WESTERN GRAY WHALE ADVISORY PANEL **WGWAP-10**

10th Meeting **13-15 May 2011**

Geneva, Switzerland

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

CONVENED BY THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE

CONTENTS

ACRONYMS

DDT	Dichlorodiphenyltrichoroethane
EIA	Environmental Impact Assessment
EMTF	Environmental Monitoring Task Force
ENL	Exxon Neftegas Limited
ENP	Eastern North Pacific
FPSO	Floating Production Storage and Offloading
GIS	Geographic Information System
GWFP	Gray Whale Feeding Point
HCH	Hexachlorocyclohexane
IBM	Institute of Marine Biology
I/CB	Intermediate/Chaivo Bay area
IFAW	International Fund for Animal Welfare
IPEE RAS	Institute of Problems in Ecology and Evolution of the Russian Academy of Sciences
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
LNG	Liquefied Natural Gas
MMO	Marine Mammal Observer
MNR	Ministry of Natural Resources of Russian Federation
NESS	North-eastern Sakhalin Shelf
NGO	Non-Governmental Organization
OA	Offshore Area
OB	Olga Bay
OSU	Oregon State University
PA	Piltun Area
PBDE	Polybrominated Diphenyl Ether
PCB	Polychlorinated Biphenyl
PCCI	Name of company based in Virginia (USA) specialising in engineering and environmental problems
PCFG	Pacific Coast Feeding Group
PHC	Petroleum Hydrocarbon
PML	Perimeter Monitoring Line
POC	Persistent Organohaline Compound
POI	Pacific Oceanological Institute
RMS	Root-Mean-Square
SEL	Sound Exposure Level
SINTEF	(Norwegian: Stiftelsen for industriell og teknisk forskning) Foundation for Scientific and Industrial Research
SSTF	Seismic Survey Task Force
uERD	Ultra Extended Reach Drilling
WGWAP	Western Gray Whale Advisory Panel
WNP	Western North Pacific

1 OPENING

The tenth meeting of the Western Gray Whale Advisory Panel (WGWAP-10) was held at Hotel Epsom, Geneva, Switzerland, from 13-15 May 2011 under the chairmanship of R.R. Reeves. The meeting was preceded by the seventh meeting of the Seismic Survey Task Force at the same venue on 10-11 May.

All Panel members were present for WGWAP-10 (Annex 1).

Brandon Southall (Associate Scientist) attended the meeting at the request of the Panel.

Representatives of the following organisations also attended the meeting (see Annex 1):

AEA Group	Standard Chartered Bank
International Fund for Animal Welfare	UK Government
International Union for Conservation of Nature	WWF International
Mizhuo Corporate Bank, Ltd	WWF Russia
Pacific Environment	WWF UK
Sakhalin Energy Investment Company Ltd	

Finn Larsen and Béatrice Riché of IUCN facilitated meeting preparations and logistics. Sarah Humphrey served as meeting rapporteur. The efforts of Larsen, Riché and Humphrey in support of the Panel's work are greatly appreciated.

1.1 Introduction and logistics

Reeves summarised the expertise and remit of the Panel, noting that it is not qualified to comment on legal or regulatory issues. The Panel's expertise lies primarily in areas of biological sciences and some relevant aspects of oil industry practice.

Observers

Reeves noted that according to the WGWAP Terms of Reference, four seats at each meeting are allocated to observers representing non-governmental organisations (NGOs), four to lender representatives and four to Russian government representatives. Because of a misunderstanding, somewhat more than four NGO representatives and four lender representatives were present at this meeting (all are listed in Annex 1). After a brief discussion it was agreed that for this meeting, those NGOs and lenders with more than one representative present would each function as a single delegation, ensuring that one person spoke for the group and other members of the delegation remained silent although they would be allowed to listen to the presentations and discussions. It was expected that the normal procedures, as specified in the Terms of Reference, would apply at future WGWAP meetings.

1.2 Adoption of agenda

The agenda was adopted with only minor changes (Annex 2).

1.3 Documents

The list of documents is given in Annex 3. Those designated as public are available at http://www.iucn.org/wgwap/wgwap/meetings/wgwap_10/.

1.4 Reporting procedures and timelines

The normal procedure is for the Panel to develop its draft report as quickly as is feasible, with a general goal of making it available for fact checking by Sakhalin Energy within two weeks after the meeting. The Company is expected to complete its fact check within two weeks so that the final report can be made public approximately a month after the meeting. This delivery schedule has often proven to be overly optimistic but it remains a reasonable goal. Given the lateness of this meeting (most spring WGWAP meetings have taken place in April or very early May), there could be a delay because several Panel members have unavoidable commitments related to the annual meeting of the IWC Scientific Committee, which begins in the last week of May.

1.5 Update on outstanding business from previous meetings including status of recommendations

A number of outstanding issues from previous WGWAP meetings have been explicitly included in the agenda for this meeting. Reeves noted that progress continues to be made towards ensuring that the cumulative list of Panel recommendations (numbering more than 400, starting with those of the Independent Scientific Review Panel's report in 2005) is up to date and publicly available (http://www.iucn.org/wgwap/wgwap/recommendations/). Since the last meeting, efforts have been made by all involved parties – the Panel, IUCN, Sakhalin Energy – to update the status of all recommendations (e.g. closed, open, rejected etc.). However, the nature of the process means that the online list can never be 100% current.

Tracking the status of recommendations is one of the most important parts of the WGWAP process and it is a joint responsibility of IUCN, the Panel and the Company. According to the Terms of Reference, Sakhalin Energy is obliged to accept and implement Panel recommendations or, if it does not accept or will not implement them, provide a 'clear explanation' of the reason(s). The majority of recommendations made to date have been closed in one manner or another. Some are open and in progress (anticipating satisfactory close); some require clarification through communication between Panel members and Company officials. The nine status categories are explained on the website (cited above).

2 REPORT OF 7TH MEETING OF THE SEISMIC SURVEY TASK FORCE

Donovan provided the chair's summary. The task force had held its 7th meeting on 9-10 May 2011, immediately before WGWAP-10, and the main topics addressed were analyses of data from the 2010 Astokh 4-D survey and the planned monitoring and mitigation programme for the proposed 2011 South Piltun 2-D survey.

2.1 Analyses of data from 2010 Astokh 4-D

As anticipated in the recommendations from WGWAP-9 (Recommendations 9/21-26) and their target completion dates and Company responses (see http://cmsdata.iucn.org/downloads/wgwap_9_recommendations_table_final_with_seic_responses.pdf), not all of the analyses were expected to be completed and presented at WGWAP-10. Rather, the Panel requested and was assured it would receive a progress report and statement of intent at this meeting regarding the work. Sakhalin Energy confirmed its intention to complete the work as prescribed in the SSTF-6 and SSTF-7 reports (see http://www.iucn.org/wgwap/wgwap/task_forces/seismic_survey_task_force/). Progress has been delayed due to contractual issues that emerged following a company audit.

Among the issues emphasised in the SSTF-7 report was the critical, overarching importance of resolving uncertainties surrounding distance estimation. More robust methods of estimating distance initially, or of adjusting (i.e. 'correcting') estimates and finding ways to integrate correction factors into the various analyses, remain a high priority and require prompt attention, as recognised previously. Sakhalin Energy assured the Panel that this work would proceed and be completed as soon as possible, given the limits on availability of key analysts.

Progress was made at SSTF-7 towards developing approaches and models for multivariate analyses of behaviour and distribution data, in combination with acoustic data, to assess whale responses to seismic noise. Explanatory and impact variables were identified and agreed. Among problems that need to be addressed in the analyses of distribution data are temporal and spatial autocorrelation, seasonal influxes of animals, and the uncertainty of distance estimation. The task force also agreed on the concept of investigating a carefully selected set of 'cases' with sufficiently long focal-animal follows ('tracks'), including but not limited to instances in which seismic source shutdown occurred, in order to evaluate specific whale responses to specific estimated noise exposure levels.

A workplan was agreed such that besides timely completion of the distance estimation analyses, the draft behaviour analysis and case studies would be finalised no later than WGWAP-11. At least some initial results of the distribution studies would also be available by that time. The Panel **recommends** that Sakhalin Energy adheres to this workplan and its timelines. In order to ensure that there are no delays or misunderstandings, it was agreed that an advisory group comprised of Donovan, Cooke, Nowacek, Vedenev and Weller would be available for regular consultation with Sakhalin Energy and its contractors. Broker, on behalf of the company, will provide the advisory group (together with Reeves and Bernal/Riché) with regular (at least monthly) e-mail updates on progress, and teleconferences will be arranged if and as necessary to resolve issues. The responsibility for ensuring that this arrangement functions (i.e. regular reminders, setting up teleconferences etc.) rests with the IUCN relationship management team.

2.2 Planning for 2011 South Piltun 2-D seismic survey

In its previous report, the Panel noted that the planned 2011 2-D seismic survey was of significantly smaller scale and thus likely to have less impact on the whales than the 2010 Astokh 4-D survey. However, it also noted that its recommendations on the mitigation measures for the 2-D survey did not have the benefit of insights gained from analyses of data from the 2010 survey.

In addition, the Panel at WGWAP-9 had stressed that its efforts to provide advice on the 2-D survey in order to minimise risks to western gray whales should not be interpreted as an implicit endorsement of the South Piltun development as a whole. It **reiterates** that view here.

In reaching its conclusions for the 2011 seismic survey, the Panel took into account the following four points.

(1) Analysis of the 2010 data. One of the main aims of the monitoring programme associated with the 2010 4-D survey was to gather data that could throw light on the extent of impact of such surveys on gray whales, and therefore guide practice with respect to future surveys. Whilst recognising the logistical difficulties experienced by Sakhalin Energy, the Panel **regrets** finding itself in the position of having to advise on the next survey before analyses of the data collected during the 2010 survey are available.

(2) Sound source and assumed sound levels for behavioural response. The Panel agrees that the predicted sound levels from the 2-D survey reaching the PML (of around 140 dB_{SEL}) are considerably lower than for the 2010 survey and well below the 156dB_{SEL} level assumed (based on the limited data of Malme et al. 1988) to cause significant behavioural responses and used for the mitigation protocols applied to the 2010 4-D survey. However, the collection of better data for the future was one of the key components of the 2010 monitoring and mitigation plan. Whilst the preliminary analyses of case studies from the 2010 surveys should not be over-interpreted, it appears that in one case a behavioural response occurred at around ~149 dB_{SEL}. It is not clear how the recommended full analyses of 2010 data might affect assumptions concerning the thresholds for behavioural response but precaution should be employed until those analyses have been completed. The overall potential population-level effects are also a function of the density of whales present during operations and this is discussed in (3) below.

(3) Timing and location of the survey. The Panel has consistently expressed its view that the most important mitigation measure to minimise impacts of seismic surveys is to begin as early in the season as ice conditions allow when fewest whales are present. This was the strongest recommendation for the proposed 2011 2-D survey[1] and the Panel is extremely disappointed that the

[1] "The Panel **reiterates** the extreme importance of starting (and completing) any 2D survey as early in the season as possible and ensuring that the appropriate equipment is available and ready for deployment in the expected environmental conditions. Further, it **recommends** that an explicit requirement in this regard be included in any contract for the 2D survey and **requests** that Sakhalin Energy provide the Panel with an update on this as soon as possible." (WGWAP 9/029)

proposed start date (as conveyed by the Company at SSTF-7 and WGWAP-10) is about one month later than was achieved in 2010. While not as late as the peak period of whale presence in the area, this timing will coincide with a considerable influx of whales including mothers and calves, and the survey location is closer to the perennially dense whale aggregation at the lagoon mouth than was the location of the 2010 survey.

(4) Other monitoring and mitigation measures. In addition to the primary measure of starting early in the season, the Panel has also agreed a number of other monitoring and mitigation measures (i.e. provided in detail in the report of SSTF-7). It welcomes the fact that Sakhalin Energy has adopted these although it has some concern over the workload of the MMOs. The Panel also notes the Company's proposal to allow operations if visibility is between 500-1000m but does not believe this is justified.

Given the above, the Panel **reiterates** that the key element of the agreed mitigation programme – starting the survey as early in the season as possible to minimise the risk of injury or disturbance to gray whales – is essential. Therefore, the Panel **strongly recommends** that, if the 2-D survey occurs in 2011,[2] it should only be if Sakhalin Energy ensures that:

(1) The survey starts significantly earlier, i.e. as early in the season as ice conditions allow, as was intended for the 2010 survey; and

(2) The monitoring and mitigation plan as specified in the SSTF-6 report (and as refined in the SSTF-7 report) is fully implemented, including (a) shut-down if daytime visibility is less than 1000m; (b) that experienced MMOs are used who have received training in estimating distance at sea; and (c) that two MMOs operate at the same time during operations and receive adequate rest periods in accordance with the specified mitigation measures.

2.3 Seismic survey (and other noise-generating) work by other companies planned for 2011

WWF-Russia (Knizhnikov) advised the Panel that according to an EIA submitted by a company called Romona, the same vessel that Sakhalin Energy is planning to use for its 2-D seismic survey will be carrying out other seismic work for Gazflot in the summer of 2011. This work will be in the Kirinsky lease area well south of the main gray whale feeding areas. As far as could be determined from information available at the meeting, the Kirinsky work will take place after completion of Sakhalin Energy's proposed South Piltun 2-D seismic survey.

No other major noise-generating activities or events planned for the summer of 2011 were brought to the Panel's attention at the meeting.[3] Sakhalin Energy indicated that according to conversations with ENL officials, that company has no plans for a seismic survey in 2011. Also, Broker reported that Rosneft had told the most recent meeting of the Inter-departmental Working Group it did not intend to continue the Lebedenskoye seismic survey in 2011 even though the survey was not completed in 2010.

2.4 Public availability of monitoring and mitigation programme

As recommended at WGWAP-9 (recommendation WGWAP-9/27), IUCN has posted the Astokh 4-4-D monitoring and mitigation plan (collated from several reports and with a brief introduction) (see http://www.iucn.org/wgwap/wgwap/seismic_survey_monitoring_and_mitigation_plan/) in order to make it readily available to the public as well as to other oil and gas companies. Sakhalin Energy noted that chapter 7 of the EIA for the 2010 Astokh 4-D seismic survey also provides a good

[2] The Panel was notified by Sakhalin Energy on 1 July 2011 that the 2-D site survey had been postponed until 2012.

[3] In the weeks following the meeting, the Panel learned of two 3-D seismic surveys planned for the 2011 open-water season: one by Elvary Neftegaz (BP and Rosneft) in the Kaygan-Vasukansky block of Sakhalin-5, the other by Gazflot (Gazprom) in the East Odoptu block of Sakhalin-3.

summary of the plan. The most recent version of the EIA has incorporated all of the measures recommended over the years by the SSTF and the Panel concerning the Astokh 4-D seismic survey.

2.5 Future work of the Seismic Survey Task Force

Although it was agreed that the work of the SSTF should continue, it was emphasised that a further meeting to consider the 2010 results should await substantial progress towards completion of the analyses outlined in the SSTF-7 report. Therefore the date of the next SSTF meeting as well as the nature and timetable of inter-sessional task force work were left to be decided in the coming months through discussions among IUCN, the Company and relevant Panel members.

