

EXECUTIVE COUNCIL

CONFIDENTIAL

Title of Report: Review of the Environmental Impact Statement produced by Argos Resources Ltd for offshore exploration and appraisal drilling

Paper No: 215/11

Date: 28 September 2011

Report of: Chief Executive/Environmental Planning Officer

1.0 Purpose

1.1 To consider an Environmental Impact Statement (EIS) submitted by Argos Resources Ltd in respect of its licensed area (PL001) in the North Falkland Basin.

2.0 Recommendations

- (a) Honourable members recommend HE the Governor to approve the EIS for exploration drilling prepared by Argos Resources Ltd, subject to the submission of a project-specific Oil Spill Contingency Plan, Waste Management Plan and a detailed Operational Addendum containing details of the drilling contractor, drilling unit, location and number of wells to be drilled, together with dates of operation;
- (b) The Oil Spill Contingency Plan referred to in (a) revisit the Oil Spill Modelling section of the EIS with regard to the base data and assumptions employed.
- (c) A notice of receipt of the Operational Addendum be published in the Gazette, and that the Mineral Resources Committee be given authority to approve this document; and
- (d) The external review undertaken by the Scottish Association for Marine Science and the submissions from Falklands Conservation, JNCC and DECC be made available to the public, together with Argos Resources Ltd response.

3.0 Financial Implications - None

4.0 Background

4.1 A consortium which included Argos Resources was awarded Production Licence PL001 by the Falkland Islands Government on 2 June 1997. The

consortium acquired seismic data and drilled two wells within the licence area in 1998. Amerada Hess and the other group members, except Argos, subsequently withdrew from the licence leaving Argos with 100% equity.

- 4.2 Argos entered the second phase of its exploration licence in November 2008. As part of this second phase, Argos plan to drill up to four exploration wells in PL001 situated in the North Falkland Basin. The nearest landfall to the exploration area of interest is situated at Cape Dolphin on East Falkland Island, approximately 210 kilometres due south.
- 4.3 In May 2011 Argos submitted an Environmental Impact Statement (EIS) which provides an assessment of the potential environmental impacts associated with the proposed drilling, together with mitigation and management measures and a description of any residual impacts to the environment. The assessment utilises a study of the baseline environment, together with a description of the proposed operations, in order to assess the risk of impacts occurring.
- 4.4 The Non-technical Summary of the EIS is attached as Appendix 1.

5.0 Summary of EIS

- 5.1 Argos plan to drill up to four wells using the semi-submersible drilling rig Ocean Guardian. Under the current schedule, drilling is scheduled to commence in Q4 2011. It is anticipated that the rig will be on location for up to 176 days (44 days for each well). This assumes that each well will make a discovery and will be tested. Following drilling, irrespective as to whether hydrocarbons are identified, each well will be plugged and abandoned in accordance with Oil & Gas UK guidelines.
- 5.2 All chemicals to be used during the drilling have been selected to minimise the potential environmental impacts as much as possible. The vast majority (by volume) of planned chemicals are naturally occurring products (e.g. barite) that are either biologically inert or readily dispersible or biodegradable. Other chemicals are selected based on drilling performance and environmental acceptability to ensure low toxicity and high biodegradability.
- 5.3 The macrofauna and benthic environment of the proposed drill areas are not fully estimated in the study but, from the estimation of potential impacts on seabed faunal communities, the developer does not consider them to be sensitive.
- 5.4 The licence area is identified as a spawning area for several key commercial fish species, namely *Illex argentinus* and hake. The area is considered to be of high sensitivity for several species of cetaceans and a high number of albatross, petrel and shearwater species are identified as being present or migrating through the area at different times of the year. Four penguin species have also been observed feeding in the vicinity of the proposed drilling area.
- 5.5 The key environmental risks associated with the proposed drilling programme include drill cuttings disposal, waste disposal and use of resources (i.e. fuel and potable water). The results of the impact assessment indicate that the

majority of impacts from the proposed drilling operations will be negligible to moderate and mostly undetectable shortly after drilling is completed.

- 5.6 The developer has concluded that the highest risk of pollution during the drilling programme is from large oil spills and acknowledges that a major oil spill following a blowout may have a major impact on offshore seabirds. Oil spill modelling undertaken indicate that there is a 0.9 to 2.6 percent probability of oil beaching in the event of a well blowout under typical weather conditions. Diesel spills will not impact the coastline and offshore wildlife is likely to be affected only in a close proximity to the spill. The developer states that these events are highly unlikely and can be effectively controlled through prevention, preparedness and response.
- 5.7 Several trajectory and stochastic oil spill scenarios were modelled at various hypothetical locations in the licence area, and between Stanley and the licence area to reflect potential supply vessel spills. Once the exact location of wells is known the model will be re-run and results included in an Operational Addendum to be submitted later in the year.
- 5.8 The scenarios undertaken used the residual surface current speed and direction observed in the vicinity of PL001. For the trajectory modelling, a 30 knot onshore wind was chosen to represent a worst case scenario. For the stochastic modelling scenarios, the wind rose from the drilling rig *Borgny Dolphin* recorded between May 1998 to November 1998 were used for the oil spill modelling, as this was thought to be representative of actual wind speed conditions that may be experienced in the PL001 area.
- 5.9 Modelling of a well blow out at the North-east location with a worst case 30 knot onshore wind indicated that approximately 300 tonnes of oil would impact the coast of Cape Bougainville after 134 hours (5.5 days). However, when the stochastic model is run under typical weather conditions, the modelling results suggest that there would be a 0.9 percent probability of the oil spill slick beaching at Cape Bougainville and Jason Islands after 164 hours (6.8 days).
- 5.10 Modelling of a well blow out at the South-east location with a worst case 30 knot onshore indicated that approximately 370 tonnes of oil would impact the coast of Cape Bougainville after 122 hours (5 days). However, when the stochastic model is run under typical weather conditions, the modelling results suggest that there would be a 2.6 percent total probability of the oil spill slick beaching at Cape Bougainville and Jason Islands after 153 hours (6.4 days).
- 5.11 Modelling of a full inventory loss of diesel fuel aboard the drilling rig (1,108 tonnes), and an operational release of diesel (10 tonnes) for both release locations indicated that that a 1,108 tonne diesel spill would disperse after 9 hours at a distance of 117 kilometres to the south-east of the rig, whereas the loss of 10 tonnes of diesel would fully disperse within 1 hour.
- 5.12 The EIS concludes that the beaching probabilities under typical weather conditions are considered to be low and therefore are unlikely to occur.

5.13 The potential impacts of the proposed drilling activity will be mitigated in a number of ways, including:

- Maintaining a spirit of openness and ongoing consultation with the Falkland Islands Government (FIG), the public and key stakeholders;
- Applying established UK standards to operations, particularly in offshore chemical use and emissions reporting;
- Using water based drilling muds and low toxicity chemicals approved under the UK Offshore Chemical Notification Scheme;
- Implementing a high level of environmental management offshore and applying environmental procedures for potentially impacting operations (chemical storage, bunkering, waste handling, maintenance programmes, benthic surveys etc);
- Implementing a Waste Management Plan to minimise the quantity of waste going to landfill, prevent unsuitable disposal of waste, maximise the re-use of materials; and
- Establishing and implementing a project specific Oil Spill Contingency Plan and conducting training of key personnel in oil spill response. Argos plans to become a member of OSRL prior to drilling, which provides assistance in the case of a major spill. The Oil Spill Contingency Plan will be submitted to FIG for approval prior to commencement of the drilling operations.

5.14 The key environmental risks associated with the proposed drilling programme include drill cuttings disposal, waste disposal and use of resources (i.e. fuel and potable water). The highest risk of pollution during the drilling programme is from large oil spills, which it considers to be a highly unlikely event which can be effectively controlled through prevention, preparedness and response.

5.15 The EIS concludes that, despite the high sensitivity and international importance of the Falklands Islands' waters, there is clear dedication to carrying out these operations to a high environmental standard. It goes on to state that "given the current operational commitments and proposed mitigation measures, it is considered that the proposed operations can be undertaken without significant impacts to the Falkland Islands' environment".

6.0 Review of EIS and Public Consultation

6.1 As with previous EIS's received in connection with the current round of offshore exploration and appraisal drilling, the Environmental Planning Department commissioned the Scottish Association for Marine Science (SAMS) to undertake an external review. SAMS also undertook similar reviews in association with the 1998 offshore drilling round.

6.2 The EIS was also placed on deposit for 42 days during May and June 2011. Three sets of detailed comments were received; from Falklands Conservation

(FC), the JNCC ACAP officer (JNCC) and the UK Department of Energy and Climate Change (DECC).

- 6.3 SAMS submitted its review in early June 2011 and a copy was duly sent to Argos Resources. The consultants acting on behalf of Argos have made a full response to all the points raised by SAMS, as well as the comments submitted by Falklands Conservation, JNCC and DECC.
- 6.4 In its review SAMS has made a number of comments which it believes, if accepted, would significantly improve the EIS. Some of these concern minor corrections, including the use of correct scientific names, while others concern errors, misinterpretations and omissions which, if addressed, should be improve the quality of the EIS.
- 6.5 In its response, Argos has taken the opportunity to reference additional research and put more information into the public domain to address specific points raised by SAMS, FC, JNCC and DECC. The company also acknowledge that, prior to any oil and gas development, further research may be required to expand the limited knowledge base in some areas. It believes that this additional information is not required at present due to the limited duration of the exploration drilling programme.
- 6.6 The following section highlights the key areas commented upon by SAMS, FC JNCC, DECC and the response provided by Argos. The full details of comments received and responses from Argos Resources can be found in appendix two and three (attached).

Data acquisition

- 6.7 At various stages of review SAMS, FC, JNCC and DECC question the references and data used in the EIS by Argos. Notably they cite the estimation of sensitive seabird and marine mammal areas as an issue and concern. All four organisations question the data gaps which remain in estimating important areas for wildlife, as well as the risks to them from hydrocarbons exploration.
- 6.8 Argos acknowledges the limitations of the data sources used in this EIS. It argues that due to the short drilling period and low spill risk associated with this project, the impacts arising as a result of the exploration operations will be short-term, and ultimately have a negligible impact on the environmental resources of the area.
- 6.9 Argos go on to comment that the data used throughout the EIS gives an indication as to the distribution of species, which it considers sufficient to show that species of high risk to oil and disturbance (such as seabirds and marine mammals) are of low number in the proposed exploration area. Mitigation measures have been proposed in section 5 of the EIS, to reduce the risks associated with drilling operations and ensure that all impacts are reduced to ALARP (as low as reasonably practical).
- 6.10 Argos intends to produce an Addendum to the EIS which will further detail the impacts relating to the proposed drilling months for the exploration wells.

Where possible, data on seabird vulnerability will be supplemented with available data from the various satellite and geolocation tracking studies that have recently been undertaken in the Falkland Islands. However, Argos points out that although the satellite tracking data is available, the authors of the tracking data have expressed serious concerns over the sample size of the data.

Standard Information Sheet and Non-Technical Summary

- 6.11 Minor details within the standard information sheet and non-technical summary concerning the area of interest and scope of the project are commented upon by both FC and JNCC. In its response Argos has agreed to provide further details in the Addendum to be submitted for approval prior to drilling.

Well Testing

- 6.12 DECC question the amount of oil to be tested if the operator encounter hydrocarbons and decide to bring oil to the surface at any of the wells for testing with associated flaring.
- 6.13 In its response Argos has said that testing would take place over 14 days (not 16 as stated in the EIS), and that this is the total time for all well test operations using a worse case estimate based on the recent well testing operations by Rockhopper Exploration. Argos has stated that well testing operations will be clarified in the Operational Addendum to the EIS. In addition, in the event of a significant discovery and subsequent well test, a brief justification document will be prepared outlining well testing operations and assessing possible environmental impact from atmospheric emissions.

Section 3.3.6 Drilling Muds

- 6.14 DECC question the disposal of drilling muds and associated chemicals and also the use of some specific lead-based chemical products.
- 6.15 Argos has responded by saying that this section may have been misunderstood – all cuttings will be discharged to sea, although some will be passed through the rig mud recycling system first. All chemical for use for drilling operations on the rig will be further detailed in the Operational Addendum to the EIS.

Section 4.1.1 Potential Impacts

- 6.16 The section on potential impacts at the beginning of the environmental description section of the EIS is questioned by all four parties that reviewed the document (notably SAMS which questions the estimation of impact of an oil spill on sensitive seabird areas at sea). In reply, Argos considers that at this exploratory stage of drilling involving short-term impacts, the seabird vulnerability maps sited in the Seabirds at Sea surveys and reports of 1998-2001 are sufficient to consider the potential impact of a spill.

Physical Environment

- 6.17 The review by SAMS, and also comments from FC and DECC raise concern over the Physical Environment section of the EIS regarding the following subsections; Geography, Geology and Bathymetry, Sediments and Oceanography. All the omissions are minor and have been accepted by Argos, which also intends to provide further information in the Addendum to be submitted for approval prior to drilling.
- 6.18 DECC has also proposed that precautionary plans should be in place to deal with the threat from sea ice. In response, the company considers that the risk of encountering sea ice in the vicinity of the proposed exploration well locations is minimal, based on historical records.

Biological Environment

- 6.19 The review by SAMS, as well as comments by FC and DECC identify concerns in the Biological Environment section of the EIS regarding the following subsections; Plankton, Phytoplankton, Zooplankton, Seabed Communities, Fish, Commercial Fishing, Spawning Locations, Marine Mammals and Seabirds. Argos has produced additional information regarding all of these sections and agreed to include further details in the Addendum, notably regarding seasonality and potential impacts and vulnerability of key species.

Key Environmental Sensitivities

- 6.20 Biological sensitivities are again of concern in this section of the EIS with comments from all four organisations (SAMS, FC, JNCC and DECC) regarding them. Notably SAMS suggest the developer places too much emphasis on the studies and research undertaken to date, and do not go far enough in recognising limitations to the studies undertaken, particularly those surveys undertaken by the Seabirds at Sea surveys (1998-2001). Argos acknowledges the limitations but again stress that for the purposes of exploration drilling the data is sufficient to consider environmental sensitivities.

Deposition of drill cuttings

- 6.21 DECC question the discharge figures used to interpret the cuttings discharge to sea bed models.
- 6.22 Argos accepts that the text could have been clearer on this and explains the basis of the modelling. Future modelling submissions will address this issue.

Oil Spill Modelling

- 6.23 All four organisations question the oil spill models utilised and the results from the modelling. Notably the calculation and selection of current speeds is questioned in this section. Argos has queried this criticism but has agreed to undertake further modelling work which will be provided in the Oil Spill Contingency Plan.

Environmental Hazards, Noise and Vibration

- 6.24 The section on the impacts of noise and vibration are identified by all four organisations as lacking. Comments are made on the following subsections; Potential Impacts on Fish, Sound Pressure, Potential Impacts on Cetaceans and Potential Impacts on Pinnipeds. Argos acknowledges the majority of these comments and has agreed to conduct further research and to provide further information in the Addendum to be submitted prior to the commencement of drilling.

Worst Case Scenario

- 6.25 The authors admit that the worst case scenario is a blow-out but they offer only statistical assurances that this will not happen in this case. SAMS and DECC consider that after the Deepwater Horizon disaster there should be much more information about how oil companies have learnt from that experience and put appropriate systems in place to give confidence that such a disaster would not happen again. SAMS and DECC suggest that this is a serious weakness of this EIS. In reply, Argos states that valuable lessons have been learnt from the Macondo well blow out incident and that various measures will be put in plan to mitigate the impacts. These measures will be addressed in a functional Oil Spill Contingency Plan (OSCP) which will be submitted to FIG for approval prior to the commencement of the drilling operations.
- 6.26 In its response to a query from DECC the company has confirmed that it intends to become a member of Oil Spill Response at associate level and will ensure that membership is adequate for the exploration drilling activities proposed.

7.0 Views of Minerals Committee

- 7.1 The Minerals Committee considered the EIS at its meeting on 22 August 2011. In their deliberations Members asked what was being done to fill the gaps in environmental data. The answer is that the industry has provided some support (e.g. putting observers on oil vessels and making ROV images available), whilst Falklands Conservation and other environmental organisations are engaged in a significant number of wildlife tracking projects. The Fisheries Department also carries out on-going research which is of value. However, these latter initiatives are not directly related to offshore exploration and to date there has been no strategic overview as to what data needs to be collected for the purposes of offshore minerals exploration, and who should be responsible for collecting it. These questions will be considered further by the new Offshore Environmental Hydrocarbons Forum (the first meeting of which was due to take place on 27 September 2011). The Government is likely to play an important role through the preparation of a Strategic Environmental Assessment, which will be required if any licensed area moves towards commercial production.
- 7.2 At the time of the meeting comments from DECC had not been received. The Committee resolved to recommend to Executive Council that the Argos EIS be

approved with conditions, subject to any adverse comments being received from DECC.

- 7.3 DECC's response has now been received and states that "the document is generally well completed in relating the description of the environment and species around the Falkland Islands and is perhaps more than what is required for the purpose of the specific planned area of interest". DECC go on to say that "Overall our conclusions from the data and information presented indicates that the drilling campaign is unlikely to have a significant impact on the local environment. However the points raised during the review process should be dealt with particularly the modelling and site specific information".
- 7.4 Argos has agreed to revisit both the modelling and site specific information in the Operational Addendum.

