Приложение 3

Appendix: Excerpts from reports by the Western Gray Whale Advisory Panel and predecessor panels regarding the potential significance of Piltun Lagoon to the productivity of gray whale feeding areas near offshore development projects "Sakhalin I" (operated by Exxon Neftegas Ltd. [ENL]) and "Sakhalin II" (operated by the Sakhalin Energy Investment Company [SEIC]):

1. Report of the Independent Scientific Review Panel (ISRP) on the Impacts of Sakhalin II Phase 2 on Western North Pacific Gray Whales and related biodiversity. February 2005. www.iucn.org/themes/marine/sakhalin/isrp/

A. From the Executive Summary:

Section 3.3 ("Oil Exposure"): "A spill or release of oil in or near Piltun Lagoon also is a major concern because it could alter the ecological processes that maintain the Piltun (nearshore) foraging area where female gray whales nurse and wean their calves. This concern applies to both Sakhalin II and Sakhalin I, which includes plans for a pipeline crossing of the lagoon itself."

Section 3.4 ("Physical Disturbance"): "In the present context, any disruption of exchange mechanisms between Piltun Lagoon and the Piltun (nearshore) foraging area is a special concern."

Section 4 ("Information gaps and essential monitoring"): "With regard to the potential effects of noise, collisions, oil and gas spills and habitat destruction, research and monitoring are needed to characterize both the risk factors and the dependent variables (i.e. whale, prey or habitat response). Due to uncertainty regarding potential effects and their detection, monitoring and research efforts will require careful and rigorous design to ensure that there is a high probability of detecting changes in demography that will have a significant effect on the recovery of the population. The Panel's review identified the following general areas for future research, including some that will require annual monitoring and some that will depend on circumstances (e.g. in the event of a spill):"

[The list includes the following points]:

"• Investigation of the ocean dynamics (currents, tides, winds) in the vicinity of Sakhalin II, the Piltun (nearshore) and offshore feeding habitats, and the Piltun Lagoon; *inter alia* this will allow for better modelling of the dynamics of oil spills and improved response strategies.

• Investigation of the ecology of Piltun Lagoon and the nearshore foraging area, and the links between them; *inter alia* this will provide a more secure basis for evaluating the likely risks to gray whales and their prey and better inform decisions on siting pipelines and other infrastructure and activities."

[The above two points are repeated in the main body of the Report on p. 96]

Section 5 ("The need for a comprehensive strategy to save western gray whales and their habitat"):

"A comprehensive, international strategy (including research) is essential for saving this whale population. The Panel recognised the need for a comprehensive strategy that addressed not only oil and gas development, but also other threats to the population. The results of population modelling (Chapter VII) showed that quite small impacts on the animals or their habitat, if they are persistent, could lead to the population's extinction. A piecemeal approach, based on assessment of the impacts of one development project at a time, will not adequately address the western gray whale conservation problem, because the accumulated total of impacts may prevent recovery of the population even if the impact of each project can be limited to apparently acceptable levels. The survival of the population cannot be assured without a protection regime for the nearshore feeding habitat, aimed at limiting the combined impact of all current and future developments (including but not limited to oil and gas developments) on this habitat and the whales feeding there."

B. From the main body of the report:

Section 3.1.2.5 (p. 52): "The possibility that spilled oil could enter Piltun Lagoon raises considerable concern. Circumstantial evidence suggests that organic detrital effluent from Piltun Lagoon is an important source of food for benthic communities outside the lagoon. This possibility may explain the fidelity of gray whales to the Piltun foraging area. Should spilled oil alter the lagoon such that detrital effluent is curtailed, the consequences for the gray whale population could be catastrophic. In concept, such a scenario could be investigated using appropriate field research methods. Without such studies, the effects of this and other plausible scenarios about indirect effects cannot be evaluated."

Section 4.1 (pp. 65-66): "Dobrynin *et al.* (2004) speculated on the processes that form the broad Piltun zone of fine sand and the high productivity of the area. They suggested that the export of terrigenous material from Piltun Lagoon, specifically in spring when wave activity in the surrounding sea is limited by remaining sea ice, is one key factor. The nearshore eddies developing in the area apparently capture the particles and concentrate, redistribute and deposit them over an area to the east and north of Piltun Lagoon. The same processes may determine the export and retention of particulate organic matter that settles in that region."

"As noted in section 3.1.2.5, transport of detrital effluent from Piltun Lagoon to adjacent benthic habitats outside the lagoon may be fundamentally important in understanding the persistent use of the Piltun feeding area by gray whales."