There was a brief discussion of the 'good practices' review paper being prepared by a group of SSTF members for submission to a peer-reviewed journal. Although meeting participants expressed considerable enthusiasm for the idea of such a paper, they also emphasised that it could not be universally applicable for marine seismic mitigation and monitoring. The particular circumstances of seismic surveys on the north-eastern Sakhalin Shelf where a small, well-studied and critically endangered whale population occurs near enough to shore for shore-based monitoring are exceptional, so the Astokh 4-D monitoring and mitigation programme is best seen as an instructive example rather than as a model for exact replication.

Sakhalin Energy emphasised its intention to publish a series of papers on aspects of the Astokh 4-D programme. The idea is to produce something broadly similar to the collection of papers concerning ENL's 2001 ENL Sakhalin seismic survey that appeared in 2007 as a special section of *Environmental Monitoring and Assessment*. The Panel **strongly supports** this initiative as a good practice and looks forward to seeing the papers published in the peer-reviewed literature.

3 PHOTO-ID

3.1 Way forward for catalogue comparisons

The comparison of the IBM and Russia-US catalogues has been updated annually since 2008. It was agreed at WGWAP-7 that the updated catalogues, with data through the previous year's field season, would be submitted to IUCN by 1 September and that cross-matching would be completed in time for the results to be reported at the following WGWAP meeting. The matching focuses on new whales, but the entire catalogues are checked for new matches. Additionally, the total number of whales observed in total by both teams is calculated. To date, the catalogues have been matched based on data through the 2009 field season.

The Panel anticipates that this annual procedure will be continued and that, for efficiency, it will be combined this year with the task identified under Item 3.2 (below).

3.2 Way forward for integrating photos from satellite tagging into both catalogues

An analysis by Amanda Bradford of the photo-ID data collected during tagging and pre-tagging in 2010 had been submitted to WGWAP-9 (document WGWAP 9/12). A total of 75 animals were identified, of which 4 were calves, 68 were non-calves that can be found in the 2009 update of the Russia-US catalogue, and the remaining 3 were 'new' non-calf whales. At this meeting, Tsidulko provided a progress report on matching of the tagging and pre-tagging photos to the IBM and Kamchatka catalogues (this matching is being conducted by Tyurneva).

The Panel considers that the comparison of the two teams' matching of the tagging and pre-tagging photos with their respective catalogues will be undertaken most efficiently if combined with the regular annual update of cross-matching of the 2010 catalogues. However, whales identified during the tagging or pre-tagging fieldwork should be clearly indicated as such.

Accordingly, the Panel **recommends** that each team:

(i) include whales identified during the tagging and pre-tagging work in the 2010 update of its Sakhalin catalogue;

(ii) upon submitting its updated catalogue, indicate which whales were identified in the tagging and pre-tagging work. Here the teams should distinguish between:

(a) whales identified only during the tagging or pre-tagging work and

(b) whales identified both during tagging or pre-tagging work and during other surveys.

The Panel further **recommends** the following timetable:

IUCN (Bernal) sends a request to the two teams on 15 July 2011, asking them to submit their Sakhalin catalogues (based on data collected through 2010, and including data from the 2010 tagging/pre-tagging surveys) to IUCN by 1 September, following the previously established schedule. IUCN then forwards the catalogues to each team, with a request for results of cross-matching to be returned by 1 January 2012.

This recommendation **supersedes** recommendation WGWAP-9/034. On behalf of the IWC, Donovan confirmed that permission is granted for using the tagging and pre-tagging photo-ID data for this purpose (although publication priority will be given to those who collected the data).

The Panel **expresses its appreciation** to both teams for their co-operation in this arrangement, which it believes enhances the value of both catalogues.

3.3 Future photo-ID work (comparisons to the Kamchatka catalogue, and to eastern gray whale photo collections)

3.3.1 Kamchatka comparisons

The IBM Sakhalin and Kamchatka catalogues have been regularly cross-matched in recent years and the results reported to MNR and the WGWAP. Document WGWAP 9/14 contains the results through the 2009 field season. While the Russia-US and IBM Sakhalin catalogues have been compared with each other, so far no direct comparison has been made between the Russia-US and Kamchatka catalogues. In principle, whales could exist that are common to the Russia-US and Kamchatka catalogues but are not found in the IBM Sakhalin catalogue. The number of such whales, however, is expected to be small (possibly even zero). Tyurneva offered to conduct this comparison, subject to the required permissions being obtained.

The Panel **recommends** that permission from the respective data owners (Burdin, Vertyankin) and co-owners (Sakhalin Energy and ENL in the case of the Kamchatka catalogue) be sought by IUCN (or by Sakhalin Energy on IUCN's behalf) and that an exchange and cross-matching between the Russia-US and Kamchatka catalogues be organised on the same basis as the arrangements used to date for comparisons of the two Sakhalin catalogues. The timetable may have to be slightly later than that proposed above for the Sakhalin catalogues, depending on the time taken to receive the required permissions. The Panel **requests** that IUCN (Bernal) take the lead on this.

It was also noted that all feasible efforts should be made by Russian scientists and authorities to ensure that data (photographic and genetic) from the gray whales killed every year off Chukotka are incorporated into the various comparative studies. Both the Russian western gray whale strategic planning group (chaired by Yablokov) and the IWC Scientific Committee have made similar suggestions.

3.3.2 Matches with 'eastern' gray whales

Weller summarised information on movements of western gray whales from the Okhotsk Sea to the eastern North Pacific based on evidence from photo-ID and genetic matching. Photo-ID images of 181 individual western gray whales collected off Sakhalin between 1994-2009 by the Russia-US joint research programme (referred to here as the WNP catalogue) were compared to a catalogue of nearly 1,200 eastern gray whales identified by Cascadia Research Collective and its collaborators working in US and Canadian waters from California to Alaska (called the ENP catalogue) (Calambokidis *et al*. 2002, 2010). The ENP catalogue focuses on a group of several hundred gray whales, called the Pacific Coast Feeding Group (PCFG), that feed during summer and fall in coastal waters between northern California and the Gulf of Alaska, but also includes a small number (*n*=247) of migrating gray whales identified in the spring (March to May) during their northward passage to the Bering, Beaufort and Chukchi Seas.

The WNP/ENP catalogue comparison resulted in a total of six confirmed matches, including three males, two females and one whale of unknown sex. Lang (2010) had reported that **two** adult individuals sampled off Sakhalin in 1998 and 2004 matched the microsatellite genotypes, mtDNA haplotypes and sexes (one male, one female) of **two** whales sampled off southern California on 20 and 23 March 1995. When these two genetic matches are combined with the six photographic matches reported above, a total of **eight** adult WNP gray whales have been matched to the ENP. These **eight** matches include **four males** and **three females**, providing evidence that **both sexes**, in approximately equal numbers, move between the WNP and the ENP.

While these matches provide new records of WNP to ENP movements, winter/spring observations of gray whales off Japan, including a 2006/2007 photo-match from Sakhalin to Honshu (Weller *et al*. 2008), suggest that not all of the gray whales identified off Sakhalin share a common migration route and wintering ground.

The Panel was pleased to learn the results of this comparison and **recommends** that additional matching to other existing catalogues be undertaken. Some individuals in the IBM catalogue have not been found in the Russia-US programme's catalogue. The Panel therefore **encourages** inclusion of these IBM whales in the present comparison with the ENP catalogue. Tsidulko drew attention to a potentially large set of photographs collected by Vladimir Burkanov of gray whales along the north-eastern Kamchatka and eastern Karyakia coasts and the Panel **encourages** that Burkanov be approached and invited to contribute his data and photographs to the comparison exercises.

4 FOLLOW-UP ON 'ANOMALOUS' WHALE DISTRIBUTION IN SEPTEMBER 2009 (SEE SECTION 1.5.1 OF WGWAP-9 REPORT)

At its previous meeting the Panel had requested an analysis of whale density (1- or 2-week moving average) at stations 10 and 11 for the period 15 August to 15 October 2009 specifically to determine whether an observed change in distribution was statistically significant (Recommendation WGWAP-9/002). Sakhalin Energy indicated that a statistician was being consulted and the analysis was underway but not ready for presentation at this meeting. The Panel, whilst acknowledging that the Company has many analyses ongoing, particularly with respect to the 2010 Astokh 4-D seismic survey, noted the ready availability of geospatial analysis tools that could be used for this work. Sophisticated models should not be needed for an informative initial analysis of the density data. For example, even a relatively simple, time-synchronised GIS depiction of the sightings and acoustics data and the human activities/events in various layers would represent a good start.

The Panel had also requested that Sakhalin Energy provide more information concerning activities on or near the PA-A platform that could have produced the noise recorded at buoys X-Z from mid-August through mid-September 2009 (Recommendation WGWAP-9/003). Evans provided a thorough report on the Company's investigation into this matter, concluding that only 'routine' activities occurred during the time period of interest. Several vessels were moving near the platform, but the dates do not align with the recorded noise signatures (see below). During the course of inspecting the data, significantly higher noise levels were noted near the PA-A platform in 2009 than in 2010 (Item 6.5).

Following the presentation by Evans, Racca presented acoustic data from the three nearest buoys (X-Z) during the period of interest. He identified several 'loud' events for which the sonograms suggest vessels passing and at times abruptly changing speed. The level of vessel activity indicated by this relatively small sample is of concern for three reasons, as follows: (a) the noise was relatively loud (particularly the rapidly changing noise), (b) the inferred location and activity of the vessel(s) may have implications for ship strike risk and (c) there is no obvious explanation for the noise source. More pertinent to the current discussion of potentially anomalous whale distribution is the 'background' noise levels, specifically those recorded between the presumed vessel passes.

Racca identified one period of relative quiet, i.e. quiet compared to other periods between vessel passes. The levels during this 'quiet' period appear to have been 10-15 dB (depending on the frequency band considered) below the normal din of 'industrial' noise recorded by the acoustic sensors, which is most prominent in the 20-200 Hz band (see further discussion under Item 6.5).

The Panel **expressed its appreciation** of the effort by Sakhalin Energy to investigate this 'anomaly' and considered that Recommendations WGWAP 9/003 and 004 had been fully implemented. Further, the Panel looked forward to receiving the analyses called for in Recommendation WGWAP 9/002 before the next meeting.

5 POPULATION ASSESSMENT

5.1 Independent review of joint assessment

As recommended at WGWAP-7, IUCN contracted for an independent review of the joint population assessment based on data from both the IBM and Russia-US Sakhalin catalogues, as was presented at WGWAP-8 (document WGWAP 8/9). Prof. P. Hammond and Dr. M. Lonergan of St Andrews University, Scotland, conducted the review. The reviewers were provided with the assessment paper (WGWAP 8/9) and supplementary material from Cooke (data, computer code, input and output files, technical notes). The reviewers' report was received shortly before WGWAP-10 and posted as document WGWAP 10/9.

The reviewers identified a number of points which they felt merited further investigation, although they did not expect this to change the results of the assessment to any substantial extent. The Panel **expressed its appreciation** to the reviewers for their work.

Cooke noted that some of the reviewers' comments were requests for more information on the model, or for the fitting of alternative models, to check the sensitivity of the assessment to its assumptions. These should be relatively straightforward to address. Other comments of the reviewers referred to aspects of the results that they found counter-intuitive. In these cases, the response would be to provide a more intuitive explanation. For example, the reviewers expressed surprise that the estimate of population size did not increase when the IBM data were added. Cooke explained that capture-recapture models, of which this assessment model is an example, estimate the number of animals 'missing' from the data; if the assumptions are met, one should not expect a significant increase in estimates as new observations are added, although small changes in either direction within the estimated confidence limits are likely. The Panel **requests** that Cooke prepare a written response to the reviewers' comments before WGWAP-11.

The Panel **recommends** that the assessment be submitted for publication with the authorship that had been agreed between the two teams, and that it include data through the 2009 season (the version that was reviewed included data through 2008).

5.2 Update on future population assessments

The Panel stressed the importance of updating the population assessment regularly, as it currently represents the most reliable indicator of population status and trends.

In view of the movements of gray whales between Sakhalin and the eastern North Pacific, as evidenced by the satellite tracking results (see Item 14.1) and the genetic and photographic matches (see Item 3.3.2, above), the Panel considered that the next update should allow for the possibility of interchange with other 'populations' of gray whales. Issues raised in the independent review of the joint assessment should also be considered if they are found to be significant in terms of their effects on the results.

The Panel noted that the status of gray whales, including the implications of movement between the western and eastern North Pacific, would be discussed in some detail at the forthcoming meeting of the IWC Scientific Committee in June 2011. Therefore, the Panel refrained from making any new recommendations concerning the next assessment; this should give the scientists involved the flexibility to consider all available sources of information.

5.3 Data collection in 2011

On behalf of Alexander Burdin (Kamchatka Branch of Pacific Institute of Geography – Far East Division of Russian Academy of Sciences), the Principal Investigator of the Russia-US research programme, Weller provided an overview of planned research activities in 2011. As in the past, boat-based photo-ID and shore-based scan sampling and distribution studies will be conducted. There is also a possibility of biopsy sampling in tandem with photo-ID if the necessary collaborative agreements can be reached. The field programme will be all-Russian and the tentative timing of operations is mid-June to mid-September. The International Fund for Animal Welfare (IFAW) and possibly other organisations will provide funding. It is expected that preliminary results from the project will be available for consideration at WGWAP-11.

The Panel notes the high value of this work for the ongoing monitoring of the population and looks forward to receiving a report.

Sakhalin Energy indicated that the IBM photo-ID programme, including the collection of photographs and data at both Sakhalin and Kamchatka, would continue in 2011 as in the past.

6 FINAL REPORTS ON FIELD ACTIVITIES IN 2010 (OTHER THAN THOSE ASSOCIATED WITH THE ASTOKH 4-D SEISMIC SURVEY)

The Panel noted that there had been a substantial improvement over previous years in the readability, thoroughness and integrative nature of the final reports from the joint Sakhalin Energy-ENL programme. It welcomed this development and urged that this standard be maintained in the future.

Also under this item, Sakhalin Energy drew the Panel's attention to the Company's commitment to the Russian Ministry of Natural Resources to provide a synthesis report on all components of the overall gray whale research and monitoring programme by the end of 2011. Besides this report, Sakhalin Energy referred to its plans for a series of integrative papers to be published in the peer-reviewed literature (along the lines of the special section of Environmental Monitoring and Assessment in 2007 entitled 'Mitigating and Monitoring the Impacts of a Seismic Survey on the Endangered Western Gray Whale'). Noting that it had called repeatedly for more analytical and integrative reporting of the results of the gray whale programme, the Panel **welcomed** this initiative and looks forward to the update promised by the Company for WGWAP-11.

6.1 Benthic monitoring

Fadeev presented an overview of data collected on benthic ecosystems of the north-eastern Sakhalin shelf (NESS) during the 2010 field season as well as a synthetic summary of benthic ecosystem data collected and analysed from 2002 through 2010. The Panel noted the excellence of this work and particularly welcomed the recent progress towards a synthesis from the entire time span of benthic studies associated with the Sakhalin II development.

The reference document presented the 2010 data in exhaustive detail. Here, the Panel provides a brief summary of those portions of the 2002-2010 synthesised data set most relevant to gray whale conservation. This summary is intended to highlight Panel concerns and recommendations for continued work during the 2011 field season and beyond.