8.0 Conclusion

- 8.1 The SAMS review of the Argos EIS, as well as the comments from Falklands Conservation, JNCC and DECC during the public consultation, collectively raise a number of further questions regarding the assessment. I think it fair to say that Argos have made a good effort to answer the criticisms of the assessment where possible in their response documents.
- 8.2 This critique follows the same line as reviews and comments made in response to previous EIS's in connection with the current drilling round, reflecting data gaps in current research and knowledge.
- 8.3 It is clear that there are still major gaps in data and knowledge in the marine environment of the Falklands and if further development of hydrocarbons is to take place then these will need to be filled. At this stage of exploration it is my view that a single developer cannot be expected to undertake major data collection exercises to estimate potential impacts on understudied biological sensitivities. The new hydrocarbons forum is the appropriate mechanism for discussing and agreeing long-term requirements, should the industry move towards a development phase.
- 8.4 I share some of the concern expressed by SAMS and respondents concerning the oil spill modelling used in the EIS. It should, for instance, have been possible for the company to use wind data from the Ocean Guardian for the relevant time period for the proposed drilling, rather than that actually used (from the Borgny Rig in 1998) which was for a different time of year. I am therefore pleased that the company has agreed to revisit the oil spill modelling, including using more up to date offshore wind data from the current drilling campaign and from the 3D seismic survey vessels that have attended the area. The new information will be included in an Oil Spill Contingency Plan to be provided to FIG prior to drilling.
- 8.5 The key overall question for Council to consider is whether the external review undertaken by SAMS or comments received from third parties have identified any critical concerns that should preclude the proposed drilling from going ahead at the present time.

8.6 Although there are gaps in the environmental baseline data I have seen nothing to indicate that the immediate environment around the proposed drilling locations, the wildlife present in these areas or passing through or indeed the wider environment (e.g. the Falkland Islands) is under any particular threats arising from the proposed drilling operations. On this basis, and subject to the production of a satisfactory Operational Addendum and Oil Spill Contingency Plan, I recommend that the EIS be approved.

9.0 Financial Implications - None

10.0 Legal Implications - None

11.0 Human Resources Implications - None

Appendices

1. Argos Exploration and Appraisal Drilling Environmental Impact Statement for PL001 April 2011 Non-Technical Summary.
2. Argos response to EIS comments, July 2011.
3. Argos response to DECC comments, September 2011

Exploration and Appraisal Drilling Environmental Impact Statement for PL001

April 2011
Revision: 00



Argos Resources Limited

Exploration and Appraisal Drilling Environmental Impact Statement for PL001

April 2011

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DATE	VERSION	DESCRIPTION	PREPARED	CHECKED	APPROVED
April 2011	01	Final Issue	GN / SJS	KS	KS

Standard Information Sheet

Project Name	Exploration Drilling Environmental Impact Statement for PL001
Type of Project	Exploration and Appraisal Drilling
Undertaker Name	Argos Resources Limited
Undertaker Address	Argos Resources Limited Argos House H Jones Road Stanley Falkland Islands FIQQ 1ZZ
Licensees/Owners	Argos Resources Limited is the operator, with 100% ownership of PL001.
Short Description	<p>Argos Resources Limited (hereafter referred to as 'Argos') plan to initially drill up to four exploration wells in PL001 situated in the North Falkland Basin. Argos is the sole licensee of PL001 holding 100% equity.</p> <p>Argos is currently undertaking detailed analysis of seismic data and as such, the precise exploration well locations are not known at this stage. However, for the purposes of analysing the environmental impact, it is assumed that drilling is likely to take place in the north-east and south-east of PL001. The precise well locations, and confirmation of the number of exploration wells to be drilled, will be confirmed in an Addendum to this EIS at a later stage.</p> <p>The nearest landfall to the exploration area of interest is situated at Cape Dolphin on East Falkland Island, approximately 210 kilometres due south.</p> <p>It is anticipated that hydrocarbons, if discovered, would primarily comprise of oil, with an anticipated °API ranging between 26.2 and 29.2 (specific gravity (at 60°F) of between 0.90 and 0.88, respectively).</p> <p>The wells will be drilled using the semi-submersible drilling rig Ocean Guardian. The exploration wells are currently planned as vertical wells. Following drilling, the wells will be logged and evaluated. If a discovery is made, well clean-up and testing may also be carried out.</p> <p>Following drilling operations, the wells will be plugged and abandoned in accordance with Oil and Gas UK Guidelines.</p>
Anticipated Commencement of Offshore Work	Q4 2011
Previously Submitted Environmental Documents	N/A
Significant Environmental Impacts Identified	None
Statement Prepared By	Argos in conjunction with RPS Energy (RPS) and the Marine Resources Assessment Group (MRAG).

Non-Technical Summary

Project Overview

Argos Resources Limited (hereafter referred to as 'Argos') plan to drill up to four exploration wells in PL001 situated in the North Falkland Basin. Argos is the sole licensee of PL001 holding 100% equity.

Argos is currently undertaking a detailed analysis of seismic data and as such, the precise exploration well locations are not known at this stage. However, for the purposes of analysing the environmental impact, it is assumed that drilling is likely to take place in the north-east and south-east of PL001. The precise well locations, and confirmation of the number of exploration wells to be drilled, will be confirmed in an Addendum to this EIS at a later stage. The PL001 area is illustrated in Figure 1.

The nearest landfall to the exploration area of interest is situated at Cape Dolphin on East Falkland Island, approximately 210 kilometres due south.

It is anticipated that hydrocarbons, if discovered, would primarily comprise of oil, with an anticipated API ranging between 26.2 and 29.2 (specific gravity at 60°F of between 0.90 and 0.88, respectively).

The wells will be drilled using the semi-submersible drilling rig Ocean Guardian. The exploration wells are currently planned as vertical wells. Following drilling, the wells will be logged and evaluated. If a discovery is made, well clean-up and testing may also be carried out.

Following drilling operations, the wells will be plugged and abandoned in accordance with Oil & Gas UK guidelines.

Under the current schedule, drilling of exploration wells is scheduled to commence in Q4 2011.

The Existing Environment

Table 1 illustrates the range of environmental sensitivities present in the vicinity of PL001 and surrounding waters for each month. Seasonal vulnerabilities likely to be present in the vicinity of PL001 and for the wider North Falkland Basin are summarised below:

Biological sensitivities:

- Fish species known to spawn in the vicinity of PL001 include hake (*Merluccius sp.*).
- Cephalopod species known to spawn in the vicinity of PL001 include *Illex argentinus*.
- Based on the JNCC survey results (*White et al., 2002*), the following species of cetacean were recorded in the vicinity of PL001 area of interest: fin whale, long-finned pilot whale, hourglass dolphin and Peale's dolphin.
- South American fur seal have been known to frequent the waters in the vicinity of PL001 in low numbers. However, little is known of the at-sea distribution of Falkland Islands pinnipeds, and it is possible that South American sea lion, South American fur seal and southern elephant seal may be present within the vicinity of PL001 in low numbers.
- Of the penguin species recorded offshore the Falkland Islands, king penguin, rockhopper penguin, Macaroni penguin and Magellanic penguin have been observed in the vicinity of PL001.
- It is possible that the following species of albatross may be present in the vicinity of PL001 throughout the year: southern and northern royal albatross, black-browed albatross and grey-headed albatross, with peak numbers most likely to occur from February to June. Wandering albatross have been observed in the vicinity from October to June and white capped albatross from January to May.

- Petrels and shearwaters known to be present in the vicinity of PL001 include: southern and northern giant petrel, cape petrel, blue petrel, kerguelen petrel, soft plumaged petrel, Atlantic petrel, white chinned petrel, Wilson's storm petrel, grey-backed storm petrel, black bellied storm petrel, diving petrel, great shearwater and sooty shearwater. Other species that may be present include Antarctic fulmar, prion sp., skua sp., kelp gull and Arctic tern.
- Within PL001, seabird vulnerability to oiling is highest in March, May, and from August until October, is rated as high on the vulnerability scale. Seabird vulnerability is rated as medium in January, February, June, July and November. Seabird vulnerability within PL001 is rated as low for December. The remaining month (April) has no data. However, from analysing the data from nearby areas, vulnerability is likely to be rated as medium, due to the proximity of an area of medium vulnerability to the west of the area.
- Numerous sensitive areas exist on the Falkland Islands coast related to seabirds and seal colonies, the closest of which to the PL001 is the Jason Islands group (approximately 220 kilometres to the south-west).

Socio-economic sensitivities:

- The *Illex argentinus* squid species is the main catch in the vicinity of PL001, although historical data indicates that catches of other species have been made in the wider vicinity, mainly in areas to the west and south-west of PL001.
- No shipping lanes within the vicinity of PL001, with very low shipping density.
- Low levels of tourism on the Falkland Islands, although tourist numbers are steadily increasing.
- Limited oil and gas activity in the vicinity, with only the existing 14/9-1 and 14/9-2 wells present in PL001.

Table.1 Overview of the key seasonal environmental sensitivities for PL001 and surrounding waters

Species	J	F	M	A	M	J	J	A	S	O	N	D	
Plankton	■	■	■									■	
Key	Peak bloom period			Summer bloom period									

Species	J	F	M	A	M	J	J	A	S	O	N	D
Fin Fish												
Hake (<i>Merluccius sp.</i>)						■	■	■	■	■		
Key	Peak spawning			Spawning								

Species	J	F	M	A	M	J	J	A	S	O	N	D
Cephalopods												
<i>Illex argentinus</i>	■	■	■	■	■	■						
Key	Peak spawning			Spawning								

Species	J	F	M	A	M	J	J	A	S	O	N	D
Seabirds												
Southern giant petrel	■	■	■	■	■	■	■	■	■	■	■	■
Northern giant petrel	■	■	■	■	■	■	■	■	■	■	■	■
Cape petrel	■	■	■	■	■	■	■	■	■	■	■	■
Antarctic fulmar	■	■	■	■	■	■	■	■	■	■	■	■
Blue petrel					■	■	■	■	■	■	■	■
Kerguelen petrel					■	■	■	■	■	■	■	■
Soft plumaged petrel	■	■	■	■	■	■	■	■	■	■	■	■
Atlantic petrel	■	■	■	■	■	■	■	■	■	■	■	■
Prion sp.	■	■	■	■	■	■	■	■	■	■	■	■
White chinned petrel	■	■	■	■	■	■	■	■	■	■	■	■
Great shearwater	■	■	■	■	■	■	■	■	■	■	■	■
Sooty shearwater	■	■	■	■	■	■	■	■	■	■	■	■
Wilson’s storm petrel	■	■	■	■	■	■	■	■	■	■	■	■
Grey-backed storm petrel	■	■	■	■	■	■	■	■	■	■	■	■
Black-bellied storm petrel	■	■	■	■	■	■	■	■	■	■	■	■
Diving petrel	■	■	■	■	■	■	■	■	■	■	■	■
Skua sp.	■	■	■	■	■	■	■	■	■	■	■	■
Kelp gull					■	■	■	■	■	■	■	■
Arctic tern	■	■	■	■	■	■	■	■	■	■	■	■
Key	Peak occurrence				Known occurrence							

Species	J	F	M	A	M	J	J	A	S	O	N	D
Penguins												
King penguin	Low	Low	Low	Low	Low	High	High	High	High	Low	Low	Low
Rockhopper penguin	Low	Low	Low	Low	Low	Low	Low	Low	High	High	High	Low
Macaroni penguin	V. low	V. low	V. low	V. low	V. low	V. low	V. low	V. low	V. low	V. low	V. low	V. low
Magellanic penguin	High	High	High	High	No animals	No animals	No animals	No animals	Low	Low	High	High
Key (Penguin numbers recorded per month (White et al., 2002))												
High (>100)	Medium (10-99)	Low (4-9)	V. low (1-3)	No animals								

Species	J	F	M	A	M	J	J	A	S	O	N	D
Albatross												
Southern Royal albatross	Low	Low	V. low	V. low	V. low	V. low	V. low	Low	Low	Low	Low	Low
Northern Royal albatross	Low	Low	V. low	V. low	V. low	V. low	V. low	Low	Low	Low	Low	Low
Black-browed albatross	Low	V. low	V. low	V. low	V. low	Low	Low	Low	Low	Low	Low	Low
Grey-headed albatross	Low	V. low	V. low	V. low	V. low	Low	Low	Low	Low	Low	Low	Low
Wandering albatross	Low	Low	Low	Low	Low	Low	No animals	No animals	No animals	Low	Low	Low
White capped albatross	Low	Low	Low	Low	Low	No animals	No animals	No animals	No animals	No animals	No animals	No animals
Key	Peak occurrence					Known occurrence					Low	

Seabird vulnerability	J	F	M	A	M	J	J	A	S	O	N	D
In the vicinity of PL001	Med	Med	High	Med	High	Med	Med	High	High	High	Med	Low
Key (Seabird vulnerability to oiling (JNCC, 2002))(blank= no data, interpolated vulnerability entered as text)												
Low:	Med:	High:	V. high									

Species	J	F	M	A	M	J	J	A	S	O	N	D
Pinnipeds												
South American Fur Seal	No animals	V. low	V. low	V. low	V. low	V. low	V. low	V. low	V. low	V. low	No animals	No animals
Key (Numbers recorded per month (White et al., 2002))												
High (<10)	Medium (6-10)	Low (3-5)	V. low (1-2)	No animals								

Species	J	F	M	A	M	J	J	A	S	O	N	D
Cetaceans												
Fin whale	High	No animals	V. low	No animals	No animals	No animals	V. low	No animals	V. low	No animals	High	High
Long-finned pilot whale	No animals	High	High	High	High	High	High	High	High	Low	Low	High
Hourglass dolphin	High	High	High	V. low	No animals	V. low	V. low	Low	High	High	High	High
Peale's dolphin	High	High	High	High	High	High	High	High	High	High	High	High
Key (Cetacean numbers recorded per month (White et al., 2002))												
High (>50)	Medium (10-49)	Low (4-9)	V. low (1-3)	No animals								

Hazard, Effects and Mitigation Measures

The results of the impact assessment indicate that the majority of impacts from the proposed drilling operations will be negligible to moderate and mostly undetectable shortly after drilling is completed (Table 2).

The key environmental risks associated with the proposed drilling programme include drill cuttings disposal, waste disposal and use of resources (i.e. fuel and potable water). Oil spill modelling indicated that there is a 0.9 to 2.6 percent probability of oil beaching in the unlikely event of a well blowout under typical weather conditions. A major oil spill during blowout may have a major impact on offshore seabirds (Table 2). Diesel spills will not impact the coastline and offshore wildlife is likely to be affected only in a close proximity to the spill. It can be concluded that the highest risk of pollution during the drilling programme is from large oil spills. These are highly unlikely events however, and can be effectively controlled through prevention, preparedness and response.

Table2 Potential Hazards and Associated Impacts from the Proposed Drilling Operations

Hazard	Water & Air		Flora & Fauna						Socio-economic						Other					
	Water Quality	Air Quality	Plankton	Seabed Fauna	Fish Spawning	Offshore Sea Birds	Coastal Birds	Marine Mammals	Sensitive Coastal Sites	Fishing	Shipping	Military Activity	Pipelines, Wells & Cables	Drilling & Support Crews	Dredging	Archaeology	Tourism / Leisure	Land Use	Sediments	Resource Use
Physical Presence									5	5						5				5
Seabed Disturbance				4												5			4	
Noise & Vibration					5	5		5												
Atmospheric Emissions		4																		
Marine Discharges	5		5	4	5															
Solid Waste								4										3		
Minor Loss of Containment	4		4		5	4		5		4	5						5			
Major Loss of Containment	3		3		3	2	3	3	3	3	4						3			

Key to Significance of Effect (see Table 5.2 for definitions)

1	Severe	2	Major	3	Moderate	4	Minor	5	Negligible		None	6	Beneficial
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All operational risks will be controlled using safe drilling practices and effective planning. The potential impacts of the proposed drilling activity will be mitigated in a number of ways, including:

Maintaining a spirit of openness and ongoing consultation with the Falkland Islands Government (FIG), the public and key stakeholders;

Applying established UK standards to operations, particularly in offshore chemical use and emissions reporting;

Using water based drilling muds and low toxicity chemicals approved under the UK Offshore Chemical Notification Scheme;

Implementing a high level of environmental management offshore and applying environmental procedures for potentially impacting operations (chemical storage, bunkering, waste handling, maintenance programmes, benthic surveys etc);

- Implementing a Waste Management Plan to minimise the quantity of waste going to landfill, prevent unsuitable disposal of waste, maximise the re-use of materials; and
- Establishing and implementing a project specific Oil Spill Contingency Plan and conducting training of key personnel in oil spill response. Argos plans to become a member of OSRL prior to drilling, which provides assistance in the case of a major spill. The Oil Spill Contingency Plan will be submitted to FIG for approval prior to commencement of the drilling operations.

Conclusions

Despite the high sensitivity and international importance of the Falkland Islands' waters, there is clear dedication to carrying out these operations to a high environmental standard. Given the current operational commitments and proposed mitigation measures, it is considered that the proposed operations can be undertaken without significant impacts to the Falkland Islands' environment.



Argos Response to EIS Comments

July 2011

Date	VERSION	DESCRIPTION	PREPARED	CHECKED	APPROVED
July 2011	00	Issued to Client	GN / SJS	GC	GC

Document Reference:

Introduction

In April 2011, Argos Resources Limited (hereafter referred to as “Argos”) submitted the Offshore Falkland Islands Exploration Drilling Environmental Impact Statement (EIS) to the Falkland Islands Government (FIG). The EIS provided an assessment of the potential impacts from proposed exploratory drilling within the PL001 licence area of the North Falklands Basin. The document was written to meet the requirements outlined in the Falkland Islands’ legislation pertaining to offshore exploration and production activities – The Offshore Minerals Ordinance 1994; (as amended).

Following the submission of the EIS, comments on the document were provided to FIG from Falklands Conservation (FC); the Joint Nature Conservation Committee (JNCC) and the Scottish Association for Marine Science (SAMS) as part of the public consultation process.

Given the above, this supplementary report has been prepared to address the comments received via FIG from Falklands Conservation, the Joint Nature Conservation Committee and the Scottish Association for Marine Science (SAMS).

Response to Falkland Conservation's Comments

The following section addresses the comments raised during FC's review of the EIS. The comments have been placed with reference to the headings and numbering system used in the EIS.

Standard Information Sheet

Q1. Falklands Conservation Comment

Ref 0	<i>It would be beneficial for the proponent to clearly indicate the size (hectares, km², etc.) of the license area in, and to relate it to wildlife survey coverage.</i>
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A1.Response

Argos acknowledges the above comment. The distribution of the survey effort achieved throughout the surveys conducted from February 1998 to January 2001 in relation to PL001 is shown in Figure 4.16 on page 82. The survey effort for the eastern part of PL001 was in the region of 25-59 km² per month and approximately 60-100km² per month for the western part of PL001, which represents approximately 5-10% of the total size of the licence area (Production Licence 001 covers an area of approximately 1,126 square kilometres).