[Reference: Dobrynin, D.V., Dementiev, M.N., Krasilnikov, E.A., Saleliev, A.A., Spiridonov, V.A. and Zeits, M.A. 2004. Western Pacific gray whale habitat: Physical structure revealed by remote sensing and necessary measures for protection. Unpublished

Report. Remote Sensing Laboratory, Soil Science Faculty, Moscow State University. 14pp.]

Chapter 6, section 1 (p. 74): "The dangers of ship collisions increase incrementally with each additional vessel operating in waters inhabited by gray whales, as do the dangers of oil and gas spills with additional platforms and pipelines, of noise disturbance with additional construction and oil and gas production, and of habitat degradation with expanding development of all kinds on and near the northeastern Sakhalin Shelf. Exxon's plan to dredge and install a pipeline across Piltun Lagoon to transport oil from Sakhalin I is an obvious example. If such dredging is undertaken and it alters water and nutrient flow out of the lagoon, or if oil is spilled into the lagoon from a pipeline, it could add significantly to the risk of habitat degradation in the nearshore foraging area near and immediately north of the mouth of the lagoon."

Chapter 8, section 4 (p. 96): "In addition, a spill or release of oil in or near Piltun Lagoon is a major concern because it could alter the ecological processes that maintain the Piltun (nearshore) foraging area where female gray whales nurse and wean their calves. This concern applies to both Sakhalin II and Sakhalin I, which includes plans for a pipeline crossing of the lagoon itself."

Annex D (p. 107): "In both 2001 and 2002, amphipod and isopod crustaceans showed highest densities in areas immediately adjacent to the single entrance to Piltun Lagoon. Such patterns suggest an important role for export of benthic nutritional resources from the lagoon proper to the adjacent offshore waters used for feeding by gray whales."

2. Report of the Interim Independent Scientists Group (IISG) Review Panel (ISRP) on Mitigation Measures to Protect Western Gray Whales during Sakhalin II Construction Operations in 2006. April 2006.

Section on Long-term Environmental Monitoring (LTMP): "Here we suggest attributes of LTMPs for the two known feeding areas ("Piltun" and "Offshore") for western gray whales off northeastern Sakhalin Island, and for benthic communities within Piltun Lagoon. Lagoon monitoring is strongly encouraged because of the persistent proximity of the primary feeding area for western gray whales to the Piltun Lagoon entrance channel. This pattern is consistent with the hypothesis of a functional ecological linkage between Lagoon biota and gray whale feeding location. Where appropriate, we provide suggestions for LTMP attributes in both spatial and temporal contexts.

"Primary questions
Two primary questions must form the basis for LTMP implementation in the gray whale feeding areas and in Piltun Lagoon:

"1. How will pollution events such as oil spills, occurring in association with Sakhalin II activities, influence the structure and dynamics of marine benthic communities of

significance to the nutrition of the western gray whale population? How will such effects be distinguished from natural variation in the ecosystems of the Okhotsk Sea region?

"2. How will events such as pipeline or platform construction that produce physical alteration of natural habitats, occurring in association with Sakhalin II activities, influence the structure and dynamics of marine benthic communities of significance to the nutrition of the western gray whale population? How will such effects be distinguished from natural variation in the ecosystems of the Okhotsk Sea region?

"Existing Studies and Data
Studies of benthic communities in the western gray whale feeding areas have been conducted annually since 2002. A data set of high quality, incorporating a number of relevant and important target variables, has resulted. Collectively, the existing data provide a comprehensive basis for initiation of LTMP work in the feeding areas.

"Field survey work was conducted on benthic communities within Piltun Lagoon in September 2002. Document 15 summarizes data collected in 2002, and provides a synthesis of relevant data collected in the Lagoon prior to 2002. Data available on Lagoon benthos are not as comprehensive as those collected in recent years in the feeding areas, but nevertheless are substantial and useful in planning LTMP work in the Lagoon. The historical data sets available on Lagoon biota are valuable in the context of understanding long-term trends in ecosystem structure and function.

"Suggestions regarding target variables and species
We suggest that the following variables, or classes of variables, should be the primary target variables for LTMP effort in the whale feeding areas. Selection of variables is based primarily on established data sets described in IISG Document 13-D.
Density and biomass of sampled animal species
Size distributions for dominant animal species
Fecundity patterns in dominant animal species
Sediment grain size distributions
Sediment total organic carbon fraction by mass
Sediment petroleum hydrocarbon residues by mass

"Based on data collected to date, we suggest the following, at a minimum, as species of particular interest in whale feeding areas, because of overall abundance and because of likely inclusion in gray whale diet.
Amphipoda
Pontoporea affinus
Eogammarus schmidti
Ampelisca spp.
Isopoda
Synidotea cinerea
Saduria entomon
Cumacea
Diastylis spp.