Physical characteristics of benthic sediments and bottom water temperatures have been measured over the periods 2002-2010 and 2007-2010, respectively, and the Panel endorses the need and relevance for measurements of this kind on an annual basis. However, the Panel notes with concern the lack of coordination between the benthic and acoustic sampling efforts and **recommends** that the company coordinate environmental sampling to the extent practical in order to maximise insights on the NESS habitat and avoid duplication of effort.

Levels of persistent organohaline compounds (POCs, including dichlorodiphenyltrichloroethanes [DDTs] and hexachlorocyclohexanes [HCHs]), heavy metals and petroleum hydrocarbon residues have been measured in sediment samples in 2005 and from 2008 through 2010. The POC concentrations in all samples in all years are quite low, with minimal variance and no apparent temporal trends. All recorded concentrations are consistent with expectations for relatively pristine marine habitats. Heavy metal assessments have included arsenic, barium, cadmium, chromium, copper, mercury, lead and zinc. In all samples across all years, concentrations of all assessed heavy metals have been below 'active concentrations' (a standard for threshold levels that produce concern in the context of environmental protection) and are consistent with expectations for pristine habitats. Petroleum hydrocarbon (PHC) measurements suggest a positive correlation with depth. However, all concentrations observed across all years are low, with minimal temporal variance and no evidence of temporal trends. All observed PHC concentrations on the NESS are consistent with a hydrologically dynamic marine benthic environment, and with expectations for sediments without significant anthropogenic contamination. Finally, concentrations of heavy metals (primarily iron and zinc) in tissues of five benthic polychaete worm species (three species of *Nephtys* and one each of *Nereis* and *Capitella*) were also quite low and consistent with expectations for animals living in pristine habitats.
The Panel was pleased to see the efforts to establish contaminant baselines for the NESS, and makes three recommendations in that regard:

1. Whilst recognising the low levels of POCs, heavy metals and PHCs in samples collected to date, the high cost of sample collection and processing, and the crowded agenda for sample collection and analysis facing the benthic monitoring team during and immediately following each field season, the Panel **recommends** that the sampling schedule for NESS POCs, heavy metals and PHCs be changed from annual to biennial or triennial. An annual schedule should be reinstated if any anthropogenic event occurs on the NESS that might reasonably be expected to alter the currently recognised patterns in benthic contaminants in a significant way.

2. The Panel **recommends** that sampling be initiated in summer 2011 for concentrations of polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs). Both are recognised as anthropogenic contaminants often associated with industrialisation of coastal marine environments, and both are a matter of significant concern in the context of marine conservation on a global scale because of potential for toxicity, accumulation in tissues and persistence. Levels of PCBs and PBDEs should be measured on the NESS annually for a minimum of three years, after which the need and frequency for subsequent measurements can be assessed.

3. Also with regard to contaminants, the Panel **recommends** sampling known or suspected significant prey of gray whales on the NESS. At a minimum, the sampled prey species should include the amphipods *Monoporeia affinis* and *Ampelisca eschrichti* and the sand lance *Ammodytes hexaptera*. Tissue concentrations of POCs (including DDTs, HCHs, PCBs and PBDEs), heavy metals and PHCs should be measured in these species (and others deemed appropriate by Fadeev) on the NESS annually for a minimum of three years, after which the need and frequency for subsequent measurements can be assessed.

Fadeev's presentation and reference documentation described benthic ecosystem data in four primary locations at which gray whale foraging is known to occur, on both the NESS and along the east coast of Kamchatka. The locations on the NESS are known as the Piltun Area, the Offshore Area (OA), and the Intermediate/Chaivo Bay Area (I/CB). The sole location off eastern Kamchatka is Olga Bay (OB). In addition, benthic samples and data have been collected at gray whale 'feeding points' (GWFPs) where feeding dives have been observed within those four primary locations. Based on the data currently available, only the PA and OA should be regarded as stable feeding areas of long-term significance to western gray whales.

The four identified primary locations have the following major attributes relevant to gray whale feeding:

Piltun Area (PA): The area consists of a small stretch of near-shore waters ('core' area about 70 km long) along north-eastern Sakhalin, from the surf line to a depth of ~30 m and including the mouth of Piltun Lagoon. Primary prey are amphipod crustaceans, most notably *Monoporeia affinis*, which occur at high densities in well-sorted fine sands at depths of 15 m or less, and sand lance, which occur farther offshore. Whales sometimes feed in the deeper portions of the area (>20 m depth), focusing on sand lance and large epibenthic isopods *Saduria entomon* that occur as localised patches in areas dominated by epibenthic sand dollars *Echinoarachnius parma* (*E. parma* is not eaten by gray whales). Although highly mobile forage fish, sand lance are vulnerable to consumption by gray whales as a result of their habit of burrowing into sediments when at rest. The region of dense amphipod abundance extends along the entire length of the PA. Sand lance densities are patchy in space with highest densities typically occurring in the northern part of the PA.

Significant temporal variation in amphipod biomass density has been detected in the PA over the period 2002-2010. Densities were highest from 2002 through 2005, lowest in 2006 and 2008 and at intermediate levels in 2007 and 2009-2010, based on statistical analyses reported by Fadeev. The maximum observed variation in mean biomass density among years was ~twofold. Amphipod biomass densities and gray whale feeding activity are concentrated consistently among years in the vicinity of the entrance channel to Piltun Lagoon, located in the southern portion of the PA. Sand lance densities differed among years. Highest densities were observed in the northern PA in 2004 and 2005. Densities observed in 2002-2003 and 2006-2009 were as much as ten times lower than those of 2004-2005. Frequencies of occurrence of sand lance in benthic samples approximately doubled between 2009 and 2010. Gray whales appeared to concentrate portions of their foraging effort in areas of high sand lance densities in years when such densities occurred. Within the PA, the major community-scale pattern has been dominance by amphipods and isopods in shoal waters and by sand dollars in deeper waters, with an apparent boundary at ~20 m.

Offshore Area (OA): The area is farther offshore than and south of the PA. Depths in the OA range from ~18 to ~68 m. Sediments are primarily fine sand with interspersed patches of coarser sand or gravel. The area is approximately 35 (north-south) by 25 km in maximum dimensions, with the eastern and north-western borders apparently variable from year to year. Fadeev's team sampled benthic communities in the OA from 2002-2010. Benthic communities in the OA are dominated by amphipod and cumacean crustaceans and polychaete worms. Benthic biomass densities are typically five- to tenfold higher than those in the PA. Primary gray whale prey species in the OA are amphipods, principally *Ampelisca eschrichti*, with biomass densities typically two to five times higher than amphipod biomass densities in waters < 20 m deep in the PA. Fadeev's team has detected no significant temporal trends in principal gray whale prey in the OA. Cumacean crustaceans are also abundant in the OA and have high potential nutritional value to consumers, but they apparently are too small to be efficiently retained on the baleen of foraging gray whales.

The OA has a complex patch structure lacking obvious correlations with depth, and involving five recognised benthic community types. Gray whales appear to feed primarily in patches dominated by two of the five assemblages, one dominated by *Ampelisca eschrichti* and several bivalve and anemone species, and a second dominated exclusively by *A. eschrichti*. Fadeev notes in his written report that the *Ampelisca*-dominated assemblage in the OA bears significant similarities to *Ampelisca*-dominated communities used for feeding by gray whales in the Bering Sea.

Intermediate/Chaivo Bay Area (I/CB): The area is located between the PA and the OA and is directly west of the Orlan production platform. The I/CB extends along the Sakhalin shoreline for a distance of ~15 km from north to south, and from the surf line eastward to a depth of about 30 m. Fadeev's team sampled benthic communities in the I/CB in 2002 and annually from 2007 through 2010. The spatial distribution, biomass densities and community composition of benthic ecosystems in the I/CB are generally similar to those of the PA. An exception is an assemblage of tunicates occurring as localised patches in waters > 20 m deep in the I/CB but not in the PA. In addition, the sand dollar assemblage in the I/CB appears to be spatially more patchy than in the PA. The physical configuration of the benthic habitat in the I/CB is more complex than in the PA. Densities of organisms that typify the benthos in the PA, OA and I/CB appear to be substantially lower as one moves south from the I/CB. Based on the size of the area and the relatively small number of individually identified gray whales recorded in the area, Fadeev suggests that the I/CB is of minor importance in the overall nutrition of the western gray whale population.

Olga Bay (OB): The area is located off the east coast of Kamchatka, immediately south of the Kronotskiy Peninsula. Benthic samples were obtained from OB in 2009 and 2010. The physical habitat and benthic assemblages resemble those of the shoaler portions of the PA. Sediments are primarily fine sands, with some patches characterised by a mixture of medium sands and gravel. Amphipods and cumacean crustaceans occurred in 100% of benthic samples and comprised 95% of the total biomass in sampled benthic communities. The dominant gray whale prey species found in OB is the amphipod *Monoporeira affinis*, with biomass densities similar to those typically observed in shoaler portions of the PA. Olga Bay is smaller than other known feeding areas. Given that 40 different individual gray whales were photographically identified in OB in 2010, Fadeev surmises that there must be other feeding areas along the eastern Kamchatka coastline not yet identified.

Gray whale feeding points (GWFP): Feeding points in the PA, I/CB, and OB most often occurred in areas with shallow waters, fine sands and benthic assemblages dominated by amphipods, particularly *Monoporeira affinis*. During 2004 and 2005 some GWFPs in the PA were in deeper habitats dominated by sand dollars in the northern part of the area. GWFPs observed in 2004 and 2005 also included high densities of sand lance. Benthic samples from GWFPs in OA were typically dominated by *Ampelisca eschrichti*. Mean depths of GWFPs in OA increased steadily over time from 2005 through 2009, and were similar between 2009 and 2010.

Fadeev concluded his presentation and report with suggestions that two additional factors may be important in understanding benthic community dynamics and availability of prey for gray whales on the NESS, namely interannual variation in bottom water temperatures and interannual variability in the extent and timing of break-up of sea ice cover. Life cycles of the two amphipod species that likely dominate the diet of western gray whales, *Monoporeia affinis* and *Ampelisca eschrichti*, are suspected to be sensitive to water temperature. In the Baltic Sea, the life cycle of *M. affinis* is completed in one year if sea water temperatures are relatively warm, and two years if temperatures are relatively cool. Other species of *Ampelisca* are known to show similar patterns, with the life cycle of *A. macrocephala* (which occurs in OA and is known to be important prey for gray whales in the Bering Sea) ranging from 2-3 years in warm regimes but 5-6 years in cooler conditions. Likewise, there is reason to surmise significant functional relationships between gray whale prey populations and variations in ice cover and break-up date on the NESS. Productivity pulses in high-latitude coastal marine ecosystems have strong temporal linkages to the onset of increased photoperiod during spring and summer. By virtue of the capability of sea ice to both reflect and absorb solar energy, ice cover can delay initiation of ecologically crucial phytoplankton blooms, with important ecosystem-level consequences. Fadeev notes in his written report that the minimum observed biomass densities of *Monoporeia affinis* on the NESS during the period 2004 through 2010 occurred in 2006, which featured the lowest ocean temperatures, one of the largest extents of sea ice cover and the latest ice break-up date of any year during his field studies.

The Panel acknowledges and **commends** the extraordinary effort and insight reflected in the benthic data collected by Fadeev and his team over a span of time that will constitute a full decade by the end of the 2011 field season. The Panel has provided frequent encouragement for an increased effort to synthesise the data, and was impressed with the extent and implications of the synthesis provided at WGWAP-10. The Panel now **encourages** Fadeev and his colleagues to take the next step, and begin the process of establishing a modelling framework for the apparently dynamic relationships between foraging gray whales and the associated benthic assemblages in the identified feeding locations. It is important to begin the process by focusing on ecological relationships. As noted under Item 10.2 (below), the subject of ecological modelling will be part of the agenda for the Environmental Monitoring Task Force Workshop, now tentatively planned for autumn 2011 or winter 2011-2012.

Finally, the Panel recalls repeated expressions of interest in and concern about the functional significance of Piltun Lagoon to the nutrition of the western gray whale population, and the consequent need to protect the Lagoon and its ecological processes from anthropogenic disturbances.

Fadeev's team has carried out significant work of excellent quality that has tested and rejected several hypotheses concerning the mechanism(s) by which Piltun Lagoon may contribute to local secondary production of gray whale prey on the NESS. Nevertheless, an obvious pattern remains to be understood: At a population scale, western gray whales seem to prefer to forage near the mouth of Piltun Lagoon over all other known options. This statement is the most plausible interpretation of the data presented in the reference document, which reflect whale behaviour for nearly a decade. At previous Panel meetings, it has been suggested that the influence of upwelling processes on the NESS, and subsidies to local secondary productivity from effluent of the Amur River, have important effects on apparently high benthic food web productivity near the Piltun Lagoon mouth, and consequently on observed spatial patterns of gray whale foraging within the PA. However, the spatial distribution of local upwelling events on the NESS and the spatial and temporal patterns in movement of Amur River effluent lack sufficient spatial focus and specificity to explain the concentration of gray whale foraging effort near the Piltun Lagoon mouth. Observed patterns of whale foraging are much more likely a result of enrichment of local benthic secondary productivity by the effluent of Piltun Lagoon. Based on such perceptions, the Panel **recommends** that the benthic monitoring team be encouraged to develop and test new hypotheses, perhaps including export of phytoplankton biomass or inorganic nutrients from Piltun Lagoon, allowing the significance of Piltun Lagoon effluent, Amur River effluent and local upwelling events and processes to be better understood and placed in context with regard to western gray whale conservation.

6.2 Photo-identification

Tyurneva provided an overview of information collected during the joint Sakhalin Energy/ENL 2010 photo-ID surveys. Overall, the 2010 effort was similar to that in previous years. Small-boat surveys, deployed from the R/V Akademik Oparin, were conducted off Sakhalin on 17 days between 4 August and 27 September with 36 hours dedicated to photographing whales in the Piltun, Offshore and Chaivo areas. Nearly 13,500 photographs were collected, resulting in the identification of 105 whales, including five mother-calf pairs and three independent calves, these latter having also been seen in Kamchatka earlier in the open-water season (meaning the total number of calves in 2010 was 8).

In addition to the photo-ID effort off north-eastern Sakhalin in 2010, small-boat surveys were conducted in Olga Bay on the south-eastern coast of Kamchatka. Between 22 June and 10 August, there were four days of effort in June, seven in July and two in August. Almost 17,000 photographs were collected, resulting in the identification of 82 whales of which 34 were not in the IBM Sakhalin catalogue (i.e. they were 'unique' to Kamchatka). Three mother-calf pairs were recorded in Olga Bay. All of these females had been sighted off Sakhalin in previous years. One of them had been photographed off Sakhalin in 2004 and 2007 with a calf while the other two had never been recorded as mothers. All three of the calves were seen later in the 2010 season off Sakhalin.

In discussion, the Panel asked whether a high proportion of whales were coming to Sakhalin from Kamchatka, rather than the previously assumed arrival to Sakhalin via a southern route. The timing of the photo-ID effort in different areas makes it difficult to draw any supportable conclusions regarding this matter. Additionally, it is important to recognise that multiple migratory routes could be used to reach Sakhalin, including corridors from the northeast (i.e. from Kamchatka) and/or the south (i.e. from Japan).