Non- Technical Summary

Q2. Falklands Conservation Comment

Ref 3	<i>The proponent presents a series of vulnerability tables but does not define HIGH, MEDIUM, and LOW vulnerability.</i>
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A.2 Response

Argos disagrees with the comment. Methods used for development of the vulnerability atlas are complex, well documented and widely accepted for the assessment of vulnerability in offshore areas, as described in Section 4.3.7.9, page 115. The vulnerability tables define HIGH, MEDIUM and LOW vulnerability in terms of the numbers of species recorded per month. Seabird vulnerability was measured in terms of peak occurrence and known occurrence. These seabird vulnerability indices are qualitative rather than quantitative measurements.

Q3. Falklands Conservation Comment

Ref 4	<i>Proponent has focussed on sensitive coastal areas, whereas seabirds are equally likely to be impacted at key pelagic sites, where data is much sparser.</i>
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Q4. Falklands Conservation Comment

Ref. 5	<i>Environmental sensitivity tables for penguins suggest very low detection rates, drawing into question the appropriateness of "seabirds at sea" data for analysing potential impacts of hydrocarbon activities on these species.</i>
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A.3&4 Response

Argos acknowledges the limitations of the data sources used in this EIS. Due to the short drilling period and low spill risk associated with this project, it is considered that impacts arising as a result of the exploration operations will be short-term, and ultimately have a negligible impact on the environmental resources of the area.

The data used throughout the EIS gives an indication as to the distribution of both seabird species and penguins, which is considered sufficient to ensure that species of high risk to oil and disturbance (such as seabirds and marine mammals) are of low number in the proposed exploration area. Mitigation measures have been proposed in section 5 of the EIS, to reduce the risks associated with drilling operations and ensure that all impacts are reduced to ALARP (as low as reasonably practical).

It should also be noted that an Addendum to the EIS will be produced further detailing the impacts relating to the proposed drilling months for the exploration wells. Where possible, data on seabird vulnerability will be supplemented with available data from the various satellite and geolocation tracking studies that have been undertaken in the Falkland Islands. Argos would like to point out that although the satellite tracking data is available; authors of the tracking data have expressed serious concerns over the quality of the data.

Q5. Falklands Conservation Comment

Ref. 6	<i>The proponent acknowledges that a major oil spill could have a major impact on offshore seabirds, yet no Oil Spill Contingency Plan or Emergency Response Plan has been provided at this time. Well site location seems unlikely to influence these plans.</i>
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A5.Response

Argos will submit an Emergency Response Plan which will outline the emergency response procedures in the event of an incident. An Oil Spill Contingency Plan will also be submitted which will outline the response procedure in the event of an oil spill incident. An appropriate response strategy will be identified in the Plan along with response resources.

These documents are required as per The Offshore Minerals Ordinance 1994 (as amended) and will be submitted to FIG for approval prior to the commencement of the exploration drilling operations.

Section 1.1 Project Scope

Q6. Falklands Conservation Comment

Ref. 18, 1.2	<i>The project scope does not clearly explain limitations of available data, nor that data regarding environmental sensitivities specific to this undertaking were not collected.</i>
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A.6 Response

Argos acknowledges the comment. Argos will provide a summary of all available environmental data presented in the EIS in the Addendum to the EIS, comment on its possible limitations and highlight possible areas for future study/research focus.

Section 3.1 Proposed Drilling Programme

Q7. Falklands Conservation Comment

Ref. 31, 3.1	<i>The proponent has failed to provide detailed locations regarding planned activities. However, they have selected two indicative sites within the drilling license area. Were these areas chosen at random or because they represent potential risk to wildlife or for some other reason?</i>
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A.7 Response

For the purpose of analysing the environmental impact, it was assumed that drilling is likely to take place in the north-east and south-east areas of PL001. Argos has clearly stated in the EIS that detailed analysis of seismic data is currently taking place which will dictate the precise tophole locations of the exploration wells. The locations were chosen as these were the most likely locations for drilling based on information available at the time of writing. In addition, the two locations were chosen to test a representative sample of the PL001 acreage. Detailed drilling locations will be specified in the Addendum to this EIS.

Q8. Falklands Conservation Comment

Ref. 38-42 3.3.6, 3.3.7, 3.3.8	<i>The proponent has not identified the contingency chemicals that might be used if problems or emergencies occur during operations, nor clearly indicated the circumstances under which they might be used. As FIG may only become aware of these chemicals after they have been used, the chemicals should be identified and the proponent's capacity to mitigate the potential impacts of these 'unknown' chemicals demonstrated prior to approval of drilling plans.</i>
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A.8 Response

Argos disagrees with the above comment stating that '*FIG may only be aware of these chemicals after they have been used*'. A list of all contingency chemicals, including drilling, cementing and rig chemicals, will be provided for inclusion in the Addendum to the EIS, which will be submitted to FIG prior to the commencement of the drilling operations.

Q.9 Falklands Conservation Comment

Ref.39 3.3.7	<i>The proponent advises that 10% or perhaps as much as 20% of cementing chemicals used during the operation will be discharged into the environment. However, Table is inconsistent with this assertion.</i>
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A.9 Response

Argos acknowledges the comment. During cementing of well casing back to the seabed, the quantity of cement discharged in this operation is typically less than 10 percent of the total volume used. However, as a contingency, the quantity discharged could double (up to 20%). On analysing Table 3.8 in line with the above comment, it can be seen that the total discharge expected for each well is approximately 33%. Therefore it is recognised that for the Falkland Islands offshore drilling programme, up to 33% of cement planned for use could be discharged from each well. This is to allow for extra contingency for cementing operations in these well cementing applications, which are critical to the integrity of the well construction. However, it should be noted that 33% is an absolute worst case scenario and that the drilling programme will aim to loose as little cement as possible to the seabed during cementing operations. The text in the EIS Addendum will be in amended to reflect this extra contingency provided by the cementing contractor.

Full details of the well construction programme will be provided in the Addendum to the EIS, which will be submitted in due course once detailed well planning is completed.

Section 3.5 Support Operations**Q10.Falklands Conservation Comment**

Ref.44 3.6.4	<i>There is a lack of detailed plans regarding the handling of waste materials from drilling operations, and indeed what becomes of those wastes should the proponent be unable to dispose of them in Stanley.</i>
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A.10 Response

Argos is committed to ensuring that all waste will be handled and if necessary disposed of, in the correct manner and in accordance with legal requirements and best industry guidelines/practices. Specific waste handling/disposal routes and procedures will be established once a rig had been contracted and will form part of the drilling programme. Specific details on waste handling and disposal will be included in a Waste Management Plan which will be submitted prior to the commencement of the exploration and drilling operations.

Section 4.1 Introduction

Q11. Falklands Conservation Comment

<p>Ref. 46 4.1.1</p>	<p><i>The proponent suggests that seabird vulnerability in the project area is low to medium during the proposed drilling period, but has not yet identified the specific drilling locations. Further, Table 4.7 clearly shows that vulnerability is HIGH in March and May (with no data available for April), all three months falling within the 176 day drilling period assuming a December 1 start date (Table 3.3). Figures 4.29 and 4.30 also show how dynamic the vulnerability polygons can be month to month, thus the proponent should adopt a precautionary approach in assessing months for which no data exists. Lastly, the text refers readers to section 4.3.3 which relates to benthic communities, not seabirds.</i></p>
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A.11 Response

It is appreciated that where seabird vulnerability data do not exist for a specific month, the likely seabird vulnerability index can be interpolated from data from surrounding months. As vulnerability is observed to be HIGH in March and May, it can be reasonably assumed that seabird vulnerability will likely be HIGH in April as well. This represents a worst case scenario in terms of seabird vulnerability assessment. An EIS Addendum will be produced to assess the impacts of the exploration programme on the environment during the proposed drilling period to identify the species that will be in the vicinity of the exploration well locations and assess the significance of any impacts.

The error in the cross referencing is noted.

Physical Environment Section 4.2 and 6.4

Q12 Falklands Conservation Comment

<p>Ref. 64, 4.2., 6.4</p>	<p><i>The proponent uses wind rose data for oil spill modelling taken from just a single year's data, and of the opposite season to the proposed drilling period. This, despite the existence of a 100+ year data set from Stanley Harbour that coincides with the proposed drilling period. Is there not also opportunity to use more appropriate data gathered by other oil operators in the North Falkland Basin during the current drilling round?</i></p>
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A12.Response

Argos disagrees with the comment. The wind rose from the drilling rig *Borgny Dolphin* recorded between 12th May 1998 and 19th November 1998 was used for the oil spill modelling, as it was thought more representative of actual wind speed conditions that may be experienced in the PL001 area, rather than the use of the onshore wind data for Stanley Harbour. The offshore data collected is also from the austral winter period, and therefore it is thought that this would indicate worst case wind conditions in terms of wind strength. Despite the 100+ year dataset for Stanley Harbour, it is thought that conditions at Stanley Harbour do not accurately reflect offshore wind conditions, as there is often a marked difference in wind strength, and therefore offshore wind data from the previous drilling campaign was used for the modelling scenarios. There is now opportunity to use more up to date offshore wind data from the current drilling campaign and from the 3D seismic survey vessels that have attended the area. This data will be analysed and used for the oil spill modelling to be conducted for the Oil Spill Contingency Plan.

Additional wind data have been obtained from the seismic survey vessels. This data will be analysed for inclusion in the EIS Addendum and subsequent oil spill modelling for the Oil Spill Contingency Plan.

Sections 4.3.4 and 4.3.5 Fish and Cephalopods

Q13. Falklands Conservation Comment

Ref. 77-80 4.3.4 , 4.3.5	<i>There are a number of factual inaccuracies in these sections, likely resulting from the use of old data or a lack of consultation with the Fisheries Department. Most notably, the proponent has highlighted a couple of non-existent fisheries, and suggested that Argentina and the Falklands cooperate on the management of southern blue whiting.</i>
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A.13 Response

Argos disagrees with the comment. Up to date data has been sourced from work undertaken by FIFD. In addition, Argos sub-contracted the Marine Resources Group (MRAG) to provide input on fisheries related matters. MRAG was granted permission to access a database of observer and survey reports held by the Falkland Islands Fisheries Department. Efforts were focused on obtaining data from the area north of 51⁰. The outputs are presented in the commercial fisheries section 4.4.3.

Argos acknowledges the comment on Argentine / Falklands cooperation through the South Atlantic Fisheries Commission which is not operating at present as the Argentine government has withdrawn cooperation in fisheries matters. This information will be amended in the EIS.

Section 4.3.4 Marine Mammals

Q14 Falklands Conservation Comment

80-81, 4.3.6	<i>The proponent indicates that at-sea surveys were carried out in every month between February 1998 and January 2001. However, it is unclear whether surveys were conducted in every month of the year in PL001. The proponent could also state the survey effort as a proportion of the total licence area. Was there 5% coverage of the area, 1%, or 20%? During which months was PL001 surveyed?</i>
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A.14 Response

Argos acknowledges the comment. The distribution of the survey effort achieved throughout the surveys conducted from February 1998 to January 2001 in relation to PL001 is shown in Figure 4.16 on page 82. The survey effort for the eastern part of PL001 was in the region of 25 -59 km² and approximately 60 - 100km² for the western part of PL001, which represents approximately 10 -20 % of the size of the licence area.

Maps showing the monthly survey effort for PL001 from February 1998 to January 2001 will be included in the EIS Addendum.

Section 4.3.6 Marine Mammals

Q15. Falklands Conservation Comment

Ref. 85 Figure 4.18	<i>The proponent has provided an interpretation of cetacean density, but fails to quantify or qualify the difference between categories (High, Medium, Low), which would make the information of more use to readers. What can be taken from the figure is that PL001 itself was not well surveyed.</i>
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A15. Response

Argos acknowledges the above comment. Argos will endeavour to provide information on cetacean density scales on maps produced for the Addendum to this EIA. On consideration of Figure 4.18 on page 85, it can be seen that the PL001 licence area lacks full survey coverage for cetacean density.

There is survey data, however, for all except one species (Commerson's dolphin) close-by to the PL001 area. From this information, the likely density within Licence area PL001 can be inferred. It should also

be remembered that cetacean density data are indicative only and are of a qualitative rather than a quantitative nature, and cannot be taken as proof of presence or absence in any given area at any given time. The cetacean density information will be reviewed and expanded further where appropriate in the Addendum to this EIA.

Q16. Falklands Conservation Comment

Ref. Figure 4.22	<i>Pinniped density estimates for PL001 appear to suffer from a similar lack of surveys, and again interpretations lack quantification.</i>
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A16. Response

Argos acknowledges the above comment. Argos will endeavour to provide quantification information on maps produced for the Addendum to this EIA. On consideration of Figure 4.22 on page 85, it can be seen that the PL001 licence area lacks full survey coverage for pinniped density. However, there is either density survey data (for South American Fur Seal) or sightings data (Southern Elephant Seal and South American Sea Lion) for all four species presented in Figure 4.22 close-by to the PL001 area (in the case of South American fur seal from February to October, density data covers most of PL001). From this information, the likely density and likelihood of occurrence within Licence area PL001 can be inferred. It should be remembered that pinniped density data are indicative only, and cannot be taken as proof of presence or absence in any given area at any given time. The pinniped density information will be reviewed and expanded further where appropriate in the Addendum to this EIA.

Q17. Falklands Conservation Comment

Ref. 93 4.3.6.2	<i>This section of the EIS presents contradictory statements a number of times. The proponent could clarify issues such as number of breeding sites and maximum distance adults forage from colonies.</i>
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A.17. Response

On reference to Section 4.3.6.2.2 on page 93, paragraph 1 states that South American Fur Seal breed at 15 known sites within the Falkland Islands, mainly preferring elevated rocky shores. However, review of the data indicates that the South American Fur Seal is known to breed at approximately 10 sites across the Falkland Islands. Therefore the statement in paragraph 1 is erroneous and should be discounted. In paragraph 5 of the same Section, it is stated that seals can forage as far away as 100 kilometres from the shore breeding sites. However, the satellite tracking study discussed subsequently clearly indicates that individuals were recorded foraging more than 195 kilometres away from their respective colonies. Therefore, the opening sentence to paragraph 5 is erroneous and should read that South American Fur Seal have the ability to forage for food hundreds of kilometres from their shoreline colonies. Argos acknowledges these errors.

Q18 Falklands Conservation Comment

Ref. 94-95	<i>What indications are there that the population of Southern Elephant Seals has declined in the past few years?</i>
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A.18. Response

On review of the information related to the statement that there are indications that the Falkland Islands population of elephant seals has declined over the last few years, it is clear that this statement refers to the general population of elephant seals in the subantarctic region as a whole, not specifically associated with the Falkland Islands population. In addition to the erroneous statement, the reference for the statement was also omitted (provided below).

There is evidence to suggest that the general population of southern elephant seal has declined significantly over the last forty years at locations including Heard Island, Marion Island, Campbell and Signy Islands, and the Kerguelen Islands. The reasons for the declines in populations remain unclear.

However, such declines in subantarctic island colonies further highlight the importance of the Falkland Islands southern elephant seal colonies.

Reference: Marine Bio (2011), Southern Elephant Seals, Mirounga leonina, [Internet], available: <<http://marinebio.org/species.asp?id=296>>. Last updated: 4/23/2011 1:33:52 AM

Section 4.3.7 Seabirds

Q19. Falklands Conservation Comment

<p>Ref. 96 – 107 4.3.7</p>	<p><i>This section of the EIS frequently presents outdated and/or inaccurate information, and also contradicts itself a number of times (providing two values for items like global population estimates). The proponent has not attempted to clarify the limitations of existing data, nor highlight the purposes for which data were originally collected nor discuss whether or not that data might be appropriate for assessing the potential impacts of proposed activities. It would have been useful to include the distribution maps of penguins and albatross from various times of the year, which are referred to in the text but not presented. Conservation status of a number of species is not presented in the text, though it does appear in Appendix 4. The use of excerpts from historic publications without placing those excerpts into context is particularly concerning.</i></p>
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A.19. Response

Argos disagrees with the comment regarding outdated information. MRAG was granted permission to access the database of Observer Reports held by the Falkland Islands Fisheries Department. Efforts were focused on obtaining data from the area north of 51^o. Bird data was collected by observers from longline fishing vessels between 2000 and 2010. The sightings of the 2 categories of birds and the overall effort are illustrated in Figures 4.27 and 4.28 respectively in the EIS.

The results have shown that there has not been much fishing effort in the vicinity of PL 001 as most effort is concentrated towards the east and the largest numbers of birds are sighted to the east on the outer conservation zone.

Argos believes that the inclusion of the additional data adds value to the EIS in the absence of recent publications on the subject.

Argos acknowledges the comment on the inclusion of the conservation status of a number of species is not presented in the text. However, this information is presented in Appendix 4 of the EIS.

Q20. Falklands Conservation Comment

<p>Ref. 119, 4.3.7.9</p>	<p><i>The proponent states in the text that the northern portion of PL001 is rated as low in February, whereas Table 4.7 indicates medium.</i></p>
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A.20 Response

Argos acknowledges the above comment. This discrepancy will be clarified in the Addendum to this EIA.

Section 4.4.4 Interactions of Black-browed Albatross with Fisheries

Q21. Falklands Conservation Comment

Ref. 139 - 140, 4.4.4	<i>It is a positive sign to see the proponents acknowledges the value of satellite tracking in assessing interactions between threatened species and fisheries. Would satellite tracking not be of similar value in assessing interactions between threatened species and hydrocarbon activities?</i>
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A.21 Response

Argos acknowledges the comment. Satellite tracking data for seabirds have been obtained which would be useful in assessing interactions between threatened species and hydrocarbon activities. The data will be analysed and included in the EIS Addendum.

