REPORT OF THE NOISE TASK FORCE AT ITS 10TH MEETING

17-18 MAY 2016
GLAND, SWITZERLAND

CONVENED BY THE INTERNATIONAL UNION FOR CONSERVATION OF NATURE

CONTENTS

ACRONYMS

AUAR	Automated Underwater Acoustic Recorder
BAP	Biodiversity Action Plan
Company	Sakhalin Energy Investment Company Ltd.
EIA	Environmental Impact Assessment
ENL	Exxon Neftegas Limited
ESIA	Environmental and Social Impact Assessment
FRC	Fast Rescue Craft (with jet drive)
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
M-C	Mother-Calf
MMP	Monitoring and Mitigation Programme
NTF	Noise Task Force
OBN	Ocean Bottom Node
P-A	Piltun-Astokh
Photo-ID	Photo Identification
PME	Mode Parabolic Equation
PML	Perimeter Monitoring Line
POI	Pacific Oceanological Institute
PSTF	IFC Performance Standards Task Force
RHIB	Rigid Hull Inflatable Boat
Sakhalin Energy	Sakhalin Energy Investment Company Ltd.
SEER	State Environmental Expert Review
SEL	Sound Exposure Level
SEZ	Source Exclusion Zone
SPL	Sound Pressure Level
UNDP	United Nations Environment Programme
WGWAP	Western Gray Whale Advisory Panel

1 INTRODUCTION

The 10th meeting of the Noise Task Force (hereafter NTF-10) of the Western Gray Whale Advisory Panel (WGWAP) was held at IUCN Headquarters, Gland, Switzerland, 17-18 May 2016 under the chairmanship of Greg Donovan. The list of participants is given as Annex A.

Anete Berzina and Giulia Carbone of IUCN facilitated meeting preparations and logistics. Simon Delany served as rapporteur. Interpreters Alexander Danilov and Grigory Shkalikov provided simultaneous Russian-English and English-Russian interpretation. NTF-10 sincerely appreciates the efforts by all of these individuals as they helped make this a successful meeting.

The meeting agenda is given as Annex B. The list of documents and presentations is given as Annex C, along with information on their availability.

2 PROGRESS WITH ANALYSES OF DATA FROM THE 2015 SEISMIC SURVEYS

2.1 Available data and information

2.1.1 *Data collected during the 2015 season with emphasis on the period of MMP implementation* (Documents NTF-10/4 and 7)

COMPANY PRESENTATION

Samatov gave a presentation entitled *Gray whale monitoring data and preliminary results during 2015 seismic survey* in response to Recommendation WGWAP-16/02, providing information on the quantity and quality of data available from the 2015 Sakhalin Energy seismic survey. A summary of his presentation is given below.

The 2015 4D seismic survey on the Piltun-Astokh (P-A) license area acquired 36 seismic lines (length ± 40 km each) in total. The survey began on 8 July, a day after the completion of the Odoptu seismic survey of Exxon Neftegas Limited (ENL), thus avoiding simultaneous activity and causing less ensonification throughout the seismic survey period. The seismic survey was completed on 29 July, prior to the expected peak in gray whale numbers in the feeding area. Real-time monitoring allowed implementation of gray whale protection measures in accordance with the Environmental Impact Assessment (EIA) / State Environmental Expert Review (SEER) and Sakhalin Energy Monitoring and Mitigation Plan (MMP) 2015 criteria:

- source exclusion zone (SEZ) from the seismic vessel for gray whales (and other protected species) - 2 km;
- safety zone for gray whale mother-calf (M-C) pairs - 156 dB re 1 μPa^2-s per-pulse Sound Exposure Level (SEL) (A-lines).

Shore-based Marine Mammal Observers (MMOs) were mobilised on 30 June, one week prior to the survey, and demobilised on 4 August, one week after completion of the survey. The number, distribution and behaviour of gray whales were recorded from four observation stations during shore based monitoring.

There was a total of 21 monitoring days during the seismic survey (14 - favourable, 7- fog, storm) and a total 10 days before and after completion of the seismic survey (7 - favourable, 3 - fog, storm). During the full monitoring period there were 74 complete scans and 152 incomplete scans, resulting in 1,512 gray whale sightings (1,707 individuals).

Bad weather was a significant factor resulting in a smaller array of data than planned; Samatov, however, expressed the view that this would not compromise analysis of spatial and quantitative distribution data.

Altogether, five source activity suspensions due to observation of marine mammals within or about to enter the SEZ were initiated by the Lead MMO during the seismic survey: 1 small cetacean (12 July), 2 common minke whales (19, 22 July) and 2 pinnipeds (20, 22 July). Total standby time (source non-active) due to

presence of marine mammals amounted to 24.9 hours (approximately 5% of total survey time). There were no shut downs due to gray whale M-C-pairs in the A-zone or SEZ.

The detailed data collected from observations of gray whales had yielded information on their spatial and quantitative distribution in the Piltun feeding area during the 2015 seismic survey. Preliminary whale movement data consisted of 225 tracks, of which 74 met the Company's quality criteria. An initial review indicated that insufficient data were collected for meaningful analysis of gray whale respiratory behaviour (only 4 individual tracks during the seismic survey period met the relevant criteria).

Some shore-based photo-ID work was carried out during the seismic survey but this work was mostly conducted in August and September, after the survey had finished.

DISCUSSION

In discussion it was noted that (a) detailed information about whale sightings would be made available to all Task Force members and (b) observation data were available from only a single station (Station 10), due to the complexity of obtaining simultaneous theodolite and binocular observations over extended periods.

DATA QUALITY

The NTF members expressed concern that the criteria used to assess data quality appeared to be so stringent that much of the data collected appeared to be unusable i.e. only 74 out of 224 movement tracks and four tracks with respiratory observations were considered useable according to the Company criteria. There was agreement that the NTF and WGWAP should evaluate the criteria to ensure they were appropriate. Lock agreed that Sakhalin Energy would share the criteria and welcome comments. This would be an important early step because it is critical for understanding what analyses might be possible.

It was suggested that analyses of the time series of observations should examine the data at a daily scale.

The NTF **concluded** that with regard to data quantity and quality, (i) the data on whale numbers and distribution data were sufficient, (ii) the data on whale movements were limited (possibly due to inappropriate application of criteria or inappropriate criteria) and (iii) the respiration data were inadequate. It was **agreed** that Sakhalin Energy would provide the NTF with a document explaining how the various datasets were collected and the criteria applied for quality control.

ANALYSIS OF 2015 DATA

NTF-10/4 includes preliminary suggestions for analyses. The NTF **agreed** on the need for analyses of:

(a) whale distribution, abundance and behaviour (movements and respiration);

(b) multivariate analyses (using Gailey *et al.* 2016 as a guide and taking into account a full suite of variables such as behavioural state, e.g. feeding, non-feeding, travelling); and

(c) if at all possible, analyses using the combined data from Sakhalin Energy and ENL.

