

EXECUTIVE COUNCIL

CONFIDENTIAL

Title of Report: Review of the Environmental Impact Statement produced by Falkland Oil and Gas Limited for offshore drilling

Paper No: 275/11

Date: 14 December 2011

Report of: Head of Policy/Environmental Planning Officer

1.0 Purpose

- 1.1 To consider an Environmental Impact Statement (EIS) submitted by Falkland Oil and Gas Limited (FOGL) in respect of its licensed area in the South and East Falkland Basins.

2.0 Recommendations

- (a) Honourable Members recommend HE the Governor to approve the revised EIS for exploration drilling prepared by Falkland Oil and Gas Limited, 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) A notice of receipt of the Operational Addendum being published in the Gazette, and that the Mineral Resources Committee be given authority to approve this document; and
- (c) The external review undertaken by the Scottish Association for Marine Science and the submissions from Falklands Conservation, the Fisheries Department and the UK Department of Energy and Climate Change being made available to the public, together with the response from Falkland Oil and Gas Limited and the revised EIS.

3.0 Summary of Financial Implications – None.

4.0 Background

- 4.1 Falkland Oil and Gas Limited (FOGL) hold 100% equity interest and operatorship of 13 exploration and production licences offshore of the Falkland Islands. The exploration and production licences cover approximately 48,740 square kilometres and are located in water depths ranging from 500 to 2,000 metres.
- 4.2 FOGL is a UK-based company and has been engaged in the exploration for oil and gas in the South and East Falklands Basins since 2004. The company carried out a number of seismic and site surveys and drilled its first well in the Falkland Islands (61/05-1 on the Toroa prospect) in 2010 (in partnership with BHP Billiton). The evaluation of Loligo, Scotia, Nimrod and Vinson West and other key prospects

continues with the next drilling programme proposed for 2012. See appendix 1 for a map of the FOGL acreage and prospects.

- 4.3 In September 2011 FOGL 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. Considerable input from consultants RPS and Marine Resources and Fisheries Consultants (MRAG) were made in producing the EIS.
- 4.4 The Non-technical Summary of the EIS is attached as Appendix 1.

5.0 EIS in detail

- 5.1 FOGL plan to drill two wells using use the Leiv Eiriksson dynamically positioned, fifth-generation semi-submersible rig. The first well will be on the Loligo prospect at location A or NW. The second well location has not been confirmed but will be either on the Vinson West, Nimrod or Scotia prospects or potentially it will be a well in the Loligo area e.g. Loligo NW.
- 5.2 The proposed wells lie to the east and south-east of the Falkland Islands. The nearest well to the shore is Vinson West (155 kilometres) and the furthest is Scotia East D (314 kilometres). The water depths at well locations vary between 1,300 - 1,800 metres.
- 5.3 Under the current plan drilling is scheduled to commence in March or April 2012. It is anticipated that the rig will be on location for between 90 – 100 days (45 to 50 days per well). More detailed information on the two well locations will be included in an Operational Addendum.
- 5.4 Following drilling, the wells will be plugged and abandoned in accordance with ‘UK Oil and Gas’ Guidelines. FIG guidelines for removal of obstructions from the seabed will be followed. Water-based muds will be used to drill both wells. Chemicals to be used during the drilling have been selected to minimise the potential environmental impacts as much as possible.
- 5.5 The key physical sensitivities identified in the Falkland Islands offshore area are characterised by harsh weather conditions with strong winds and average wave heights of 2-3 metres. The EIS also cites the rare occasions of icebergs occurring in the licensed area.

Key Biological Sensitivities

- 5.6 The EIS identifies and describes the potential impacts on several key biological features found in the FOGL offshore license area.
- 5.7 A medium density of kelp species is identified as found throughout the project areas, which provides food and habitat for a wide range of marine invertebrates and fish.
- 5.8 Prominent colonial epifauna encountered across the Loligo site constitutes several species of soft corals and at least one species of hard or stony coral. The recovered coral samples, although superficially similar to the cold water coral *Lophelia pertusa*, are believed to be analogous Antarctic species, capable of withstanding colder waters. FOGL suggest that there is insufficient evidence to conclude that recorded coral species are part of cold coral colonies/reefs classified as Annex I habitat under

the EU Habitats Directive. [It should be stressed that this data was only found at the Loligo well site, further survey work relating to the other four well sites will be included in the addenda document prior to drilling].

- 5.9 Fish species known to spawn in the vicinity of the FOGL exploration wells include Patagonian toothfish (peaks in May and July through to August), and grenadier during March-April. [It should be stressed that the impact of drilling operations are likely to be negligible as just two wells are to be drilled at this stage in a 48,740 square kilometre license area].
- 5.10 The following species of cetacean were recorded during the austral winter around the proposed FOGL well sites; fin whale, long-finned pilot whale, southern bottlenose whale, hourglass dolphin, Peale's dolphin, sei whale, minke whale, sperm whale, killer whale, blue whale, and spectacled porpoise.
- 5.11 Pinnipeds present in the vicinity of the FOGL sites include; South American sea lion, southern elephant seal, South American fur seal and the leopard seal. All of these species except the leopard seal spend the summer months ashore on the Falkland Islands breeding. During winter, however, they have been observed undertaking long foraging trips which overlap with the FOGL blocks.
- 5.12 Petrels are known to be present in the vicinity of the FOGL sites, with particularly high numbers occurring during the proposed drilling period. These include; Antarctic fulmar, Kerguelen petrel, cape petrel, and blue petrel. Other seabird species likely to be present include; soft-plumaged petrel, white chinned petrel, grey-backed storm petrel, great shearwater, sooty shearwater, great shearwaters, little shearwater, prion and skua species, kelp gull, South American tern and the Arctic tern. [Past seabird observations in the South and East of Falkland Islands water do not give good coverage over the FOGL licence area, but it is likely that seabird numbers will be generally lower in the winter months than in summer.]
- 5.13 Of the penguin species recorded offshore of the Falkland Islands, only king penguins and gentoo penguins are likely to be present in significant numbers during the proposed drilling period. However, although they can forage far offshore they predominantly stay closer to the shore.
- 5.14 It is possible that the following species of albatross will be present in the vicinity of FOGL blocks throughout the year: southern and northern royal albatross, black-browed albatross and grey-headed albatross, light-mantled sooty albatross, wandering albatross and shy albatross. Again it is likely that the numbers of albatross will be lower in the winter months.
- 5.15 FOGL has assumed that seabird vulnerability is high throughout the drilling period due to variability in seasonality and the presence of various species with protected status.
- 5.16 Numerous protected areas exist on the Falkland Islands coast related to seabirds and seal colonies. The closest to the proposed FOGL well locations is Stanley Common & Cape Pembroke National Nature Reserve, located approximately 153 kilometres north-west of the Vinson West well site.

Key Socio-Economic Sensitivities

- 5.17 Patagonian Toothfish and grenadier are the main catch noted throughout the FOGL licensed area, with some rock cod fishing in the vicinity of the northern well sites. Other species caught in this region include skates, hake and Loligo squid. Loligo is

caught outside the license area to the west of the FOGL blocks and should therefore not be affected by drilling activities.

- 5.18 A low density of shipping occurs in general offshore and in the vicinity of the proposed wells.
- 5.19 While tourism in the Falklands is growing rapidly, levels peak in the austral summer, outside the FOGL drilling timetable.
- 5.20 There is an increasing hydrocarbons exploration interest, with a focus on the North Falklands licences. To the south and east of the Falklands, only one well (Toroa - 2010) has been drilled to date.