Section 5 Environmental Hazards, Effects and Mitigation Measures

Q22. Falklands Conservation Comment

Ref 154, Table 5.2.	<i>The absence of data and the absence of potential impacts appear to be synonymous, with many boxes where no data exists to make a reliable assessment receiving a classification of NONE, whereas a more accurate analysis might be "DATA DEFICIENT".</i>
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A22. Response

Argos disagrees with the comment. Table 5.1 provides the definitions of the criteria used for the assessment of the significance of hazards in line with UKOOA (now Oil and Gas UK) Guidelines. The classification NONE is defined as circumstances where there is no interaction between the hazard and the ecosystem, and no change to the environment is expected. It does not refer to the absence of data.

Section 5.4.3 Model Set-Up and Assumptions

Q23. Falklands Conservation Comment

Ref. 156, 5.4.3	<i>The proponent indicates that there is insufficient current data to inform the model, but does not comment on how the use of an "override function" might affect the accuracy of, or confidence in models produced.</i>
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A.23 Response

Argos disagrees with the above comment regarding the selection of current data input into the modelling programmes for both oil spills (OSIS) and cuttings deposition (PROTEUS). As stated in the description in Section 4.2.5.1 of the EIS (page 60), the models apply a blanket current across the area of interest when using the current override function, as shown in Figure 4.5 of the EIS (page 61). The use of residual current speed and direction for input into the models represents an accurate reflection of the fate of spilt oil in the marine environment, as the residual current speed and direction takes into account the resultant current drift due to the influence of tidal harmonics in the area. The resultant current drift is the main influence on surface current drift over extended periods of time. Paragraph 5 on page 58 of the EIS highlights the importance of selecting these data carefully from data sources for input into the modelling programmes.

RPS Energy will acquire a hydrodynamic hindcast database for the Falkland Islands. This current data will be built into the OSIS model and will comprise of the following:

- Daily surface current velocity fields derived from ocean circulation model hindcast data (at 1/12 degree resolution). These will be combined with surface tidal current velocities from BMT ARGOS' tidal database.
- Resultant data, representative of the total surface current velocity, at 1/12 degree resolution across the area of interest.

Oil spill modelling will be re-run using the new current database and the outputs will be included in an Addendum to the EIS. A full justification for the use of the OSIS programme for oil spill modelling will be given in the Oil Spill Contingency Plan.

Argos acknowledges the limitations of oil spill modelling software and the fact that oil spill modelling is a decision support tool and not a decision-making tool.

Section 5.9 Loss of Containment

Q24. Falklands Conservation Comment

Ref. 166, 5.9	<i>The units chosen for presentation of spill frequency data are lacking clarity, and could be presented in a more digestible format. It appears to this reader that there were 150 spills per 1000 wells, which suggests that 15% of wells had a spill, or roughly 1 out of every 7 wells drilled. The scale on the vertical axis of Figure 5.6 is also unclear.</i>
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A.24 Response

Argos acknowledges the above comment and will ensure that oil spill frequency data referenced from UKCS and SINTEF databases is further clarified in the Oil Spill Contingency Plan (OSCP).

Section 5.10 Oil Spill Impacts

Q25. Falklands Conservation Comment

Ref. 181, 5.10	<i>Regardless of the risk of a major loss of containment, we continue to have serious concerns regarding the ability of the proponent to respond effectively to oil spills. Rapid deployment of mitigation measures following a spill is vitally important to reducing impact, the vessels/equipment needed to deal with a spill should be on and, or at least available in the Falklands, not several days away by sea or air links.</i>
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A.25 Response

The issue of emergency response to a remote location will be addressed in the project specific Oil Spill Contingency Plan (OSCP) that will be written and submitted to FIG once drilling options (e.g. precise well location, drilling rig and drilling timetable) have been finalised. The OSCP will define tiers of response, equipment requirements and time to respond which will define where equipment must be located.

Response to JNCC Comments

The following section addresses the comments raised during JNCC's review of the EIS. The comments have been placed with reference to the headings and numbering system used in the EIS.

Section 1.1 Project Scope

Q1. Joint Nature Conservation Committee Comment

	<i>The project scope does not clearly explain limitations of available data, nor that data regarding environmental sensitivities specific to this undertaking were not collected.</i>
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A.1 Response

Argos acknowledges the comment and the limitations of the available data. The different vulnerability categories will be clearly defined in the EIS Addendum. Adopting a quantitative risk assessment approach can be beneficial in assessing the impacts on sensitive receptors, however it should also be recognised that there are vast data deficiencies. These deficiencies can only be addressed through ongoing research efforts. Due to the short term nature of this project a qualitative approach to risk assessments is deemed sufficient

Q2. Joint Nature Conservation Committee Comment

<i>Ref. Page 22</i>	<i>Table 2.1 indicates that the UK, including on behalf of the relevant Overseas Territories, ratified ACAP in April 2001. This is not correct. The UK formally ratified ACAP in April 2004.</i>
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A.2 Response

Argos acknowledges the comment. The EIS will be amended accordingly.

Section 4.3.3, Seabed communities

Q3. Joint Nature Conservation Committee Comment

<i>Ref. Page 72</i>	<i>The EIS does not appear to include any reference to site-specific benthic survey information or analogue data to support the conclusions drawn of the area. We question how the proponents propose to identify the potential impacts and habitats present in the vicinity of the wells? We would expect such an application to be supported by an analysis of such data.</i>
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A.3 Response

Argos acknowledges the comment. Gardline Environmental Surveys carried out benthic survey work in 1998 under the FOSA Agreement. Two wellsites, 14/13-B, situated approximately 21 kilometres to the south-west of PL001, and Little Blue A, located within PL001 just to the north of PL003 were surveyed. Due to the similarity in depth and proximity to PL001, species at the areas of drilling interest are expected to be very similar to these findings. Argos will endeavour to obtain the full survey reports for these surveys. Once these are available, the statistical analyses for the benthic samples will be fully described in detail in the Addendum to this EIS.

Section 4.3.7.1.2**Q4. Joint Nature Conservation Committee Comment**

Page 99	<i>Section 4.3.7.1.2 provides information on Rockhopper Penguins from the Falkland Islands State of Environment Report, but does not highlight that the historical and current trend overall is of a declining population. This is an important point, as Rockhopper Penguins are one of the species that are susceptible to oil pollution.</i>
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A.4 Response

Argos acknowledges the comment. A literature review will be carried out and the findings will be included in the Addendum to the EIS.

Section 4.3.7.2.1,**Q5. Joint Nature Conservation Committee Comment**

Pages 101-102	<i>In, it is stated that a recent review of albatross surveys in the Falkland Islands has provided evidence that populations of Black-browed Albatross are increasing, contrary to popular belief (New Island Conservation Trust, 2010). The authors of the EIS may not be aware of the surveys conducted by Falklands Conservation, which have show an overall decline in numbers of Black-browed Albatrosses in the Falkland Islands (Huin and Reid, 2007). These results clearly differ with the results from work by Strange (2008) and the New Island Conservation Trust (2010) reference. The discrepancies in these two sets of results clearly require urgent investigation and attention, including an assessment of possible differences attributable to the census methods, timing of the surveys and other factors, to get the best scientific interpretation possible of historical, recent and current data. Indeed, such an assessment is underway. However, for the purpose of the EIS, it would be appropriate to refer to both studies, and not just the one, indicating the differences in the results.</i>
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A.5 Response

Argos acknowledges the comment. The difference in the results of both studies will be noted in the Addendum.

Section 4.3.7.3**Q6. Joint Nature Conservation Committee Comment**

Page 103	<i>The Southern Giant Petrel is currently classified as of Least Concern, and not Vulnerable, as stated.</i>
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A.6 Response

Argos acknowledges the comment. The EIS will be amended accordingly.

Section 4.3.8**Q7. Joint Nature Conservation Committee Comment**

Page 119	<i>Threatened is a collective term for IUCN Red List categories. The 'threatened' categories are: 'Critically Endangered', 'Endangered' and 'Vulnerable' (to extinction). Lower risk categories include Near Threatened and Least Concern.</i>
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A.7 Response

Argos acknowledges the comment. The EIS will be amended accordingly.

Section 4.4.4

Q8. Joint Nature Conservation Committee Comment

Pages 139-40	<p><i>As indicated earlier, this study highlights the usefulness of tracking data in investigating interactions between seabirds and fisheries activities, or other potential threats. Note that in the study only adult birds feeding young chicks were tracked, and it is misleading to state that interactions between Black-browed Albatrosses and fishing vessels do occasionally occur. It is common for thousands of birds to attend trawlers in the Falkland Islands. The Granadiero et al. (2011) shows that in their study adult birds feeding young chicks spend much less time attending vessels than was previously thought (and that there were in the degree of association between two nearby colonies), but there are still many birds which do attend vessels.</i></p>
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A.8 Response

Argos acknowledges the comment. Satellite tracking data for seabirds have been obtained which would be useful in assessing interactions between threatened species and hydrocarbon activities. The data will be analysed and included in the EIS Addendum.

Section 5.9 Loss of Containment and oil spill scenarios

Q9. Joint Nature Conservation Committee Comment

Page 166	<p><i>We note that OSIS has been used to predict the potential impacts in the event of an oil spill event. We recommend that the limitations of OSIS in modelling the trajectory and dispersal of oil in the event of a blow out scenario in waters of the depth such as those found in this location are fully considered and accounted for. It is also important to note that the oil will become a risk to many seabirds well before it beaches on the coast. The tracking data and approach to determine the probability of a bird encountering a slick, mentioned earlier, will enable an informed assessment of the risks associated with the different spill scenarios.</i></p>
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A.9 Response

Argos acknowledges the limitations of oil spill modelling software. It is important to note that oil spill models, whilst a good planning tool, should not be used as a decision-making tool.

RPS Energy will acquire a hydrodynamic hindcast database for the Falkland Islands. This current data will be built into the OSIS model and will comprise of the following:

- Daily surface current velocity fields derived from ocean circulation model hindcast data (at 1/12 degree resolution). These will be combined with surface tidal current velocities from BMT ARGOS' tidal database.
- Resultant data, representative of the total surface current velocity, at 1/12 degree resolution across the area of interest.

Oil spill modelling will be rerun using the new current database and the outputs will be included in an Addendum to the EIS. A full justification for the use of the OSIS programme for oil spill modelling will be given in the Oil Spill Contingency Plan.

Argos acknowledges the limitations of oil spill modelling software and the fact that oil spill modelling is a decision support tool and not a decision-making tool.

Section 5.10 Oil Impacts

Q10. Joint Nature Conservation Committee Comment

Page 180	<p><i>Table 5.8. While the impacts of oil pollution have been broadly identified, it is important to note that the studies cited and some of the outputs mentioned, refer to the northern hemisphere. There are similarities between the northern and southern hemispheres with respect to seabird vulnerability to oil pollution, but there are also some important differences, one of which is the absence of penguins in the northern hemisphere. Given the length of time they spend at the surface of the water, penguins are amongst the most vulnerable seabirds to oil pollution. It would be useful, then, to consider studies of the impacts of oil pollution in areas which do have penguins, such as Australia, South Africa and Argentina. Very simply, most seabirds which become oiled, and are not captured and rehabilitated relatively soon afterwards, are likely to die. Experience has shown that oiled penguins especially can be cleaned successfully, but this is dependent on the ready availability of teams of trained people and appropriate facilities, both of which are severely limited in the Falklands Islands. The priority, then, should be to try and ensure that seabirds do not become oiled in the first place. The statement in the EIS that seabird populations can often recover from an oil spill over time due to their high mobility should be treated with caution. Many of the seabird species in the Falklands are long-lived, and have low reproductive rates. Any incident which impacts large numbers of adult birds will likely have a severe impact on populations. Further, many seabirds are philopatric, returning to the same colony each year to breed, and also face a number of other threats, which may serve to undermine any recovery of affected populations.</i></p>
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A.10 Response

Argos acknowledges the comment.

Section 5.10.1 Mitigation Measures

Q11. Joint Nature Conservation Committee Comment

Page 180	<p><i>We certainly support the need for an effective and resourced Oil Spill Contingency and Emergency Response Plan. It is important that this plan, and the associated equipment, is tailored to the meet the local needs and circumstances. For example, rough seas, even close inshore, will often render shoreline booms ineffective. It is stated elsewhere in the EIS that use of dispersant remains the most viable oil pollution response. Dispersants are not effective in all conditions, for example in high sea states, and the limitations should be fully outlined and considered in preparing the plan.</i></p>
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A.11 Response

Argos acknowledges the comment. Argos will have an approved Oil Spill Contingency Plan (OSCP) in place prior to the commencement of the drilling operations, including access to Tier 1 and 2 resources through membership with Oil Spill Response Limited.

Section 8 References

Q12. Joint Nature Conservation Committee Comment

Page 194	<p>Reference No. 77. The proper reference is: <i>White, RW, Gillon, KW, Black, AD and Reid, JB. (2001). Vulnerable concentrations of seabirds in the Falkland Islands waters. Joint Nature Conservation Committee, Peterborough, UK.</i></p>
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A.12 Response

Argos acknowledges the comment. The EIS will be amended accordingly.

Issues not addressed in the EIS

Q13. Joint Nature Conservation Committee Comment

	<p><i>Research has shown that some birds may be attracted to offshore platforms and vessels (e.g. Sage 1979, Tasker et al. 1986, and Montevecchi 2006). Causes and consequences of light attraction, including attraction to flares at oil and gas platforms, are reviewed by Montevecchi (2006). Light attraction and consequent bird strikes and mortalities tend to be most problematic for 'nocturnal' burrowing petrels, and especially on misty nights, when the poor visibility presumably increases attraction to the illuminated structure. A number of mitigation strategies have been considered, such as manipulating light colour (van de Laar 2007), but this remains to be properly tested. We are not saying that this is a critical issue for the Falkland Islands, but given the number of burrowing petrels in and around the Falkland Islands, it warrants further investigation. One possibility would be to station a dedicated observer on the rig, or one of the standby vessels, during periods of the exploratory drilling activities to conduct observations and collect relevant data.</i></p>
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A.13 Response

Argos acknowledges the comment.

Response to SAMS Comments

The following section addresses the comments raised during the SAMS review of the EIS. The comments have been placed with reference to the headings and numbering system used in the SAMS Comments and in the EIS.

Section 4.0 Environmental Description

4.1 Introduction

4.1.1. Potential Impacts

Q.1 SAMS Comment

<p>EIS Page 46</p>	<p><i>Paragraph three states that ‘the proposed exploration wells are located away from the identified areas of highest seabird vulnerability (refer to section 4.3.3). As section 4.3.3 has information regarding seabed communities it is unclear what the justification for this statement is.</i></p> <p><i>The second part of this paragraph states that the areas with highest vulnerability are those associated with inshore areas due to the presence of resident species. This statement is true if vulnerability is only calculated in terms of number of species affected by a potential oil spill. However as many of the seabird species that breed in the Falklands are seasonally migratory and forage offshore, it could be argued that offshore areas are just as important as inshore in terms of sensitivities for particular species.</i></p>
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A.1 Argos Response

Argos acknowledges the above comment. The Section reference should read ‘4.3.7.9. Seabird Vulnerability’ as opposed to Section 4.3.3.

Argos recognises the importance of offshore areas in respect of seabird vulnerability. Offshore areas are just as important as inshore areas in terms of species sensitivity and Argos agrees with this comment. However, seabird vulnerabilities inshore play an important factor in terms of worst case scenario oil spill modelling. Worst case scenarios presented in Section 5.9.2 on page 167 show a number of scenarios where oil is shown to beach. In these instances, it could be considered that inshore vulnerabilities are just as important as those offshore, due to the possibility of impacts on coastal breeding areas and colonies.

The statement in the final paragraph on page 46 of the EIS, ‘*The proposed exploration wells are located away from the identified areas of highest seabird vulnerability*’ would perhaps be better understood if the full seabird vulnerability maps for the Falklands area were presented, and not just the zoomed in version for the immediate PL001 area, as provided currently in Figures 4.29 and 4.30. In these Figures, it can clearly be seen that, in a general sense, areas of highest seabird vulnerability tend to be associated with those offshore waters in closer proximity to the coastal areas. These Figures will be provided in the Addendum to the EIS, and a detailed description of patterns observed in seabird vulnerabilities across the wider area and in the area associated with the exploration well locations will be given.

4.2. Physical Environment

4.2.1. Geography

Q.2 SAMS Comment

EIS Page 48	<i>Most of this section concentrates on the topographic geomorphology of the Falkland Islands. Whilst the relevance of this is clear in the final sentence, that no operations will be visible from the islands, this section is rather long.</i>
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A.2 Argos Response

Argos acknowledges the above comment.

4.2.2. Geology

Q.3 SAMS Comment

EIS Page 48	<i>The geology here is rather brief, contains no stratigraphic information and is unreferenced. Considering the importance of the sub-seabed geology to the project this is rather surprising.</i>
	<i>Figure 4.2 Geological Basins of the Falkland Plateau - This figure is rather vague and shows no geological formations, only a general geological overview. Some idea of bathymetry would be useful to the following discussion.</i>

A.3 Argos Response

Although the underlying geology is of course highly important to the exploration drilling programme, it has little relevance to the EIA in terms of possible environmental impact to the area. Detailed geological information is available in the Competent Person's Report, which is available on the company website.

4.2.3. Bathymetry and Seabed Features

Q.4 SAMS Comment

EIS Page 50	<i>As above the inclusion of a bathymetric map would be very beneficial. As with the geography section, there is a lengthy description of the bathymetry of the coast of the Falkland Islands.</i>
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A.4 Argos Response

The general bathymetry of the Falklands area is displayed in Figure 4.4 on page 54 of the EIS, which also displays the metocean buoy deployment locations. Reference to Figure 4.4 should have been made in the above Section to make this clear.

4.2.4. Sediments

Q.5 SAMS Comment

EIS Page 50	<i>Overall this is a fair summary of the seabed sediments in the area. I would question the highly precise depths quoted – suggesting some surveys have been conducted – but the text is not supported with these data, if they exist.</i>
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A.5 Argos Response

Argos disagrees with the above comment. The second paragraph of Section 4.2.4 on page 50 of the EIS clearly states that previous benthic survey work has been carried out. The two site surveys described are mentioned in the text as being referenced from the Desire Petroleum Environmental Impact Statement from 2005, although the full references from the Desire EIS for the individual well site surveys are not given. These references to the two well sites described (from the Desire 2005 EIS) are:

Gardline (1998), Benthic Environmental Baseline Survey of the sediments around the exploration "Minke" 14/13-B Well (June 1998), Gardline Surveys Limited.