Sakhalin Energy noted its intention to analyse their own 2015 data first, with comparisons to data from its 2010 and 2012 seismic surveys. It was considered too soon to be able to determine the feasibility of analyses using the combined datasets from Sakhalin Energy and ENL in terms of data availability. The NTF **agreed** that the Company should consider pooling their own data across years to increase the power of analyses, regardless of whether ENL eventually agrees to share data and collaborate in analyses.

2.1.2 Information on the ENL MMP

IUCN reported on progress with respect to Recommendation WGWAP-16/06 on obtaining the ENL 2015 MMP. Carbone reported that IUCN had approached the appropriate officials at the Ministry of Natural Resources and after delays and complications, IUCN had approached ENL directly. ENL said that a synopsis of its MMP would be made public after analyses had been made generally available in peer-reviewed papers. ENL's approach was to include this synopsis in the published results, and to look at opportunities to combine and analyse overlapping (combined) data from the two programmes only after such publication. Limited information was available to the NTF about the ENL MMP, as given in public presentations. Sakhalin Energy stated that it had provided its own MMP to ENL for purposes of comparison but that ENL was unwilling to reciprocate.

The NTF **agreed** that a useful approach might be for the NTF or a smaller group (including representatives of the Panel and Sakhalin Energy) to develop some specific questions for ENL regarding their MMP rather than simply requesting the complete document.

2.1.3 Progress with a possible expert group made up of scientists from Sakhalin Energy and ENL

Sakhalin Energy reported on progress made towards the establishment of such a group (with the offer of assistance from the Panel to discuss the nature and objectives of future analyses of the 2015 data, as well as safeguards for data holders - WGWAP-16 report, Item 3.2.1).

A thorough, combined analysis of data collected by the two companies is regarded as ideal from a scientific and conservation perspective. Sakhalin Energy indicated that ENL was open to discussing the possibility of combined analyses but noted that ENL would not consider this seriously until after the results of its own work have been published.

2.2 Results and/or progress update of analyses recommended at NTF-9/WGWAP-16

2.2.1 Acoustic data (Documents NTF-10/6, NTF-10/5, NTF-10/3)

PRESENTATION

The Company reported on progress with respect to Recommendation WGWAP-16/03 (5-minute average SEL for a range of frequency bands) and also provided highlights of Sakhalin Energy's 2015 Seismic Survey Acoustic Monitoring Report by the Pacific Oceanological Institute (POI).

Racca gave a presentation on analyses of 2015 acoustic data, providing highlights of the report *4D Seismic Survey Acoustic Monitoring at Piltun-Astokhskoye Hydrocarbon Field in 2015* by Rutenko et al. (NTF-10/3) and showing additional results from the initial analyses of acoustic data from the Sakhalin Energy monitoring programme in July 2015. He gave a brief overview of the spatial and temporal parameters of deployment for the 11 Automated Underwater Acoustic Recorder (AUAR) stations (9 on the Perimeter Monitoring Line (PML), 2 on the 10m bathymetry line) that had effectively recorded data, noting that a 12th station at the southern end of the PML had been removed after twice drifting from its mooring and that one of the PML stations had produced data of inadequate quality due to excessive internal electrical noise. He then proceeded to describe the various types of data analysis that had been performed to characterize the pulses from seismic surveys that were received at the monitoring stations.

Firstly, Racca presented a sample graphical comparison of the levels generated by the simple sliding-window algorithm that was used on-board the telemetric AUARs for Iridium-based transmission with the corresponding pulse levels obtained from post-analysis of the recorded full-waveform data, showing that the two matched well. Next, he reviewed an annotated sample output from the POI report of the peak SPL and per-pulse SEL metrics produced by the full pulse analysis, outlining how different types of seismic survey pulses (both from Sakhalin Energy P-A and from another operation) could be identified in the graphs. Lastly, he showed a detailed comparison, over several days of data at one station, between the per-pulse SEL from the full waveform analysis and the 5-minute average SEL that had been recommended at NTF-9 as a convenient overall sound level assessment metric for initial analysis. With minor exceptions, the two metrics tracked each other very well over any interval where seismic survey pulses were detected – showing that the 5-minute average SEL indeed provided an easily computed, pulse-agnostic and yet representative metric of received level for periods both with and without seismic survey activity.

On this basis, Racca noted that a sense of the noise distribution over the monitored area could be gleaned by presenting the 5-minute average SEL results as colour-encoded points at the AUAR locations on a map, and that by adding the AIS-reported locations of the seismic survey vessel(s) in the area to the map, one could achieve a contextual assessment of the observed sound levels from the operations. He then showed a time-lapse animation of the described map rendering over the initial four days (8-11 July) of the Sakhalin Energy P-A seismic survey, noting how events such as the activation and shut-off of the seismic source array at the start and end of lines, the approach of that source abeam AUAR locations, and the occasional line-turn passages near the south end of the PML of the ENL seismic vessel performing a survey to the south (with

only a mitigation airgun operating) could all be readily discerned and quantified in the colour-encoded depiction of received levels (see Figure 1).

At the end of his presentation Racca gave a brief overview of the progress made by POI scientists, as described in their report, in the numerical modelling of pulses from a seismic survey at arbitrary locations from the measured pulse properties at a reference point (AUAR station) through a process of equivalent source function estimation and further re-propagation using a Mode Parabolic Equation (MPE) computational algorithm.

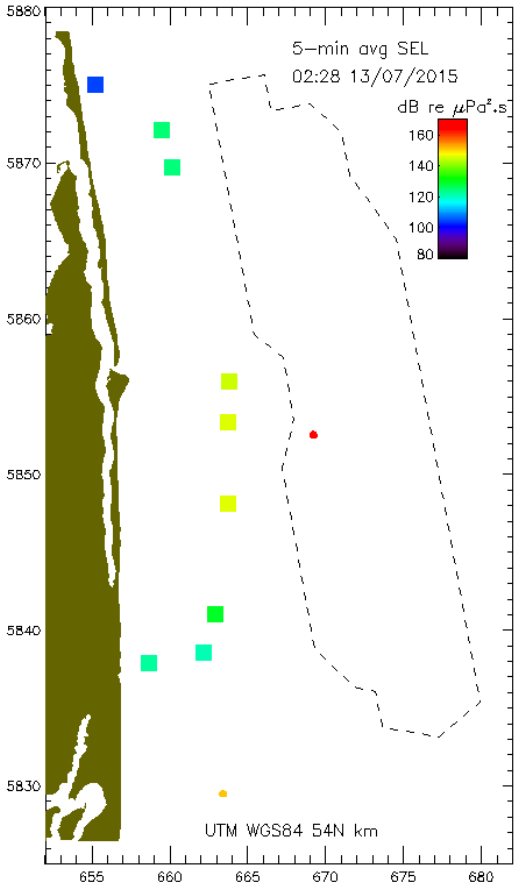

Fig. 1. 5-minute average SEL results as colour-encoded points at the AUAR locations, with AIS-reported location of the Sakhalin Energy (red dot mid-field) and ENL (orange dot to the south) seismic survey vessels.