Discussion of Impacts and Mitigation

- 5.21 FOGL conclude that proposed exploration activities have the potential to induce noise, atmospheric emissions, physical disturbance and a variety of discharges (routine, and non-routine, such as spills) and wastes.
- 5.22 The EIS concludes that the risk of accidental hydrocarbon spillage to the sea is the main environmental concern associated with the proposed drilling programme. Spilled oil can have a number of environmental and economic impacts.
- 5.23 The greatest environmental sensitivity to oil spills is the presence of vulnerable and protected seabird populations (i.e. penguins, petrels, albatrosses) and marine mammals (cetaceans and pinnipeds in particular). Without the implementation of mitigation measures to stop or disperse a worst case scenario spill, the impact on these species is likely to have severe consequences affecting regional population count and dynamics, long term (>10 years) damage and poor potential for recovery rates. Provided that an effective and timely spill response is put in place, the overall impact is likely to be reduced to a lower significance, where medium term (>2 years) damage to ecosystem occurs with a likelihood of recovery within 10 years.
- 5.24 Cuttings deposition modelling has been undertaken as part of the assessment and shows minimal and only short-term impacts on the environment.
- 5.25 Cumulative environmental effects from the planned exploration programme are considered to be minor given the short term nature of the drilling and low level of exploration activities in the East and South Falkland Basins.
- 5.26 The potential impacts of these operations will be mitigated in a number of ways, including:
 - Maintaining a culture of openness and ongoing consultation with the Falkland Islands Government (FIG), the public, and key stakeholders.
 - Applying international best practice and established UK standards to the proposed operations.
 - Extensive logistical planning prior to commencing operations to ensure that no strains are placed on current onshore capacities.
 - Comprehensive operational planning, risk assessment and provision of suitable specification equipment for drilling (i.e. Blowout preventer) and planning for emergencies (i.e. capping device, relief well);
 - Implementing a high level of environmental management offshore and applying environmental procedures for potentially impacting operations (chemical storage, bunkering, waste handling, maintenance programmes, seafloor surveys etc).

- Establishing and implementing a project specific Oil Pollution Emergency Plan and carrying out training of key personnel in spill response. FOGL intends to be a member of Oil Spill Response Ltd and have access to their Tier 1, 2 and 3 response capabilities as well as a dedicated oil wildlife response capability provided by the Sea Alarm.
- Preparation of an Iceberg Management Plan covering iceberg surveillance and monitoring procedures and detailing avoidance and mitigation measures.
- Implementing a detailed waste management plan to minimise the quantity of waste going to landfill, prevent unsuitable disposal of waste, and maximise the re-use of materials. All hazardous waste will be transferred to UK for treatment and disposal.
- Using water based drilling muds and low toxicity chemicals approved under the UK Offshore Chemical Notification Scheme.
- Ensuring all discharges from the rig/supporting vessels are treated and discharged according to the MARPOL Convention.
- Preventing increased noise levels in ecologically sensitive areas, i.e. avoiding helicopter flights over seabird and pinniped colonies.
- Collecting and sharing environmental data wherever possible, for example in offshore sightings, seabed surveys and meteorological and oceanographic conditions.

Further Studies and Recommendations

5.27 FOGL has identified a number of data and information gaps that exist regarding the environment in its license area. These are:

- Absence of reliable scientific data on fish spawning and nursery grounds around the Falklands Islands. Although a number of publications discuss this subject, there is insufficient coverage, or correlation between various results, to build up regional and temporal overviews of the spawning areas.
- Sparse information on the benthic environment, including protected habitats (i.e. cold coral colonies) offshore of the Falkland Islands. There is therefore a need for a strategic coordinated survey and monitoring programme.
- The numbers and distribution of marine mammals in the offshore environment, their use of the area and its resources. Survey effort to date has been limited to fishing observations and a single ‘Seabirds at Sea’ programme undertaken in 1998-2001. There is a need for a strategic co-ordinated survey and monitoring programme based on adequate scientific approach. Given weather conditions offshore, a programme of acoustic monitoring is also desirable to complement visual surveys throughout the year.
- Existing MMO reports from rigs and seismic surveys have not been collated into the main body of knowledge on cetaceans. With suitable co-ordination and methods development, existing cetacean data gathering could be improved and systematised.
- Few data, including the Seabirds at Sea programme, 1998-2001, and observations from fishing vessels, currently exist to indicate foraging areas for pinniped species along the Falklands Shelf. The first attempts to determine the offshore distribution of pinnipeds using tagging and satellite telemetry methods, began in 2000. However, in most cases the sample sizes were too small to be conclusive of pinniped distribution trends. A FI wide survey to assess the abundance and distribution of pinnipeds is highly desirable due to their high vulnerability to marine noise and oil spills.
- The numbers and seasonal distribution of seabirds in the offshore environment, and their vulnerability to surface pollution at different times of the year. Fishing vessel observations are partially biased as vessels tend to attract certain types of birds, whilst the Seabirds At Sea survey (1998-2001) effort was

particularly low to the east and south of the Falkland Islands i.e. the FOGL licence area. Seabird tracking data has been collected since 1994 and is limited to few species of protected petrels and albatrosses.

General Recommendations - data gaps and data management

5.28 FOGL has made several general recommendations to fill these data gaps, related to the wider development of oil. The recommendations are:

- Survey data (benthic, cetaceans, pinnipeds) collected by various operators should be designed to generate datasets that can support both strategic and site-specific approaches to environmental assessment;
- Falkland Islands marine monitoring and data gathering initiatives should be initiated and integrated across and between the various state agencies, research institutions and commercial operators; and
- Environmental data (physical, chemical, biological and relating to other sea users) should be collated and held in a co-ordinated and readily accessible database at an identified location for use in future oil and gas-related environmental assessments.

5.29 These recommendations to be welcomed and cover issues that will be pursued through the Hydrocarbons Environmental Forum gap analysis working group.

Project Specific Recommendations

5.30 The EIS make two project specific recommendations to enhance the knowledge of its license area which FOGL intends to implement. These are:

- Use of marine mammal and seabird observers during drilling programme; and
- Compiling and releasing seabed visual observations from ROV surveys where these provide information on seabed habitats or species.

5.31 I welcome these initiatives.

EIS Conclusion

5.32 FOGL state that its assessment of potential environmental impacts from the proposed drilling programme has been carried out using a conservative precautionary approach, and is based on publicly available literature, unpublished research data, inputs from stakeholder consultation combined with the expert judgement of the RPS Energy consultants and Falkland Islands Government departments, Falkland Conservation, Birdlife International and other NGOs. On the basis of the assessment conducted, a wide range of preventative and mitigation measures have been proposed.

5.33 Given the current operational commitments and proposed mitigation measures, FOGL consider that routine drilling activities can be undertaken without significant impacts to the Falkland Islands' environment. However, in the event of a potential blowout under worst case scenario conditions (i.e. loss of control of the well due to failure of numerous redundant safety systems e.g. blow-out preventer; long term release of liquid hydrocarbons before capping device or relief well can be enacted), the impact is likely to be of major significance.

6.0 Review of EIS and Public Consultation

- 6.1 As with previous EIS documents 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 September and October 2011. Detailed comments were subsequently received from Falklands Conservation (FC), the Falkland Islands Government Fisheries Department and the UK Department of Energy and Climate Change (DECC).
- 6.3 SAMS submitted its review in early November 2011 and a copy was duly sent to FOGL. FOGL has made a full response to all the points raised by SAMS, as well as the comments submitted by Falklands Conservation, the Fisheries Department 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 The following section highlights the key areas commented on by SAMS, FC, Fisheries and DECC, and the responses provided by FOGL.
- 6.6 All the parties who commented on the EIS thought that it was an adequate document and an improvement on previous EIS submissions. DECC considered that it was a 'generally good EIA, possibly too detailed in places, and could be made more concise'. FC did not undertake a detailed review but commented that the EIS appeared to be 'a high quality, comprehensive document, and a useful bringing together of much disparate information'. The Fisheries Department commented that 'this EIS has made an attempt to acknowledge data gaps, particularly within the areas that FOGL will be operating. The overall quality has improved and the authors have made more of an attempt at reviewing current literature'.
- 6.7 However, the parties were surprised by the number of typographical and general errors in the text and in citations in the document. In response FOGL and RPS have stated their regret that there were so many errors which was due to a pre-finalised version of the document being submitted. Once this mistake was spotted the company decided to continue rather than recall the document and delay the EIS process. FOGL has now submitted a revised version of the EIS that corrects these errors, as well as incorporating amendments in response to comments received.