Gardline (1998), Benthic Environmental Baseline Survey of the sediments around the exploration "Little Blue A" Well (February 1998), Gardline Surveys Limited.

The precise depths quoted in the text are taken from the above references.

4.2.5. Oceanography

Q.6 SAMS Comment

EIS Page 52	<p>Tables 4.1 and 4.2 appear to be current speeds rather than velocities as given in the titles.</p> <p><i>The description of the method used to extract current data for use in the dispersion modelling is confusing and inadequate. At first we are told that the speed and direction data are to be taken from the nearby mooring at Location A – this would be a very good idea. But then we are told that that is not in fact what was done. For no sensible reason, the model has been run using a single residual current speed and direction given in table 4.3. Running a dispersion model with a single current speed and direction is pointless when much better data are clearly available. The only possible explanation is to save a little effort but this means that the results are a useful scenario rather than a prediction.</i></p>
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A.6 Argos Response

Argos acknowledges the above error in respect to the titles of Tables 4.1 and 4.2. The figures given in the Tables are current speeds and this should have been reflected in the Table titles. The Table titles will be amended.

Argos disagrees with the above comment regarding the selection of current data input into the modelling programmes for both oil spills (OSIS) and cuttings deposition (PROTEUS). As stated in the description in Section 4.2.5.1 of the EIS (page 60), the models apply a blanket current across the area of interest when using the current override function, as shown in Figure 4.5 of the EIS (page 61). The use of residual current speed and direction for input into the models represents an accurate reflection of the fate of spilled oil in the marine environment, as the residual current speed and direction takes into account the resultant current drift due to the influence of tidal harmonics in the area. The resultant current drift is the main influence on surface current drift over extended periods of time.

RPS Energy will acquire a hydrodynamic hindcast database for the Falkland Islands. This current data will be built into the OSIS model and will comprise of the following:

- Daily surface current velocity fields derived from ocean circulation model hindcast data (at 1/12 degree resolution). These will be combined with surface tidal current velocities from BMT ARGOS' tidal database.
- Resultant data, representative of the total surface current velocity, at 1/12 degree resolution across the area of interest.

Oil spill modelling will be rerun using the new current database and the outputs will be included in the Oil Spill Contingency Plan.

Argos acknowledges the limitations of oil spill modelling software and the fact that oil spill modelling is a decision support tool and not a decision-making tool.

Nevertheless, the use of the current override function provides a relatively accurate estimation of the fate of spilt oil and cuttings deposition in the marine environment, provided that careful consideration of the current input data has taken place. Paragraph 5 on page 58 of the EIS highlights the importance of selecting these data carefully from data sources for input into the modelling programmes.

4.2.5.4. Sea Ice

Q.7 SAMS Comment

EIS Page 62	<i>It would have been easy for the authors to have told us what procedure was in place to mitigate the risk of iceberg collision.</i>
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A.7 Argos Response

As stated in the final paragraph in Section 4.2.5.4 on page 63 of the EIS, the risk of encountering sea ice in the vicinity of the proposed exploration well locations is considered to be minimal based upon historical data indicating that icebergs encountered in the Falklands region, particularly to the North of the Islands, are extremely rare occurrences.

4.3.2. Plankton

Q.8 SAMS Comment

EIS Page 70	<p><i>The statement “Due to a lack of knowledge on the distribution and ecology of plankton species in Falkland Islands waters, current information is based on the “Discovery research expeditions undertaken during the early part of the twentieth century between the Falkland Islands and South America, compiled from 1926–1986.” is not really correct. There have been more recent studies and some are cited in Agnew (2002).</i></p> <p><i>It should also be noted that some recent (2008-2009) Continuous Plankton Recorder tows have been made from the Falklands to South Orkneys and South Georgia. In addition some AMT studies may be relevant. These data will update the Discovery expeditions. UK NOCS and BAS is co-ordinating these surveys. No attempt appears to have been made by the authors to contact these organisations to see if more recent plankton data or reports are available.</i></p>
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A.8 Argos Response

The description of plankton given in Section 4.3.2 of the EIS is considered sufficient for the purposes of the EIS report. However, it is noted that there are now more recent studies than those mentioned in the first paragraph of Section 4.3.2 and that Agnew (2002) is cited later in Section 4.3.2.2 ‘Zooplankton’ (page 72). The organisations of the above studies suggested above have been contacted to ascertain whether more recent study data is available in order to strengthen the Plankton Section of the EIS. The two main potential data sources are:

- Continuous Plankton Recorder (CPR) surveys from the Falkland Islands to South Orkney and South Georgia, conducted by the British Antarctic Survey (BAS, 2008-2009);
- The Atlantic Meridional Transect (AMT) programme: biological, chemical and physical oceanographic research during the annual return passage of the RRS *James Clark Ross* between the UK and the Falkland Islands.

In the event that more recent data is made available, this will be summarised briefly in the Addendum to this EIS. Future EIS submissions will also make reference to this data, should this be available for use.

4.3.2.1. Phytoplakton

Q.9 SAMS Comment

<i>EIS Page 70</i>	<p><i>The account is very generic and could do with referring to some research specific to the region to the north of the Falklands.</i></p> <p><i>In addition the phytoplankton bloom images shown need latitude and longitude labelling and an overlay of the oil exploration area – at present it is almost impossible to relate the features shown to the proposed drilling sites.</i></p>
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A.9 Argos Response

Argos acknowledges the above comment that Section 4.3.2.1 ‘Phytoplankton’ is currently rather generic in nature. In the event that data become available from the two studies identified above, this section will be reviewed and strengthened with relevant data where appropriate. In the event that more recent data is made available, this will be summarised briefly in the Addendum to this EIS.

Whilst it is appreciated that it is difficult to relate Figure 4.13 precisely to the proposed drilling sites, it should be noted that this image was taken from the NASA Sea-viewing Wide Field-of-view Sensor (SeaWiFS) public image library. Adding latitude and longitude lines to such an image would prove to be highly inaccurate. The image was intended to show that the possibility of phytoplankton blooms exists in the north offshore area of the Falkland Islands, and hence the potential for similar phytoplankton blooms to exist in the vicinity of the proposed operations. Overlaying the well locations onto this Figure would add little benefit to the analysis, as Figure 4.13 represents a single snapshot event in 2002. Overlaying the image with the licence area would inform if the phytoplankton bloom occurred in the vicinity of the proposed drilling operations, but this would not provide any additional insight. Overlaying the well sites onto a map which showed probability of occurrence of phytoplankton blooms (comparable in nature to the free floating kelp distribution estimation map shown in Figure 4.12 on page 69) would, however, be very useful. However, the authors are not yet aware that such a database exists to enable such mapping to be conducted.

4.3.2.2. Zooplankton

Q.10 SAMS Comment

<i>EIS Page 72</i>	<p><i>The major omission in this section is the observation that the oil exploration area coincides with the major high summer zooplankton zone (Agnew, 2002) in the region. This is an important feature to note as this zone will attract higher trophic level organisms which feed on the zooplankton e.g. Agnew states that this area of productivity is exploited by planktivorous Ilex argentinus and southern blue whiting. At present this point is downplayed in the rather generic sentence quoted below.</i></p> <p><i>“The complex current patterns around the Falklands, with the rising bathymetry and the extensive shelf area, create stable areas to the north and to a lesser extent in the south-west, where high salinity and nutrient-rich waters enhance phytoplankton activity supporting high levels of zooplankton (Agnew, 2002).”</i></p> <p><i>Agnew (2002) discuss the potential impacts of oil pollution on this production zone and although they conclude, from the oceanography of the area, that major impacts are relatively unlikely, this discussion from Agnew is not fully drawn out in the Argos EIS.</i></p>
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A.10 Argos Response

Argos acknowledges the above comment. It is appreciated that the drilling operations have the potential to coincide with a high summer zooplankton zone. This information will be reviewed and strengthened where possible upon consideration of the above references.

After review of the report presented by Agnew (2002) stating that impacts from oil pollution are relatively unlikely, it was considered that the potential high zooplankton zone was of a lesser concern to the proposed exploration drilling operations. However, it is appreciated that this is not discussed in sufficient detail in this Section of the EIS in its present state. This section will be revised for future EIS submissions, which will include review of any data made available from the above highlighted studies and a more detailed discussion of data available from Agnew (2002).

4.3.3. Seabed Communities

Q.11 SAMS Comment

<p>EIS Page 72</p>	<p>The report presents data from grab samples taken at two well locations in the vicinity of the PL001 area. This section is rather superficial and could usefully be expanded to provide more quantitative information on community composition in these two areas. At present, the only details given are total numbers of taxa found, the breakdown of these by major group (Phylum or Class), and a listing of the 10 most abundant taxa in each area. Stating that (for example), the community at the 14/13-B well site contains 68 species of Annelida, 52 species of Crustacea, 15 species of Mollusca and 17 species of Echinodermata is not very informative, as these major groups would be expected to dominate the infaunal community at virtually any location or depth. Similarly, listing the 10 most abundant taxa at the 14/13-B and 'Little Blue A' areas is sufficient to show that 6 out of 10 are common in both areas, but the degree of similarity/difference could be more usefully illustrated by some basic multivariate analysis using abundance data from the grab samples. This type of analysis, using the PRIMERTM package, is now standard procedure in marine benthic surveys and would require very little additional effort to perform. I recommend that this section should be expanded to include the following information:</p> <ul style="list-style-type: none"> ▪ Total macrofaunal abundance (mean \pm SD, ind. m⁻²) for the individual sampling stations at the 14/13-B and 'Little Blue A' survey areas, using the two grabs taken at each station as replicates. Data should also be presented similarly for total biomass if this parameter was measured. The sieve mesh size used in the processing of macrofaunal samples should also be given (I cannot see this information anywhere). ▪ Mean (\pm SD) abundance (ind. m⁻²) for the 10 most abundant taxa should be added to Tables 4.4 and 4.5. ▪ A basic multivariate analysis (using PRIMERTM) of abundance data from the two survey areas, using individual grab samples as replicates. Grouping of samples should be represented visually using a Cluster Analysis dendrogram and non-metric multidimensional scaling (nMDS) plot. The ANOSIM and SIMPER routines in PRIMERTM can be used to interpret the clustering of samples and the individual taxa which make the greatest contribution to generating the observed pattern.
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A.11 Argos Response

Argos acknowledges the above comment. The aim of this section was to present an overview summary of the existing survey information in the area, relevant to the proposed exploration drilling locations. It is recognised that statistical information in relation to these surveys was not included in the report. At the time of writing, only the summary reports for these surveys were available, as described in the Desire

Petroleum plc Environmental Impact Assessment (Desire, 2005). Argos will endeavour to obtain the full survey reports for these surveys, all previously conducted as part of the 1998 drilling campaign. Once these are available, the statistical analyses for the benthic samples will be fully described in detail in the Addendum to this EIS.

4.3.3. Seabed Communities

Q.12SAMS Comment

<p>EIS Page 75</p>	<p><i>The following section, focusing on epifauna, is of very limited use in characterizing the benthic environment and biological communities of the PL001 area. Figure 4.14 shows the breakdown of epifaunal biomass by major group (Phylum or Class) at a large number of stations using ‘data collected by observers using different gear’. However, for the many pie-charts to be any value for comparison of stations we would need to know which types of gear were used, whether the same gear was used consistently at each station, and for some standardization of sample size to be applied (e.g. distance or duration of tow). None of these details are given. Figure 4.15 is slightly more useful in that it shows data from bottom trawls only, but still provides only the most rudimentary information. As an example, knowing that Porifera (sponges) make up 50% of the trawled epifaunal biomass at a site tells us very little about the benthic community. A single large sponge in a trawl could easily weigh as much as the rest of the catch combined, even if sponges were rare and scattered across the seabed. The same result could be obtained if sponges were small-sized but abundant, with rare individuals of some other large-bodied taxon accounting for much of the remaining 50% of biomass. The breakdown of trawled biomass only to Phylum or Class level is also too broad to provide any clear picture of the communities involved. None of the epifaunal sampling stations are actually located within the PL001 box, so that characterization of that area is dependent on the assumption (or hope) that it will resemble the closest neighbouring stations. Figures 4.14 and 4.15 show that adjacent stations can often differ considerably at the taxonomic level shown, so that this assumption is rather dubious.</i></p> <p><i>In conclusion, the epifaunal data presented in Figures 4.14 and 4.15 provide a very poor basis for characterizing the epifaunal communities of the PL001 box. A seabed imaging survey using video and/or still photography would have been a much more effective and informative survey technique. If trawl or other bottom- sampling data are the only form available, results from the stations adjacent to PL001 should be analyzed in much greater detail, including standardization of data by gear type and effort, and finer-scale taxonomic identification of the fauna sampled.</i></p>
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A.12 Argos Response

Argos agree with the above comment that Figures 4.14 and 4.15 are of little use in characterising the benthic environment and biological communities of the PL001 area, the main reason being that the data does not focus on the PL001 area itself. It has already been mentioned above that the benthic macrofaunal statistical analyses for the well site surveys, referenced in the EIS document to be in close proximity to the PL001 area, will be obtained by reference to the full site survey reports previously conducted as part of the 1998 drilling campaign. This information will be provided in the Addendum once these reports have been obtained.

The data presented in Figures 4.14 and 4.15 focuses on the wider north Falklands area and hence provide a good indication of the general epifauna of the wider offshore north Falklands area.

Argos acknowledges the above comment on fishing gear types. This is always going to be problem when using fishing gear to ‘sample’ benthic environments as there will always be an element of gear selectivity. In respect of this comment, Argos agrees that there should perhaps have been some indication of what gear was being used to sample the benthos. Argos is endeavouring to obtain the gear types used in relation to the amount of survey effort in each area and will display this information in the Addendum where relevant.

The data obtained for Figures 4.14 and 4.15 were recorded to varying levels of accuracy, with items recorded from species up to phylum level. An attempt was made to group the observations into the most logical groups, following guidelines produced by the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) which was designed for observers to record benthic species classified as indicators of Vulnerable Marine Ecosystems (VMEs). 'Glass' and 'siliceous' sponges were grouped into 'sponge' as this was how most observers recorded them. Anthozoa also tended to cover a number of categories and many observers also recorded these, particularly on the longline vessels. Otherwise the Figures follow the categories set out in the CCAMLR guide.

With regard to quantifying the catches, three basic ways are commonly identified to achieve this: by number, by volume and by weight. There have been a number of debates at CCAMLR over quantification when discussing VMEs and what is the most representative way to record them. For the data represented in Figures 4.14 and 4.15, the data were recorded by weight, so there was no other way to present it. To serve as an example, observers will take, for example, all the Gorgonaceas on one catch and weigh them all together. There will always be a bias towards sponges; almost by definition sponges soak up water which is retained when it is weighed. However as long as this is realised when interpreting the data, it will still give an indication as to where different species are located, and therefore the Figures do provide some use as general indicators of benthic species location across the north Falklands Offshore area. However, Argos agrees that the way in which the data is presented means that it should be treated with caution, and perhaps the limitations described above should have been made clearer in the EIS.

4.3.4. Fish

Q.13 SAMS Comment

<i>EIS Page 77</i>	<p><i>Section 4.3.4 of the EIS summarises the main species of fish, squid and shellfish found around the Falkland Islands based on reports from the Fisheries Department (FIDF) and the 2008 State of the Environment Report (Otley et al., 2008). Coggan (2006) is also cited but sampling stations were to the east and south of the Falkland Islands. Although Goggan (2006) provides general background on fish species found in the general region it is not very relevant to the area of interest. [NB: There are examples of sloppy referencing e.g. Coggan (2006) is cited but not listed in the references.]</i></p> <p><i>Nearly all this section focuses on commercial species, presumably because information is more available for these. However, any biodiversity impacts would need to take account of the whole fish community. The lack of a comprehensive fish survey for the region has not been emphasised.</i></p> <p><i>According to the EIS at least 80 species of fish have been recorded in Falkland Islands waters but detailed information is only provided on the major commercial species. The report should at the very least attempt to identify any fish species of special conservation interest which occur in the vicinity of the oil exploration area.</i></p>
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A.13 Argos Response

Argos acknowledges the above comment. The wide availability of fisheries statistics data from the Falkland Islands Department of Fisheries (FIDF) for commercial species, together with the high importance of the fisheries industry to the Falkland Islands economy, warrants their inclusion and detailed discussion in the EIS. Nevertheless, it is appreciated that the acknowledgement of a comprehensive fish survey for the region is not made clear in the EIS.

It is also acknowledged that Coggan *et al.* was erroneously omitted from the references Section. The full reference for Coggan *et al.* should read:

Coggan, R. A., Nolan, C. P. & George, M. J. A. (1996), Exploratory deep-sea fishing in the Falkland Islands, south-western Atlantic. Journal of Fish Biology, 49 (Supplement A): pp 298-310.

4.3.5.1 to Argentine Shortfin Squid (*Ilex argentinus*) to 4.3.5.4 Shellfish

Q.14 SAMS Comment

EIS Page 78	<p><i>Presents what is known about distribution of commercial fish species and spawning locations and times. These sections would be aided by inclusion of some maps showing the actual distributions of adults and eggs and larvae (where known). For example, Agnew (2002) shows an overlap of the summer Ilex fishery with the northern oil tranche area. However, it is quite difficult to work out whether this overlaps with the Argos area of interest and this should be clarified.</i></p> <p><i>Furthermore although section 4.4 presents plots of recent commercial catches (Dec 2007 - Mar 2010), these recent distributions may not fully reflect the area over which the species occur. This is especially true for Ilex argentinus where the stock biomass/distribution appears to have changed in recent years but it should be noted that if the stock status improves then the geographical distribution extent would be likely to expand again.</i></p>
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A.14 Argos Response

Argos agrees that the catch statistics maps may not coincide wholly with the locations over which the species occurs. However, in the absence of detailed fish spawning and nursery data from which to create spawning and nursery area maps for these species, it is thought that the fish catch data are a reliable indication of where the species occurs in a general sense. It is a reasonable assumption to make that a species occurs over areas that have been intensively fished for these species in previous years. The fisheries industry has exceptional knowledge and skill in locating commercially valuable species.