DISCUSSION

After discussion and clarification of technical details of the POI report, it was noted that there was a high level of correlation between various pulse level parameters, which tracked one another very closely. It was **agreed** that simplification of the analyses through identification of correlations in both behavioural and acoustic data, resulting in a reduction of the number of variables, would be beneficial.

When asked whether the apparent rise of 10 dB at around 130Hz between the 2010 and 2015 source spectra as estimated by POI (see p. 95 of POI report) was a product of the source, Racca said that it could have to do with the optimization of the source that was performed in 2015, which may have enhanced some frequencies while reducing others. It was **agreed** that it would be necessary to verify that the back-propagation performed by POI gives reliable results to test if this difference is real.

With respect to comparing the 2010 and 2105 Sakhalin Energy sources from the data collected during each seismic survey, Racca noted that this could be done by carrying out a sound source verification using a number of different passes and tracking the position of the source relative to one or more receivers. He saw no reason why a good estimate of the source spectral levels could not be obtained from the data collected. The NTF **recommended** that such an approach be taken in order to compare the two sources.

The NTF **agreed** that it was desirable to use as much of the data as possible from both monitoring efforts to optimise analyses. It might also be necessary to account for the lateral deflection of sound due to sloping

bathymetry to improve the modelling alongshore. The model might be affected by 3-D effects in these areas and the accuracy of the model in such conditions should be optimised.

Nowacek and Southall **agreed** to work on a draft recommendation for consideration at the next NTF-meeting to assist POI in incorporating the above considerations in their analysis.

2.2.2 Implications of change of rule re: behavioural shutdowns and shooting lines at night (Recommendation WGWAP-16/04)

Recommendation WGWAP-16/04 recommends that "ideally prior to the next NTF meeting, the Company examines the existing data [from the 2015 seismic survey] to investigate what the effect would have been on the time taken to complete the Sakhalin Energy survey if the criteria for behavioural shutdowns had been applied to all whales, and not just M-C pairs, and if no A-lines had been acquired at night." The recommendation also indicates that the Panel would be "willing to assist the Company in this exercise, or indeed to carry it out, should sufficient resources be available."

Blonk reported that while the recommendation was clear and appropriate, in the view of Sakhalin Energy it would be difficult for the Company to implement with its own expertise and therefore it was interested in accepting help from the Panel. He added, however, that he was sceptical that modelling would provide definitive answers given the quality and quantity of the input data as well as the many assumptions needed to construct and run the model. Panel members clarified that the rationale for this work would not necessarily be to find definitive answers concerning alternative outcomes in 2015 but rather to gain insights concerning the implications of different approaches to mitigation for consideration in planning future seismic surveys. Moreover, it was suggested that a risk analysis approach to planning was always desirable and that for this such an approach, relative rather than absolute descriptors regarding the effects of mitigation would be preferable (e.g. referring to the effects as negligible, minor, moderate or major).

At the request of the NTF, Cooke prepared the following proposal for consideration:

Objective: To estimate what would have been the effect of different mitigation options on:

(a) time to complete the survey and
(b) exposure of whales to seismic noise.

Rationale: There is a need to determine whether there are any lessons for future Sakhalin Energy surveys or future surveys by any other operator in the Sakhalin area with respect to the costs and benefits of different mitigation options. 'Costs' in this case are measured in survey days rather than funds.

Mitigation options to consider: The different mitigation options include:

- Survey of A-lines
  (a) Any time
  (b) Not at night or in fog
  (c) 'B-section' A lines
- Shutdown of A lines when
  (a) MC pairs are or
  (b) Any gray whale is
  seen inside an area of feeding ground estimated to be ensonified above 156dB per-pulse SEL
- Shutdown when marine mammal enters
  (a) 500m or
  (b) 2km
  exclusion zone
- Start time as originally expected before ENL announced its seismic survey plans.

Data requirements: In order to conduct the estimation, information is needed on:

- Requirements for shooting lines, including

(a) Tide conditions (specify point in daily tidal cycle, and monthly (spring/neap) cycle if relevant)
(b) Weather conditions
(c) Decision rules for these
(d) Maximum extent of survey

- Weather encountered on 2015 survey, broken down as relevant, e.g.
  (a) Good/OK
  (b) Fog (can survey but not see marine mammals)
  (c) Too rough to survey
- Lines shot in 2015. For each line:
  (a) Start time/date and position
  (b) End time/date and position
  (c) Reason for ending, e.g.
    - Normal completion
    - Marine mammal
    - Weather-related
    - Technical problem
- Time and position of each sighting of marine mammals by each team in operation.

Methods: The survey can be simulated and exposure of whales estimated for different scenarios estimated as by Cooke (2015)[1], modified to take account of special requirements for shooting lines. It would also be useful to rerun Cooke (2015) with actual ENL survey timing and sound source, and assuming the 'normal' increasing-presence-of-whales scenario.

The NTF **agreed** that this was a good approach, which *inter alia* would be needed when developing the next Sakhalin Energy seismic survey MMP (see below). The Chair noted that there would be financial implications if work originally expected to be carried out by the Company was to be undertaken by Panel members. A small group was appointed to follow up in setting a timeline and tracking progress with this proposal (Blonk, Cooke, Donaghy, Donovan, Hancox, Nowacek, Racca, Reeves, Vedenev).

3 UPDATE ON PLANS FOR A POSSIBLE FUTURE OCEAN BOTTOM NODE SURVEY

3.1 Technological options and implications for whales (Document NTF-10/1)

3.1.1 Presentation by Company

Blonk provided the following update on the Company's plans (a follow-up to WGWAP-16 report, Item 4.2).

Survey planning and associated timelines for the next P-A 4D seismic survey are at an early stage and driven mainly by the need for a two-year lead time. The currently preferred technical option is to use an Ocean Bottom Node (OBN) system, which would: (i) allow acquiring data near and under the platforms, and imaging through 'gas clouds', (ii) deliver a step-change improvement in future 4D repeatability and (iii) provide future opportunities to scale the environmental footprint.

An important time-saving over streamer surveys is the much reduced distance that needs to be covered during turns. This time-saver needs to be weighed against the need for additional shooting for OBN as compared to streamer for a similar target area in order to compensate for a sparser receiver distribution with OBN than with streamer. However, OBN would allow focusing on a much smaller target area than streamer

[1] Cooke J.G. 2015. Updated predictions of cumulative sound exposure for Sakhalin gray whales from the proposed 4D seismic survey in 2015, with comparative predictions for other surveys.
http://cmsdata.iucn.org/downloads/cooke___final_16_may_2015_1.pdf

would. OBN surveys are also less sensitive to tidal currents, and could reduce problems with night shooting, since the chances are that lines can be more easily re-shot the next day.

Challenges associated with OBN, are: (i) backward compatibility between OBN and past streamer data; (ii) access to qualified vendors for the remote Sakhalin region; and (iii) likely longer duration and a larger cumulative shot effort for the first OBN survey. Given these challenges, it may prove necessary to still use streamers, or perhaps a hybrid streamer-OBN option, to acquire the next 4D survey.

