfortunately, these are the two loudest phases of construction. Thus, the analysis pertains only to the anchor installation and scour protection phases of the construction period. In addition, most of the behavioural and distributional data were limited to whales within 2-3 km of shore (*i.e.*, 9-10 km inshore of the CGBS), undermining the probability that effects on whales farther offshore would be detected if such effects occurred. Gailey advised the Panel that the information in document WGWAP 1/INF.2 would be taken into account in the final report of this study, but that, after a telephone-link discussion with the reviewers, recommended changes to the underlying statistical models would not be made. This is unfortunate because it indicates that the analytical shortcomings of the report will not be fully addressed and these important, although limited, data will not be as thoroughly explored as they might be, an important element of multivariate analysis (see below).

In spite of its shortcomings, the analysis suggests possible effects. The strongest apparent effect was displacement of whales offshore during periods of higher noise. The ramifications of seaward displacement are unknown but may include effects on foraging efficiency or, conceivably, increased exposure to predators or offshore vessel traffic. Such potential effects may be particularly significant for mother-calf pairs that otherwise limit their movement patterns to the near-shore environment.

Another apparent effect was a change in diving behaviour: dives increased in length with decreasing distance to the CGBS location. Although there are multiple possible

explanations for such an observation, the time spent diving may be an indicator of foraging effort or success and should be explored more carefully. In this case, the Panel **suggests** that reanalysis based on percent of total time below the surface would be a useful follow-up to assess possible changes in foraging effort.

In view of the endangered status of this population, the observed offshore displacement, change in diving pattern, and other potential effects warrant additional scrutiny and follow-up. Points to consider include the following:

1. From a conservation perspective, the objective of the study was to test the null hypothesis that construction noise and associated activities have no impact on the population. The observation of apparent effects on individuals (*e.g.* offshore displacement) suggests that a population impact may occur and this possibility should be investigated further rather than being dismissed as insignificant.
2. The study would benefit from an exploration of the relationships among the predictor variables and among the response variables. For example, response variables may be related, given that they depend on the behaviour of an animal (*e.g.* an animal that is travelling at greater speed spends more time at the surface and moves in a more nearly constant direction). Such possibilities should be explored to provide the best possible understanding of the relationships among the different variables and the most appropriate form of the predictor and response variables. Principal components analysis is one way to examine these relationships and is often used as a preliminary step to explore the data before hypothesis testing is initiated.
3. The 'subjects' of the research also warrant reconsideration. In the analysis considered at the meeting, the authors had chosen to pool data for mother-calf pairs and single-whale groups. Unfortunately, this adds a confounding discontinuity in the subject pool because mother-calf pairs behave differently from single whales. Such pooling should always be preceded by comparison of the behaviour of the groups under consideration to confirm their homogeneity before pooling. Homogeneity is highly unlikely given the different distributions and behaviours of the two types of group.
4. The results were confounded by extraneous variables, most notably vessel noise from watercraft used for research purposes (photo-id). In future studies, greater effort should be made to avoid the confounding effects of such variables either by eliminating them as part of the research design or developing analytical methods to remove their influence on the analysis. It is also worth noting that this finding provides a clear basis to recommend that duplication of photo-identification research effort be avoided in the future.
5. The use of variables that are more-or-less arbitrarily determined (*e.g.* noise exposure over a 10-minute period) also should be examined to determine the potential effect of the chosen time period on the results. For example, in the case where distance offshore is the response variable, an implicit assumption of using 10-minute noise exposure as an explanatory variable is that whales would move back towards shore during a 10-minute lull in the noise. This assumption is not realistic; it may take much longer for the distribution of whales to return to normal. Use of the 10-minute interval as the explanatory variable could, therefore, seriously underestimate the true effect of noise.
6. Finally, during previous reviews of Sakhalin Energy's activities and evaluations of the potential effects of construction noise, the panels have repeatedly indicated that noise level alone may not be the most relevant or the only indicator of the influence of noise on the whales. The analysis apparently did not take into account the total noise energy

exposure, duration of exposure, frequency and bandwidth of the noise, amount of variation in noise levels over time, occurrence of noise spikes, etc. In particular, the timescale involved in the whales' response to a stimulus (*e.g.* movement offshore) and in the subsequent decay of the response (*e.g.* movement back towards shore) needs to be considered explicitly in an analysis. This and other aspects of the noise exposure ought to be considered and explored before reaching firm conclusions about potential effects.

The Panel commends Gailey and his co-investigators for progress on the multivariate analysis. They have developed a useful tool for investigating an issue that has been a major source of concern. As is usually the case with such complex analyses, however, the Panel believes more refinement is necessary before reliable conclusions can be drawn regarding the effects of the 2005 construction activities on the behaviour and distribution of gray whales.

The shortcomings of the analysis were in part a function of the study design and implementation. It is disappointing that adequate baseline (pre-exposure) data were not collected and that behavioural data were not collected during the tow-in and positioning phases of the CGBS installation. At this meeting (and see item 7 below), Sakhalin Energy informed the Panel that again in 2006, the company had faced a choice between (a) delaying construction activities and collecting adequate baseline information, with the attendant risk that construction would not be completed in that season and further work would be required in 2007, and (b) initiating construction without observers in place. Sakhalin Energy noted that its decision had been based, at least in part, on its interpretation that one aspect of the IISG's advice (*i.e.* that work should start as early in the season as possible) took precedence over another (*i.e.* that collection of baseline data should occur). The Sakhalin Energy decision in 2006 now means that those data will suffer some of the same inadequacies as suffered by the 2005 data. Although the Panel understands that logistics in this region are difficult, it also believes that a stronger effort should have been made to initiate whale observations at least in synchrony with construction activities in 2006

A multivariate analysis of the kind performed is a reasonable means of identifying explanatory and response variables that might be important. An actual quantification of the response requires the development of a model of whale response and fitting it to the data. The analysis performed shows that movement of whales offshore is a likely response to noise, but it is insufficient for quantifying the extent of movement.

The Panel **recommends** that:

- The above 'points to consider' be taken into account in the final report on the multivariate analysis of 2005 data.

Page 8 WGWAP 1/3 Report of the First Meeting of the Western Gray Whale Advisory Panel

- In the final report, and in any other outlet citing its findings (*e.g.* on Sakhalin Energy's website), the study's limits, as outlined above *e.g.* in relation to the lack of baseline (pre-disturbance) behavioural data and the failure to collect behavioural data during the two loudest phases of the construction activity, be clearly acknowledged. It should not be claimed that the extent of the whales' response to noise, such as movement offshore, has been quantified.

- The foregoing concerns and suggestions be considered in analyses of effects using 2006 data and also in the planning and decision-making process for data collection and analysis in 2007.