"The above species should be considered for monitoring size distributions and fecundities. All are pericarid crustaceans, in which females have a marsupium bearing relatively large, easily enumerated eggs or recently hatched juveniles, counts of which can provide a fecundity index and information on seasonality of reproduction. Along with data for density and biomass, information on size distribution and fecundity of dominant species will provide additional insight into population dynamics that may be sensitive to impacts from Sakhalin II, and relevant to the foraging ecology of gray whales.

"Suggestions regarding methods

Piltun Lagoon

Lagoon benthic communities are dominated by large stands of plants, such as the seagrass *Zostera spp*. and the pond weed *Potamogeton perfolatus*, and by bivalve mollusks and amphipod crustaceans. Mean water depth in the Lagoon is < 3 m, and sampling must be done from small vessels. Quantitative benthic sampling of high quality will require use of coring devices that can be deployed effectively from small craft such as skiffs, or that can be operated by divers. We suggest that documentation of the extent and dynamics of large plant stands will be most effectively done by application of remote sensing methods, supported by sampling of plant biomass densities in the field, to allow estimation of total plant biomass on larger scales.

"*Piltun Lagoon Entrance Channel*

The transport of organic material from Piltun Lagoon to the adjacent offshore whale feeding areas may have substantial importance in sustaining the productivity of whale prey in the offshore grounds. We encourage the development of methods to monitor rates of transport of organic materials from inside the Lagoon to the adjacent offshore waters. Sampling should focus on phytoplankton, zooplankton, and various categories of detritus transported offshore, recognizing that dominant planktonic and benthic species in the Lagoon are generally different from those occurring offshore. An effort should be made to sample transport processes among seasons to the extent feasible, as ecologically significant transport periods may be temporally decoupled from whale feeding activity

"**Suggestions Regarding Sampling Design**

The determination of whether to sample repeatedly over time in the same location, or to place samples in newly randomized locations for each sampling effort, requires evaluation of costs and benefits. Newly randomized sample locations for each sample interval maximize the spatial scale of inference when data are interpreted. However, when randomly placed samples encompass multiple habitat patch types, variance in the data is typically increased, and the statistical power to detect trends in the data is reduced. In contrast, sampling at permanent locations repeatedly over time typically reduces variance in patchy habitats and increases the power to detect trends over time, but also reduces the spatial scale of allowable inference in data interpretation. We recommend the latter approach because of the value we see in high power to detect trends. In both approaches, variance and power can be manipulated by stratification. Inferential strength also is improved if the initial selection of permanent sample locations is random.

"Determination of minimum detectable change is an arbitrary decision, but it must be tempered by the realities of the variance structure in the data. Assuming that high power for detection of trends over time is a primary goal in LTMP design, desirable qualities of sample data include low variance, high replication, and small sampling interval. The attainable level of minimum detectable change emerges analytically from patterns of variance, replication, and sampling interval. In the case of both the feeding areas and Piltun Lagoon, field conditions likely constrain sampling interval to once per year in general. Logistical considerations also likely influence the number of replicate samples that can be gathered at a given location during a sample time step. We recommend that minimum levels of detectable change be set at 25% for total benthic animal biomass, and at 50% for species that are dominant community members, such as those listed above. With target values for minimum detectable change specified, it is then possible to compute the minimum number of replicate samples per sampled site per year that must be collected. If desirable levels of replication are not feasible and multiple sample series within years are not possible, then minimum detectable changes in data time series are forced to larger values. We strongly encourage LTMP designers to make a maximum effort to attain replication levels necessary for the specified levels of minimum detectable change, ensuring adequate power to detect trends in benthic animal data.

"*Piltun Lagoon*
For Lagoon sampling, we suggest pre-sampling stratification by dominant plant type or by dominant sediment type. Post-sampling stratification can be considered by animal assemblage type.

"We do not have recommendations for minimum detectable change levels in assessments of large plant stands based on remote sensing methods, because of lack of availability of indices of variance over time in stand extent in the Lagoon. We suspect that properly implemented remote sensing methods for plant stand size estimation will produce data sets with low variance and high consequent power to detect trends, potentially supporting the ability to establish small values for minimum detectable change."

3. Report of the Western Gray Whale Advisory Panel (WGWAP) at its First Meeting. November 2006.
http://www.iucn.org/themes/marine/pdf/wgwap/WGWAP%201_3%2021%2011%2006.pdf

Section 11 ("Environmental Monitoring"): "The IISG report encouraged the development of Long Term Monitoring Plans (LTMPs) for benthic communities in the two known WGW feeding areas ('Piltun' and 'Offshore') and within Piltun Lagoon. It made a number of recommendations for the design of LTMPs in these areas. Lagoon monitoring was strongly recommended because of the persistent proximity of the primary whale feeding area to the Piltun Lagoon entrance channel, and the suspected enhancement of benthic productivity in the Piltun feeding area as a result of detrital effluent from the lagoon.