Current potential technology options can be evaluated in the light of the 2008 white paper called 'Seismic Source Optimization Project 2009 Astokh 4D Seismic Survey', which summarized optimization of streamer acquisition parameters with a focus on reducing the environmental footprint. Some main conclusions of the white paper were that a reduced source level as compared to 1997 was not feasible from a 4D-repeatability perspective, and the environmental benefits of any such reduction would be limited.

Two critical points that need to be addressed upfront are to (i) provide sufficient confidence that OBN would allow a proper 4D analysis against 2015 streamer data and (ii) identify vendors offering viable node deployment and data acquisition in the Sakhalin area under strict commercial, technical and HSE qualification constraints. Regarding the former critical point, engagement with global experts has resulted in cautiously optimistic to rather pessimistic views; Sakhalin Energy has initiated efforts within Shell to investigate this further. Regarding the latter point, technically acceptable options were identified previously, although they were not commercially viable. More options are currently being looked into.

Regarding OBN options, the 'nodes-on-ropes' concept seems preferred, offering both technical and environmental benefits over using regular nodes. However, availability of qualified vendors may be very limited, and actual feasibility to deploy such a system in the region needs to be assessed, including the potential associated impacts on the whales.

The options for optimizing OBN acquisition in terms of environmental impact and cost efficiency, where two main drivers are 'shortest survey duration' and 'minimum source effort' while preserving 4D-repeatability, are:

- *Small(er) conventional sources*, for which proprietary tests within Shell are being followed by Sakhalin Energy, with promising early indications of highly repeatable systems (like OBN). However, it is unlikely that switching to a much smaller conventional source could be implemented during a change from streamer to OBN surveys;
- *Marine Vibroseis*, which generates non-impulsive signals and has the potential to reduce radiated noise levels, has a number of drawbacks. Performance is still unproven, with special challenges related to 4D-repeatability, timely mobilization, extended survey duration, and not knowing how continuous source signals affect whales. Therefore, application for the next survey is considered unlikely;
- *Bolt eSource* is a new type of airgun designed to reduce the potential impacts of seismic operations on sea life. However, it has not yet been used to any great extent. Given the specific Piltun-Astokh setting (seabed geometry and types of mammals at greatest risk), eSource may not bring as many relative benefits as it might for other environments and animals;
- *4D Distributed Acoustic Sensing (DAS)* offers the potential for small-scale field monitoring. It is not being considered to replace the next 4D survey, but it might become part of field monitoring and reduce the required frequency of regular field-scale 4D monitoring.

Overall, he concluded that it is unlikely that any of these options can actually benefit the whales for the next Piltun-Astokh 4D survey, although they have potential for surveys further in the future.

3.1.2 Discussion

The NTF thanked Blonk for his presentation, noting that this topic has been on its agenda for several years. Southall reported that in the summer of 2015 there had been a comparative survey in the Gulf of Mexico using Vibroseis and conventional survey methods. The NTF **encouraged** Blonk to obtain and consider the implications of any outputs of this work.

The Company **assured** the NTF that it will have decided on the method, or combination of methods, to be used in the next seismic survey before the November 2016 NTF and WGWAP meetings. Blonk indicated that 'nodes-on-ropes' was currently the 'frontrunner'.

3.2 Timeline for decision-making for the next seismic survey (Document NTF-10/1)

3.2.1 Company information

Blonk indicated that the next 4D survey is planned for 2018 and noted that the timing would be critical to many field development decisions. Obviously, the results of the ongoing 4D interpretation (of the 2015 survey data) and the overall business climate will also affect any decision regarding a future 4D survey. The tendering and permitting process will have notionally begun by Quarter 1, 2017.

In planning for 2018, Blonk indicated that a buffer was needed to allow for delays in contractor selection, funding and permits. If the oil price were to decrease any further, another seismic survey in 2018 might not be economically justified.

Survey planning timelines are (tentatively) as follows:

- November 2016-April 2017 – Tendering process;
- November 2016-November 2017 – MMP definition;
- May 2017-July 2017 – Geophysical survey programme;
- January 2017-April 2018 – Approvals and permits.

Corresponding MMP timelines:

- May 2016 – Preparations discussion;
- November 2016 – Guiding principles agreed;
- May 2017 – Draft MMP completed;
- November 2017 – Final (or '90%') MMP completed.

Analyses of the 2015 seismic data should be completed during 2016. Blonk noted that one of the advantages of OBN systems is the shorter analysis time; for example, if fully switched to OBN, it should be possible to complete the basic processing and interpretation from the second OBN survey onwards within six months or even less of survey completion.

The Company noted that the frequency of surveys of P-A has increased due to the stage of development of the fields. A switch to nodes might make comparison between 2015 and 2018 impossible, in which case the next time the Company could obtain an image of the reservoir would be in 2021, resulting in a 6-7 year 'blind period'. Therefore this is one reason why it is critical from a business perspective to acquire suitable data in 2018.

The Company believed that it was unlikely that ENL would conduct a seismic survey in 2018. Communication channels between the two companies are open and both companies want to avoid surprises. However, it should be noted that if ENL sees something surprising from last summer's data, it is possible that it may decide that a 2018 survey is necessary. Both companies are keeping each other informed and intend to continue doing so.

The Company noted that the timing for preparation of tendering relative to the timing for preparation of the MMP and survey planning is very tight, leaving little space for consideration of analyses. It should be possible to go to tendering without a final (or at least near-final) MMP, but this would not be ideal. If necessary, the MMP could be fine-tuned in consultation with the vendor. From the Company's perspective, the 2015 MMP could be used as the basis for what is required in 2018 – at least this is the case.

3.2.2 Discussion

One of difficulties leading into the 2015 season was uncertainty about what the definitive specifications of the sound source would be. This time, there is uncertainty about which method of acquisition will be chosen, and this will strongly affect the MMP. A further doubt concerns the availability of a company to deploy new acquisition methods (e.g. use of nodes) in the Sakhalin region. Blonk noted that the source is very unlikely to change from 2015, but the number of shots might differ. Once a method is selected, it will be known how many shots need to be produced, and this will provide a basis for modelling. As long the depth of deployment does not change, it should be possible to use previous transmission modelling results with a new source.

Nodes would require more shots, but in Blonk's opinion, the method is still preferable because it would allow shorter survey duration after having acquired an OBN baseline and greater flexibility of deployment (notwithstanding that, as mentioned above, the first OBN survey would likely be of longer duration and require a larger cumulative shot effort than the conventional streamer survey). Smaller sources could likely also be used eventually. The cumulative amount of sound could be higher, but peak and per-shot exposure levels would be well controlled.

The NTF **agreed** on the need for careful consideration of, among other things, the trade-offs between weaker sources and more shots.