6.3 Behaviour monitoring

Gailey provided an overview of information collected during the joint Sakhalin Energy/ENL 2010 shore-based behaviour studies. Although the 2010 effort was methodologically identical to previous years, a major programmatic change was the use of only one research team (as opposed to the standard of two). Overall, 36 days and nearly 281 hours were dedicated to the collection of distribution and behaviour data. In addition, shore-based photo-ID work was conducted throughout the study period.

Data collected by the behaviour team showed considerable intra-seasonal variation in how whales used their feeding habitat. This intra-seasonal variation included (1) a significant number of whales distributed further from shore in August than in most other years (east of the 20 m isobath) and (2) a late-season (i.e. September) shift in distribution from the south to the north.

In discussion, the Panel asked what factors, either anthropogenic or natural, might have contributed to the observed shift of some whales to waters east of the 20 m isobath and from the south to the north. Gailey hypothesised that such changes were likely due to prey availability. He acknowledged, however, that whilst the behaviour team gathers precise theodolite-derived positional data on the whales, it is difficult to relate this to prey availability or disturbance factors without having equally precise information on those aspects.

Given that analyses of behaviour in relation to acoustic conditions have been the primary means of assessing the potential effects of industrial activities on western gray whales thus far, the Panel **reiterates its earlier recommendation** (see item 2.1.7 of WGWAP-9 report) that Sakhalin Energy continue this component of its research and monitoring programme.

6.4 Distribution monitoring

Broker provided an overview of data collected during the joint Sakhalin Energy/ENL 2010 vessel- and shore-based distribution surveys. Overall, the 2010 effort generally mirrored that of previous years in both scope and timing. Vessel surveys were conducted from the R/V Akademik Oparin and followed the transect lines employed in 2009. In general, visibility and sea state conditions were reasonably good during the study period, allowing complete surveys to be conducted in the Offshore (n = 4), Arkutun-Dagi (n = 2), Piltun (n = 2) and Piltun-Astokh (n = 2) areas. Surveys of the Piltun-Astokh region represent a relatively new effort (initiated in 2009) to better document the distribution of whales in proximity to the PA-A and PA-B platforms (as well as the planned PA-C platform; see Item 13, below).

Results from these 2010 vessel surveys show that whales were observed (1) further from shore, beyond the 20m isobath, especially in the northern portion of the near-shore Piltun area, (2) east of the transect grid in the offshore area, as was also true in 2009, (3) in the Arkutun Dagi licence area in much higher numbers (n=16) than had been reported previously and (4) in August (n=16) and September (n=14) near the western and southern margins of the Piltun-Astokh license area.

In discussion, the Panel expressed particular interest in the sightings in the Piltun-Astokh area in light of their proximity to the planned 2011 2-D seismic survey. Regarding the sightings of whales beyond the eastern end of the 2009 and 2010 offshore survey transects, the Panel looks forward to reviewing the results of the planned extension of transect lines to the east to provide adequate coverage of that region.

The 2010 shore-based distribution effort was similar to that of previous years. Surveys were conducted between 5 August and 28 September 2010. Although poor weather conditions prevailed during some portions of the study period, a total of 19 surveys (i.e. all 13 shore stations covered in a single day) were completed. Trends in the shore-based data were consistent with those in the vessel data, with a shift of whales from the southern to the northern part of the feeding area and movement farther offshore (beyond the 20m isobath) at stations 1 to 4. Few whales were observed in the southernmost part of the survey area, i.e. between stations 10 and 13.

6.5 Acoustics monitoring

6.5.1 Follow-up on data for periods of Lebedenskoye and Gazprom offshore seismic surveys in 2010 (Recommendations WGWAP-9/010, 011, 012, 013, 014)

Full consideration of the 2010 Lebedenskoye nearshore and the Gazprom offshore seismic surveys was impossible due to the absence of information about those operations and any concurrent observations of responses of animals in the area. However, in coming months the Panel will review and assess the 2010 acoustic data provided for WGWAP-10 to determine whether there is any useful information relevant to assessment of impacts or that could improve future seismic monitoring and mitigation planning.

Little progress was made with regard to recommendations WGWAP 09/010 through 014. Recommendation WGWAP 9/010 refers to Sakhalin Energy’s processing of acoustic data for specified time periods and WGWAP 9/011 to the Company’s analysis of distribution data for those same time periods. In both instances, the formal Sakhalin Energy response indicated that the requested data and analyses would not be provided because they concerned operations by other companies. The Panel continues to be frustrated by this limitation which repeatedly prevents a robust effort to assess impacts and improve future planning efforts aimed at limiting impacts of industrial activity on western gray whales. As specified in the WGWAP Terms of Reference, the Panel ‘must have access to all the relevant information and data from all interested parties’.

With regard to recommendation WGWAP 9/012, the NGO observers had no further information to offer, and with regard to WGWAP 9/013, Larsen indicated that IUCN had received no response to repeated requests. Finally, the formal Sakhalin Energy response to recommendation WGWAP 9/014 was the same as to 010 and 011.

With regard to the 2010 Lebedenskoye and Gazprom seismic surveys, the figures presented in document WGWAP-10/16-17 do not explicitly show received sound levels on the Piltun feeding area but these can be estimated from the graphs. It appears that the average levels of noise (over 20-minute periods) received at acoustic station ‘Odoptu-N-20’ during 25-28 August 2010 were ~160 dB_{RMS} and thus above what the Panel considers likely to cause behavioural disturbance according to the Astokh 4-D seismic survey monitoring and mitigation plan. These high average levels (and because these are averages, at least some individual sounds at higher levels) were received at the Odoptu-N-20 buoy during both daytime and nighttime; this buoy is located approximately 10 km from the southern boundary of the Lebedenskoye survey area. Furthermore, the Lebedenskoye survey area lies within the Piltun gray whale feeding area. Without specific information about the location of the survey vessel and in the absence of a monitoring and mitigation programme, it is difficult to make definitive conclusions about impacts. However, the Panel can conclude that the levels received in the feeding area clearly exceeded 160 dB_{RMS}. Therefore, for whales present in this northern section of the feeding area, the levels of exposure would be expected to cause significant behavioural disturbance, and possibly even temporary or permanent hearing impairment.

Data in document WGWAP-10/16-17 also indicate that individual pulsed sounds resulting from the Gazprom offshore seismic survey impinged on the Offshore feeding area at levels approaching and in some cases just exceeding the criteria for behavioural disturbance under the Astokh 4-D monitoring and mitigation plan. The Panel **recommends** that for future seismic surveys by any company, received sound levels at the edge of a western gray whale feeding area be kept below what is predicted to cause behavioural disturbance. This level was defined by the SSTF to be 156 dB_{SEL} (per one of any radiated pulse) or 163 dB_{RMS}. However, processing and analysis of data related to the 2010 Astokh 4-D seismic survey may indicate that these levels are either overly conservative or not conservative enough. As discussed elsewhere, until new information becomes available to revise these criteria based on measurements in 2010, the Malme et al. (1983; 1984) analyses remain as the sole basis for setting exposure criteria.

6.5.2 2010 final report on acoustics

The 2010 acoustics monitoring report (i.e. the one submitted to MNR and prepared by POI; WGWAP-10/16-17) was ready for MNR on 7 April but not received by the relevant Panel members (and the Associate Scientist) until much later. Documents as extensive and complex as this one need to be available to the Panel as early as possible to allow sufficient time for careful review.

The 2010 acoustics monitoring data include some periods during which the Lebedenskoye and Gazprom seismic surveys were underway and therefore, as indicated under Item 6.5.1 (above), the Panel reserves the option of re-opening that discussion at its next meeting.

During the presentations by Rutenko and Racca on 2009 data (see Item 4, above), the Panel noted there was substantial continuous noise, as much as 10-15 dB above background, primarily in the 20-200 Hz band. This noise was recorded at the 'Molikpaq' acoustic buoy, where levels in 2009 were 6 dB higher (i.e. double the energy) than in 2010. A preliminary examination of the 2003-2009 acoustics review document (WGWAP-10/18-19) leads the Panel to conclude that additional consideration of such continuous noise, particularly in the 20-200 Hz frequency band, is warranted, given the possibility that continuous noise is reaching the Piltun feeding area at levels approaching applicable thresholds under the Panel's continuous noise exposure criteria. The elevated levels of continuous noise recorded in 2009 apparently were the result of 'normal' operations on the PA-A (Molikpaq) platform (see Item 4, above). This is cause for concern because it could mean the acoustic habitat of the whales on this summer feeding ground is being altered significantly by continuous noise, in addition to the episodic high-power noise of seismic surveys.

The Panel continues to have problems with the scope and format of the annual acoustics reporting. To date, unless specific analyses are requested, Sakhalin Energy has provided compiled data for every hydrophone for the entire deployment interval, with simple levels calculated. The Panel has made recommendations concerning the structure and parameters of the plots and the company has generally complied, but these plots remain little more than an accounting of the levels received at an individual sensor. The Panel is perplexed by this continued cursory level of analysis, particularly compared to the level of initial analyses and syntheses presented each year for other data sets, e.g. distribution, behaviour and photo-ID. What is needed is not simply a presentation of raw data but, more importantly, some integration of those data to produce an overall assessment and timeline of the acoustic environment in the absence and presence of industry operations during the period of the measurements. Moreover, the statistical analyses for 1/3 octave spectra (used by POI since 2010) used to estimate background noise (e.g. in 'Control' point) fails to convey the temporal detailed dependence of received noise. While it provides time-averaged noise levels that may be generally informative for interpreting any observed changes in specific types of behaviour or in distribution, this type of depiction of noise levels greatly limits any possibility of correlating specific received levels with data on the behaviour of individual whales, as would be needed to investigate possible impacts of noise and to improve exposure criteria in the future.

Exploratory analyses of acoustic data, such as those presented in the 2003-2009 comprehensive data document (WGWAP-10/18-19), are relatively straightforward and should be completed, along with some overarching assessment of the acoustic conditions and timelines relative to known industry activities. Unfortunately and apparently because of time constraints, document WGWAP-10/18 and 19 does not follow previous Panel advice concerning the form of data presentation (e.g. recommendations WGWAP 6/010 and 8/03). The presented spectrogram plots do not even have a scale in dB while the large time interval of spectra averaging (1 hour) makes it impossible to classify the noise type – pulsed or continuous. In some cases for data presented on percentile plots from buoys deployed in the feeding area, the maximum and even 90% percentile levels exceed 'permissible' levels for gray whales (e.g. ENL piling operation in 2009) but integral sound levels (in full frequency band) were not presented, thus making it impossible to reach any conclusions concerning presence or absence of impacts on gray whales according to the Panel's (or Sakhalin Energy's) continuous noise exposure criteria.

Without appropriate simple analyses, e.g. average levels in full bands and 1/3 octave bands at a given sensor, the Panel cannot conduct even preliminary analyses of these data and assess any potential impacts the noise might have had on the whales. Therefore, the Panel **recommends** that document WGWAP-10/18-19 be expanded to include acoustic data presented in the form specified in recommendations WGWAP 6/010 and WGWAP 8/03 so that these sound data can be integrated with the comprehensive 2003-2009 data on distribution and behaviour and checked against the Panel's and Sakhalin Energy's continuous noise exposure criteria.

6.5.3 Future information needs

Basic needs include a summary of overall deployment schemes, dates and locations; an accounting of major acoustic events detected (Sakhalin Energy activities and activities by other energy companies); a description of any problems or surprises; summaries of ambient noise statistics; and integration of the behaviour and photo-ID data with the acoustic data, particularly focussing on major noise-generating events such as platform or pipeline construction and seismic surveys.

7 OIL SPILL PREVENTION, PREPAREDNESS AND RESPONSE

7.1 Malmö conference

Dicks presented a brief summary of his written report to the Panel (document WGWAP 10/10) regarding an oil pollution conference held in Malmö, Sweden, organised by the World Maritime University and sponsored by a number of international bodies including IUCN (see www.wmu.se/oilspillriskmanagement for details).

The conference covered five broad spill-related topics, three of which are of particular interest to the Panel. These were (1) the Deepwater Horizon (Macondo) blowout in the Gulf of Mexico in 2010, (2) developments in oil spill contingency planning and (3) progress with spill response in ice conditions.

The Deepwater Horizon blowout provided one more example of how difficult it is to clean up oil spills in remote areas. Regrettably, contingency plans often were not followed and the lessons learned from previous spill events were not always used to inform responsive actions. For example, there was a great deal of controversy at the time of the spill concerning the application of dispersants even though their use in this area had already been pre-approved in contingency plans. Dispersant use was delayed by the disputes. Also, once shores had become oiled, widespread marshland clean-up efforts proceeded because of public and political pressure even though it had long been acknowledged that such efforts are potentially damaging and detrimental to natural marsh recovery. At the peak of cleaning operations, some 48,000 people and large numbers of aircraft and vessels were involved, creating major logistical complications. Although this was a predictable problem, there seemed to be no way of avoiding it. Operations had to be suspended at times, particularly because of safety issues arising from the difficulties of coordinating aircraft involved in aerial surveillance, dispersant application and filming by the media. The conflicting requirements of potentially incompatible response techniques (e.g. dispersant application, mechanical recovery and in-situ burning) also created challenges. Because of those challenges, these techniques had to be applied on different areas of oil slick.

There was considerable debate at the Malmö conference concerning the effectiveness and relative contributions from clean-up versus natural oil breakdown, which is a combination of physical, chemical and biological processes. Interestingly, Macondo crude oil is relatively light, which means that it evaporates and disperses well. Natural processes seem to have been important in promoting the removal and likely microbial breakdown of a large proportion of the spilled oil and many presenters were convinced that the combination of these natural breakdown processes and clean-up had, by the time of the conference, resulted in removal of the great majority of the spilled oil.

In-situ burning received much attention at the conference as it had been conducted extensively on slicks in calm and warm waters. As a result, the method was being promoted as being a fully operational, mainstream technique. In Dicks's view, this is difficult to justify. The burns produced considerable air pollution, but because they were so far offshore (up to ca. 50 miles) and largely out of public view, there was no significant outcry. Responders justified the air pollution as the lesser of two evils compared to difficulties associated with recovering or dispersing the slicks. Little or no mention was made of unburned residues from the heavier components present in this oil; such residues likely would have sunk. Dicks continues to believe that burning is of limited applicability off Sakhalin and should be used with caution if at all.

Detailed chemical and physical characteristics of the Macondo crude oil have proven difficult to track down, but they are important for understanding its behaviour and fate. Dicks intends to pursue further information for comparison with the available information on Vityaz crude, with the aim of evaluating whether there are any further lessons to be learned that are applicable to Sakhalin Energy’s oil spill response plans.

The main point arising from discussions of contingency planning at the Malmö conference was that spill response plans were being reviewed and revised industry-wide because of the Deepwater Horizon spill. Whilst this is a positive outcome, it is important to emphasize that regular review and revision should be routine and not require another major incident to trigger the process. Dicks noted that comprehensive oil spill response plans are in place for Sakhalin Energy’s operations, and that the Panel has endeavoured over the years to contribute to their improvement. Existing plans should be followed and not overridden in a crisis.