Non Technical Summary

- 6.8 SAMS has commented that this section should not include the detailed overview of seasonal sensitivities in Table 1, which it found to be highly misleading. FOGL responded by saying that, rather than remove the table, it will be amended as suggested in the revised edition of the EIS to clearly show that the seabird vulnerability shown is predominantly in coastal areas. This change has been made and I find this acceptable as most commenting bodies appreciated the inclusion of a seasonal sensitivities table.
- 6.9 SAMS noted and agreed with the conclusion that there is insufficient data on fish spawning and nursery distributions but also noted that not much seems to be proposed to address this gap – and presumed that this would occur in collaboration

with the Falkland Islands Government (FIG). FOGL agree with this comment and state that they are working with FIG and NGO's through active participation in the Falkland Islands Offshore Hydrocarbons Environmental Forum. The company will be working with other parties to improve the available stock of environmental data and to carry out a gap analysis relating to the Falkland Islands.

- 6.10 SAMS noted the potential for significant colonies of EU Annex 1 corals and commented that providing good information on this should be a key objective of any future benthic survey. FOGL respond by saying that existing survey coverage did not show the presence of any colonies of corals. It is therefore inconclusive as to the presence or absence of any colonies outside the surveyed areas. Future surveys will be on potential well locations. However, the data will be considered for any wider regional evaluations.
- 6.11 Under 'project specific recommendations', SAMS noted the recommendation on the use of marine mammal and seabird observers during the drilling programme and consider that this is highly desirable to improve the seabird distribution knowledge of the licensed area, as this information is clearly lacking. By way of response FOGL has emphasised its intention to have a MMO/seabird observer on one of the supply vessels at regular intervals.

Drilling mud and casing cement

- 6.12 DECC question the planned use of lead-based lubricants and suggest that FOGL does more research on finding zero discharge value products. DECC also comment on the anticipated cement losses and believe FOGL should do more work on reducing the potential losses to less than 10%. FOGL acknowledge these comments and will seek to limit losses.

Bathymetry and Seabed Morphology

- 6.13 SAMS question various technical points in this section of the EIS, such as how steep is the Falklands escarpment? How gentle is the north-eastern slope? And how deep is the east-west Falkland Trough? FOGL acknowledged this but consider that the Bathymetric detail provided by the water depth contours on the map is sufficient for the purpose of this EIS and has addressed geological age comments in the revised EIS.

Seabed Sediments

- 6.14 SAMS question the quality of the analysis of seafloor sediment sampling. FOGL has responded by explaining the choice of sample sites and stating that the survey report for the Loligo NW site will be included in the proposed Addendum.

Oceanography

- 6.15 SAMS question the age and validity of research cited regarding oceanography in the EIS and thought that it would be useful to know if there has been any development from the Proudman 1997 model of the Patagonian Shelf, which is nearly 15 years old. SAMS also question the level of analysis regarding current trends and depth of water. This is an additional concern when related to oil spill modelling. The company has acknowledged the comments and provided further information on current depth and speed.
- 6.16 SAMS note the reference to eddies in the section on icebergs and suggest it would be useful to include this in the description of the oceanography as the eddy field would be rather important in any dispersal modelling. FOGL acknowledge the comment but

has said that the available data on the eddy field is not compatible with the dispersal modelling software available.

Plankton

- 6.17 SAMS point out that the picture presented relating to plankton is based on relatively old data (Discovery Series from the early 20th century). There are more recent sources of data e.g. Recent (2008-2009) Continuous Plankton Recorder tows have been made from the Falklands to South Orkneys and South Georgia. These data will update the Discovery expeditions although data from these tows is not yet available. A BAS team is co-ordinating these CPR surveys and should be contacted. FOGL acknowledge this point, but consider that it is best practice to only reference published material. However, new current data will be examined in the future.
- 6.18 SAMS also identify the Atlantic Meridional Transect programme run from Plymouth Marine Laboratories which undertakes biological, chemical and physical oceanographic research during the annual return passage of the RRS James Clark Ross between the UK and the Falkland Islands [or the RRS Discovery between the UK and Cape Town, a distance of up to 13,500 km]. The AMT program will have more recent data for the waters around the Falkland Islands and SAMS believe that the program should be consulted. This is also acknowledged by FOGL.

Benthos

- 6.19 The Fisheries Department note that the benthic sample data illustrate a number of taxa not identified to any resolution. Considering that these data were collected in 2009 it wonders if there has been any further work to redress this and query whether the specimens have been sent to specialist taxonomists or museums for other scientists to work on. In terms of the benthic environment this is one of the least studied areas in the world so these samples have great value. This observation was noted by FOGL which points out that the FUGRO 2009 survey samples at the Loligo A location included in the EIS were evaluated by the Natural History Museum (NHM) specialists in London. The specimens are currently held by the NHM and were used as reference for the Gardline 2011 site survey EBS reporting. Gardline has confirmed that the EBS reports should be released in December 2011. These will be included in the proposed Addendum. FOGL will also provide contact details at the NHM.
- 6.20 SAMS noted that the ROV observations demonstrated the presence of large, suspension-feeding sessile epifauna in the survey area, including gorgonian corals and a stony coral which may be *Lophelia pertusa* or a close relative. SAMS comment that the EIS is correct to state that there is currently no evidence of well-developed biogenic reefs, but the records of coral species raise the possibility that such structures might exist. A much more comprehensive survey will be essential if large-scale development proceeds in this area to determine whether any Annex I reef habitats are present. SAMS therefore supports the statement on Page x of the Non-Technical Summary “*There is therefore a need for a strategic co-ordinated survey and monitoring programme*”. FOGL acknowledge this comment but do not elaborate further. This is an area the Hydrocarbons Environmental Forum gap analysis group may wish to consider.
- 6.21 DECC also comment that more work on cold water corals is required to qualify statements over their presence and potential impacts from drilling. FOGL note the point and suggest that the text refers to the observation that the epifaunal community in the surveyed area was patchy and limited to areas of hard standing. This point has since been clarified in the revised EIS.

Fish, Squid and Shellfish

- 6.22 SAMS noted that the EIS provides a reasonable summary of available data for the area and commented that most of the data related to commercial species, with relatively little known about non-commercial species, which it considered to be a weakness. This is acknowledged by FOGL who point out that it is dependent on the availability of data.

Marine Mammals

- 6.23 SAMS noted that, while not a comment on this individual EIA, it is of grave concern that given all of the oil and gas related interest in the waters surrounding the Falkland Islands, the only reliable offshore marine mammal survey effort is now a decade old and severely compromised by having been tacked onto a survey method actually designed for recording birds. However, what is highly relevant to this EIA is the lack of appreciation by RPS of the limitations of this and other even more potentially biased datasets being cited (seismic, fisheries observers etc).
- 6.24 SAMS goes on to consider the sea conditions during survey effort. This factor is not so critical for bird surveys but is of fundamental importance to offshore marine mammal surveys – put simply – you see fewer marine mammals in rough water whether they are there or not. This report ignores the sea conditions during the surveys despite making comments about higher or lower numbers of various species being seen in summer vs. winter months. SAMS consider that this is an embarrassingly basic error and makes it near impossible to draw conclusions on the species likely to occur near the drilling operations. These comments are acknowledged by FOGL which has extended the relevant section in the revised EIS to better contextualise the cetacean data used.