In the opinion of some task force members, the step between a draft and the final MMP should be informed by the results of analyses of the combined ENL and Sakhalin Energy data, which are unlikely to be available by 2018. Recognising these difficulties, the NTF noted that one element of the ENL dataset from 2015 that would help Sakhalin Energy in its MMP planning for 2018 is information on the early-season occurrence, distribution and numbers of gray whales in June i.e. recent information on when animals start to arrive and how their numbers build through the early portion of the open-water season. The NTF **recalled** comments it made when developing the previous MMP, about the fact that it had been a long time since Sakhalin Energy collected, or tried to collect, early-season data (June and July). These data are essential to verify that the 'early in, early out' approach to remains a pillar of any mitigation strategy. The observation was also made that photo-ID work conducted early in the season could prove valuable for determining turnover rates and revealing how individual whales move and become redistributed through time within the open-water period.

A further complication for the timeline is the fact that the MMP is part of the approval and permitting process, and the timeline for tendering already begins in November of the current year (2016). The permitting process normally lasts about 6 months, but a full year was needed to obtain permits from fisheries agencies for the last survey. It will be necessary to work closely with the contractor to avoid surprises with the EIA, which is why more than a year of intense planning and preparation is needed. A further consideration is the need for Sakhalin Energy to deal with the Environmental and Social Impact Assessment (ESIA) and Biodiversity Action Plan (BAP) processes required by the IFC Performance Standards (see report of the 1st meeting of the IFC Performance Standards Task Force - PSTF-1).

Given that the entire monitoring and mitigation effort hinges on acoustic modelling and that the whales are likely to be exposed to greater cumulative seismic noise in 2018 than they were during the Sakhalin Energy survey in 2015, the NTF **agreed** that advice and preliminary modelling results from JASCO are required as soon as possible if the Company and the Panel are going to be able to consider a full range of options.

In conclusion, the NTF **agreed** that there is an urgent need for a detailed timeline (and associated workplan), as otherwise it will problematic for the NTF and ultimately the Panel to provide advice in time to allow the next 4D seismic survey to go ahead with Panel advice.

MMP 'OPTIMIZATION' IN NOVEMBER 2016

The main areas for potential future MMP optimization were discussed at NTF- 9 (November 2015) to sharpen the focus for extensive MMP discussions expected to occur at NTF-11 (November 2016) and to define preparatory work needed to facilitate those discussions. The anticipated NTF-11 discussion points included:

(a) reviewing and if possible simplifying the MMP, underpinned by a cost-benefit analysis of the 2015 MMP;

(b) potential revisions of the PML definition and the A-zone concept; and

(c) reviewing the required level of real-time acoustic monitoring.

There are a number of important and complex issues to discuss including:

(a) whether the level of precision and accuracy of the acoustic model is sufficient to provide confidence that real-time monitoring is unnecessary;

(b) whether there have been sufficient advances in equipment and methods to make remote monitoring of recorders and data feasible e.g. if the Iridium system works well, a large acoustics team may no longer be seen as an indispensable element of the monitoring effort.

Donovan stressed that any fundamental changes to the MMP would need to be backed up by a document giving details of the relevant evidence and rationale. In this regard, it was seen as unfortunate that at least some of the data and analyses that would form the basis of a revised MMP are unlikely to be available until after the November 2016 meeting. This makes it all the more important to discuss and agree on priorities for analyses. A ranked list of mitigation measures according to their relative benefits in protecting whales would be valuable for development of the MMP, but data and analyses need to be available to inform such a ranking process. It was also noted that the lessons learned from the 2015 experience, such as those related to timely recruitment of specialists and adequate pre-survey training of field personnel, must be incorporated into MMP planning.

The NTF **agreed** that it would have an extensive discussion during NTF-11 in November 2016 to establish guiding principles for the 2018 MMP, focusing on the most effective mitigation measures and the conditions needed for successful implementation. In principle, this could then lead to a draft 2018 MMP around May 2017 and a final MMP by November 2017, the latter needing at most only very minor modifications in 2018. As noted before, it is important to ensure that sufficient resources are made available both within the Company and the Panel, to ensure that this timeline can be met.

4 GENERAL ISSUES REGARDING SEISMIC SURVEYS

4.1 Consideration of strategies for simultaneous or same-season surveys (Recommendation WGWAP-16/07)

4.1.1 Company information

At WGWAP-16, the Panel recommended that "the issue of how to manage multiple seismic surveys in and near the Sakhalin gray whale feeding areas be given priority on the NTF's agenda."

Blonk summarised his views of the advantages and disadvantages of Sakhalin Energy and ENL conducting seismic surveys in the same season, as follows:

Advantages	**Disadvantages**
Sharing costs of mobilization/demobilization	Complex and sub-optimal logistics including practical considerations - it is unrealistic to expect either company to give way to the other's priorities
Maximizing the number of 'quiet' seasons	Longer season preventing both companies meeting the key mitigation strategy of finishing as early as possible
Potentially consistent and combined MMP activities	Very short annual window for surveys doesn't allow much flexibility
	Drawing from same limited pool of MMOs

Complete logistical cooperation between the companies will be difficult because, for example, they have different acquisition parameters, source types and depths of streamers. In addition, there may be legal complications given that the companies obtain their own permits and SEER approvals.

4.1.2 Discussion

In discussion, Tsidulko reminded participants that the effectiveness of mitigation during the Sakhalin Energy survey in 2015 was reduced by the delayed timing, which necessitated waiting for optimal feather effects (tides) and acquiring some nearshore survey lines at night.

A number of other points were raised by individual members:

(a) simultaneous seismic surveys in proximity to one another are generally infeasible because of the problem of acoustic interference;

(b) from an operators' perspective, conducting surveys sequentially (back-to-back) is an efficient approach;

(c) analyses of present and future data may help judge whether survival rates of the whale population are influenced by different levels of seismic survey activity (e.g. multiple or single surveys in a given season) – factors to be considered include the nature and type of noise-generating activity, changes in whale distribution during the season of the activity and demographic changes in the whale population in subsequent years.

The NTF **agreed** that there is still no scientific basis for determining (from a whale conservation perspective) whether it is better to have all seismic survey activity in one year or spread over two years (see previous NTF and Panel reports). It noted that it was illogical, inequitable and counterproductive for two companies to be conducting similar work in the same area but being subject to different rules (i.e. MMPs). Therefore, the NTF **encouraged** that Russian authorities ensure all operators adhere to a common set of rules regarding monitoring and mitigation during seismic surveys off Sakhalin.

4.2 Safety zones and source shutdowns

Under this item, the NTF reconsidered issues related to thresholds of disturbance or injury and to safety (exclusion) zones, following the discussions at WGWAP-16 (see WGWAP-16 report, Items 3.2.1, 3.2.2 and 9.2).

A concern raised at the last Panel meeting was that while Sakhalin Energy used 2 km as the safety radius (exclusion zone) for its 2015 seismic survey, ENL used 500 m. As explained by Samatov and Vedenev, once the conclusions of a company's environmental impact assessment have been approved by SEER, they become legally binding on that company. SEERs are carried out by independent experts whose perspectives and opinions vary. There is no rule or regulation that stipulates how large a safety zone should be or how it should be calculated, e.g. according to source characteristics, species of concern etc.