Response in ice conditions is of considerable interest to the Panel. SINTEF, the specialist Norwegian oil research institute, provided an excellent review of the subject and identified future research needs. This review indicated that only limited advances in ice response had occurred in recent years, which is consistent with the review of the MMS and WWF studies considered at WGWAP 9 (see item 8 in the WGWAP-9 report). A new skimmer for use in ice was on display at the conference but it had not been used operationally. One presentation highlighted the generally limited availability of specialist ice-classed response vessels in the Arctic. Sakhalin Energy has ice-classed spill response vessels and the Panel believes it would be appropriate for the Company to re-evaluate whether the numbers of such vessels available and the likely transit times from base to possible spill areas around Sakhalin are reasonable.

Sakhalin Energy emphasised that its Sakhalin II operations are in shallow-water conditions significantly different from those where the Deepwater Horizon platform was situated. Sakhalin Energy’s blowout equipment is comparatively accessible on the platforms. Moreover, the Company is in the process of certifying its blowout preventers and has ordered a spare for backup. To assist with response resources in the event of a blowout, Sakhalin Energy has entered into response equipment sharing agreements with other companies operating at Sakhalin.

7.2 Updates on other issues

7.2.1 Earthquakes and tsunamis

Sakhalin Energy reported that because of the sheltering effect of the Kuril Islands and Hokkaido, the recent catastrophic tsunami in Japan had resulted in a wave surge of only about 60 cm at Aniva Bay, which is less than is typically caused by a winter storm. Loading at Aniva Bay had already been suspended as a precaution. No surge was observed at the Sakhalin II platforms. Evans commented on the geological characteristics that cause tsunamis and explained that Sakhalin Energy’s work sites are on a different back arc (tectonic) system from the main western Pacific faults, and that such arcs are typically associated with smaller earthquakes. Taking into account local seismicity, the Sakhalin Energy platforms and LNG terminal were designed to withstand up to a Richter scale 8 earthquake.

VanBlaricom noted that the Panel has had only limited discussion of earthquake hazards. He spoke in general terms about categories of risk and earthquake characteristics on and near Sakhalin. A seismically active, right lateral strike-slip fault zone bisects Sakhalin Island from north to south. A branch of the fault zone, known as the Piltun Fault, is close to Piltun Lagoon and generated an earthquake in 1995 (7.1 on the moment magnitude scale) that caused substantial damage and loss of life. The town of Neftegorsk, located ~10 km west of Piltun Lagoon, was largely destroyed by the earthquake and was subsequently abandoned. Most of the earthquake motion associated with the Sakhalin strike-slip fault zone is horizontal and thus unlikely to produce tsunamis. VanBlaricom showed a map illustrating subduction zone ruptures in the northwestern Pacific. Subduction zone earthquakes in the region are known to reach magnitude 9.0 (moment magnitude scale) and are capable of producing large and de structive tsunamis. The greatest impacts from tsunamis are likely to be from simultaneous multi-segment ruptures in the Kuril and Japan subduction zones. According to seismologists, an event of this kind last occurred in the 1600s and the repeat time is roughly 500 years (Schwartz 1999; Nanayama et al. 2003).

Brownell noted that western gray whales could be exposed to high levels of anthropogenic radionuclides released as a result of the Fukushima Daiichi Nuclear Power Plant accident (caused by the recent earthquake and tsunami) if they feed on sand lance while migrating along the Pacific coast of Japan. A fishery for these fish was closed southeast of the plant because ceasium-137 levels exceeded the provisional upper limit of 500 Becquerels/kg for food safety established by the Japanese Ministry of Health, Labour and Welfare.

7.2.2 Manuals

Evans provided an update on recommendation WGWAP-8/011 concerning Sakhalin Energy's manual for oil spill response in ice and the related handbook on environmental monitoring. Both documents have been subjected to external review by PCCI and the Lenders. Consequent revisions are expected to be completed by the third quarter of 2011. The Panel **recommends** that it receive (via IUCN) the updated and revised manual and handbook for further technical review and comment as soon as they are available and before they are finalised, preferably in advance of WGWAP-11.

7.2.3 Drills

In 2010, Sakhalin Energy conducted 181 oil spill response drills and exercises and a similar number (196) are planned for 2011. One exercise in 2010 was conducted for Federal agencies to test the overall effectiveness of the plans. Two of the exercises planned for 2011 (August and September) are to involve substantial onshore deployment of equipment near the Piltun feeding area (as recommended by the Panel, WGWAP 7/019) and in the vicinity of the PA-A (Molikpaq) platform.

Dicks had been shown a series of short reports on drills during his last visit to Sakhalin and at that time, the company had offered to provide them to the Panel (Recommendation WGWAP 7/020). The major onshore and offshore exercises likely to be relevant to gray whales are of particular interest (details of all 181 drills would not be needed). Evans agreed to check the notes and follow up accordingly.

7.2.4 General

The observer representing WWF-Russia welcomed the Panel's continued interest in oil spill response in ice and restated his organisation's position that the limitations of response capability mean Sakhalin Energy is inadequately prepared. A joint government-industry conference on oil spill response was to be held in Russia during the week following this meeting and Knizhnikov offered to brief the Panel on the conference proceedings at WGWAP-11. WWF also restated its position that the additional oil spill risks from the proposed South Piltun development were unacceptable and that the controversy surrounding the use of dispersants in the Gulf of Mexico added weight to the argument for banning their use off Sakhalin.

7.3 Future information needs

Oil spill risk assessments (similar to those for the PA-A and PA-B platforms) will be needed for the construction phase, drilling phase and operational phase of a proposed PA-C platform. From what the Panel has been told thus far, additional spill risk will come from construction vessels, the platform and associated pipelines, but apparently there will not be any tanker operations at Piltun.

At this early stage, there is no reason to believe the risks will differ in any fundamental way from those associated with the earlier platforms, although clearly an additional platform will represent additional spill risks.

8 PROGRESS ON RANGEWIDE INITIATIVE AND WGW CONSERVATION PLAN

Larsen reported that IUCN has continued to seek funding for this plan. He had understood that the International Whaling Commission (IWC) would be able to provide a significant amount of funding. However, the donor country for the funds that were to be used, Australia, has decided that the funds should be allocated differently. Larsen requested that IUCN provide some level of support but was told that no internal funding is available.

9 INFORMATION FROM MEETINGS OF RUSSIAN INTERDEPARTMENTAL WORKING GROUP ON WESTERN GRAY WHALE CONSERVATION

As was true of the previous meeting, no representative of the Russian government attended WGWAP-10 and no formal presentation or other documentation was available to consider. Broker provided a brief summary of the agenda for the fifth meeting of the Interdepartmental Working Group, which was held on 1 April 2011. The main relevant points in the minutes of that meeting were as follows:

- A recommendation that Sakhalin Energy and ENL should fund additional satellite tagging.
- A plan to notify all companies operating on the Sakhalin Shelf that they must include gray whales as a regular part of their environmental monitoring efforts.
- A request to Sakhalin Energy and ENL that their permit application be updated (this was done but the permit had not yet been approved at the time of WGWAP-10).
- Confirmation that development of a national framework (based on the Sakhalin experience) for marine mammal monitoring (as mentioned under item 14 in the WGWAP-9 report) is a responsibility of the western gray whale strategic planning group headed by Yablokov.
- A request for Yablokov’s group to consider the marine mammal health study proposed by Sokolova (see item 11 in the WGWAP-9 report).
- Discussion of the budget for the Sakhalin Energy-ENL joint programme for gray whale research and monitoring (issues still unresolved at the time of WGWAP-10).

Yablokov added that his strategic planning group had been assigned a task to assist in development of the tables of contents for the synthesis report (mentioned under Item 6, above) although Sakhalin Energy noted this had not been recorded in the meeting minutes.

10 REPORT FROM ENVIRONMENTAL MONITORING TASK FORCE

10.1 Review of literature on benthic ecosystems of the north-eastern Sakhalin shelf region

VanBlaricom acknowledged that no progress had been made on the planned literature review of benthic ecosystems on the north-eastern Sakhalin Shelf region due to his unavoidable competing academic and other professional commitments. He nevertheless indicated an intention to follow through with the literature review and to provide a draft for participant review prior to the planned Environmental Monitoring Task Force (EMTF) Workshop, discussed under Item 10.2 (below). Details of the content of the planned literature review are provided in the report of WGWAP-8.

As noted previously, a major issue for carrying out the literature review is the availability of assistance with translation, primarily from Russian to English. Fadeev has indicated that the bulk of technical and historical literature on the ecological communities of the region is in Russian, with only a few relevant documents in Japanese or English. In order to complete the literature review and to provide English and Russian versions of the synthesis report to the Panel, funding will be needed. VanBlaricom proposed to work with the Panel Chair and IUCN representatives to clarify the scope of the need for translation support and to identify potential sources of funding for it. These questions must be resolved during summer 2011 if the indicated timeline for the literature review is to be met.

10.2 Workplan (including workshop)

VanBlaricom led a brief discussion about the need for an EMTF Workshop. Concern was expressed that such a Workshop may not be necessary and may not represent the best use of Panel time and resources. In response, VanBlaricom argued that the effort was timely and justifiable, noting that several patterns in movement and activity of western gray whales on the north-eastern Sakhalin Shelf (NESS) in recent years were difficult to interpret without data from benthic ecosystems in which gray whales forage.

There was a lengthier discussion of when and where an EMTF Workshop should take place. It was generally agreed that organising the workshop to occur immediately before (i.e. in conjunction with) WGWAP-11 would be ill-advised and that planning and organisation would be easier if the Workshop were a stand-alone event held sometime in advance of WGWAP-11. Suggested locations included Geneva, Vladivostok, Seattle, Seoul and Tokyo. VanBlaricom will lead the effort during summer 2011 to select a venue and dates, working in collaboration with the Panel Chair, EMTF members, IUCN and Sakhalin Energy.

There was a brief discussion regarding the agenda for the Workshop. The current plan is for discussion to centre on the following items:

1. Review of published technical and historical literature on benthic ecosystems of the NESS.

2. Topics related to monitoring of benthic ecosystems on the NESS under the auspices of Sakhalin Energy:
   a) Physical habitat properties, including temperature patterns and sediments;
   b) Chemical contaminants, including persistent organohaline compounds (DDTs, HCHs, PCBs, PBDEs), petroleum hydrocarbon residues and heavy metal residues, both in sediments and in the bodies of known or suspected gray whale prey organisms;
   c) Benthic prey populations in recognised locations used by western gray whales for foraging (see Item 6.1, above);
   d) Identification of possible additional feeding locations for western gray whales along the eastern coast of Kamchatka (see Item 6.1, above);
   e) Continuing syntheses of benthic data collected to date from the NESS, in order to establish long-term trends and spatial patterns;
   f) Roles of effluents from Piltun Lagoon and the Amur River and of local upwelling patterns and events in determining spatial and temporal patterns of secondary productivity in gray whale prey populations on the NESS;
   g) An initial framework for integrative ecological modelling, with the following as the ultimate goal: A working model capable of providing templates and tools to: a) understand the connectivity and dynamics of interactions of benthic ecosystems and western gray whale movement, behaviour and population dynamics on the NESS and b) evaluate the probability of various anthropogenic activities, including those associated with Sakhalin II, having impacts on the movements, behaviour and population dynamics of western gray whales on the NESS.

3. Topics related to the potential for significant oil spills on the NESS:
   a) Risk assessment;
   b) Monitoring;
   c) Prevention;
   d) Response;

e) Waste disposal.

A draft agenda will be circulated to likely Workshop participants during autumn 2011, to be finalised and circulated prior to the opening of the Workshop.

11 2-YEAR EVALUATION

The second formal, independent, external evaluation of the WGWAP process, as mandated in the Terms of Reference, has begun. The IUCN Evaluation Department will manage the evaluation, including overseeing design, hiring the evaluator, ensuring the quality of the evaluation process and disseminating the results. Stephen Turner has again been contracted to carry out the evaluation. His previous evaluation (completed in March 2009) and the official IUCN management response to it are available at http://www.iucn.org/wgwap/wgwap/evaluations/. Turner advised the meeting that the general and specific objectives of the second evaluation will be similar to those of the first but the Terms of Reference this time emphasise the 'Panel process' rather than the 'Panel' *per se*.

He noted that, among other things, the evaluation would make use of the 'self-evaluation' sections of WGWAP meeting reports (e.g. Item 15, below), a questionnaire sent to stakeholders and follow-up interviews with various individuals via telephone or Skype. Turner requested assistance from meeting attendees in identifying a Russian evaluator and also Russian stakeholders with whom he should communicate in connection with the evaluation.

A draft evaluation report is expected to be available for review by the end of September and the final report by the end of October 2011. Turner anticipates attending WGWAP-11 to report on his evaluation in-person. As previously, IUCN will prepare a management response and action plan related to the evaluator's recommendations, which are expected to be clear and actionable.

12 SOUTH PILTUN

12.1 Options considered

At its last meeting the Panel recommended that Sakhalin Energy should provide a document describing the feasible options that had been considered before deciding, at least tentatively, to proceed with the construction of a new (South Piltun) platform (Recommendation WGWAP-9/016). The Panel's expectation was that this document would include information on how the risks to western gray whales and their habitat had been accounted for and compared. The Company's response was that 'whether and how to proceed' would depend on meeting a number of criteria and 'the purpose of engaging with WGWAP on the issue is precisely to allow consultation to have taken place'. Further, the Company indicated the two feasible options presented at WGWAP-9 would be discussed in more detail at WGWAP-10.

Terwogt gave a presentation entitled 'Development Concepts and Concept Options Discarded to Date**'.** The following four concepts were considered by Sakhalin Energy but rejected:

- *Sub-sea development and tie-back to and processing on existing platforms* – This concept was rejected on the basis of major technical feasibility concerns related to operating in shallow water (it is generally intended for deeper waters) in a sub-Arctic environment. It was considered relatively high cost and high risk and it was expected to result in lower recovery of hydrocarbon volumes compared with other options. It would only allow for oil extraction and cause all gas to be left behind.
- *Subsea development plus Floating Production Storage and Offloading (FPSO)* – This concept is also better suited to deep water and was rejected on the basis of technical feasibility considerations (e.g. mooring, anchoring, ice management). It would require a return to the mode of Sakhalin II Phase 1 which involved a shuttle tanker for transport of oil to shore, limiting operations to the open-water season.

- *Ultra Extended Reach Drilling (uERD) from existing platforms* – This option was investigated in detail but deemed technically infeasible. It would require drilling 'out-reach' to 10-12 km, which is beyond current capabilities for deposits of this depth. ENL uses uERD from the beach, where space is far less constraining than on the offshore platforms. The South Piltun deposits are too far from the Sakhalin Energy platforms for uERD. Other problems are that recovery of hydrocarbon volume would be reduced (a major consideration for the Russian party according to Terwogt) and the later gas phase would not be covered.
- *Reused platform* – This option was studied extensively in 2010. In view of the limited number of Arctic structures available, some of which are in poor condition, no cost or scheduling advantages were found and the risk profile was judged to be higher than would be the case for a newly built structure.