Pinnipeds

- 6.25 As with the cetacean section, SAMS noted the general confusion between the importance of seeing an animal at sea and it's actual presence at sea which is the biologically important component to be considered in this EIA. There are several sentences that portray this blurring: along the lines of “Due to their occasional sightings they are highly unlikely to be sighted during the development”. Also, as with the cetacean section, the importance of reporting (or even better correcting for) effort and sea-state appears to have been ignored in reporting the at-sea sightings. It is very difficult to infer anything concrete from the maps as they are presented. Telemetry data from tracking studies is briefly mentioned but not presented or fully described. FOGL acknowledge this and has since clarified the text in the seabird section in the revised EIS.

Seabirds

- 6.26 DECC and the Fisheries Department both question using observer data from fishing vessels suggesting it is not appropriate as it does not provide data on the normal at sea distribution of seabirds as they are attracted to the vessels as a source of food – from discard and bycatch. FOGL agree with these comments and said that an acknowledgement to the limitations on this data is located within the section. The EIS has identified that gathering improved seabird data would be highly beneficial.

- 6.27 SAMS comment that it is very pleasing to see that the EIS has provided a relatively sensible assessment of the data available, particularly in terms of its limitations, and has suggested further studies should be commissioned to address data gaps.
- 6.28 Although some satellite tracking information has been noted in the species sections, for Rockhopper, Gentoo and Magellanic Penguins, two studies have been overlooked which would further inform these sections. This is acknowledged by FOGL and additional references will be collected, reviewed and (where appropriate) used in future reports.
- 6.29 FC note the appendices with IUCN red list data for bird and marine species as being very useful.

Biological sensitivities

- 6.30 SAMS noted that the information on cetaceans simply says which species were seen in winter near the sites of interest. This ignores the tremendous difficulties of sampling in winter and very likely data gaps. If a genuine attempt was actually made to determine species impact this should be a best guess given what we know about these species, and then supplemented by the at-sea observations. This point is acknowledged by FOGL and the text has been amended in the revised EIS with discussion added accordingly.

Noise and Vibration

- 6.31 DECC suggest that noise propagation modelling, which was not undertaken, would benefit analysis of impact. However, based on the evidence provided, UK Coastal Shelf experience, the proposed mitigation measures and the relatively short duration of the planned drilling activity programme, DECC considers it unlikely that any cetaceans would be significantly impacted by the proposed operations. FOGL acknowledge this point and elaborate on it in their revised EIS.
- 6.32 SAMS comment that this is a general (school pupil level) section on marine mammal sound production and use and would have hoped for information on zones / levels of hearing damage and criteria for disturbance that have been developed for other industries, sectors and areas. SAMS cite a variety of similar simplifications regarding potential impact of sound on marine species. In response FOGL has amended this section in the revised EIS to address the points raised. The company consider that the level of information provided is sufficient for the purpose of this EIS.

Mitigation Measures

- 6.33 SAMS suggest that this section include practical advice including stopping pinnipeds from hauling out on structures near drilling operations and requiring operators to turn off sonars/echosounds etc when not in use. FOGL has responded to these points by noting that the design of the rig is such that there should not be any structures where pinnipeds can haul out. The point made regarding sonars etc. is noted. However, as the rig is dynamically positioned, continuous monitoring of its position relative to the wellhead, using transponders, will be required.

Oil Spill Modelling

- 6.34 The Fishery Department consider the stochastic models used are inappropriate for this area and depth and the fate of oil from a blow-out at these depths is far more complex and will be influenced by temperature, density and the direction of the main

water masses. SAMS also question the current data employed in oil spill modelling which is a fundamental basis to the modelling results.

- 6.35 These points are noted by FOGL, who comment that oil spill models, whilst a good planning tool, should not be used as a decision-making tool. FOGL is aware of the deep water currents from prior publications and from 9 months of current monitoring from a moored buoy over the water column near the Loligo A location. The modelling in the EIS followed prior DECC guidelines, which required sea surface releases for both 10 day onshore wind trajectory modelling and stochastic modelling. Wind direction clearly affects oil movement at the sea surface, one of the reasons for using surface models. FOGL is reviewing new modelling software which can incorporate seabed release, deep currents, and longer spill periods. The company has said that it would be happy to provide the mooring current report to the Fisheries Department.
- 6.36 DECC identifies oil spill modelling and mitigation in its comments and suggests that FOGL should work up an absolute worst case scenario (well blow-out with total loss of containment). Further mitigation measures should be planned including drilling a relief well. These comments are noted by FOGL who state that an Oil Spill Contingency Plan (OSCP) to comply with Falkland Government Legislation has been submitted. This document addresses the salient points raised above. Model results are discussed further in the OSCP. Relief well planning is also covered. FOGL has also said that it is reviewing modelling software for longer time runs and seabed release.
- 6.37 SAMS noted that the potential impacts of any accidental events with regard to seabirds are highlighted adequately in this section.

Environmental Management System (EMS)

- 6.38 DECC has suggested that FOGL demonstrate that they have an independently verified EMS in place. In its reply FOGL has said that it discussed the requirement for a verified EMS with FIG Department of Mineral Resources and in view of the following plans, FIG-DMR advised that a specific EMS was not required:-
- a) The guiding management requirements are covered in the EIS.
 - b) A Health and Safety audit of the Leiv Eiriksson rig will be carried out by FOGL, jointly with Borders & Southern, using specialist auditors ADT of Aberdeen.
 - c) A specialist audit on the BOP system will be carried out.
 - d) An audit will be carried out of both AGR (FOGL's drilling management contractor) and Ocean Rig HSEMS's at management and operational level.
 - e) HSE monitoring of, and reporting on operations by Ocean Rig and AGR, including compliance with the Waste Management Plan reporting requirements.
 - f) FOGL will retain an HSE adviser from RPS, from pre to post drilling phases to monitor compliance (with HSE requirements and the Environmental Management Plan), and ensure appropriate reporting. A post well report on performance will be produced.
 - g) Audit findings and HSE reports will be copied to FIG-DMR.

- 6.39 FOGL also intends to add a specific section on Environmental Management Objectives and Guidelines to its HSEMS. This will be provided to FIG-DMR.

Further Studies and Recommendations

- 6.40 Falklands Conservation noted and welcomed the inclusion of data gap identification in the EIS.
- 6.41 SAMS thoroughly endorsed the need for a proper marine mammal survey but thought that this should not be weakened by any effort to collate MMO sightings as MMO sightings come from platforms unsuitable for marine mammal surveys and ultimately deliver useful but biased data (using a seismic ship is akin to surveying on land for deer using a parade float with brass band). They are not a replacement/alternative to a proper survey. This comment is acknowledged by FOGL which intends to have an MMO/seabird observer on one of the supply vessels at regular intervals.
- 6.42 SAMS think a useful recommendation would be an agreed/accepted set of databases and/or models of the meteorology and currents for the region that all EIAs are expected to use. The Environmental Officer intends to take this proposal forward through the Hydrocarbons Forum and the gap analysis working group. SAMS also endorsed the recommendations in this section with regard to seabirds.

References

- 6.45 SAMS identify a number of missing references from the bibliography, which are acknowledged by FOGL and have since been addressed in the revised EIS.

7.0 Views of Minerals Committee

- 7.1 The Minerals Committee considered the EIS at its meeting on 30 November 2011. Members were largely content with the FOGL submission and welcomed the acknowledgement of data gaps. They also welcomed the recommendations made by the company and their undertaking to include marine mammal and seabird observer presence on support vessels during part of the drilling, as well as providing ROV images and footage to interested scientists.
- 7.2 Members of the Committee queried the potential impact of drilling activities on the loligo fishery. I can confirm that the EIS shows that loligo are caught outside and to the west of the FOGL licence areas and should therefore not be affected by drilling activities. Modelling also shows that any oil spills should move towards the north east and away from the fishery.
- 7.3 The Committee supported the recommendations set out in this report, but further recommended that Executive Council's approval be conditional upon the receipt of the revised EIS addressing the points that the company has said that it would in its response. I can confirm that the revised document has since been received and does include the proposed amendments.