It is appreciated that the species *Ilex argentinus* exhibits high seasonal variability, and that should the species experience a dramatic improvement in stock levels (compared to those experienced in recent years), the areas over which the species occur would likely expand in response to this. However, as the impacts on fish spawning were envisaged to be insignificant, particularly due to the limited duration of the exploration programme, it is considered that such an expansion in relation to the proposed drilling activities would have only a minor impact on fish spawning activities. In the event of a significant discovery where field development is feasible, methods of data collection to provide data on the occurrence fish spawning over the proposed development location will be considered.

4.3.5.3.4. Cod (*Notothenia* spp.)

Q.15 SAMS Comment

EIS Page 80	<p><i>This section includes some information from general egg and larval surveys which should be in a separate section since this does not refer to Notothenia specifically. Again inclusion of a figure from Ehrlich et al. (1999) showing distribution of eggs and larvae would have been helpful.</i></p> <p><i>Although the main spawning times for the commercial species are known there is relatively little solid information on spawning and nursery locations. The report acknowledges this on page 81 where it is stated "Many of the commercially caught demersal species are likely to spawn in deep water and have planktonic eggs and larvae. Immature stages of some species may occur inshore; however, there is little information on specific nursery areas." Taking a precautionary approach, and having in mind that fish egg and larval stages may be particularly vulnerable to the effects of hydrocarbon pollutants such as PAHs, this issue requires further examination. Given the lack of information, ichthyoplankton data should have been collected to demonstrate that the license area or the zone over which spills might be dispersed are not important spawning areas.</i></p>
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A.15 Argos Response

Argos agrees with the above comment. Argos is aware that fish egg and larval stages may be particularly vulnerable to the effects of hydrocarbon pollutants such as polycyclic aromatic hydrocarbons (PAHs).

It was concluded that ichthyoplankton surveys were not necessary for exploration drilling in Falkland Islands waters as the impacts on fish spawning were envisaged to be insignificant, particularly due to the limited duration of the exploration programme. However, if a development situation occurs, ichthyoplankton data collection will be considered to provide data on the occurrence fish spawning over the proposed development location.

4.3.6. Marine Mammals

Q.16 SAMS Comment

<p>EIS Page 80</p>	<p><i>This is an extremely basic and rather unimaginative review of knowledge of marine mammals around the Falklands with references to what has been seen in and around PL001.</i></p> <p><i>The review entirely ignores that there was an extensive whaling industry based around the Falklands and is heavily reliant on the most recent large-scale sightings survey made during the Seabirds at sea surveys (White et al., 2002). When considering whether any particular species was seen in proximity to PL001, the author(s) of this report misunderstand the value and limitations of seeing marine mammals on these kinds of surveys. They suggest several times (P85, 86, 89, 93, and 94) that because species X happened not to be seen on the survey then it is unlikely to be present in the site. This is extremely naive for several reasons:</i></p> <ol style="list-style-type: none"> <i>1) We are given little useful information on how much trackline effort was actually expended in and around PL001 - figure 4.16 is insufficient because it represents all effort summed. It is very unlikely that sufficient effort was expended (during what was a very wide-scale survey) in and around the block of interest to draw firm conclusions about what species do not use the area.</i> <i>2) We are given no indications of what the weather conditions were like during the survey legs relevant to PL001. Sea-state is critically important for seeing marine mammals and the criteria are more sensitive for marine mammals than they are for birds (for which the surveys were better suited). Thus there may have been lots, or alternatively, no suitable survey effort in the PL001 area - this fundamentally important detail is given no consideration.</i> <i>3) Marine mammals are diving animals that are also sensitive to the presence of boats. Thus an absence of a sighting does not mean it wasn't there - it simply means that it wasn't at the surface, visible when the ship went by and the single observer happened to spot it. The total absence of beaked whales in this section is a tell-tale indication of this effect.</i> <p><i>The fact that the above caveats (common to all line/strip transect type surveys) are not discussed is a clear failing in this report.</i></p> <p><i>We recommend that a fuller synthesis of what species may be expected to occur in the area based on global location and species habitat preferences be added. In consequence (and more realistically) more species will be added to the list of those exposed to the development.</i></p> <p><i>There is something seriously wrong with Figure 4.18 & 4.22. Large chunks of the some of the maps appear to have been "unsurveyed" while in others the same pieces of water have sightings of other species - how would this be the case.</i></p> <p><i>Figure 4.21 - what are "South American seals"?</i></p>
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Section 4.3.6.2.2 South American Fur seals (final para). The following quote does not present this EIA in good light “Figure 4.22 illustrates that South American fur seals have been sighted within the vicinity of PL001 in low densities...” They have also been seen in the vicinity is high densities - why is this not stated?

Section 4.3.6.2.3 Southern Elephant Seal - final sentence of the section “None were observed within the vicinity of PL001.” We suggest that the following be added to give this sentence it’s proper importance “however given the very low proportion of time these seals spent at the surface when foraging at sea the White et al. 2002 surveys were inappropriate for determining their presence (or not) in the area of interest”.

Section 4.3.6.3. The relevance of this section is not clear at all. It would have been much more useful to look into the spatial distribution of whaling records than to describe a study that has yet to produce relevant results.

A.16 Argos Response

Argos recognise that little is known about the populations, distribution and habits of marine mammals in the waters surrounding the Falkland Islands, particularly in the deeper waters to the south and east. After the award of the initial round of hydrocarbon exploration licenses in 1996, six wells were subsequently drilled. The threat to seabird and marine mammal populations was recognized, and in view of the lack of published data available, the Joint Nature Conservation Committee (JNCC) and Falklands Conservation (FC) conducted a Seabirds and Marine Mammals At Sea Survey between February 1998 and January 2001 (*White et al., 2002*). To date, the findings from these surveys are still the major body of work regarding the frequency and distribution of marine mammals, particularly cetaceans, in the region, and for this reason were the main reference source used within the EIS.

Argos recognises the shortfall in discussion highlighted in the above comments regarding the limitations of at sea sightings surveys for the identification and location of marine mammals. This will be discussed in further detail in the Addendum, where the limitations of the Seabirds and Marine Mammals At Sea Survey will be summarised.

Argos recognises the shortfall in data regarding the population, distribution and abundance of marine mammals in Falklands offshore waters. In light of this, a marine mammal survey was conducted on the 3D survey in conjunction with Rockhopper Exploration plc. The monitoring effort was carried out to ensure compliance with the Joint Nature Conservation Committee (JNCC) Guidelines for Minimising the Risk of Disturbance and Injury to Marine Mammals from Seismic Surveys (February, 2010). A total of 1,310 hours and 11 minutes of visual observation and 943 hours and 47 minutes of passive acoustic monitoring (PAM) were carried out. There were 142 encounters of 12 different marine mammal species seen. The methodology employed for this survey and the survey results will be presented in the Addendum to this EIS.

Argos acknowledges the comment on Figures 4.18 and 4.22. These figures will be reviewed when preparing the EIA Addendum and any clarification necessary will be provided.

Argos acknowledges the above comment regarding Figure 4.21. This is clearly a typing error and should read ‘South American fur seals’.

Argos acknowledges the above comment regarding Section 4.3.6.2.2 ‘South American Fur seals’. The final paragraph of this Section should be rephrased to read, “*Figure 4.22 illustrates that South American fur seal have been sighted within PL001 in low densities between February and October, and in the vicinity of PL001 in high densities from November to January. The species has the potential to occur in the vicinity of PL001 throughout the year*”. It is appreciated that the assessment should be based on the worst case scenario, i.e. if high densities of species have been sighted in the vicinity of PL001, and then this should be stated. This Section will be amended in future submissions.

Argos acknowledges the above comment with reference to Section 4.3.6.2.3. This comment refers again to the limitations of the Seabirds and Marine Mammals at Sea Survey; this will be addressed in further detail in the Addendum, where the limitations of this survey will be summarised.

Argos disagrees with the above comment with reference to Section 4.3.6.3. Whilst it is recognised that this study has yet to produce comprehensive results, it was felt important to highlight the study as a possible reference for future submissions, particularly in light of the possibility of the study as a future source of more detailed satellite tracking data. In addition, it was felt that this study was relevant due to the initial analysis of satellite tracking data, mentioned in the EIS in the final paragraph on page 95. The data indicated that individuals sometimes embarked on long offshore foraging trips, highlighting the possibility that these individuals could be encountered in distant offshore areas, as stated in this Section. The relevance of the study to the project is made clear in the final paragraph of this Section on page 96 of the EIS, “*The ongoing studies by the ESRG will no doubt provide highly valuable information into the population, genetics and behaviour of the southern elephant seal population at Sea Lion Island, which will also provide useful indicators of their foraging behaviour offshore*”. Argos therefore considers this study highly relevant due to the potential for further detailed offshore satellite tracking of individuals, which will provide valuable insight into foraging behaviour and distribution in relation to oil and gas exploration areas.

4.3.7. Seabirds

Q.17 SAMS Comment

EIS Page 96	<p><i>This EIA has sourced virtually all of its data and information from two main documents. The Falklands State of the Environment Report (Otley et. al., 2008), and The distribution of seabirds and marine mammals in Falkland Islands’Waters (White et. al., 2002). The report by White et. al. (2002) also used its data in a slightly earlier document, Vulnerable concentrations of seabirds (White et al., 2001), which has also been quoted, but is essentially selected information that was repackaged into White et. al. (2002) along with some additional survey work.</i></p> <p><i>Whilst the document by Otley et. al. (2008) provides a good summary source of general Falklands seabird information, and White et. al. (2002) has the most comprehensively published at sea distribution of seabirds, there is a lack of inclusion of data and information from many satellite and geolocation tracking studies that have been undertaken both in the Falklands, and from other areas. The EIA has included information from a study by Forster (2009) which reviewed satellite information for three species, however the conclusions that the EIA drew from this study are misleading. The use of White et. al. (2002) and White et. al. (2001) to provide seabird vulnerability maps in section 4.3.7.9, which is the important part of the seabirds assessment, is also potentially misleading due to methodological shortcomings from these studies, and because they have not taken into account the aforementioned satellite and geolocation tracking studies.</i></p> <p><i>The introduction to the seabirds section lists a series of surveys that have been undertaken from vessels at sea. However there is no mention of any satellite or geolocation tracking studies that have been performed in the description sections for each individual species.</i></p> <p><i>References in the first two bullet points of the introduction section are incorrectly cited. Otley et. al. (2006) should be Otley et. al. (2007) and Otley (2005) should be Otley et. al. (2006).</i></p> <p><i>Seabird data and information in the EIA is mainly derived from two main sources. The Falklands State of the Environment Report (Otley et. al., 2008) and The distribution of seabirds and marine mammals in Falkland Islands’Waters (White et. al., 2002). The report by White et. al. (2002) also used its data in a slightly earlier document, Vulnerable concentrations of seabirds (White et al., 2001), which has also been quoted, but is essentially selected information that was repackaged into White et. al. (2002) along with some additional survey work. Also included is some additional survey work from Otley et. al. (2007) taken from commercial longlining vessels. In all</i></p>
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cases these studies have shortcomings due to the fact that vessels of convenience were used as bases for survey effort. The study by White et. al. (2002) relied on the use of Falklands fishery patrol vessels as bases for their observers, and whilst transect observation protocols were used for data collection, the location of the transects are skewed both spatially & temporally towards the western and southern areas of the Falklands EEZ. This is due to most of the fishing activities taking place in this region, and because the border of the EEZ aligns with Argentina (along a north-west to south-west arc). The study by Otley et. al. (2007) used data collection on longlining vessels that target Patagonian Toothfish. Toothfish are generally found in deep waters (300m-3,500m), and the main areas within the Falklands EEZ for this fishery are to the east and south of the islands. Thus observer coverage for the licence block is both temporally and spatially variable through the calendar year, although it should be acknowledged that the authors of the EIA have provided predictions on seabird vulnerability where data is lacking, based on information from neighbouring areas.

The use of at-sea survey data to predict foraging areas of penguins is not a recommended method. It is very difficult to identify both species and numbers of birds during to the short time they spend at the surface when foraging, and this is exacerbated further in even a moderate sea state. Therefore this should not be seen as a comprehensive method of distribution assessment for penguins.

Figures 4.29 and 4.30 map provided visual summaries of seabird vulnerability within the license area. Whilst these maps have been produced using the methodology developed in White et. al. (2001), they also show that in four calendar months, at least part or all of the license block had no observer coverage. This demonstrates the difficulty in predicting seabird vulnerability for the license block accurately. The maps also do not take into account information derived from satellite tracking studies.

Section 4.3.7.10 summarises a study undertaken by Forster (2009) which looked at foraging areas utilised by all seabird species that had been satellite tracked from Falkland Island colonies. Whilst the EIA has summarised the findings from this study, it would be more accurate to cite the individual studies that provided tracking data for separate species. This could easily be done in the general species specific descriptions, and would highlight the tracking data that has been undertaken more comprehensively. The concluding paragraph to this section also notes that whilst there are occurrences of black-browed albatross and rockhopper penguin in the licence area, no such records of these species exist for the common incubation and chick rearing periods. This statement is misleading as it makes the assumption that satellite tracking studies comprehensively cover the year round period for the species analysed, and this is most definitely not the case.

A.17 Argos Response

The short-comings of the data sources used in this EIS have been noted. Due to the short drilling period and low spill risk associated with this project, it is considered that impacts arising as a result of the exploration will be short-term, and ultimately have a negligible impact on the environmental characteristics of the area. The data used throughout the EIS gives an indication as to the distribution of both seabird species and penguins, which is considered sufficient to ensure that possible impacts to species of high risk to oil and disturbance in the proposed exploration area (such as seabirds and marine mammals) are adequately addressed. Mitigation measures have been proposed throughout the impacts section of the EIS to reduce the risks associated with drilling operations and ensure that all impacts are reduced to ALARP (as low as reasonably practical).

Argos recognise that little is known about the population, distribution and habits of marine mammals and seabirds in the waters surrounding the Falkland Islands, particularly in the deeper waters to the south and east. After the award of the initial round of hydrocarbon exploration licenses in 1996, six wells were subsequently drilled. The threat to seabird and marine mammal populations was recognized, and in view of the lack of published data available, the Joint Nature Conservation Committee (JNCC) and Falklands Conservation (FC) conducted a Seabirds and Marine Mammals At Sea Survey between February 1998 and January 2001 (*White et al., 2002*). To date, the findings from these surveys are still the major body of work regarding the frequency and distribution of marine mammals and seabirds (particularly cetaceans), in the region, and for this reason were the main reference source used within the EIS.

Argos disagrees with the above comment with regard to the statement that the seabird vulnerability maps produced are potentially misleading due to the methodological shortcomings from these studies. The methods devised to produce the vulnerability indices are well documented throughout the industry, having drawn on considerable experience from similar undertakings in the North Sea. The seabird vulnerability Figures are not maps of potential seabird distribution, they are maps of seabird sensitivity to surface pollution such as oil. They use an index, developed by the JNCC, which takes into account species specific oil vulnerability indices and area vulnerability indices. The species specific indices take into account the following information:

- The proportion of the time spent on the surface of the sea by that species;
- The size of the biogeographical population of that species;
- The potential rate of recovery of the species after a reduction in numbers;
- The reliance on the marine environment by that species.

Therefore, the seabird vulnerability indices provide a good assessment of the potential impact on seabirds if an oil spill or similar pollution incident were to occur.

Argos acknowledges the above comment with regard to the Otley *et al.* references. These will be amended for all future submissions.

Argos recognises the shortfall in data regarding the population, distribution and abundance of seabirds and marine mammals in Falklands offshore waters. In light of this, a marine mammal and seabird survey was conducted on the 3D seismic survey vessel in conjunction with Rockhopper Exploration plc. The monitoring effort was carried out to ensure compliance with the Joint Nature Conservation Committee (JNCC) Guidelines for Minimising the Risk of Disturbance and Injury to Marine Mammals from Seismic Surveys (version February 2010). A total of 1,310 hours and 11 minutes of visual observation and 943 hours and 47 minutes of passive acoustic monitoring (PAM) were carried out. In addition to the marine mammal data collected, a seabird survey was also conducted voluntarily. This comprised of 242 separate survey periods, totalling 308 hours and 1,350 kilometres of surveying effort. This survey was intended to provide a spatially specific dataset that would act to strengthen knowledge of seabird activity within licence area PL001 during the summer exploration season. This data will be of particular relevance to environmental risk assessments undertaken ahead of further seismic or drilling campaigns. The survey methods were based upon standardised protocols developed by the UK based Joint Nature Conservation Committee (JNCC) Seabirds at Sea Team (SAST UK). The methodology employed for these surveys and the survey results will be presented in the Addendum to this EIS (at the time of submission of the EIS, this report was unavailable).

Argos acknowledges the above comment regarding the limitations of the use of the at sea survey data for the prediction of penguin foraging areas. As mentioned above, the limitations of the Seabirds and Marine Mammals at Sea Survey will be summarised in the Addendum. In addition, a review of relevant literature on the distribution of penguin foraging areas in relation to the PL001 licence area will be discussed in the Addendum to the EIS.

Argos acknowledges the above comment regarding Figures 4.29 and 4.30. As stated above, the full seabird vulnerability maps for the Falklands area will be presented in the Addendum to this EIS, and not just the zoomed in version for the immediate PL001 area, as currently provided in Figures 4.29 and 4.30. In these Figures, the seabird vulnerability indices for the wider area can be better appreciated. Although the licence block showed that in four calendar months, at least all or part of the licence block had no observer coverage, the use of ‘nearest neighbour’ data to infer likely seabird vulnerabilities in the area of interest makes sense in terms of interpolating the likely seabird vulnerability to be encountered within that area. The validity of making conclusions based on surrounding areas and months was recognized in the original report by the JNCC:

“It is possible to make informed decisions about the likely vulnerability of those areas not already surveyed. Comparison of an unsurveyed area with adjacent areas with survey coverage in the same month will give an indication of the level of vulnerability that might be expected in the unsurveyed area. In addition, comparison of this area with the same area in adjacent months (if survey coverage exists for those months) will also give an insight into the expected vulnerability of an area. However, there is no substitute for empirical data and, where possible, decisions should be based on data rather than implied knowledge.” (White et al., 2001)

The maps do not take into account information derived from satellite tracking studies, simply because this data is not compatible for integration with the seabird vulnerability indices information.