"Responses of Sakhalin Energy to the IISG recommendations for benthic monitoring were summarized in WGWAP 1/INF.13 and additional relevant material can be found in WGWAP 1/INF.29. Fadeev presented an overview of benthic studies supported by Sakhalin Energy on the NE Sakhalin Shelf, and during the meeting he provided comments to the Panel regarding the IISG recommendations. Except as noted below, there was general concurrence between the IISG recommendations and the company's LTMP plans. WGWAP 1/INF.13 identified documents from previous years describing benthic communities on the NE Sakhalin shelf and in Piltun Lagoon.

"Sakhalin Energy's objections to development of an LTMP in Piltun Lagoon are based on the premise that Sakhalin II project activities are not likely to influence the lagoon ecosystem. The Panel recognizes the spatial separation of Piltun Lagoon from Sakhalin II activities, but nevertheless continues to **recommend** studies of the linkage of Lagoon biota and detrital output with WGW feeding areas. The Panel's view on this matter is driven by the potential linkage among areas by detrital transport and the potential for anthropogenic modifications of the lagoon ecosystem. The Panel recognizes the logistical challenges and potential costs of maintaining an effective LTMP in Piltun Lagoon, given its size and physical complexity and the spatial variation in within the lagoon ecosystem. It is **recommended** that Sakhalin Energy focus on measurements of quality and quantity of detrital transport from the Lagoon to whale feeding areas. Primary goals for study of detrital transport should be: identification of source species contributing to detrital mass, stable isotope signatures for detritus transported from the Lagoon to whale feeding areas, and interannual variation in quality and quantity of transported detritus.

"The Panel **recommends** that Sakhalin Energy researchers take the following concepts into account as they proceed to develop LTMPs of benthic communities in the whale feeding areas:

> (a) LTMP design should reflect consideration of possible spatial and temporal separations in processes important to benthic community structure, dynamics and productivity. Detritus transport connections between Piltun Lagoon and the whale feeding areas are an example of spatially distinct processes that could be important to whale food availability. Effects of winter and spring sea ice cover and movement on subsequent patterns and productivity of benthos provide examples of potentially important processes that are temporally disjunct."

4. Report of the Western Gray Whale Advisory Panel (WGWAP) at its Second Meeting. April 2007.
http://www.iucn.org/themes/marine/sakhalin/meeting_april07/WGWAP%202%20-%20FINAL%20Report%20-%2010%20May%2007%20(2).pdf

Section 15 ("Whale Monitoring by Non-Sakhalin Energy Groups"): "The present WWF proposal for a nature reserve is not sufficiently developed for further scientific or technical comment by the Panel. However, the Panel **encourages** the continued development of any proposal that may contribute to improved conservation of the

western gray whale population. The Panel supports efforts that include protection of Piltun Lagoon from industrial development and other types of anthropogenic disturbance [WGWAP 2/021]. In previous reports the Panel and its predecessors (ISRP, IISG) have stated strong support for protection of both Piltun Lagoon and the nearby gray whale feeding area. In that regard, the Panel continues to have concern over any plans for a pipeline to be constructed across the northern part of the lagoon with potential for damaging/degrading the lagoon and surrounding land."

5. Report of the Western Gray Whale Advisory Panel (WGWAP) at its Third Meeting. November 2007.
http://www.iucn.org/themes/marine/pdf/wgwap/WGWAP%203%20Report%20Final%20%2021%2012%2007doc.pdf

Section 6 ("Oil Spill Prevention, Preparedness and Response"): "***Ecological monitoring of Piltun Lagoon and feeding area***—At virtually all steps in the review of Sakhalin II, Phase 2, WGW panels have highlighted the importance of Piltun Lagoon and the Piltun feeding area to the conservation of WGWs. In particular, the panels have recommended rigorous, systematic collection of baseline information from both areas to provide an adequate baseline for measuring the effects of oil and gas operations, including in the event of an oil spill. The Panel **reiterates** that recommendation [WGWAP 3/015].

"Restoration of lagoons, wetlands, beaches and dunes—The value of the Piltun area as a feeding ground for the WGW population is based on ecological links of wetlands, lagoons and shallow-water nearshore environments. If a spill occurs, much of the nearshore environment could be damaged by response activities, with long-term adverse effects on the ecology of the feeding area and thus on gray whale foraging, demography and recovery. For that reason, the Panel **recommends** that any damage to the wetlands, lagoons, beaches and dunes of the Piltun ecosystem be addressed by restoration efforts as soon as possible following spill response activities [WGWAP 3/023]."