Although the Panel welcomed the presentation, it was disappointed by the lack of detail on how risks to western gray whales had been considered in the Company's evaluation of various options. Terwogt stated that this aspect had been a significant consideration, and that it was particularly relevant for the uERD option. That is to say, the potential for reducing disturbance of the whales was seen as a strong element in favour of the option, making it especially unfortunate that uERD proved technically infeasible. Terwogt explained that more details on how the risks to western gray whales and their habitat were accounted for and compared in relation to the various options would be included in the Environmental Impact Assessment (EIA) anticipated for completion in 2013.

12.2 Update on status of Sakhalin Energy planning and decision-making

In order to update the Panel on the status of South Piltun planning and decision-making, Terwogt presented 'Development Study – General Overview and Status'. Much of this was repeated from her presentation at the previous meeting (see item 4 and Annex 4 of WGWAP-9 report). She emphasised that although a new platform had been judged by the Company as likely the only viable option for recovering oil from the 'South Piltun' part of the formation, the timeline is tentative and the 'development opportunities' are still being studied. No commitment to construction has been made and environmental concerns have a role in the ongoing evaluation process. The geotechnical site survey (seismic survey) planned for summer 2011 is discussed under Item 2.2 of this report. The Company's current aim is to select the best development concept sometime in mid-2012, to be followed by further design and construction engineering work, permitting and approvals under the Production Sharing Agreement and Russian legislation, a final investment decision, and then platform installation and early drilling. Among issues still undecided are the rig type to be used for pre- and early drilling, facility sizes, how to achieve synergies with existing infrastructure, and where to locate the 'tie-in point' to the existing oil export pipeline. The phased nature of the South Piltun development means that most of the planning presently focuses on oil recovery, with a gas phase deferred. Additional pipeline (both intra-field and export) will be required for the gas phase.

In discussion, the Panel asked for clarification of the phased nature of the planned development. In particular, it noted that whereas Phase 2 (PA-B platform construction) had been characterised, from the outset, as an *integrated* oil and gas project, South Piltun is being characterised as oil-only but with a gas phase clearly expected to follow, requiring additional pipeline infrastructure. Terwogt acknowledged that construction of a South Piltun platform and associated infrastructure would be different, at least in this regard, from the PA-B. The Panel **requests** that Sakhalin Energy provide a clear explanation of how the objective of minimising potential impacts on gray whales and their habitat has been reconciled with the phasing of oil and gas exploitation at South Piltun.

The Panel also took note of the information in the NGO statement of concern provided to this meeting (WGWAP 10/Inf.1). In its last report (WGWAP-9, item 4.3.1) the Panel stated that with the completion of PA-B construction and the recent Astokh 4D seismic survey in 2010, it had 'anticipated a period of reduced industrial activity and thus diminished disturbance and risk to the whales'. In fact, the material in the NGO statement, quoting from Company documents, shows that there was good reason to believe there would be no more platform construction. Section 5.3.1, Extended Reach Drilling and Number of Platforms, of the Sakhalin II Phase 2 EIA (http://www.sakhalinenergy.ru/en/documents/doc_38_eia_1_chapter5.pdf) notes that advances in extended reach and non-vertical drilling had made it possible to extend the lateral reach from a platform to 6 km. This, according to the EIA, had 'reduced the number of platforms needed to achieve full field development at Piltun Astokskoye and Lunskoye fields to two and one respectively', resulting in 'a smaller footprint with consequent reduced environmental impact'. According to Terwogt's presentation summarised above (Item 12.1), the Company's current assessment is that a lateral reach of 10-12 km is needed (from both platforms) to achieve full development of the Piltun Astokskoye field and such reach remains beyond what is technically feasible. The Panel **requests** clarification of this apparent inconsistency between the Company's EIA for Phase 2 and its current conclusion that a third platform will be needed for 'full field development'.

Recognising that market (and often political) factors play a large role in an energy company's decision-making and planning, the Panel is not surprised that Sakhalin Energy is seeking to maximise oil production at this time of high and rising oil prices. What *is* surprising, however, is that the Company is at the same time reducing its investment in gray whale research and monitoring. Particularly at a time when the 'environmental footprint' of Sakhalin II is set to expand once again, the reduced field season and elimination of the behaviour monitoring programme appear incongruous and as such, the Panel considers them ill-advised. This said, the Panel also recognises that financial expenditures alone do not necessarily provide a reliable index of relevant learning and that investments in data collection and analysis need to be well justified. In that regard, the Panel **welcomes** the promised synthesis report and integrative papers mentioned above (Item 6). Also, it **reiterates** the importance of seeing completed analyses of the data collected during the Astokh 4-D seismic survey in 2010 (Item 2.1, above). These results have potential importance not only for monitoring and mitigation in future seismic surveys, but also for exposure criteria in relation to construction noise such as that anticipated at South Piltun in coming years.

12.3 Retrospective analysis of issues

As indicated in Recommendation WGWAP 9/020, the Panel is expecting Sakhalin Energy to provide a comprehensive overview of the issues and risks that need to be addressed for South Piltun, including a risk matrix that makes clear how the Company would prioritise the various elements, as well as how the company assesses each issue in terms of potential short-, medium- and long-term effects on the western gray whale population. In its response, Sakhalin Energy stated that this recommendation would be addressed as part of the impact assessment process for the South Piltun project and de Koning presented 'A Retrospective Overview of Issues and Risks', a brief summary of progress to date. She said the intention was to review: the Sakhalin II Phase 2 EIA, the western gray whale EIA, Sakhalin Energy's Comparative Environmental Assessment for the pipeline decision in 2005, the Company's Marine Mammal Protection Plan and the reports of the Independent Scientific Review Panel, the Interim Independent Scientists Group and the WGWAP. Moreover, de Koning emphasised the importance attached by Sakhalin Energy to receiving input from the Panel on the review document before it is finalised.

Mate (Lender representative) suggested that de Koning incorporate in her document some of the details concerning how Panel recommendations have actually influenced Company policies, procedures, workplans etc. – e.g. pipeline routing, vessel speed limits, carcass surveys, additional oil spill response drills etc. This should not overstate what has been accomplished, but at the same time it may be taken as an opportunity to demonstrate some of the scientific and conservation benefits of the IUCN engagement.

There was a prolonged discussion concerning the process and timing of Panel review, summarised in the following section (12.4).

12.4 Integration of South Piltun issues into task force scopes (environmental monitoring, oil spill and noise issues)

Sakhalin Energy officials have indicated on numerous occasions that they value the work of task forces, which provide opportunities for technical, in-depth discussions of specific subjects with relevant Panel members. Whilst the Panel agrees in principle, it also draws attention to the WGWAP Terms of Reference, which require that task forces are constituted by the Panel and function under the coordination of a panel member, subject to IUCN approval. Task forces, as creatures of the Panel, report back to it, and their findings and recommendations are considered at meetings of the full Panel, which bears the responsibility for producing formal advice and recommendations to which the Company is obliged to respond.

To date, WGWAP task forces have been constituted to address issues concerning Seismic Surveys, Photo-identification, Oil Spills and Environmental Monitoring (see http://www.iucn.org/wgwap/wgwap/task_forces/). Therefore some, but not all, of the major topics identified in de Koning's presentation (Item 12.3) are potentially amenable to being addressed in detail by task forces. The topic of Noise and Disturbance might be addressed by the Seismic Survey Task Force on the understanding that its remit is broadened to include potential disturbance by continuous noise from construction, vessels etc. The topic of Benthos might be addressed by the Environmental Monitoring Task Force but this would require some reconfiguration of its terms of reference so that they explicitly encompass consideration of the potential for added risks from seabed disturbance, smothering, changes in the nearshore hydrodynamic regime etc. associated with a South Piltun platform. The issues surrounding Oil Spills might also be addressed within a revised terms of reference for the Environmental Monitoring Task Force, or alternatively by a reconstituted Oil Spill Task Force. Among the major topics identified by de Koning that are best addressed by the Panel as a whole are Cumulative Effects and Vessel Collisions.

During the discussion, panel members conveyed their difficulties regarding the timescale for the reviewing and advice-giving process. There may be a mismatch between what the Company expects and what the Panel can deliver. Certain panel members have many conflicting commitments and therefore scheduling alone is bound to be a challenge. On numerous occasions in the past, the Panel has found itself in the position of being expected to provide advice on short notice and without the benefit of completed analyses – the proposed 2011 2D seismic survey is a case in point. The analyses are often technical and complicated, and as such, they require time to deliberate and exchange thoughts on such things as how best to investigate or interpret a particular set of data.

After lengthy discussion, it was agreed that the next full Panel meeting would be planned for some time in early 2012, recognising that this implicitly means a new contract between Sakhalin Energy and IUCN will have to be negotiated before the present contract expires on 31 December 2011. This later timing of the next Panel meeting should enable Sakhalin Energy to make more progress towards completion of analyses (most importantly those related to the 2010 seismic survey) as well as the synthesis reports for MNR and the integrative papers (see Item 6, above), and give panel members sufficient time to study the information in advance. Further, it will avoid the problem that has arisen in the past when Panel meetings take place in December, immediately before the holiday season, leading to major delays in production of final meeting reports.

It was agreed that Reeves and de Koning would take the lead in attempting to organise task force meetings, as well as e-mail and teleconference consultations on specific items (notably input on de Koning's working document), during the inter-sessional period from June through December 2011. Donovan stressed that unless and until substantial progress has been made towards completion of the requested analysis of the Astokh 4D seismic survey data (none of which is constrained by joint programme ownership and access problems), there would be no point in having another meeting of what will hereafter be called the Noise Task Force.

The Panel emphasised that provision of input to de Koning's retrospective analysis must not be seen as a substitute for explicit Panel advice on the South Piltun project. To facilitate the development of such advice, and help ensure that the needed information and analyses are available well in advance of the next meeting (or for the appropriate task force meetings), the Panel has sought to provide within the text of this report some rudimentary guidance concerning information needs on individual topics – see Item 6.5.3 regarding noise, Item 6.1 regarding benthic monitoring, and Item 7.3 regarding oil spills.

Finally, the Panel again **recalls its earlier recommendation** (WGWAP 5/011) that there be no further industrial activities that might be expected, in the absence of independently verified mitigation measures (such as those developed for the Astokh 4D survey), to disturb gray whales in and near their main feeding areas off Sakhalin. And it reiterates its statement from the last meeting report, as follows: Whilst recognising that Sakhalin Energy may view the construction of a third platform as necessary at some point during the lifetime of the project in order to meet its petroleum recovery targets, the Panel **recommends** that construction not begin until there is better understanding of the effects of noise disturbance on the whales (*e.g.* a more thorough analysis of the potential effects of PA-B construction) and appropriate mitigation measures are in place. In this regard, consideration must be given not only to the platform-related construction activities themselves, but also to the cumulative risks to the western gray whale population from other associated activities, including seismic surveys, and any general increase in temporary or permanent human presence in the area that may result directly or indirectly from further construction projects.

13 SAKHALIN ENERGY WORKPLAN FOR NEXT 5 YEARS

In response to the Panel's recommendation at the previous meeting that Sakhalin Energy provide a general operations plan for the next five years (WGWAP 9/018), Evans referred to the Company's 'journey book' that sets out a five-year projection which, however, does not provide the level of detail needed to evaluate the implications for gray whales.

Apart from activities associated with the proposed South Piltun development (see item 12), Evans explained that 'routine' work related to the PA-A, PA-B and Lunskoye platforms would continue, including regular pipeline inspection and any required remedial work, as well as drilling at the platforms (e.g. this will recommence at the PA-A platform in late 2011 or early 2012). Conductor driving at Lunskoye is planned for 2012 to install the upper part of the well.

Although, as noted in previous Panel reports, additional seismic surveys are expected to occur at intervals of several years to monitor the oil and gas deposits, the Company has not yet determined exactly when, how and at what scale such surveys will be needed for the Sakhalin II project development. Evans and Terwogt indicated that the timing of future surveys was dependent (in part) on the results from the Astokh 4D survey in 2010, which are still being analysed.

In discussion, the Panel emphasised several things concerning its need for timely notice of future activities. One is that besides noise considerations, any anticipated change in vessel activity that could increase the risk of collisions with whales should be brought to the Panel's attention. Also, it is important that the Company be clear when it comes to issues such as future seismic surveys. The Panel recognises how difficult it is for the Company to specify far in advance exactly when such surveys will be needed, given its relatively short planning horizon for such decisions. Nevertheless, it would be helpful and constructive for the Panel to be advised of the 'probability' that such activities will occur in a given future year (even just high, medium or low probability), on the understanding that such projections could be subject to change.

14 SATELLITE TAGGING

14.1 Brief review of 'Flex' results

Mate presented the main findings of last year's satellite tagging effort funded jointly by Sakhalin Energy and ENL, with contracting and administration through the IWC and IUCN. The work was conducted by the A.N. Severtsov Institute of Problems in Ecology and Evolution of the Russian Academy of Sciences (IPEE RAS) and Oregon State University Marine Mammal Institute in collaboration with the University of Washington, Sakhalin Research Institute of Fisheries and Oceanography, and Kronotsky State Nature Biosphere Reserve.

The field protocol required that tagging be attempted only on known males in healthy condition (based on external appearance as judged by the field team). After delays due to bad weather (remnants of two typhoons and two gales) and equipment problems, the field season was extended to 4 October (see WGWAP-9 report, item 10, for more details). On that day, the team tagged a 13-year-old male first seen as a calf off Sakhalin Island in 1997 (known by the Russia-US research team as 'Flex' and by the IBM research team as 'Belochvost', meaning White Tail). Although the tag was not completely deployed, it provided data for 124 days.

The whale remained near the coast of Sakhalin Island coast and within 45 km of the tagging site for the first 68 days. In mid-December he crossed the Sea of Okhotsk to the west side of the Kamchatka Peninsula, then went around the southern end of the peninsula and departed the east coast of Kamchatka in early January 2011. He crossed the western and central Bering Sea in one week. Upon arrival at the shallow eastern shelf of the Bering Sea, the whale proceeded south through the eastern Aleutian Islands, crossed the Gulf of Alaska and continued south along the coasts of Washington and Oregon, remaining 20-25 km from shore. His last satellite location was 20 km off Siletz Bay, Oregon (~45ºN), on 5 February. This meant that 'Flex' was present during the last part of the southbound migration of gray whales through the area.

In summary, Mate noted that this individual's long-range movements were very direct, suggesting purposeful migration rather than 'wandering'. During the travel segments in the Bering Sea and North Pacific Ocean, the whale's average speeds were >6.5 km/h, much higher than those usually observed for migrating gray whales in the eastern North Pacific. Such movement by gray whales across deep parts of the western Bering Sea and Gulf of Alaska has not been documented previously. Mate emphasised that these results from the first-ever tagging effort off Sakhalin do not preclude the possibility that there are other migratory routes and destinations of western gray whales. Indeed, a young, recently weaned female observed off Sakhalin in summer 2006 died after being caught in a set net on the Pacific coast of Honshu, Japan, in January 2007 (Weller et al. 2008).

In discussion, it was suggested that because the tagged whale remained close along the Sakhalin coast throughout the months of October and November 2010, a time when the Lebedenskoye seismic survey was underway (see Item 6.5, above; also WGWAP-9 report, item 3.1), it would be useful to analyse his movements in relation to underwater noise recorded by acoustic buoys during that time. Mate indicated that the transmitter on the whale provided an average of 2.5 locations per day, with an average quality of 1 kilometre. Given the extreme difficulty of matching credible estimates of received sound levels to actual positions of the whale, it was concluded that such an analysis would not be productive.