Argos acknowledges the above comment regarding the satellite tracking study by Forster (2009). The individual studies that provided the input into this reference will be examined closely in the Addendum to this EIS in terms of species specific descriptions and times of year of the satellite tracking of the various species in the study.

4.4.3. Commercial Fishing

Q.18 SAMS Comment

<p>EIS Page 139</p>	<p><i>This section introduces the broad fishery landings and revenues. Most dramatic change was a large drop in catches of <i>Ilex argentinus</i> – possible reasons for the decline are discussed in the report.</i></p> <p><i>The maps shown are adequate to demonstrate that there is relatively little fishing activity within the area of interest although, as noted above, this is based on recent years when overall the <i>Ilex</i> stock has declined.</i></p>
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A.18 Argos Response

Argos acknowledges the above comment. As fisheries data maps are based on recent years where a general decrease in *Ilex* stock has been experienced, Argos acknowledges the possibility of fishing activities occurring within PL001 due to the high variability in stock abundance and location that can often be experienced year-to-year.

4.4.4. Interactions of Black Browed Albatross with Fisheries

Q.19 SAMS Comment

<p>EIS Page 139</p>	<p><i>Information in this section is accurate, although I don’t see the relevance of it to the proposed development.</i></p>
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Q.19 Argos Response

Argos acknowledges the above comment. The information on interaction of Black-browed Albatross with fisheries was included as it may indicate the possibility of interaction with vessels associated with oil and gas operations in licence area PL001.

4.5. Key Environmental Sensitivities

4.5.1. Biological Sensitivities

Q.20 SAMS Comment

<p>EIS Page 149</p>	<p>3rd bullet point down. OK so White et al., 2002 saw these species but we know that others are likely to use the area - why is there no attempt to determine this?</p> <p>4th bullet point down “South American fur seals have been known to frequent the waters in the vicinity of PL001 in low numbers” But we know they also occur in the vicinity in HIGH numbers (Fig 4.22). Why is this not stated?</p> <p>4th bullet point down other pinnipeds “However little is known of the at-sea distribution of Falkland Islands pinnipeds may be present within the vicinity of the PL001 in low numbers”. Again if little is known why do the authors plump for the best case scenario “low” rather than “medium” or “high”? How is this position justifiable?</p> <p>Table 4.13 Pinniped box. Where does this data actually come from? Why are high densities of these pelagic & mobile seals in the vicinity to PL001 ignored?</p>
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A.20 Argos Response

Argos acknowledges the above comments. In the third bullet point in the summary list on page 149 of the EIS, the paragraph is simply stating those species that have previously been sighted in the area. However, Argos appreciates that the possibility remains that other species are likely to use the area and this should have been made clear.

In the fourth bullet point on page 149 of the EIS, the above comment relates to a previous comment on Section 4.3.6 ‘Marine Mammals’, Section 4.3.6.2.2 ‘South American fur seals’. The final paragraph of Section 4.3.6.2.2 should be rephrased to read, “Figure 4.22 illustrates that South American fur seal have been sighted within PL001 in low densities between February and October, and in the vicinity of PL001 in high densities from November to January. The species has the potential to occur in the vicinity of PL001 throughout the year”. It is appreciated that the assessment should be based on the worst case scenario, i.e. if high densities of species have been sighted in the vicinity of PL001, and then this should be stated.

Argos acknowledges that the data presented on pinnipeds in Table 4.13 on page 151 of the EIS does not accurately reflect the data presented in the bulk of the text and Figures relating to pinnipeds in the EIS document. Argos acknowledges this error and will ensure that this error is addressed when compiling future EIS submissions.

5.4.3. Model Set-up and Assumptions

Q.21 SAMS Comment

<p>EIS Page 156</p>	<p>Refer to comments above (4.2.5).</p>
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A.21 Argos Response

Refer to response above (4.2.5. Oceanography).

5.4.4. Modelling Results

Q.22 SAMS Comment

<p><i>EIS Page</i> 156</p>	<p><i>As expected from the way the model was set up, the results are a particular synthetic scenario rather than a prediction of what will actually happen. The authors could argue that the effort in running this model with available current data is not warranted owing to the modest impact seen in this scenario - but they don't.</i></p>
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A.22 Argos Response

Argos acknowledges the comment. RPS Energy will acquire a hydrodynamic hindcast database for the Falkland Islands. This current data will be built into the OSIS model and will comprise of the following:

- Daily surface current velocity fields derived from ocean circulation model hindcast data (at 1/12 degree resolution). These will be combined with surface tidal current velocities from BMT ARGOSS' tidal database.
- Resultant data, representative of the total surface current velocity, at 1/12 degree resolution across the area of interest.

Oil spill modelling will be rerun using the new current database and the outputs will be included in the Oil Spill Contingency Plan.

Argos acknowledges the limitations of oil spill modelling software and the fact that oil spill modelling is a decision support tool and not a decision-making tool.

5.4.5. Conclusions

Q.23 SAMS Comment

<p><i>EIS Page</i> 158</p>	<p><i>It is hard to reconcile the word "vener" with the observation of 20-25cm deep cuttings.</i></p>
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A.23 Argos Response

Argos acknowledges the comment. This is due to a typographical error which should read 'instead there was a thin 'vener' of cuttings dispersed over a large area in a patchy fashion, the thickest patches were observed to be 20-25mm deep.' The EIS will be updated accordingly.

5.5. Noise and Vibration

Q.24 SAMS Comment

<p><i>EIS Page</i> 158</p>	<p><i>Table 5.3 Values in Richardson et al., for Table 6.3 from which some of these values are taken, come with the caveat that "Data do not span all frequencies where boat noise is expected, and thus understate broadband source levels". Why was this caveat not repeated?</i></p> <p><i>Figure 5.4 Why was spherical spreading used when a more realistic spherical-cylindrical model not used - which would generate propagation over longer ranges.</i></p>
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A.24 Argos Response

Argos acknowledges the comment. The caveat "Data do not span all frequencies where boat noise is expected, and thus understate broadband source levels" will be included in Table 6.3.

Q.25 SAMS Comment

<i>EIS Page 158</i>	<i>Figure 5.4 Why was spherical spreading used when a more realistic spherical-cylindrical model not used - which would generate propagation over longer ranges.</i>
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A.25 Argos Response

Argos acknowledges the comment. Cylindrical and spherical spreading are two simple approximations used to describe how sound level decreases as a sound wave propagates away from a source. However both spherical and cylindrical spreading are only rough approximations to actual spreading loss in the ocean. Neither type of spreading takes into account the refraction that occurs because of the dependence of sound speed on depth, for example. More sophisticated methods of predicting the sound field around an acoustic source exist, which take into account of the actual sound speed field in the ocean and the reflections from the sea surface and sea floor as the sound moves away from a source. Nonetheless, spherical and cylindrical spreading is often used to obtain an estimate of sound levels around a source without doing complex computer calculations.

Noise from drilling operations would have minor to moderate impact on the offshore receptors irrespectively of whether spherical and cylindrical spreading is used to calculate the noise levels. The differences would be more pronounced for seismic sound sources.

5.5.1. Potential Impacts**Q.26 SAMS Comment**

<i>EIS Page 159</i>	<i>The noise produced by rigs appears to be considered in isolation. There is no mention of supply boats, helicopters etc.</i>
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A.28 Argos Response

Argos acknowledges the comment. A literature review will be conducted on anthropogenic sounds generated from supply vessels, helicopters, tugs and the findings will be included in the Addendum to the EIS.

5.5.2. Potential Impacts on Fish**Q.27 SAMS Comment**

<i>EIS Page 161</i>	<i>This section misses the fundamental fact that most fish perceive “noise” through particle motion but the assessment of impact only considers noise through pressure changes. The appraisal is therefore void. Also the assessment of disturbance is that it would only be a temporary impact. However if “temporary” were to occur during the spawning period then that could have impacts for several years after the drilling operations had finished. The conclusion that noise will not have significant impacts on fish is therefore swept too quickly under the carpet.</i>
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A.27 Argos Response

Argos acknowledges the fact that some fish are sensitive to particle velocity rather than sound pressure. However in order to examine the sensitivity of these fish it is necessary to conduct the experiments in the field, where good acoustic conditions prevail. Many published audiograms for fish are flawed, because they were measured under poor acoustic conditions, without ascertaining whether the fish were sensitive to particle velocity or sound pressure. Several general conclusions can be drawn from the audiograms available from fish. Firstly fish are sensitive to a rather restricted range of frequencies compared with terrestrial vertebrates.

Even the most sensitive fish have poor hearing above 2-3 kHz (in contrast humans are sensitive to frequencies up to and even above 15 kHz). There are one or two exceptions; some fishes do appear to be sensitive to ultrasonic frequencies. Studies have shown that some clupeid species, including alewife *Alosa pseudoharengus*, American shad *Alosa sapidissima* and gulf menhaden *Brevoortia patronus*, actively avoid ultrasonic sources and can detect sounds at frequencies higher than 20 kHz (Dunning et al. 1992; Nestler et al. 1992; Ross et al. 1995, 1996; Mann et al. 1997, 1998, 2001). Other clupeids, including bay anchovy *Anchoa mitchilli*, scaled sardine *Harengula jaguana*, Spanish sardine *Sardinella aurita* and Atlantic herring *Clupea harengus* do not detect ultrasound (Mann et al. 2001, 2005). However, the majority of fish are sensitive to relatively low frequencies, in some cases extending into the infrasonic range (Sand et al., 2000).

Reference: *Report of the Ad-hoc Group on the Impacts of Sonar on Cetaceans and Fish (AGISC). ICES AGISC Report 2005, 2nd edition. ICES Advisory Committee on Ecosystems: ICES CM 2005/ACE: 06.*

5.5.3. Sound Pressure Potential Impacts on Cetaceans

Q.28 SAMS Comment

<p>EIS Page 162</p>	<p><i>Sound pressure potential impacts on cetaceans: Opening line “Cetaceans are in general believed to be fairly tolerant of noise disturbance” Richardson may have said this in 1995 but much has happened in the 16 years since then to suggest the opposite. (e.g. Cox et al., 2006. Understanding the impacts of anthropogenic noise on beaked whales, JCRM 7: 177-187) The old perspective reflected in this EIA needs to be urgently updated.</i></p> <p><i>Para starting PL001 “pilot whale in the south-eastern region” - once again the authors demonstrate a misunderstanding of the power of the White et al survey.</i></p>
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A.28 Argos Response

Argos acknowledges the comment. The JNCC released a guidance document entitled The Protection of Marine EPS from Injury and Disturbance (JNCC, 2009) which defines precautionary noise exposure thresholds for injury and behavioural responses based on the work by Southall *et al.* (2007) A literature review will be conducted on the sound pressure potential impacts on cetaceans and the findings will be included in an Addendum to the EIS.

Q.29 SAMS Comment

<p>EIS Page 162</p>	<p><i>Para starting PL001 “pilot whale in the south-eastern region” - once again the authors demonstrate a misunderstanding of the power of the White et al survey.</i></p>
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A.29 Argos Response

Argos acknowledges the comment. PL001 lies within an area identified as having a high cetacean density for long finned pilot whale in the south-western region of the licence area and is in close proximity to areas identified as having a high cetacean density to the west and north (Section 4.3.2).

Although cetaceans may be present in the vicinity of the drilling rig, the impacts of noise is estimated to be limited and short in duration (few months), and therefore minor overall.

5.5.3. Potential Impacts on Pinnipeds

Q.30 SAMS Comment

EIS Page 162	<i>Final para: Again “low numbers of pinnipeds” are simply assumed without justification.</i>
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A.30 Argos Response

Argos acknowledges that the data presented on pinnipeds in Table 4.13 on page 151 of the EIS does not accurately reflect the data presented in the bulk of the text and Figures relating to pinnipeds in the EIS document.

5.5.5. Potential Impacts on Protected Birds

Q.31 SAMS Comment

EIS Page 163	<i>Noise from the presence of test drilling infrastructure is unlikely to have any significant effects on seabird species.</i>
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A.31 Argos Response

Argos acknowledges the comment.

5.9.2. Worst Case Scenario

Q.32 SAMS Comment

EIS Page 167	<i>The authors admit that the worst case scenario is a blow-out but they offer only statistical assurances that this will not happen in this case. After the Deep Water Horizon Disaster we need much more information about how the company has learned from that experience and has put appropriate systems in place to give confidence that such a disaster would not happen again. This is a serious weakness of this EIS. Appendix 9.1 does nothing to allay the suspicion that the authors are complacent about the possibility of a blow-out.</i>
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A.32 Argos Response

Argos disagrees with the comment. The probability of oil spills, such as the recent Macondo well blowout in the Gulf of Mexico, are exceedingly low (1:25,000 wells). Blow-outs are regarded as being of greater risk for deep water wells, which are more difficult to stop due to the greater water depths. A study indicated that of the estimated 15,000 wells drilled in the Gulf of Mexico from 1992 to 2006, there have been 39 blowouts, of which few released much oil and most were capped within a week (Bourne, 2010).

It should be noted that the environmental conditions in Falkland Islands are very different to that of the Gulf of Mexico and that the exploration and appraisal drilling will be done at water depths of approximately 450 metres.

Argos acknowledges that valuable lessons have been learnt from the Macondo well blow out incident and various measures will be put in plan to mitigate the impacts. These measures will be addressed in a functional Oil Spill Contingency Plan (OSCP) which will be approved by FIG prior to the commencement of the drilling operations.



Argos Response to EIS Comments from the UK Department of Energy & Climate Change

September 2011

Date	VERSION	DESCRIPTION	PREPARED	CHECKED	APPROVED
September 2011	00	For Issue	SJS	LH	

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Introduction

In April 2011, Argos Resources Limited (hereafter referred to as “Argos”) submitted the Offshore Falkland Islands Exploration Drilling Environmental Impact Statement (EIS) to the Falkland Islands Government (FIG). The EIS provided an assessment of the potential impacts from proposed exploratory drilling within the PL001 licence area of the North Falklands Basin. The document was written to meet the requirements outlined in the Falkland Islands’ legislation pertaining to offshore exploration and production activities – The Offshore Minerals Ordinance 1994; (as amended).

Following the submission of the EIS, comments on the document were provided to FIG from the UK Department of Energy and Climate Change (DECC) in September 2011, as part of the public consultation process.

Given the above, this supplementary report has been prepared to address the comments received via FIG from DECC in September 2011.

Response to DECC Comments

The following section addresses the comments raised during DECC's review of the EIS. The comments have been placed with reference to the headings and numbering system used in the EIS.

General Comments

The document is generally well completed in relating the description of the environment and species around the Falklands islands and is perhaps more than what is required for the purpose of the specific planned area of interest. It is also noted the planned drilling area of interest is in deep water (~450 metres), and that the exact locations of the four drilling is currently undecided at this time. In addition, it is recommended that FIG should confirm that Argos's intention is to become a member of OSRL and as to what membership level the company will join as.

Response

Argos acknowledges the above comments. The exact drilling locations will be confirmed in the Operational Addendum to this EIS which is currently being prepared. Argos can also confirm that it intends to become a member of OSR at the associate level. Argos will ensure that the OSR membership obtained is adequate for the exploration drilling activities proposed.

The Appendix referencing does not match that listed in the table of contents. The appendix is referred to as letters and/or numbers throughout the document but the ToC refers to numbers only.

Response

Argos acknowledges the above comment. It will be ensured that such errors are not made in future submissions.

In the event of a blow out at worst case scenario at the well head the document does not detail measures to deal with this, in terms of drilling a relief well, for which is the most likely approach. DECC recommends that Argos resources and FIG have measures in place to deal with such an incident, particularly since the recent Macondo incident in the Gulf of Mexico. A more detailed oil pollution emergency plan (OPEP) should be presented and it is advisable that the management plan and OPEP are re-visited by Argos to confirm that the mitigation and emergency measures proposed are appropriate for the extended drilling programme.

Response

Argos acknowledges the above comment. The subject of relief well contingency will be covered in detail in the oil spill contingency plan (OSCP) which is currently being prepared.

Notwithstanding this assessment, the EIS indicates that each well test over a protracted period of 16 days with an assumed maximum of 2000 tonnes of oil will be flared per drill stem (x2 tests per well). DECC considers this range to be excessive and would recommend that FIG should seek clarification of the quantity and proposed duration for each well test. We would further point out that, on the UKCS, it would be necessary to provide a detailed justification for any well test designed to flow in excess of 2,000 tonnes of oil or for any well test that continues for more than 96 hours. If any proposed well test exceeds those thresholds, it would therefore be appropriate to request a justification and a more detailed emissions assessment to put the well test into some sort of environmental context, as it seems likely that the total emissions from the Islands are likely to be comparatively small.

Response

Argos acknowledges the above comment, however would like to clarify that the EIS states that well testing operations are likely to take place over 14 days at each well and not 16 days as per DECCs comment. This period of 14 days includes the total time for all well testing operations, including DST equipment set-up and de-rig. Therefore, the testing operations themselves are not scheduled to take place over 14 days (i.e. 14 days of flaring). Although the figures stated in the EIS may sound excessive, these estimates of well testing operation timings are based on the worst case estimates for the recent well testing operations at the Rockhopper Exploration plc Sea Lion discovery and subsequent well test. This represents the only well in the Falklands to date to undergo a significant well test. Given that the rig and available DST equipment will be the same, it seemed prudent to base the estimated well test operations in this EIS on the previous Sea Lion well test worst case estimates. Well testing operations will be clarified in the Operational Addendum to this EIS. In addition, in the event of a significant discovery and subsequent well test, a brief justification document will be prepared outlining well testing operations and assessing possible environmental impact from atmospheric emissions.