Southall updated participants on the project he is leading to produce a series of scientific papers on noise thresholds applicable to marine mammals. It was unclear to what extent these papers would be published in time to inform MMP planning for a Sakhalin Energy seismic survey in 2018.

Racca reminded participants of the multivariate analyses of 2010 seismic survey monitoring data recently published in *Endangered Species Research.* He noted that such analyses had even explored relations between temporal patterns in sound levels over different time periods and changes in whale density, suggesting, albeit weakly, a possible delayed response to a rise and fall in sound levels over a three-day period (Muir *et al.* 2016).

Donovan appointed intersessional working groups to consider (i) how to simplify acoustic behaviour parameters based on experience from the 2010 analyses (Racca [coordinator], Vedenev, Southall, Nowacek, Weller) and (ii) effectiveness of various mitigation measures (Donovan [coordinator], Blonk, Cooke, Tsidulko). The two groups were expected to report back at the next NTF meeting.

5 NON-SEISMIC-RELATED ACOUSTIC ISSUES

5.1 Automated processing for detection of anthropogenic noise episodes (Document NTF-10/2)

5.1.1 Presentation

Racca opened the presentation by reviewing the nature and motivation of Recommendation WGWAP-13/007 to "perform a comprehensive analysis of all acoustic records using an automated detector of loud noise periods of likely anthropogenic origin" for the purpose of helping identify periods of louder industrial activity from the acoustic data collected as part of the annual Joint Program monitoring. He pointed out that whilst the recommendation described in some detail a generalized detection approach based on a two-step process with discrimination first on signal level and then on spectral composition, the use of algorithms specifically developed for a given type of noise could provide better performance. He indicated that at least as a first cut, the approach should focus on detecting two types of anthropogenic noise most commonly observed in the monitored region off North East Sakhalin: (i) sounds originating from vessels and (ii) pulses from seismic surveys, including relatively distant ones. He then presented an overview of the principle of operation of each detector.

Ships produce narrowband tones from the propulsion and other rotating machinery, as well as broadband acoustic energy from propeller cavitation. The vessel noise detection algorithm developed by JASCO includes a spectral analysis stage optimized for ship tone detection, which identifies and logs candidate vessel events in which tones lasting a minimum of 20 seconds are detected. In a parallel stage the detection algorithm computes in one-minute intervals the rms SPL for the full frequency spectrum and for a 'vessel band' of 40–315 Hz. Combining the results from the two stages, vessel noise is identified when (i) the per-minute rms SPL in the vessel band is at least 3 dB above its 12-hour centre-window median, (ii) the rms SPL in the vessel band is within 8 dB of the full-spectrum rms SPL and (iii) at least 5 ship tonals are detected. A complementary detection process for broadband sound from vessels, based on a well-established typical rate of drop of such sound with frequency, is also applied over time periods adjacent to the detection of vessel tonals.

Seismic pulse sequences are identified using correlation detection on spectrogram contours, working with 5-minute long spectrograms. The time/frequency bins in the spectrogram are subjected to adaptive thresholding to create clusters of bins that represent significant surges of acoustic energy, and any clusters between 0.2 and 6 seconds long with a bandwidth of at least 60 Hz are selected for further analysis. An 'event' time series is generated from tallying the above-threshold frequency bins at each time bin that contains selected clusters. This time series is auto-correlated to look for repeated events; the list of correlation peaks is searched for entries with a set repetition interval consistent with the normal range of seismic survey pulse periods (5–60 seconds); and the event time series is searched for all peaks that match the repetition period. Having thus identified the times of candidate seismic survey pulses, the 90% energy width of each such pulse is computed in the original acoustic signal time series, and pulses with unrealistically long or statistically inconsistent duration are rejected. The accepted pulses can be used to compute acoustic metrics for the identified seismic survey sequence. The detected peaks are then removed from the event time series and the process is repeated to look for weaker sequences or changes in sequence timing. This approach, while not completely immune from detection errors caused by irregular spacing of pulses or some situations of interference between multiple surveys, is capable of handling complex instances of overlapping sequences and of identifying sound from more distant seismic surveys in the presence of dominating pulses from a closer activity.

Racca concluded the presentation by describing how the detection algorithms would be run in practice on data collected in the course of annual acoustic monitoring, which are archived at POI in Vladivostok and must be analysed in Russia due to regulations limiting the export of raw acoustic data. He explained that the detectors are integrated in an acoustic analysis and display package developed by JASCO in the java language. The prebuilt software can be installed and run on any workstation equipped with a freely downloadable java run-time environment. Racca showed a sample screen displaying, in time series and in spectrogram form, a segment of acoustic data containing both seismic survey pulses and vessel noise, automatically annotated with overlays from the detectors bracketing and identifying periods of each type of noise. He indicated that JASCO would make the software installer package available to the acoustics

monitoring group at POI and provide any required assistance with its deployment and operation. The main purpose of this automated processing is to more readily and accurately identify episodes of anthropogenic noise that can then be reviewed in greater detail.

5.1.2 Discussion

Discussion included technical questions about false positive rates, identification of different sound sources, the choice of frequencies, and statistical analyses. Although some participants expressed scepticism concerning the likelihood that Joint Programme data would be made available for these kinds of retrospective analyses, Racca did not anticipate difficulties in this regard as the detectors would not reveal any feature that would not be already discernible in the spectrograms included in the annual acoustics reports.

The advantages of simplification and reduction of the time needed for data processing were stressed, with, for example, a 15-minute wave file taking 2 or 3 seconds to process. Another advantage could be that the full analysis of biological noise would make it possible to monitor the acoustic behaviour of whales. The detectors actually run in three phases, looking for (i) animals, (ii) seismic survey and pile driving noise and (iii) vessels.

The output of automatic detector analyses would be in the form of identified periods of a type of sound and the spectrograms for those periods. These data outputs could be exchanged freely, including with scientists outside of Russia, as they are already processed to a sufficient extent that they don't bear the connotation of raw or unprocessed data.

Next steps should include testing of the automated processing in the Sakhalin environment, and inclusion of the results in annual reports in addition to the current comprehensive sonograms. The testing would need to be carried out at POI (or elsewhere in Russia), with the detector run on original data from particular time periods, using all potential historical data sources. It would be best to select and test the system on data from time periods in the past when it is known that there was anthropogenic noise.

5.2 Deployment of control stations to measure background noise

A control buoy has been deployed for many years off NE Sakhalin to measure 'natural' background noise levels. It is generally agreed that this buoy is no longer in a position to measure ambient sound unaffected by human activities because its location is now subject to substantial anthropogenic noise. The NTF therefore considered how the companies should proceed with respect to the question of monitoring and measuring ambient acoustic conditions.

Panel Members of the NTF considered that the existing buoy was a valuable tool given the continuous historical and cumulative data that it has collected. In their view, it was well worth maintaining this buoy in its current position, which should allow analysts to separate natural sound from industrial noise when calculating cumulative exposure. They also expressed the view that an additional, new buoy should be deployed in a relatively undisturbed area to meet the continuing requirement of measuring the 'natural' background noise.