14.2 Plans for 2011 tagging

At its previous meeting (see WGWAP-9 report, item 10), the Panel expressed support for continuation of the tagging programme in 2011. At this meeting, it appeared that planning for a 2011 season was well underway and that funding would be available. The movements by 'Flex', together with the other recent information on movements by gray whales between Sakhalin Island and the west coast of North America (see Item 3.3, above; also http://cmsdata.iucn.org/downloads/movements_of_western_gray_whales_from_the_okhotsk_sea_to_the_eastern_north_pacific.pdf), have raised new questions and, if anything, increased the desirability of additional tracking of Sakhalin whales. The central objective remains: learning where the whales from Sakhalin go in winter and the routes they use to get there and back to Sakhalin. This information is needed to guide efforts to protect the animals throughout their range. As previously, the Panel recognised that scientific aspects of the tagging work would be considered in detail by the IWC Scientific Committee in June and that final recommendations concerning the field protocols would be developed by the Scientific Steering Group that consists of Brownell, Burdin, Donovan, Gales, Larsen, Reeves, Tsidulko and Weller.

In the WGWAP-9 report, the Panel states that the males-only element of the tagging protocol should remain in place for 2011. The issue was discussed further at this meeting, albeit briefly. The movements of females have always been a primary interest of the Panel; in the absence of any concerns about potential health effects on the animals, the preferred scientific protocol, from the outset, would have been to tag both males and females.

At this meeting, the Panel was shown a series of photographs of tag sites on the bodies of eastern gray whales tagged in 2009 and resighted in 2010 and 2011 up to 606 days after tagging. Photographic follow-up of those whales for assessment of tag sites and surface wound healing continues. Mate reported that review of the photo collection by veterinarians had revealed only the anticipated divots, similar to what is seen at tag sites on other whale species, and in their opinions nothing to indicate significant health concerns. In response to a question regarding the potential for negative effects of tagging pregnant whales, Mate drew attention to a paper on southern right whales (*Eubalaena australis*) with some limited empirical evidence to suggest that tagging had no major impact on reproductive output or survival (Best and Mate 2007). The Panel encouraged Mate to present all relevant data to the IWC Scientific Committee at its meeting in June so that an informed decision can be made on whether to include the tagging of females as part of the approved field protocol.

In response to a question of whether the 12 transmitters/batteries stored in a freezer in Russia had been load-tested, Mate noted that his group had replicated and verified the manufacturer's tests and found no reason for concern. In his experience, batteries of this type that have been in a freezer for as long as two years are reliable.

In his presentation, Mate indicated that he expected the field effort in 2011 to begin about two weeks earlier than in 2010. Based on previous experience, he would expect about one third of the tags to perform well and continue providing locations until the whales return to Sakhalin in 2012. Perhaps half would perform well enough to identify the animal's winter destination.

The option of a shore-based tagging effort had been discussed briefly at the previous WGWAP meeting (see WGWAP-9 report, item 10.2.5) and it was raised again at this meeting. As previously, it was acknowledged that such an approach could be less costly and allow greater flexibility with regard to timing, weather and logistics. On the other hand, the shore-based option brings its own limitations with regard to geographic range and weather constraints. Safety issues may be decisive given that the two main sponsors of the tagging work (Sakhalin Energy and ENL) have expressed strong reservations about launching watercraft from shore at Sakhalin.

Finally, there was some discussion of the feasibility (and desirability) of attempting to tag known Sakhalin whales as they migrate along the North American west coast. Mate pointed out that the Panel's strong support for the tagging initiative had been premised on the need to identify wintering areas and migratory routes in Asia, and therefore tagging in the eastern Pacific could be difficult to justify. Also, with regard to feasibility, he noted there are perhaps 20,000 gray whales in the eastern Pacific, only a very few of which would be expected to head west for the summer. Therefore unless the tagging effort could somehow be selectively applied, a large number of tags would have to be deployed in order to achieve reasonable odds that at least a few of the tagged animals proved to be Sakhalin migrants.

With regard to funding, Evans confirmed that both Sakhalin Energy and ENL had included satellite tagging in their programmes of work submitted to the Ministry of Natural Resources for summer 2011. At the time of the meeting, these workplans had yet to be approved. Larsen reported that IUCN had received a contribution of US$12,500 from an auction for the privilege of assigning a name to a tagged whale, and this amount will be transferred to the IWC's western gray whale tagging fund. Elliott reported that WWF's effort to raise funds had not been successful but is still prepared to work with IUCN on a fundraising strategy if desired. Mate indicated that the numbers of visits to the OSU satellite tagging website suggested a high level of public interest in the 'Flex story'.

15 WGWAP SELF-EVALUATION

This agenda item was devoted to discussion of the ongoing process of revising the WGWAP Terms of Reference, in anticipation that the 5-year contract between Sakhalin Energy and IUCN, due to expire at the end of 2011, will be renewed. Larsen reported that consultation with stakeholders had begun in February, when IUCN sent requests for input to the Panel, Sakhalin Energy, Lenders and NGOs represented at past WGWAP meetings. Larsen and Reeves met in Geneva in late March to begin drafting revisions based on initial replies from stakeholders.

Lenders and NGOs assured Larsen that he would receive further input from them within a week after this meeting so that a draft of the revised Terms of Reference could be circulated by IUCN to all parties no later than the end of June. Evans indicated that such a draft would be adequate for the Company to proceed in mid-summer to make a decision on contract renewal and that further revisions to the Terms of Reference could be accommodated until immediately before any contract was signed late in 2011.

16 ANY OTHER BUSINESS

Reeves noted with regret that Larsen would be leaving IUCN at the end of May. The Panel expressed its appreciation for his steady hand in managing the WGWAP process and for his informed contributions to the work of both the Panel and the range-wide initiative over the years. Larsen played an important role in organising the IUCN Western Gray Whale Range-wide Workshop in Tokyo in September 2008, developing the IUCN/IWC Western Gray Whale Conservation Plan, and facilitating the satellite tagging effort in 2010. We wish him well as he returns to his former position at the Institute of Aquatic Resources Technical University of Denmark in Copenhagen.

On behalf of Sakhalin Energy, Evans presented Larsen with a book on Sakhalin Island Red Book birds, signed by Company representatives and contractors. Elliott spoke on behalf of the NGO observers, thanking Larsen for his efforts at keeping the WGWAP process on track and at the same time widening the scope of IUCN’s western gray whale conservation effort.

REFERENCES

Best, P.B. and Mate, B. 2007. Sighting history and observations of southern right whales following satellite tagging off South Africa. *Journal of Cetacean Research and Management* 9:111-114.

Calambokidis, J., Darling, J.D., Deecke, V., Gearin, P., Gosho, M., Megill, W., Tombach, C.M., Goley, D., Toropova, C. and Gisborne, B. 2002. Abundance, range and movements of a feeding aggregation of gray whales *(Eschrichtius robustu*s) from California to southeastern Alaska in 1998. *Journal of Cetacean Research and Management* 4(3):267-276.

Calambokidis, J., Laake, J.L. and Klimek, A. 2010. Abundance and population structure of seasonal gray whales in the Pacific Northwest, 1998-2008. Paper SC/62/BRG32 presented to the IWC Scientific Committee. Available from: Secretariat, International Whaling Commission, Cambridge, UK.

Lang, A.R. 2010. The population genetics of gray whales (*Eschrichtius robustus*) in the North Pacific. Ph.D. dissertation, University of California San Diego, 222 pp.

Malme, C.I., Miles, P.R., Clark, C.W., Tyack, P. and Bird, J.E. 1983. Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior. BBN Rep. 5366. Rep. from Bolt Beranek & Newman Inc., Cambridge, MA, for U.S. Minerals Manage. Serv., Anchorage, AK. National Technical Information Service PB86-174174.

Malme, C.I., Miles, P.R., Clark, C.W., Tyack, P. and Bird, J.E. 1984. Investigations of the potential effects of underwater noise from petroleum industry activities on migrating gray whale behavior/Phase II: January 1984 migration. BBN Rep. 5586. Rep. from Bolt Beranek & Newman Inc., Cambridge, MA, for U.S. Minerals Manage. Serv., Anchorage, AK. National Technical Information Service PB86-218377.

Malme, C.I., Würsig, B., Bird, J.E. and Tyack, P. 1988. Observations of feeding gray whale responses to controlled industrial noise exposure. pp.55-73. *In*: Sackinger, W.M., Jefferies, M.O., Imm, J.L. and Treacy, S.D. (eds). Port and Ocean Engineering under Arctic Conditions. University of Alaska, Fairbanks, AK. 111pp.

Nanayama, F., Satake, K., Furukawa, R., Shimokawa, K., Atwater, B.F., Shigeno, K. and Yamaki, S. 2003. Unusually large earthquakes inferred from tsunami deposits along the Kuril trench. *Nature* 424:660-663.

Schwartz, S.Y. 1999. Noncharacteristic behavior and complex recurrence of large subduction zone earthquakes. *Journal of Geophysical Research* 104 (B10):23111-23125.

Weller, D.W., Bradford, A.L., Kato, H., Bando, T., Ohtani, S., Burdin, A.M. and Brownell, R.L., Jr. 2008. Photographic match of a western gray whale between Sakhalin Island, Russia, and Honshu, Japan: First link between feeding ground and migratory corridor. *Journal of Cetacean Research and Management* 10(1):89-91.