Prior to commencing the drilling campaigns more site specific benthic surveys should be done. This is for several reasons: to determine the seabed substrate state for placing anchors and ensure that there will be minimal impact to benthic fauna.

Response

Argos can confirm that no specific benthic surveys will be carried out prior to the drilling operations. Benthic survey work was carried out in 1998 under the FOSA Agreement. Two wellsites, 14/13-B, situated approximately 21 kilometres to the south-west of PL001, and Little Blue A, located within PL001 (just to the north of PL003), were surveyed. Due to the similarity in depth and proximity to PL001, species at the areas of drilling interest are expected to be very similar to these findings. Argos will endeavour to obtain the full survey reports for these surveys. In addition, Argos will endeavour to find additional sources of information on the benthic conditions in the vicinity of the proposed drilling locations from other surveys conducted in the area during the 1998 drilling campaign. Once these are available, the statistical analyses for the benthic environmental samples will be fully described in detail in the Operational Addendum to this EIS.

It should be noted that these three points above should be dealt with in a subsequent version or addendum of the EIS.

Response

Argos acknowledges the above comment and will ensure that these issues are dealt with in future Argos submissions.

Specific Points

1. Section 3.3.6 Drilling muds and chemicals, Table 3.7, Page 40 and subsequent text.

The table refers to chemicals being discharged for each drilling operation, which contradicts previous statements on the top 36" section will be discharged directly to the seabed whilst the remainder is drilled via riser and cuttings returned to the drilling rig for on board processing via a recycle system.

Response

Argos acknowledges the above comment, although it seems that Section 3.3.6 may have been misunderstood. Drill cuttings from the 36" well sections will be discharged directly to the seabed. Subsequent well sections will be drilled with a marine riser system in place and hence drill cuttings, once passed through the rig mud recycling system, will be discharged to sea at or near to the sea surface. Drilling chemicals associated with these cuttings will also be discharged, the worst case estimates of chemical discharge per well section being given in Table 3.7. All chemicals for use for drilling operations on the rig (including contingency chemicals) will be further detailed in the Operational Addendum to this EIS.

2. Section 3.3.8 Rig and completion chemicals, Table 3.9, Proposed rig chemicals for well single well exploration.

It is noted that JET-LUBE seal guard ECF is used as a pipe dope with a discharge of 0.1 Tonnes. This product is lead (Pb) based and should be sparingly used and although it is accepted that there will be a very nominal discharge, a zero discharge value would be the acceptable value to use in these circumstances. However industry is seeking acceptable alternatives. For more information regarding this issue OSPAR have issued a recommendation (http://www.ospar.org/documents/dbase/publications/p00528_Overview%20Assessment%20Rec%202005-2.pdf) As per point above for Table 3.11 (page 44) for WEATHERFORD LUBE SEAL (UK).

Response

Argos acknowledges the above comments on the two pipe dope products identified above. The discharges for these products presented in Table 3.9 are based on the absolute worst case scenario in terms of any loss of pipe dope to the WBM from the drill string threads. Argos acknowledges that due regard should be given to the use of drill pipe dopes and their correct application in order to avoid unnecessary loss of pipe dope to the marine environment. Where possible, an alternative to these lead based pipe dope products will be sourced.

3. Section 4.2.4 Sediments

“Small depressions with a maximum depth of 4 metres were noted occasionally throughout the survey area” (near the page bottom), may potentially be pockmarks and may warrant further investigation during future surveys. Such areas may be of scientific interest, despite their small scale topographical features these may support a diverse range of fauna. It maybe be beneficial to request further clarification from Argos Resources regarding the identified depressions. More site specific information would allow an informed judgement to be made.

Response

Argos can confirm that no specific benthic surveys will be carried out prior to the drilling operations. However, benthic survey work was carried out in 1998 under the FOSA Agreement. Two wellsites, 14/13-B, situated approximately 21 kilometres to the south-west of PL001, and “Little Blue A”, located within PL001 (just to the north of PL003), were surveyed. Due to the similarity in depth and proximity to PL001, sediments at the areas of drilling interest are expected to be very similar to these observations. Argos will endeavour to obtain the full survey reports for these surveys. Once these are available, the survey findings in terms of seabed features and sediments will be fully described in detail in the Addendum to this EIS. In addition, Argos will endeavour to find additional sources of information on the benthic conditions in the vicinity of the proposed drilling locations from other surveys conducted in the area during the 1998 drilling campaign to aid further clarification.

4. Last paragraph for section 4.2.4.

“Water depth was reported to be 416.8 metres at the well location” Contradicting previous statements as they refer to the well site locations are yet to be confirmed, yet here it gives „precise depth. Please clarify.

Response

Section 4.2.4 refers to two previous well site surveys that took place during the 1998 Falklands exploration drilling campaign in the north Falklands basin. The last paragraph in the Section refers to the depth at the well location from the survey referenced i.e. the “Little Blue A” well. The depth specified does not refer to the proposed exploration well location(s).

5. Section 4.2.5.1 Tides and Water Circulation, page 61, Table 4.3 and figure 4.5

In modelling a potential oil spill a blanket current speed has been used of 0.13 ms^{-1} , when the planned drilling phase is due in Q3 2011 coincides with higher current speeds ranging from 0.39 ms^{-1} in December to 0.44 ms^{-1} in May. These are significantly higher than the modelled; this may well have likely underestimated the spread of the impacted area and extent of the oil slick. It would be in the interest of Argos Resources to re-model the oil spills scenarios using more realistic site specific current speed values.

Response

The current speeds mentioned above refer to the maximum current speeds observed in December and May from Table 4.1 in the EIS. The EIS states that the current speed of 0.13 ms^{-1} was chosen because it is generally considered that currents in the area are observed to be weak. The 50th percentile represents the most typical current speed in the area because it is exceeded for 50% of the observed time, and therefore can be considered to be more representative of a typical observed current speed in the area. The observed maximum current speeds are generally not considered to accurately represent the current speeds observed across the area as they are unlikely to occur for significant lengths of time. In addition,

the prevailing current direction serves to move oil in a north-easterly direction away from the Falklands mainland. The EIS also states that wind direction has a significant influence on current direction (page 60, paragraph 2). Therefore, using a weaker current for input into the oil spill modelling represents a worst case scenario in terms of oil spill modelling, as wind direction (either worst case onshore or stochastic) will have a greater influence on the modelling results.

Argos acknowledges the limitations of the oil spill modelling software in terms of using 'blanket' current data. In light of this, RPS Energy has acquired a hydrodynamic hindcast database for the Falkland Islands. This current data will be built into the OSIS model and will comprise of the following:

- Daily surface current velocity fields derived from ocean circulation model hindcast data (at 1/12 degree resolution). These will be combined with surface tidal current velocities from BMT ARGOS's tidal database.
- Resultant current data, representative of the total surface current velocity, at 1/12 degree resolution across the area of interest.

Oil spill modelling will be rerun using the new current database and the outputs will be included in the oil spill contingency plan (OSCP). The results will also be summarised in the Operational Addendum to the EIS.

6. Section 4.2.5.2 Waves

3rd paragraph refers to wind conditions in section 4.2.4, this section is related to sediments only. Re-reference this as 4.2.6.4 = wind.

Response

Argos acknowledges the above comment. It will be ensured that such errors are not made in future submissions.

7. Section 4.2.5.4 Ice

Its is acknowledged that the potential for icebergs to enter the proposed drilling area is considered to be minimal, DECC recommends it may be prudent to have precautionary plans in place in the event that an iceberg of significant size may enter the area. The supporting standby vessels should maintain watch for icebergs and hold equipment to tow/remove an iceberg out the danger area, as this may potentially cause significant damage to the drilling rig, drill string and anchors.

Response

As stated in the final paragraph in Section 4.2.5.4 on page 63 of the EIS, the risk of encountering sea ice in the vicinity of the proposed exploration well locations is considered to be minimal based upon historical data indicating that icebergs encountered in the Falklands region, particularly to the North of the Islands, are extremely rare occurrences.

8. Section 4.2.6.4. Wind

The wind used to model oil spill was used from a time period predominantly outside (May – November) the current planned drilling campaign and may pose a weakness in the models capabilities to accurately estimate the extrapolated extent of an oil spill. Although the onshore wind data shows a similar pattern to that offshore, it still remains a weakness in the models output.

Response

The wind rose from the drilling rig *Borgny Dolphin*, recorded between 12th May 1998 and 19th November 1998, was used for the oil spill modelling, as it was thought more representative of actual wind speed conditions that may be experienced in the PL001 area, rather than the use of the onshore wind data for Stanley Harbour. The offshore data collected is also from the austral winter period, and therefore it is thought that this would indicate worst case wind conditions in terms of wind strength, and provide a worst case scenario for the oil spill modelling. Despite the 100+ year dataset for Stanley Harbour, it is thought that conditions at Stanley Harbour do not accurately reflect offshore wind conditions, as there is often a marked difference in wind strength between onshore and offshore metocean observations, and therefore offshore wind data from the previous drilling campaign was used for the stochastic oil spill modelling scenarios.

Since submission of the EIS, additional wind data have been obtained from the seismic survey vessels that attended the PL001 area. This data will be analysed for inclusion in the EIS Addendum and subsequent oil spill modelling for the oil spill contingency plan (OSCP).

9. Section 4.3.3. Seabed communities

Paragraph 6, is confusing and contradicts itself. The text suggests longline gear is used to sample the seabed. Please make it clear how data was collected and how this fits into the context of PL001. Additionally, figure 4.14 and 4.15 implies that there has been no benthic sampling within PL001.

Response

Argos agree that Paragraph 6 of Section 4.3.3 could be interpreted as confusing and could have explained the presented data more clearly. To clarify, the data in Figures 4.14 and 4.15 present data observed on board fishing vessels of by-catch species that may be significant to the benthos. Figure 4.14 presents data from longline catches and Figure 4.15 from bottom trawl catches.

The data does not specifically characterise the benthic environment and biological communities of the PL001 areas it does not focus on the PL001 area itself. The data applies to the wider north Falklands area and hence provides a good indication of the general epifauna of the wider offshore north Falklands area. The Figures represent the total amounts caught and without effort data to support it show presence/absence of benthic organisms rather than measures of relative abundance (end of paragraph 6, Section 4.3.3). The Figures do provide some use as general indicators of benthic species location across the north Falklands Offshore area. However, Argos agrees that the limitations described above could have been clarified in the EIS.

It has already been mentioned above that previous surveys in the vicinity of the proposed exploration wells, conducted during the 1998 north Falklands Basin drilling campaign, will be obtained. Once these are available, the survey findings in terms of seabed features, sediments and benthic macrofauna will be fully described in detail in the Addendum to this EIS. This will provide a more comprehensive picture of the seabed sediments and features across the PL001 area and proposed exploration well locations. In addition, Argos will endeavour to find additional sources of information on the benthic conditions in the vicinity of the proposed drilling locations from other surveys conducted in the area during the 1998 drilling campaign to add further detail.

Despite the lack of data within the area of drilling interest it is likely that similar species will be found within the area. Discharge of drilling WBM is likely to have an impact upon benthic fauna particularly Ascidians and Porifera species assemblages through smothering in the immediate impact zone of the discharge. DECC concur with the conclusions addressed in Section 5.4.5 that the impact will be localised and recolonisation will occur over time.

Response

Argos acknowledge the above comment.

10. Section 4.3.7. Seabirds

In several subsections seabirds were sighted in the vicinity of or in the PL001 area, although the figures (4.27 and 4.28) presented do not reflect this. It should also be noted that as a consequence of bird observations conducted from longline fisheries is that the fishing boats fish where there are fish and also that through such activities seabirds are also attracted and may be biased due to the nature of the activity. Additionally, information provided is extracted from a number of different sources which is confusing as to what data is from which source (e.g. See Figures 4.21 figure title informs data is from White et al. 2002, and the legend says Data courtesy of JNCC and Falklands Conservation 2006).

Response

It should be noted that the observations described of seabird sightings in Section 4.3.7 were based on general observations of maps produced as part of the 1998 to 2001 at sea surveys (White et al., 2002). The maps detailed in White et al. (2002) have not been transposed into monthly sightings maps in relation to the licence area (as per the EIS document map format), as the GIS point observation data used to create the original maps in the White et al. (2002) report are not available. Therefore, only general observations from viewing the White et al. report in the context of the PL001 licence area could be conducted. Figures 4.27 and 4.28 in the EIS present the monthly sightings data for the whole area surveyed in White et al. (2002). Without the relevant GIS data, it is difficult to relate this data to pinpoint specific areas. However, general observations in the context of a licence area of interest were provided.

Satellite tracking data for seabirds has subsequently been obtained; the data will be analysed and included in the Operational Addendum to the EIS. This will provide a useful supplement to the seabird data already presented.

Argos acknowledges the above comment on how seabirds can be attracted to fishing activities and how this can subsequently affect any seabird observation data collected from such vessels. This limitation should have been acknowledged in Section 4.3.7.5. Argos will ensure this is addressed in future submissions.

Argos acknowledges that the referencing used in some of the Figures is sometimes contradictory and can cause confusion. This will be addressed in future submissions.

11. Table 4.13. page 152

It would be useful to include an additional row indicating the periods of drilling as this serves a useful means of interpretation other than searching through the text for each individual species related biology, including fish spawning periods within the proposed drilling area.

Response

Argos acknowledges the above comment on indicating the drilling period in the summary of environmental sensitivities table (Table 4.13). This table presents the sensitivities in the vicinity of the proposed exploration wells for the year as a whole, as the EIS aims to provide a year round description of the environment. A similar table will be produced in the Operational Addendum to the EIS, once drilling details are confirmed. This table will highlight the proposed drilling period.

12. Section 5.4.3. Model set-up and assumptions

The text refers to a total of 679 tonnes of cuttings discharge per well which is then modelled. This is interpreted differently from that of previous text which states that the top section (36") of the well is discharged directly to sea whilst the remainder is drilled via riser and WBM processed onboard (~550 tonnes) prior to discharge. Please make clear in text which discharge is being modelled and the correct discharge tonnage is being used within the model parameters. This is similar to point 1 above.

Response

Section 5.4.3 models the total cuttings discharged. This includes both the well section discharged directly to the seabed, and the well sections discharged at or near to the sea surface after passing through the drilling rig mud recycling system and shale-shakers. The cuttings model is able to differentiate the depth at which each of the well sections is discharged. However, this is not stated in the text and perhaps should have been to clarify the modelled scenario. Argos will address this issue in any future modelling submissions.

A "blanket" background surface current speed and direction is applied, which is suitable only if the data used is that from the drilling period. This should be clarified and as to what is the "blanket" speed being used. Additionally the data used "interpolates" subsurface currents, why has this been used when the data is available from the Fugro survey of 1997-1998.

Response

The 'blanket' current speed and direction used for oil spill and cuttings modelling (and the justification for such use) is given in Section 4.2.5.1. The last paragraph on page 60 states that "*In summary, the current speed and direction shown in Table 4.3 were input into the oil spill and cuttings modelling programmes, as these are considered to represent the typical current speed and residual current direction observed in the area on consideration of the available metocean data*". The final paragraph in Section 5.4.3 clarifies the source of the current input for the cuttings modelling programme.

The final paragraph of Section 5.4.3 states that, "*The model assumes the input current to be true at the surface, and interpolates the currents as slowly diminishing down through the water column in accordance with the current shear effect*". This is how the model is designed to work and unfortunately, manual inputs of current speed and direction are only possible at the surface and not throughout the water column.

Argos acknowledges the limitations of the cuttings modelling software in terms of using 'blanket' current data. In light of this, RPS Energy has acquired a hydrodynamic hindcast database for the Falkland Islands. As the cuttings modelling and oil spill programme share the same operational platform, the

current data can also be built into the PROTEUS cuttings modelling programme as well as the OSIS oil spill modelling programme. The data will comprise of:

- Daily surface current velocity fields derived from ocean circulation model hindcast data (at 1/12 degree resolution). These will be combined with surface tidal current velocities from BMT ARGOS' tidal database.
- Resultant current data, representative of the total surface current velocity, at 1/12 degree resolution across the area of interest.

Cuttings modelling will be rerun using the new current database and updated well profile (if applicable). The results will be included in the Operational Addendum to the EIS.

13. Section 5.5 Noise and vibration

The EIS does not include any noise propagation modelling, which would have provided further reassurance in relation to the overall assessment. Based on the evidence provided, experience in other areas of the world, the proposed mitigation measures and the relatively short duration of the planned drilling activity programme it is considered unlikely that any cetaceans would be significantly impacted by the proposed operations. For any future submissions it would be a useful addition to include any marine mammal observers (MMO) reports and data for comparison.

Response

Argos acknowledges the above comment on making reference to noise propagation modelling. This will be included in future submissions.

Argos recognises the shortfall in data regarding the population, distribution and abundance of marine mammals in Falklands offshore waters. In light of this, a marine mammal survey was conducted on the 3D seismic survey in conjunction with Rockhopper Exploration plc. The monitoring effort was carried out to ensure compliance with the Joint Nature Conservation Committee (JNCC) Guidelines for Minimising the Risk of Disturbance and Injury to Marine Mammals from Seismic Surveys (February, 2010). A total of 1,310 hours and 11 minutes of visual observation and 943 hours and 47 minutes of passive acoustic monitoring (PAM) were carried out. There were 142 encounters of 12 different marine mammal species observed. The methodology employed for this MMO survey and the survey results will be presented in the Operational Addendum to this EIS.

14. Section 5.7.1. Water based mud (WBM) and drill cuttings

It is noted that all WBM will be discharged overboard with some processing done prior processing (Appendix 1, drilling mud page 201). In the event of the well being successful the lower drill section of the WBM will likely be contaminated with hydrocarbons. In this event the drill cuttings should either be:

- skipped and shipped to shore for processing or*
- a recycling system should incorporate a filtration system before being discharged.*

Discharges from this drill section should not be discarded without prior hydrocarbon and WBM separation and Argos should clarify their intentions. Prior to discharge, the quantity of reservoir hydrocarbons should be estimated as current UK regulations require a OPPC permit.

Response

Argos acknowledges the above comments. Measures to deal with oil contaminated drill cuttings will be included in the Operational Addendum to this EIS.