The Company members of the NTF expressed a desire to better understand the risks associated with not having a control site. They expressed doubts about the value of expanding the monitoring to include background 'natural' sound. They questioned whether the currently available control data have been fully analysed and suggested that measuring variability and cumulative exposure to background sounds, although of academic interest, would not necessarily contribute to meeting the practical analytical needs of the Company.

Nowacek responded that the importance of issues such as chronic noise exposure are becoming more widely recognised, and therefore having a control station that is relatively unaffected by noise from industrial activities is increasingly critical for state-of-the-art analyses. With regard to natural sounds, there is no way to determine what acoustic information is being 'missed' or 'lost' if no recordings are being obtained in conditions other than those dominated by industrial noise. In addition, a new station would aid in understanding how the underwater acoustic environment as a whole is changing, and this is especially

relevant to the issue of cumulative impacts, which is hard to address quantitatively under the best of circumstances but virtually impossible if comparative data are not available.

The NTF also considered potential locations for a proposed new control station. It was agreed that the location should be somewhere south of Piltun–Astokh and Lunskoye. Ideally, the new location would be identified using clear criteria, e.g. distance from shore, depth, presence of gray whales, presence of fishing nets, presence of fishing trawlers, which normally operate at depths greater than 50 m in these waters.

Several additional points were raised, one being that relevant MNR reports might exist that would inform decisions concerning control stations. It was suggested that this matter be investigated. In addition, if assuming that meteorological conditions at a new control station should be similar to those at the current site, meteorological data should be checked when deciding on a new site.

Given this discussion, the NTF agreed to the following recommendation:

Recommendation on the deployment and location of 'control' noise measurement stations

Rationale

This strategy provides the ability to compare and interpret the levels of noise created by the industrial activity in the Piltun area. The data should make it possible to frame the levels of acute and chronic exposure in the context of implications for stress from chronic exposure and behavioural changes from acute exposure to loud events. Several reports from the US National Research Council (1999, 2003, 2005) have recommended this basic approach to obtaining and using comparative noise data.

Objectives and rationale for retaining the existing 'control' site

Use of time series from the current 'control' site to track the overall increase in industrial noise at that site, i.e. the levels to which a whale in this area is exposed now versus its exposure in ~2000

Objectives and rationale for having intra-annual comparative noise measurements, i.e. a new 'control' site

- Comparison of noise conditions within a given year, e.g. what is vs would be the signal-to-noise ratio of a killer whale call at the mouth of Piltun lagoon. Broad-scale natural noise levels from storms, seismic events and ice cover vary from month to month and year to year, thus simultaneous measurements at industrialized and non-industrialized locations are indispensable.
- Calculation of cumulative noise exposure for a whale in the Piltun feeding area for a given time period requires simultaneous measurements at industrialized and non-industrialized locations. Comparison is not possible using 'pre-industrial' measurements at the existing 'control' site due to variability (e.g. daily, weekly) in background noise.
- Establish a new baseline for a non-industrialized area.

Deployment notes

- Proposed location of new control site – southern edge of the Sakhalin-3 'Kirinsky' block, in an area of bathymetry and bottom type similar to the Piltun area
- Deployment should be in depths between 20-40 m
- Analysis of ambient noise data is routine and not onerous analytically or financially.

5.3 Noise levels of boats used for whale observations

Recommendation WGWAP-13/006 calls for a study to "obtain representative noise signature measurements for the Sakhalin Energy Rigid Hull Inflatable Boat (RHIB) and Fast Response Cutter (FRC) jet-drive to determine whether the latter is considered suitable for use (from a noise perspective) in the photo-ID and biopsy work during 2013 and beyond (the RHIB will be the default choice until the noise signature measurements have been collected and reviewed by a small group identified for this purpose)."

The study was carried out under the Joint Programme and it was found that inflatables (RHIBs) with mounted 50 cc 4-stroke outboard engines were quieter by about 4 dB than waterjet-propelled launches (FRCs), although the FRCs were quieter at low frequencies. Sakhalin Energy has recently bought new platform supply vessels equipped with FRCs, which the Company prefers for, among other reasons, safety. The results of field study have not been assessed as intended by the recommendation and therefore the recommendation is still open. Though common sense dictates that quieter boats are preferable for approaching, observing, photographing or sampling whales, rigorous analysis of the tradeoffs between the two types of vessels requires carefully specified criteria for assessing the disturbance caused to whales by small boats and defining what kind of and how much disturbance is acceptable.

The NTF **agreed** that the current recommendation should be broken into two separate recommendations, one of which (concerning the field experiment portion) can be considered 'Closed – implemented satisfactorily' and the other of which (concerning review by a small expert group) should be considered 'Open – no action yet taken', at least until it can be considered 'Closed – superseded by a new recommendation' once the Panel has formulated such a new recommendation.

6 OTHER BUSINESS

6.1 Update on development of 'Effective Seismic Surveys: Modern Resource Guide for Managers'

Southall and Nowacek reported on progress with this IUCN publication. It involves a self-informing, sequential way of evaluating the operational area of seismic surveys, looking at risks, exposure criteria and mitigation, then conducting post-hoc analyses. It considers various processes in detail and provides a risk assessment framework. It draws on examples from different parts of the world but won't necessarily be applicable everywhere. The aim is to identify practices that are advocated or used, show examples, and summarize case studies where things are working well. The emphasis is on the process and the guide is not meant to be prescriptive about what approach is best. It should allow responsible consideration of the different issues that need to be considered to implement a seismic survey responsibly and safely, especially in terms of preventing or limiting environmental impacts. Links to the International Finance Corporation (IFC) Performance Standards on Social and Environmental Sustainability (2012) are included. The work has been carried out in close cooperation with IUCN and it will soon be reviewed by academics, regulators and industry practitioners. Relevant Panel members would be included in the review process.

An Annex will be included, with links to as many regulatory documents as possible. This will be a resource to help readers find documents that are needed in different parts of the world. Ideally, they will be able to quickly find the necessary tools and discover what works best in their jurisdiction. The idea is to keep the Annex up-to-date as a database. The guide will be published and the Annex will be available online and regularly updated.

Production as an IUCN publication necessitates strict peer review, which will begin immediately after submission of a complete draft. The intention is for the document to be launched at the IUCN World Conservation Congress in September 2016, preferably during a short, effective event of some kind[2].

[2] https://www.iucn.org/news/turn-down-volume-new-iucn-guide-helps-navigate-seismic-survey-impacts-marine-species

6.2 Update on the status of Russia/UNDP industry guidelines for monitoring and mitigation

Carbone reported that there had been a productive meeting about these guidelines with Russian government and UNDP representatives and that the details of a United Nations Development Programme (UNDP) and IUCN collaboration to refine the draft guidelines were being worked out. She also noted that representatives of the Russian government and UNDP were planning to participate actively in the IUCN World Conservation Congress in September 2016.