8.0 Conclusion

- 8.1 The SAMS review of the EIS, as well as comments from Falklands Conservation, the Fisheries Department and DECC during the public consultation, collectively raise a number of further questions regarding the assessment. I think it fair to say that FOGL have made a good effort to answer the criticisms of the assessment where possible.

- 8.2 FOGL has acknowledged that, prior to any oil and gas development, further research is required to expand on the limited knowledge base in some areas. The company believes that this additional information is not required at present due to the limited duration of the exploration drilling programme.
- 8.3 This EIS is noticeably different from earlier documents as FOGL has sought to formally identify knowledge deficiencies and data gaps which exist regarding the estimation of impacts on the environment. This approach has been welcomed by all those who have reviewed and commented on the document. It is encouraging that FOGL has indicated its intention to place a marine mammal/seabird observer on one of the supply vessels at regular intervals. This should help identify species presence and any interactions between species and operations at an early stage. FOGL's intention to compile and release seabed visual observations from ROV surveys will help fill data gaps relating to the benthic environment.
- 8.4 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 Hydrocarbon Environmental Forum, of which FOGL is a member, is the appropriate mechanism for discussing and agreeing long-term requirements, should the industry move towards a development phase.
- 8.5 I share some of the concern expressed by SAMS and respondents concerning the oil spill modelling used in the EIS. I am therefore pleased that FOGL is reviewing new modelling software which can incorporate seabed release, deep currents, and longer spill periods and will include an update in its Oil Spill Contingency Plan to be provided to FIG prior to drilling.
- 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 Addendum, I recommend that the revised EIS be approved.
- 8.7 The Minerals Committee has considered the EIS, together with SAMS assessment, consultee responses and FOGLs response to them, and has also recommended that the EIS in its revised form be approved.

9.0 Financial Implications – none.

10.0 Legal Implications – none.

11.0 Human Resources Implications – none.

Appendices

1. FOGL Exploration Drilling Environmental Impact Statement
November 2011 Non-Technical Summary

Non Technical Summary

Overview

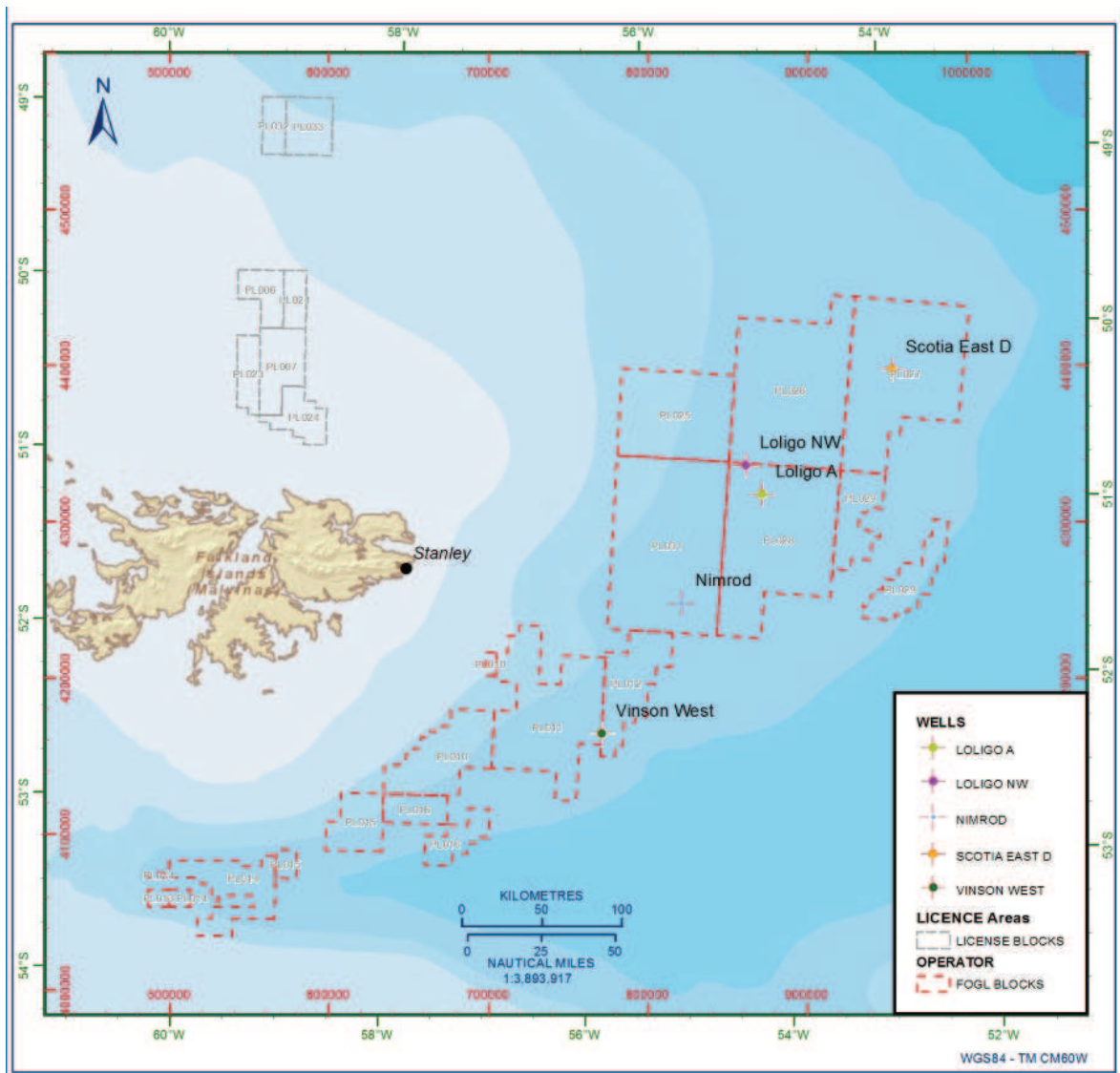
This Non Technical Summary accompanies a full report which presents the results of the Environmental Impact Assessment (EIA) undertaken for a two-well exploration drilling campaign proposed by Falkland Oil and Gas Limited (FOGL).

The purpose of the Non Technical Summary is to briefly describe the project, environmental baseline conditions, summarise potential project impacts and present recommendations on mitigation measures.

Project Background

Falklands Oil and Gas Limited (FOGL) holds 100% equity interest and operatorship of 13 exploration and production licences offshore Falkland Islands (Figure 1), a UK Overseas Territory located on the edge of the Patagonian Shelf in the south Atlantic Ocean. The exploration and production licences cover approximately 48,740 square kilometres and are located in water depths ranging from 500 to 2,000 metres.

Figure 1. FOGL Licence Area and Potential Well Locations



FOGL is a UK-based company and has been engaged in the exploration for oil and gas in the south and east Falklands Basins since 2004. The company carried out a number of seismic and site surveys and drilled their first well FI 61/05-1, on the Toroa prospect, in 2010. The evaluation of Loligo, Scotia, Nimrod and Vinson West and other key prospects continues with the current drilling programme proposed for the year 2012.

FOGL plans to drill two exploration wells. The first well will be on the Loligo prospect at location A or NW. The second well location has not been confirmed but will be on either the Vinson West, Nimrod or Scotia prospects or potentially it will be a well in the Loligo area e.g. Loligo NW (Figure 1). The proposed wells lie to the east and southeast of the Falkland Islands. The nearest well to the shore is Vinson West (155 kilometres) and the furthest is Scotia East D (314 kilometres). The water depths at these well locations vary from 1,300 to 1,800 metres.