SUMMARY OF RECOMMENDATIONS FROM THE 10TH MEETING OF WGWAP

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
Item 2: Report of 7th meeting of the Seismic Survey Task Force					
WGWAP-10/001	Item 2.1	A workplan was agreed such that besides timely completion of the distance estimation analyses, the draft behaviour analysis and case studies would be finalised no later than WGWAP-11. At least some initial results of the distribution studies would also be available by that time. The Panel **recommends** that Sakhalin Energy adheres to this workplan and its timelines. In order to ensure that there are no delays or misunderstandings, it was agreed that an advisory group comprised of Donovan, Cooke, Nowacek, Vedenev and Weller would be available for regular consultation with Sakhalin Energy and its contractors. Broker, on behalf of the company, will provide the advisory group (together with Reeves and Bernal/Riché) with regular (at least monthly) e-mail updates on progress, and teleconferences will be arranged if and as necessary to resolve issues. The responsibility for ensuring that this arrangement functions (i.e. regular reminders, setting up teleconferences etc.) rests with the IUCN relationship management team.	Sakhalin Energy, IUCN	WGWAP-11	
WGWAP-10/002	Item 2.2	Given the above, the Panel **reiterates** that the key element of the agreed mitigation programme – starting the survey as early in the season as possible to minimise the risk of injury or disturbance to gray whales – is essential. Therefore, the Panel **strongly recommends** that, if the 2-D survey occurs in 2011, it	Sakhalin Energy	2-D seismic survey	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
		should only be if Sakhalin Energy ensures that: (1) The survey starts significantly earlier, i.e. as early in the season as ice conditions allow, as was intended for the 2010 survey; and (2) The monitoring and mitigation plan as specified in the SSTF-6 report (and as refined in the SSTF-7 report) is fully implemented, including (a) shut-down if daytime visibility is less than 1000m; (b) that experienced MMOs are used who have received training in estimating distance at sea; and (c) that two MMOs operate at the same time during operations and receive adequate rest periods in accordance with the specified mitigation measures.			
Item 3: Photo-ID					
WGWAP-10/003	Item 3.2	The Panel considers that the comparison of the two teams' matching of the tagging and pre-tagging photos with their respective catalogues will be undertaken most efficiently if combined with the regular annual update of cross-matching of the 2010 catalogues. However, whales identified during the tagging or pre-tagging fieldwork should be clearly indicated as such. Accordingly, the Panel **recommends** that each team: (i) include whales identified during the tagging and pre-tagging work in the 2010 update of its Sakhalin catalogue; (ii) upon submitting its updated catalogue, indicate which whales were identified in the tagging and pre-tagging work. Here the teams should distinguish	Sakhalin Energy, Russia-US team, IUCN	Between 15 July 2011 and 1 January 2012	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
		between: (a) whales identified only during the tagging or pre-tagging work and (b) whales identified both during tagging or pre-tagging work and during other surveys. The Panel further **recommends** the following timetable: IUCN (Bernal) sends a request to the two teams on 15 July 2011, asking them to submit their Sakhalin catalogues (based on data collected through 2010, and including data from the 2010 tagging/pre-tagging surveys) to IUCN by 1 September, following the previously established schedule. IUCN then forwards the catalogues to each team, with a request for results of cross-matching to be returned by 1 January 2012.			
WGWAP-10/004	Item 3.3.1	The Panel **recommends** that permission from the respective data owners (Burdin, Vertyankin) and co-owners (Sakhalin Energy and ENL in the case of the Kamchatka catalogue) be sought by IUCN (or by Sakhalin Energy on IUCN's behalf) and that an exchange and cross-matching between the Russia-US and Kamchatka catalogues be organised on the same basis as the arrangements used to date for comparisons of the two Sakhalin catalogues, depending on the time taken to receive the required permissions. The Panel **requests** that IUCN (Bernal) take the lead on this.	IUCN, Sakhalin Energy, Russia-US team, ENL	WGWAP-11	
WGWAP-10/005	Item 3.3.2	The Panel was pleased to learn the results of this comparison [between western and eastern North Pacific catalogues] and **recommends** that additional matching to other existing catalogues be undertaken. Some individuals in the IBM catalogue have not been	Sakhalin Energy, IUCN, Panel	WGWAP-11	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
		found in the Russia-US programme's catalogue. The Panel therefore **encourages** inclusion of these IBM whales in the present comparison with the ENP catalogue.			
WGWAP-10/006	Item 3.3.2	Tsidulko drew attention to a potentially large set of photographs collected by Vladimir Burkanov of gray whales along the north-eastern Kamchatka and eastern Karyakia coasts and the Panel **encourages** that Burkanov be approached and invited to contribute his data and photographs to the comparison exercises.	IUCN, Panel	WGWAP-11	
Item 5: Population assessment					
WGWAP-10/007	Item 5.1	The Panel **requests** that Cooke prepare a written response to the reviewers' comments before WGWAP-11.	Panel (Cooke)	Before WGWAP-11	
WGWAP-10/008	Item 5.1	The Panel **recommends** that the [joint population] assessment be submitted for publication with the authorship that had been agreed between the two teams, and that it include data through the 2009 season (the version that was reviewed included data through 2008).	Panel (Cooke), Sakhalin Energy, Russia-US team	As soon as feasible	
Item 6: Final reports on field activities in 2010 (other than those associated with the Astokh 4-D seismic survey)					
WGWAP-10/009	Item 6.1	Physical characteristics of benthic sediments and bottom water temperatures have been measured over the periods 2002-2010 and 2007-2010, respectively, and the Panel endorses the need and relevance for measurements of this kind on an annual basis. However, the Panel notes with concern the lack of coordination between the benthic and acoustic sampling efforts and **recommends** that the company	Sakhalin Energy	Decision by 1 August 2011	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
		coordinate environmental sampling to the extent practical in order to maximise insights on the NESS habitat and avoid duplication of effort.			
WGWAP-10/010	Item 6.1	Whilst recognising the low levels of POCs, heavy metals and PHCs in samples collected to date, the high cost of sample collection and processing, and the crowded agenda for sample collection and analysis facing the benthic monitoring team during and immediately following each field season, the Panel **recommends** that the sampling schedule for NESS POCs, heavy metals and PHCs be changed from annual to biennial or triennial. An annual schedule should be reinstated if any anthropogenic event occurs on the NESS that might reasonably be expected to alter the currently recognised patterns in benthic contaminants in a significant way.	Sakhalin Energy	Decision by 1 August 2011	
WGWAP-10/011	Item 6.1	The Panel **recommends** that sampling be initiated in summer 2011 for concentrations of polychlorinated biphenyls (PCBs) and polybrominated diphenyl ethers (PBDEs). Both are recognised as anthropogenic contaminants often associated with industrialisation of coastal marine environments, and both are a matter of significant concern in the context of marine conservation on a global scale because of potential for toxicity, accumulation in tissues and persistence. Levels of PCBs and PBDEs should be measured on the NESS annually for a minimum of three years, after which the need and frequency for subsequent measurements can be assessed.	Sakhalin Energy	Decision by 1 August 2011	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
WGWAP-10/012	Item 6.1	Also with regard to contaminants, the Panel **recommends** sampling known or suspected significant prey of gray whales on the NESS. At a minimum, the sampled species should include the amphipods *Monoporeia affinis* and *Ampelisca eschrichti* and the sand lance *Ammodytes hexaptera*. Tissue concentrations of POCs (including DDTs, HCHs, PCBs and PBDEs), heavy metals and PHCs should be measured in these species (and others deemed appropriate by Fadeev) on the NESS annually for a minimum of three years, after which the need and frequency for subsequent measurements can be assessed.	Sakhalin Energy	Decision by 1 August 2011	
WGWAP-10/013	Item 6.1	Based on such perceptions, the Panel **recommends** that the benthic monitoring team be encouraged to develop and test new hypotheses, perhaps including export of phytoplankton biomass or inorganic nutrients from Piltun Lagoon, allowing the significance of Piltun Lagoon effluent, Amur River effluent and local upwelling events and processes to be better understood and placed in context with regard to western gray whale conservation.	Sakhalin Energy	Clarification of intent by WGWAP-11	
WGWAP-10/014	Item 6.3	Given that analyses of behaviour in relation to acoustic conditions have been the primary means of assessing the potential effects of industrial activities on western gray whales thus far, the Panel **reiterates its earlier recommendation** (see item 2.1.7 of WGWAP-9 report) that Sakhalin Energy continue this component of its research and monitoring programme.	Sakhalin Energy	Clarification of intent by WGWAP-11	
WGWAP-10/015	Item 6.5.1	The Panel **recommends** that for future seismic surveys by any company, received sound levels at the edge of a western gray whale feeding area be kept below what is predicted to cause behavioural disturbance. This level	All seismic operators on NE Sakhalin	During future seismic surveys	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
		was defined by the SSTF to be 156 dB_{SEL} (per one of any radiated pulse) or 163 dB_{RMS}. However, processing and analysis of data related to the 2010 Astokh 4-D seismic survey may indicate that these levels are either overly conservative or not conservative enough. As discussed elsewhere, until new information becomes available to revise these criteria based on measurements in 2010, the Malme et al. (1983; 1984) analyses remain as the sole basis for setting exposure criteria.	Shelf		
WGWAP-10/016	Item 6.5.2	Without appropriate simple analyses, e.g. average levels in full bands and 1/3 octave bands at a given sensor, the Panel cannot conduct even preliminary analyses of these data [in document WGWAP-10/18-19] and assess any potential impacts the noise might have had on the whales. Therefore, the Panel **recommends** that document WGWAP-10/18-19 be expanded to include acoustic data presented in the form specified in recommendations WGWAP 6/010 and WGWAP 8/03 so that these sound data can be integrated with the comprehensive 2003-2009 data on distribution and behaviour and checked against the Panel's and Sakhalin Energy's continuous noise exposure criteria.	Sakhalin Energy	WGWAP-11	
Item 7: Updates on other issues					
WGWAP-10/017	Item 7.2.2	Evans provided an update on recommendation WGWAP-8/011 concerning Sakhalin Energy's manual for oil spill response in ice and the related handbook on environmental monitoring. Both documents have been subjected to external review by PCCI and the Lenders. Consequent revisions are expected to be completed by the third quarter of 2011. The Panel **recommends** that	Sakhalin Energy	WGWAP-11	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
		it receive (via IUCN) the updated and revised manual and handbook for further technical review and comment as soon as they are available and before they are finalised, preferably in advance of WGWAP-11.			
Item 12: South Piltun					
WGWAP-10/018	Item 12.2	The Panel **requests** that Sakhalin Energy provide a clear explanation of how the objective of minimising potential impacts on gray whales and their habitat has been reconciled with the phasing of oil and gas exploitation at South Piltun.	Sakhalin Energy	WGWAP-11	
WGWAP-10/019	Item 12.2	The Panel **requests** clarification of this apparent inconsistency between the company's EIA for Phase 2 and its current conclusion that a third platform will be needed for 'full field development'.	Sakhalin Energy	WGWAP-11	
WGWAP-10/020	Item 12.4	Finally, the Panel again **recalls its earlier recommendation** (WGWAP 5/011) that there be no further industrial activities that might be expected, in the absence of independently verified mitigation measures (such as those developed for the Astokh 4D survey), to disturb gray whales in and near their main feeding areas off Sakhalin. And it reiterates its statement from the last meeting report, as follows: Whilst recognising that Sakhalin Energy may view the construction of a third platform as necessary at some point during the lifetime of the project in order to meet its petroleum recovery targets, the Panel **recommends** that construction not begin until there is better understanding of the effects of noise disturbance on the whales (*e.g.* a more thorough analysis of the potential effects of PA-B construction) and appropriate mitigation measures are in place. In this regard,	Sakhalin Energy	Clarification of intent by WGWAP-11	

Recommendation Number	Cross-Reference	WGWAP Recommendations & Requests	Responsible Party/ Parties	Target Completion Date	Sakhalin Energy Response
		consideration must be given not only to the platform-related construction activities themselves, but also to the cumulative risks to the western gray whale population from other associated activities, including seismic surveys, and any general increase in temporary or permanent human presence in the area that may result directly or indirectly from further construction projects.			

Annex 1. List of participants

PANEL MEMBERS PRESENT

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

Justin G. COOKE
Centre for Ecosystem Management Studies
Höllenbergstr. 7
79312 Emmendingen
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 CB24 9NP
UK

Douglas P. NOWACEK
Duke University
Nicholas School of the Environment &
Pratt School of Engineering
135 Duke Marine Lab Rd.
Beaufort, NC 28516
USA

Randall R. REEVES (Chairman)
Okapi Wildlife Associates
27 Chandler Lane
Hudson
Québec J0P 1H0
Canada

Grigory TSIDULKO
A.N. Severtsov Institute of Ecology and Evolution
Russian Academy of Sciences
Leninsky prospect, 33
Moscow, 119071
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
Protected Resources Division
Southwest Fisheries Science Center
National Marine Fisheries Service
National Oceanic and Atmospheric
Administration
8604 La Jolla Shores Drive
La Jolla, CA 92037
USA

Alexey V. YABLOKOV
Councillor
Russian Academy of Sciences,
Leninsky prospect, 33, office 319
Moscow 119071
Russia

Sakhalin Energy Investment Company Ltd.

Koen BROKER
Richard EVANS
Valeriy FADEEV
Glenn GAILEY
Saskia de KONING
Roberto RACCA
Alexander RUTENKO
Dorine TERWOGT de Jonge
Olga TYURNEVA
Thomas ZENGERLY

Associate Scientists

Brandon SOUTHALL

IUCN

Sarah HUMPHREY
Finn LARSEN
Béatrice RICHÉ
Stephen TURNER (Independent evaluator)

Observer NGOs

Wendy ELLIOTT, WWF International
Alexey KNIZHNIKOV, WWF Russia
Maria VORONTSOVA, IFAW
Patrick RAMAGE, IFAW
Douglas NORLEN, Pacific Environment
Heather SOHL , WWF UK
Naoko FUNAHASHI, IFAW

Observer Lenders

Corinne RAUX-FOGGON, Standard Chartered Bank
Jon HANCOX, AEA Group
Toni FERDINANDS, UK Government
Bruce MATE, AEA Group
Sayaka WAKABAYASHI, Mizuho Corporate Bank, Ltd

Annex 2. Final meeting agenda

13 May 2011		**Documents**
09:00 – 09:30	**1. Opening of 10th WGWAP meeting**	
	1.1 Introductions and logistics 1.2 Adoption of agenda 1.3 Documents 1.4 Report drafting procedures and timeline 1.5 Update on outstanding business from previous meetings incl. status of recommendations	WGWAP-10/1 WGWAP-10/2 WGWAP-10/3
09:30 – 10:30	**2. Report of 7th meeting of Seismic Survey Task Force**	
	2.1 Analyses of data from 2010 Astokh 4-D 2.2 Planning for 2011 South Piltun 2-D	WGWAP-10/4
10:30 – 10:45	***Coffee break***	
10:45 – 12:00	2.3 Future work of SSTF (for consideration of expansion of scope to include noise issues related to South Piltun see 13.4)	WGWAP-10/4
12:00 – 12:30	**3. Photo-ID**	
	3.1 Way forward for catalogue comparisons 3.2 Way forward for integrating photos from satellite tagging into both catalogues (see Recommendation WGWAP-9/034) 3.3 Future photo-ID work (comparisons to the Kamchatka catalog, and to eastern gray whale photo collections)	
12:30 – 13:30	***Lunch break***	
13:30 – 14:00	**4. Follow-up on 'anomalous' whale distribution in September 2009 (Recommendations WGWAP-9/002, 003, 004)**	
14:00 – 14:30	**5. Follow-up on data for periods of Lebedenskoye and Gazprom offshore seismic surveys in 2010 (Recommendations WGWAP-9/010, 011, 012, 013, 014)**	
14:30 – 15:00	**6. Population assessment**	
	6.1 Independent review of joint assessment 6.2 Update on future population assessments 6.3 Data collection in 2011	WGWAP-10/9
15:00	***Adjourn and coffee***	

<u>14 May 2011</u>		**<u>Documents</u>**
09:00 – 10:30	**7. Final reports on field activities in 2010 (other than those associated with the Astokh 4-D seismic survey)**	
	7.1 Benthic monitoring 7.2 Photo-identification	WGWAP-10/12-15 WGWAP-10/12-15
10:30 – 10:45	***Coffee break***	
10:45 – 11:30	7.3 Behaviour monitoring 7.4 Distribution monitoring 7.5 Acoustic monitoring	WGWAP-10/12-15 WGWAP-10/12-15 WGWAP-10/16-17
11:30 – 12:30	**8. Oil spill prevention, preparedness and response**	
	8.1 Follow-up discussion from WGWAP-9 8.2 Malmö conference 8.3 Update on other issues (*e.g.* drills, implications of Deepwater Horizon and Japan tsunami)	WGWAP-10/10
12:30 – 13:30	***Lunch break***	
13:30 – 13:45	**9. Progress on rangewide initiative and WGW conservation plan**	
13:45 – 14:00	**10. Information from meetings of Russian Interdepartmental Working Group on WGW conservation**	
14:00 – 14:45	**11. Report from Environmental Monitoring Task Force**	
	11.1 Review of literature on benthic ecosystems of the north-eastern Sakhalin shelf region 11.2 Work plan (including workshop)	WGWAP-10/11
14:45 – 15:00	**12. 2-year evaluation**	
15:00	***Adjourn and coffee***	

15 May 2011		**Documents**
09:00 – 10:30	**13. South Piltun**	
	13.1 Options considered (Recommendation WGWAP-9/016) 13.2 Update on status of Sakhalin Energy planning and decision-making	
10:30 – 10:45	***Coffee break***	
10:45 – 11:30	13.3 Retrospective analysis of issues (Recommendation WGWAP-9/020)	
11:30 – 12:15	13.4 Integration of South Piltun issues into task force scopes (environmental monitoring, oil spill and noise issues)	
12:15 – 12:30	**14. Sakhalin Energy work plan for next 5 years ('Journey Book')** (Recommendation WGWAP-9/018)	
12:30 – 13:30	***Lunch break***	
13:30 – 14:15	**15. Satellite tagging**	
	15.1 Brief review of Flex results 15.2 Plans for 2011 tagging	WGWAP-10/5 WGWAP-10/6
14:15 – 14:30	**16. WGWAP self-evaluation**	
14:30 – 15:00	**17. Any other business**	
15:00	***Adjourn and coffee***	

Annex 3. List of documents

DOCUMENT NUMBER	SUBMITTED BY	TITLE	STATUS
PRIMARY DOCUMENTS			
WGWAP-10/1	IUCN	Provisional agenda (including time schedule) (English)	Public
WGWAP-10/2	IUCN	Provisional agenda (including time schedule) (Russian)	Public
WGWAP-10/3	IUCN	List of documents distributed in connection with the 10th meeting of the WGWAP	Public
WGWAP-10/4	Donovan	Preliminary report on Seismic Survey Task Force Meeting, 10-11 May 2011, Geneva	Public
WGWAP-10/5	Mate	Preliminary report on western gray whale tagging in 2010 (PP presentation)	
WGWAP-10/6	Donovan	Western gray whale tagging at Sakhalin Island in 2011 (PP presentation)	
WGWAP-10/7	Nowacek & Vedenev	Proposed deployment of D-tags on western gray whales	Public
WGWAP-10/8		No document	
WGWAP-10/9	Lonergan & Hammond	Independent review of joint population assessment	Public
WGWAP-10/10	Dicks	Report of Malmö oil spill management conference	Public
WGWAP-10/11		No document	
WGWAP-10/12	Sakhalin Energy	2010 MNR Report Volume I Methods ENG	Public
WGWAP-10/13	Sakhalin Energy	2010 MNR Report Volume I Methods RUS	Public
WGWAP-10/14	Sakhalin Energy	2010 MNR Report Volume II Results ENG	Public
WGWAP-10/15	Sakhalin Energy	2010 MNR Report Volume II Results RUS	Public
WGWAP-10/16	Sakhalin Energy	2010 Acoustic report ENG	Public
WGWAP-10/17	Sakhalin Energy	2010 Acoustics report RUS	Public
WGWAP-10/18	Sakhalin Energy	Multi-year acoustics analysis (2003-2009) ENG	Confidential
WGWAP-10/19	Sakhalin Energy	Multi-year acoustics analysis (2003-2009) RUS	Confidential
WGWAP-10/20	Sakhalin Energy	Marine Mammal Observer Programme 2010 close-out report	Public

DOCUMENT NUMBER	PREPARED BY	TITLE	STATUS
FOR INFORMATION DOCUMENTS			
WGWAP-10/Inf.1	Various NGOs	NGO Statement of concern regarding the Sakhalin II oil and gas project	Public
WGWAP-10/Inf.2	IPEE RAS	WGW Satellite Tagging Whale Safety Protocols	Public
WGWAP-10/Inf.3	IPEE RAS	Research Program of the Okhotsk-Korean Gray Whale Population Habitat Using Satellite Telemetry in 2011-2012	Public