6.3 Other potential publications and updates

Blonk proposed that an article be prepared for publication in a geophysical journal, consisting of a concise account of the 2015 P-A seismic survey from planning through to acquisition, data processing and interpretation. In his view, such an article would be useful in terms of informing Sakhalin Energy shareholders, as well as geophysicists engaged in similar work, of the efforts made by the Company to monitor and mitigate the potential effects of the survey on the gray whales while still managing to obtain the desired technical data to meet business needs. Blonk was encouraged to proceed with such an effort. Several participants stressed that it would be important, however, for the article to be objective and critical, covering not only the aspects that went smoothly but also those that need improvement. It was **agreed** that Blonk could prepare and circulate an outline of his proposed article for consideration at the next NTF meeting.

Racca drew attention to another recent publication (Ellison *et al.* 2016), a case study of the cumulative exposure to noise of whales passing through multiple offshore operations' sites. The paper, which Racca was asked to circulate to all NTF members, presents a new paradigm: it makes an effort to combine information from multiple operators and estimate exposure over long time periods from limited operational data. It was agreed that the approach is worth consideration by the NTF and by WGWAP.

7 REFERENCES

Ellison, W., Racca, R., Clark, C., Streever, W., Frankel, A., Fleishman, E., et al. 2016. Modeling the aggregated exposure and responses of bowhead whales *Balaena mysticetus* to multiple sources of anthropogenic underwater sound. Endangered Species Research 30:95-108

Gailey, G., Sychenko, O., McDonald, T., Racca, R., Rutenko, A. and Bröker, K. 2016. Behavioural responses of western gray whales to a 4-D seismic survey off northeastern Sakhalin Island, Russia. Endangered Species Research 30:53-71.

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ANNEX A – LIST OF PARTICIPANTS

Justin Cooke (WGWAP)
Bastian Blonk (Sakhalin Energy)
Mike Donaghy (MDA/Sakhalin Energy)
Greg Donovan (WGWAP)
Jonathan Hancox (Ramboll Environ)
Stephanie Lock (Sakhalin Energy)
Douglas Nowacek (WGWAP)
Roberto Racca (Sakhalin Energy/JASCO)
Randall Reeves (WGWAP)
Brandon Southall (WGWAP)
Andrey Samatov (Sakhalin Energy)
Grigory Tsidulko (WGWAP)
Alexander Vedenev (WGWAP)
David Weller (WGWAP)

IUCN

Anete Berzina
Giulia Carbone
Simon Delany (Rapporteur)

Interpreters

Alexander Danilov
Grigory Shkalikov

Apologies: Natalya Tsarenko (Sakhalin Energy)

ANNEX B – AGENDA

1 INTRODUCTORY ITEMS (CHAIR, IUCN, LOCK)

1.1 Introductions and logistics

1.2 Adoption of agenda

1.3 Available documents/materials

2 PROGRESS WITH ANALYSES OF DATA FROM THE 2015 SEISMIC SURVEY(S)

2.1 Available data and information

2.1.1 Data collected during the 2015 season with emphasis on the period of MMP implementation (Sakhalin Energy) NTF-10/4, NTF-10/7

2.1.2 Information on the ENL MMP (IUCN)

2.1.3 Progress with a possible expert group made up of scientists from Sakhalin Energy and ENL (Sakhalin Energy)

2.2 Results and/or progress update of analyses recommended at NTF-9/WGWAP-16

2.2.1 Acoustic data (Sakhalin Energy) NTF-10/6, NTF-10/5, NTF-10/3

2.2.2 Implications of change of rule re: behavioural shutdowns and shooting lines at night (Sakhalin Energy)

2.3 Proposed analyses

2.4 Conclusions and recommendations

3 UPDATE ON PLANS FOR A POSSIBLE FUTURE OCEAN BOTTOM NODE SURVEY

3.1 Discussion of technological options and implications for whales NTF-10/1

3.2 Timeline for decision making with respect to the next seismic survey NTF-10/1

3.3 Workplan for development of a Monitoring and Mitigation Plan (MMP)

4 GENERAL ISSUES REGARDING SEISMIC SURVEYS

4.1 Consideration of strategies for simultaneous or same-season surveys

4.2 Safety zones and source shut downs

5 NON-SEISMIC RELATED ACOUSTIC ISSUES

5.1 Presentation on automated processing for detection of anthropogenic noise episodes (Racca) NTF-10/2

5.2 Highlights from 2015 Acoustic Report (Sakhalin Energy) NTF-10/3

5.3 Other noise issues beyond the ongoing matters related to seismic surveys

6 OTHER BUSINESS

6.1 Update on development of 'Effective Seismic Surveys: Modern Resource Guide for Managers'

6.2 Update on the status of Russia/UNDP industry guidelines for monitoring and mitigation

6.3 Other potential publications and updates

7 ADOPTION OF REPORT

ANNEX C – LIST OF DOCUMENTS

Document #	Title	Language	Status
Primary documents / pre-reads			
NTF-10/1-EN NTF-10/1-RU	Overview Plans for Sakhalin Energy's Future 4D Seismic over Piltun-Astokhskoye – Part 2: Summary note submitted by B.Blonk, Sakhalin Energy on technology options, implications and timelines / Общие планы по будущей четырехмерной сейсмосъемке Пильтун-Астохского месторождения – Часть 2 (agenda items 3.1 & 3.2)	English/ Russian	Confidential
NTF-10/2-EN NTF-10/2-RU	Summary note on automated processing for detection of anthropogenic noise episodes / Сводный обзор по автоматической обработке для обнаружения эпизодов антропогенного шумового воздействия (agenda item 5)	English/ Russian	Confidential
NTF-10/3-EN NTF-10/3-RU	4D Seismic Survey Acoustic Monitoring at Piltun-Astokhskoye Hydrocarbon Field in 2015, Sakhalin Island, Russian Federation (report by Dr. A.Rutenko et.al. / POI FEB RAS) / Акустический мониторинг 4-D сейсморазведки на Пильтун-Астохском углеводородном месторождении в 2015 г.о. Сахалин, Российская Федерация (А.Н. Рутенко и др. /ТОИ ДВО РАН) (agenda item 2.2.1)	Russian / English	Confidential
NTF-10/4	Feedback from the Panel on the preliminary 2015 seismic data (quantitative) summary shared by Sakhalin Energy in February 2016 (Rec. WGWAP-16/02) (agenda item 2.1.1)	English	Public
NTF-10/5	Intersessional feedback from the Panel on a proposal for the SEL calculations (per Rec WGWAP-16/03) (agenda item 2.2.1)	English	Public
NTF-10/6	Calculations of 5-min averaged sound exposure level (SEL) in the WGW feeding area for the given frequency bands: Excel tables & graphs by Dr A.Rutenko / POI FEB RAS (Rec. WGWAP-16/03) (agenda item 2.2.1)	English / Russian	Confidential
NTF-10/7	Note on the quantity and quality of data available for the 2015 Sakhalin Energy seismic survey (April update since February 2016) (agenda item 2.1.1)	English	Confidential
WGWAP-16/ Report	WGWAP-16 report	English	Public
NTF-9/Report	NTF-9 report	English	Public