It is anticipated that hydrocarbons, if discovered, would primarily comprise oil with an API of 18-25° for all wells apart from Scotia East D (API 30°). Gas with condensate is a possible alternative but not considered in this EIA as this would represent a best case scenario from the point of view of environmental impacts.

FOGL has contracted to use the Leiv Eiriksson dynamically positioned, fifth-generation semi-submersible rig, owned by Ocean Rig INC. The rig will mobilise following drilling in the neighbouring southern blocks operated by Borders & Southern. Drilling is anticipated to commence in April or May 2012 and will last for up to 100 days (45 to 50 days per well). Following drilling, the wells will be plugged and abandoned in accordance with UK Oil and Gas Guidelines. FIG guidelines for removal of obstructions from the seabed will be followed. Water-based muds will be used to drill both wells. Chemicals to be used during the drilling have been selected to minimise the potential environmental impacts as far as possible. The vast majority (by volume) of planned chemicals have a Harmonised Offshore Chemical Notification Scheme category of 'E' (which are of low aquatic toxicity, readily biodegradable and non-bio accumulative) and are naturally occurring products (e.g. barite) that are either biologically inert or readily dispersible or biodegradable.

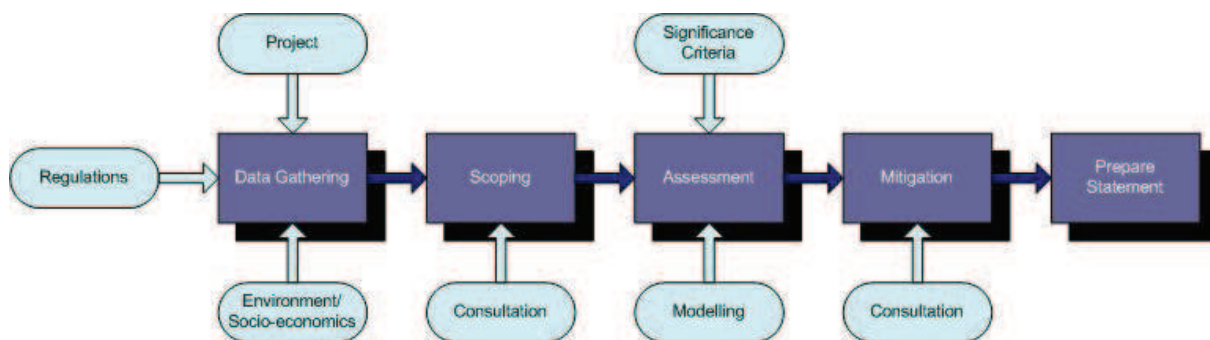
The drilling operations will be managed by AGR as drilling management contractor on behalf of FOGL. Three support vessels and two helicopters will be used throughout planned operations. Further operational details are included in Section 4.

Scope and Methodology

FOGL has commissioned RPS Energy to undertake the Environmental Impact Assessment (EIA) for the 2-well drilling programme in their southern and northern licence areas offshore Falkland Islands.

The EIA is an important management tool which ensures that environmental hazards and impacts are identified and evaluated and that appropriate control (mitigation) measures are implemented throughout all phases of the project.

Figure 2. EIA Process



The purpose of the EIA is to:

- Set EIA objectives by defining the applicable Institutional, Policy and Regulatory frameworks;
- Describe the work that the project proponent intends to undertake and how the environmental considerations have formed an essential part in the development concept, definition and selection of the activities;
- Describe the physical, biological and socio-economic components of the environment within the study area and to assess their sensitivities in the context of the intended exploration drilling programme;
- Undertake scoping exercises during the project planning stage through consultation with the Falkland Islands Government and key stakeholders, to outline key operational impacts associated with the project;
- Qualitatively and quantitatively assess the nature, significance and probability of impacts on environmental resources and receptors;
- Develop appropriate mitigation measures, together with management and monitoring procedures that will seek to avoid, minimise or reduce potential impacts to a level as low as reasonably practicable.

The EIA has been prepared to satisfy the requirements of The Offshore Minerals Ordinance 1994 (amended 1997) and other Falkland Islands' legislation pertaining to offshore exploration and production activities.

The geographical scope of this EIA includes the 13 FOGL licences together with the wider marine and coastal environment where relevant to the potential impacts of the Project (referred to as 'the project area of influence'). The focus of the EIA is on the locations where wells are likely to be drilled (see Figure 1).

Any operational details not covered by the EIS will be detailed in the Operational Addendum, which will be submitted to the Falkland Islands' Government (FIG) for review and approval, as per FOGL's agreement with FIG.

Baseline Environment

Data Collection

To provide a baseline against which potential impacts can be assessed, the EIA provides a description of the conditions that will prevail in the absence of the project. The baseline includes information on all receptors and resources identified as having the potential to be significantly affected by the proposed project. For this EIA, baseline data collection proceeded in several stages:

- Collection of available data from existing sources including:
 - Government agencies;
 - Research and academic organisations;
 - Published sources;
 - External stakeholders; and
 - Previous offshore exploration EIAs.
- In-country information gathering and stakeholder interviews.
- Benthic and geophysical surveys of the well site locations have been undertaken to inform the physical and biological components of the baseline.
- Various meteorological studies commissioned by FOGL.

- Marine Mammal Observers (MMOs) reports issued from seismic and site surveys by various operators have been analysed and incorporated to provide up-to-date information on marine mammal sightings in the area.

Overview

The Patagonian Shelf Large Marine Ecosystem, where the Falkland Islands lie, is of regional and global significance for marine resources (Croxall & Wood, 2002). Current patterns and bathymetry influence nutrient circulation and marine productivity levels. Productive waters upwell on the edge of the continental shelf, but most particularly, to the northwest of the Jason Island Group, Beauchêne Island and the Burdwood Bank (Otley *et al.*, 2008). These areas are rich in plankton and fish assemblages, and are important foraging grounds for seabirds and marine mammals (White *et al.* 2002).

Key environmental sensitivities identified within the FOGL licence blocks and surrounding areas are discussed below and summarised in Table 1.

Key Physical Sensitivities

- The Falkland Islands offshore area is characterised by weather conditions with strong winds and average wave heights of 2-3 metres.
- On rare occasions, icebergs may occur within the licensed area.
- No gas hydrates have been identified during the well site surveys.

Key Biological Sensitivities

- A medium density of kelp species can be found throughout the project areas, providing food and habitat for a wide range of marine invertebrates and fish.
- The most prominent colonial epifauna encountered across the Loligo site constitutes cnidarians, including at least two species of gorgonian (soft corals) and at least one species of scleractinian (hard or stony coral). The recovered coral samples, although superficially similar to the cold water coral *Lophelia pertusa*, are believed to be analogous Antarctic species, capable of withstanding colder waters. There is insufficient evidence to conclude that recorded coral species are part of cold coral colonies/reefs classified as Annex I Habitat under the EU Habitats Directive.
- Fish species known to spawn in the vicinity of the FOGL exploration wells include Patagonian toothfish (peaks between May and July through to August), and Grenadier during March-April.
- The following species of cetacean were recorded during the austral winter around the proposed FOGL well sites: Fin whale, Long-finned pilot whale, Southern bottlenose whale, Hourglass dolphin, Peale's dolphin, Sei whale, Minke whale, Sperm whale, Killer whale, Blue whale, and Spectacled porpoise.
- Pinnipeds present in the vicinity of the FOGL sites include: South American sea lion, southern elephant seal, South American fur seal and the rare Leopard seal. All of these species except the leopard seal spend the summer months ashore on the Falkland Islands breeding. During winter, however, they have been observed undertaking long foraging trips which overlap with the FOGL blocks.
- Petrels are known to be present in the vicinity of the FOGL site, with particularly high numbers occurring during the proposed drilling period. These include; Antarctic fulmar, Kerguelen petrel, Cape petrel, and Blue petrel. Other seabird species likely to be present include: Soft-plumaged petrel, White chinned petrel, Grey-backed storm petrel, Great shearwater, Sooty shearwater, Great shearwaters, Little shearwater, Prion and Skua sp, Kelp gull, South American tern and the Arctic tern.
- Of the penguin species recorded offshore the Falkland Islands, only king penguins and gentoo penguins are likely to be present in significant quantities during the proposed drilling period; they can forage far offshore but predominantly stay near to the shore.

- It is possible that the following species of albatross will be present in the vicinity of FOGL blocks throughout the year: Southern and Northern royal albatross, Black-browed albatross and Grey-headed albatross, Light-mantled sooty albatross, Wandering albatross and Shy albatross.
- Seabird vulnerability is assumed to be high throughout the drilling period due to variability in seasonality and occurrence of various birds with protected status. Based on the JNCC study (White *et al.*, 2002), seabird vulnerability to oil spills in the proximity of the project area is highest in August, and was rated as high on the vulnerability scale. During winter and spring months seabird vulnerability was rated as low, and there was no data for March and May. The JNCC data coverage is not sufficient for impact assessment purposes and was used as an indicator of seabird vulnerability for near shore areas only.
- Numerous protected areas exist on the Falkland Islands coast related to seabirds and seal colonies. The closest to the proposed FOGL well sites is the Stanley Common & Cape Pembroke Sanctuary Protected Area, located approximately 153 kilometres northwest of the Vinson West well site.

Key Socio-Economic Sensitivities

- The Patagonian Toothfish and Grenadier are the main catch throughout the FOGL licensed area, with some Rock cod fishing in the vicinity of the northern well sites. Other species caught in this region include Skates, Hake and Loligo squid.
- Low density of shipping in the general offshore area and in the vicinity of the proposed wells.
- Tourism in the Falklands is growing rapidly. However, tourist levels peak in austral summer, outside the FOGL drilling timetable.
- There is an increasing exploration interest, with a focus on the north Falklands licences. To the south and east of the Falklands, only one well (Toroa - 2010) has been drilled.

Table 1. Overview of the key seasonal environmental sensitivities for the FOGL blocks and surrounding waters (proposed drilling period outlined in red)

Species	J	F	M	A	M	J	J	A	S	O	N	D
Cetaceans												
Fin whales (<i>Balaenoptera physalus</i>)	Blue	Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Sei whale (<i>Balaenoptera borealis</i>)	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Antarctic minke whale (<i>Balaenoptera acutorostrata</i>)	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Sperm whale (<i>Physeter macrocephalus</i>)	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Southern bottlenose whale (<i>Hyperoodon planifrons</i>)	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Southern right whale (<i>Eubalaena australis</i>)	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Long – finned pilot whale (<i>Globicephala melas</i>)	Light Blue	Light Blue	Light Blue	Blue	Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Hourglass dolphin (<i>Lagenorhynchus cruciger</i>)	Blue	Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Peale’s dolphin (<i>Lagenorhynchus australis</i>)	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Commerson’s dolphin (<i>Cephalorhynchus commersonii</i>)	Yellow	Yellow	Yellow	Yellow	Orange	Orange	Yellow	Yellow	Yellow	Yellow	Orange	Orange
Killer whale (<i>Orcinus orca</i>)	Blue	Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Blue whale (<i>Balaenoptera brydei</i>)	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Spectacled porpoise (<i>Phocoena dioptrica</i>)	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue	Light Blue
Key	Peak Occurrence		Known Occurrence			Peak Coastal Occurrence			Known Coastal Occurrence			
			Occurrence Unlikely									

Species	J	F	M	A	M	J	J	A	S	O	N	D
Pinnipeds												
South American sea lion (<i>Otaria flavescens</i>)	Peak	Peak	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Southern elephant seal (<i>Mirounga leonine</i>)	Peak	Peak	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
South American fur seal (<i>Arctocephalus australis</i>)	Peak	Peak	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Leopard seal (<i>Hydrurga leptonyx</i>)	Peak	Peak	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Key	Peak Occurrence		Known Occurrence					Occurrence Unlikely				

Species	J	F	M	A	M	J	J	A	S	O	N	D
Penguins*												
King penguin (<i>Aptenodytes patagonicus</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Gentoo penguin (<i>Pygoscelis papua</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Southern rockhopper penguin (<i>Eudyptes chrysolophus</i>)	Peak	Peak	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Macaroni penguin (<i>Eudyptes chrysolophus</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Magellanic penguin (<i>Spheniscus magellanicus</i>)	Peak	Peak	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Chinstrap penguin (<i>P. Antarctica</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Albatrosses*												
Black – browed albatross (<i>Thalassarche melanophris</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Grey-headed albatross (<i>Thalassarche chrystostoma</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Light – mantled sooty albatross (<i>Phoebastria palpebrata</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Northern royal albatross (<i>Diomedea sanfordi</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Southern royal albatross (<i>Diomedea exulans</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Wandering albatross (<i>Diomedea exulans</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Shy albatross (<i>Thalassarche cauta</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Petrels and Shearwaters*												
Southern giant petrel (<i>Macronectes giganteus</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Northern giant petrel (<i>Macronectes halli</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Antarctic petrel (<i>Thalassoica antarctica</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Cape petrel (<i>Daption capense</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Antarctic fulmar (<i>Fulmarus glacialis</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Blue petrel (<i>Haloboena caerulea</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Kerguelen petrel (<i>Lugensa brevirostris</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Soft plumaged petrel (<i>Pterodroma mollis</i>)	Peak	Peak	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Atlantic petrel (<i>Pterodroma incerta</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Grey petrel (<i>Procellaria cinerea</i>)	Known	Known	Known	Known	Known	Known	Known	Known	Unlikely	Unlikely	Unlikely	Unlikely
Key	Peak Occurrence		Known Occurrence					Unlikely Occurrence				

Species	J	F	M	A	M	J	J	A	S	O	N	D
White-chinned petrel (<i>Procellariaequinoctialis</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Wilson’s storm – petrel (<i>Oceanites oceanicus</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Grey backed storm petrel (<i>Garrodia nereis</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Diving Petrels*												
Black bellied storm petrel (<i>Fragetta tropica</i>)	█	█	█	█	█	█	█	█	█	█	█	█
White bellied storm petrel (<i>Fragetta grallaria</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Great shearwater (<i>Puffinus gravis</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Sooty shearwater (<i>Puffinus griseus</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Little shearwater (<i>Puffinus assimilis</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Prions*												
Fairy prion (<i>Pachyptila turtur</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Rock shag (<i>Phalacrocorax magellanicus</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Imperial shag (<i>Phalacrocorax atriceps</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Swans, Geese and Ducks												
Skuas Stercorariidae*												
Catharacta skua (<i>Stercorarius skua</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Arctic skua (<i>Stercorarius paasiticus</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Long tailed skua (<i>Stercorarius lonicaudus</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Gulls Laridae*												
Dolphin gull (<i>Larus scoresbii</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Kelp gull (<i>Larus dominicanus</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Brown-hooded gull (<i>Larus maculipennis</i>)	█	█	█	█	█	█	█	█	█	█	█	█
South American tern (<i>Sterna hirundinacea</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Arctic tern (<i>Sterna paradisaea</i>)	█	█	█	█	█	█	█	█	█	█	█	█
Key	█ Peak Occurrence		█ Known Occurrence					█ Occurrence Unlikely				

*Indicating vulnerability only in coastal areas

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
Patagonian toothfish (<i>Dissostichus eleginoides</i>)			█	█	█	█	█	█				
Grenadier (<i>Macrourus spp.</i>)			█	█	█	█	█	█				
Key:	█ Known Spawning Period											

Note - meteorological, oceanographic and ecological variables during surveys have not been incorporated into the summary table outputs, and therefore the table gives only a basic guide to the presence/absence of species throughout the year.

Discussion of Impacts and Mitigation

The proposed exploration activities have the potential to induce noise, atmospheric emissions, physical disturbance and a variety of discharges (routine, and non-routine; such as spills) and wastes.

A detailed study of the potential impacts, sensitivity of receptors, mitigation measures and any residual impact has been carried out and is included within this EIS report. An overview of the main areas of impact and their significance is provided in Table 2 below.

Table 2. Potential Hazards and Associated Impacts from the Proposed Drilling Operations assuming Implementation of Pollution Prevention and Mitigation Measures

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	Archaeology	Tourism / Leisure	Land Use	Sediments	Resource Use
Physical Presence					4				4	4	5	5		5				4
Seabed Disturbance				3									5	5			4	
Noise & Vibration					5	5	5	4										
Atmospheric Emissions		4																
Marine Discharges	5		5	4	5													
Solid Waste								5								3		
Minor Loss of Containment	4		4		5	4		5		4	5	5			5			
Major Loss of Containment	3		3	4	3	2	3	2	3	3	3	4			3		4	3

Key to Significance of Effect (see Table 6.1 for definitions)

1	Severe	2	Major	3	Moderate	4	Minor	5	Negligible		None
---	--------	---	-------	---	----------	---	-------	---	------------	--	------

The risk of accidental hydrocarbon spillage to the sea is the main environmental concern associated with the proposed drilling programme. Spilled oil can have a number of environmental and economic impacts.

The greatest environmental sensitivity to oil spills would be the presence of vulnerable and protected seabird populations (i.e. penguins, petrels, albatrosses) and marine mammals (cetaceans and pinnipeds in particular). Without implementation of mitigation measures to stop or disperse a worst case scenario spill, the impact on these species is likely to have severe consequences affecting regional population count and dynamics, long term (>10 years) damage and poor potential for recovery rates. Provided that an effective and timely spill response is put in place, the overall impact is likely to be reduced to a lower significance, where medium term (>2 years) damage to ecosystem occurs with a likelihood of recovery within 10 years.

Cumulative environmental effects from the planned exploration programme are considered to be minor given the short term nature of the drilling and low level of exploration activities in the east and south Falkland Basins.

Transboundary impacts have a low probability of occurring and are assessed to be of minor significance provided the below mitigation measures are implemented. The potential impacts of these operations will be mitigated in a number of ways, including:

- Maintaining a culture of openness and ongoing consultation with the Falkland Islands Government (FIG), the public and key stakeholders;
- Applying international best practice and established UK standards to the proposed operations;
- Extensive logistical planning prior to commencing operations to ensure that no strains are placed on current onshore capacities;
- Comprehensive operational planning, risk assessment and provision of suitable specification equipment for drilling (i.e. blowout preventer) and planning for emergencies (i.e. capping device, relief well);
- Implementing a high level of environmental management offshore and applying environmental procedures for potentially impacting operations (chemical storage, bunkering, waste handling, maintenance programmes, seafloor surveys etc);
- Establishing and implementing a project specific Oil Pollution Emergency Plan and carrying out training of key personnel in spill response. FOGL will be a member of Oil Spill Response Ltd and will have access to their Tier 1, 2 and 3 response capabilities as well as a dedicated oil wildlife response capability provided by the Sea Alarm;
- Preparation of the Iceberg Management Plan covering iceberg surveillance and monitoring procedures and detailing avoidance and mitigation measures;
- Implementing a detailed waste management plan to minimise the quantity of waste going to landfill, prevent unsuitable disposal of waste, and maximise the re-use of materials. All hazardous waste will be transferred to UK for treatment and disposal;
- Using water based drilling muds and low toxicity chemicals approved under the UK Offshore Chemical Notification Scheme;
- Ensuring all discharges from the rig/supporting vessels are treated and discharged according to the MARPOL Convention;
- Preventing increased noise levels in ecologically sensitive areas, i.e. avoiding helicopter flights over seabird and pinniped colonies;
- Collecting and sharing environmental data wherever possible, for example in offshore sightings, seabed surveys and meteorological and oceanographic conditions.

Conclusions

The assessment of potential environmental impacts from the proposed drilling programme has been carried out using a conservative precautionary approach, and is based on publicly available literature, unpublished research data, inputs from stakeholder consultation combined with the expert judgement of the RPS Energy consultants and the Falklands Island Government departments, Falkland Conservation, Birdlife International and NGOs. On the basis of the assessment conducted, a wide range of preventative and mitigation measures have been proposed.

Given the current operational commitments and proposed mitigation measures, it is considered that the routine drilling activities can be undertaken without significant impacts to the Falkland Islands' environment. However, in the event of a potential blowout under worst case scenario conditions (i.e. loss of control of the well due to failure of numerous safety systems e.g. blow-out preventer; long term release of liquid hydrocarbons until a capping device can be deployed or relief well can be drilled), the impact is likely to be of major significance.

Further Studies and Recommendations

Data Gaps

EIA process is heavily reliant on the accuracy and availability of the baseline environmental data. For the current EIA, a series of data gaps have been identified which are to be considered as an element of uncertainty contributing to the final conclusions:

- Absence of reliable scientific data on fish spawning and nursery grounds around Falklands Islands. Though a number of publications discuss this subject, there is insufficient coverage, or correlation between various results, to build up regional and temporal overviews of the spawning areas;
- Sparse information on the benthic environment, including protected habitats (i.e. cold coral colonies) offshore Falkland Islands. There is therefore a need for a strategic co-ordinated survey and monitoring programme;
- Comparatively little is known about the numbers and distribution of marine mammals in the offshore environment, their use of the area and its resources. Survey effort to date is limited to fishing observations and a single 'Seabirds at Sea' programme undertaken in 1998-2001. Therefore a need for a strategic co-ordinated survey and monitoring programme based on adequate scientific approach exists. Given weather conditions offshore Falklands, a programme of acoustic monitoring is also desirable to complement such visual surveys throughout the year;
- Existing MMO reports from rig site surveys and seismic surveys have not been collated into the main body of knowledge on cetaceans. With suitable co-ordination and methods development, existing cetacean data gathering could be improved and systematised;
- Few data, including the Seabirds at Sea programme of 1998-2001, and observations from fishing vessels, currently exist to indicate foraging areas for pinniped species along the Falklands Shelf. The first attempts to determine the offshore distribution of pinnipeds using tagging and satellite telemetry methods, began in 2000. However, in most cases the sample sizes were too small to be conclusive of pinniped distribution trends. A Falkland Island wide survey to assess the abundance and distribution of pinnipeds is highly desirable due to their high vulnerability to marine noise and oil spills;
- Comparatively little is known about the numbers and seasonal distribution of seabirds in the offshore environment, and their vulnerability to surface pollution at different times of the year. Fishing vessel observations are partially biased as vessels tend to attract certain types of birds, whilst the Seabirds At Sea survey (1998-2001) effort was particularly low to the east and south of the Falkland Islands i.e. the FOGL licence areas. Seabird tracking data has been collected since 1994 and is limited to a few species of protected petrels and albatrosses.

General Recommendations- data gaps and data management

- Survey data (benthic, cetaceans, pinnipeds) collected by various operators should be designed to generate datasets that can support both strategic and site-specific approaches to environmental assessment.
- Falkland Islands marine monitoring and data gathering initiatives should be initiated and integrated across and between the various state agencies, research institutions and commercial operators.
- Environmental data (physical, chemical, biological and relating to other sea users) should be collated and held in a co-ordinated and readily accessible database at an identified location for use in future oil and gas-related environmental assessments.

Project Specific Recommendations

Project specific recommendations to enhance the knowledge of licensing area include:

- Use of marine mammal and seabird observers during drilling programme.
- Compiling and releasing seabed visual observations from ROV surveys where these provide information on seabed habitats or species.