

Noble Energy Falklands Limited

Environmental Impact Statement (EIS) for Exploration Drilling Offshore the Falkland Islands

NON TECHNICAL SUMMARY

Date: 9th January 2015

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Non-Technical Summary

The Project

Noble Energy Falklands Limited, a subsidiary of Noble Energy, Inc. (hereafter referred to as ‘Noble’) is proposing to conduct exploration drilling activities offshore the Falkland Islands within its Production License (PL) areas. Currently, the planned drilling programme consists of two exploration wells and one optional exploration/appraisal well (a potential total of three wells). To date, four potential well locations have been identified. The exploration drilling activities are planned to commence early to mid-2015. It is currently estimated that it will take between 75 and 90 days to drill and construct each well.

The exploration drilling campaign will use the *Eirik Raude* drilling rig. The drilling rig will be supported by three Offshore Supply Vessels (OSVs). One of these OSVs will remain within the vicinity of the drilling unit at all times and assume the role of Safety Stand-by Vessel (SSV).

The onshore support location for the exploration drilling activities will be in Stanley. The OSVs will travel to/from the drilling rig from the planned Noble Temporary Dock Facility (TDF) under installation in Stanley Harbour (which is the subject of a former planning submission). The vessels will transport the materials and supplies needed for the drilling operations to/from the drilling unit on an ongoing basis. Noble will also have a shore base located on Boxer Bridge Road which will be used to store drilling equipment, associated tools and chemicals. These items will be transferred between the shore base and TDF by road.

The Environment

The Noble License areas lie to the north-east, east and south-east of East Falkland Island. There are three areas of potential drilling interest to Noble.

The Falkland Islands Southern Phase A area (referred to as ‘FISA12’) is located approximately 100 kilometres from the nearest landfall at Cape Pembroke on the East Falkland mainland. FISA12 was subject to 3D seismic survey between December 2012 and May 2013.

The Falkland Islands Southern Tilted Fault Block area (referred to as ‘FIST13’) is located approximately 62 kilometres from the nearest landfall at Beauchêne Island and approximately 125 kilometres from the East Falkland mainland at Bull Point. FIST13 was subject to 3D seismic survey between May and June 2013.

The Falkland Islands Northern Area (referred to as ‘FINA13’) is located approximately 206 kilometres from the nearest landfall at Mengeary Point on the East Falkland mainland. FINA13 covers an area of 5,380km² and was subject to seismic survey between November 2013 and February 2014.

Currently, exploration drilling activities are proposed to occur in FISA12 and FIST13. Although less likely, drilling in FINA13 is also a possibility. For all confirmed well locations, EIS addenda will be prepared. The addenda will include all relevant well-specific details and will be submitted for approval (in agreement with Falkland Islands Government [FIG]) prior to drilling commencing.

Bathymetry

In the southernmost of the Noble licenses, bathymetry ranges from approximately 700 metres in the far south near the Burdwood Bank, to approximately 1,900 metres further to the north near the Falklands Trough. Across the more central and northern license areas, bathymetry ranges from approximately 1,000 to 1,600 metres.

Seabed Sediments

Towards the southernmost of the Noble licenses, sediments are expected to comprise sand and gravels of varying density, clay and silty gravelly sand. The dominant sediment type found across the FISA12 survey area was representative of slightly gravelly muddy sand. Stretching northwards, fine to coarse sand and gravels are expected to dominate.

Plankton

Plankton numbers offshore rise sharply during austral spring and summer months, peaking in January and February.

Benthos

Environmental surveys have taken place over the FISA12, FIST13 and FINA13 areas. The results of the FISA12 survey are available and have been presented within the EIS document; the results of the FIST13 and FINA13 surveys are not currently available and will be reported in EIS addenda prior to drilling operations commencing. References have been made to existing environmental surveys conducted by previous operators in the vicinity of the Noble licenses.

Across the FISA12 area (southern area licenses), infaunal communities were dominated by small polychaetes, closely followed by crustaceans which were also well represented; this finding is in line with other regional surveys. The survey found a rich epifaunal assemblage. Key faunal groups were the sponges, class Hexactinellida, Calcarea and Demospongia; many of the genera were typical for deeper water. The Cnidaria were represented by nine genera of thecate and athecate Hydrozoa and two genera of Stylasteridae. The live solitary coral belonging to the species *Flabellum curvatum* (a potential CITES Appendix II coral species) was also recorded. Several Octocorallia were found, including the sea pens Pennatulidae (generally too small to identify) and two species of Gorgonacea. Bryozoa were also a very common constituent on pebbles and stones, with many species endemic to the South Atlantic region. Echinoderms were represented, with ophiuroids, crinodea, asteroids and holothurians present. Where drop-stones were present, encrusting sponges were common along with anthozoans. Often rooted into soft sediments bryozoans and hydroids were observed as sparse tufts. There were also numerous burrows likely to be associated with crustacean and holothurian activity. Free-swimming megafauna included the demersal teleosts: moridae, grenadier, hake and batoids.

Across the FIST13 area (southernmost license area), evidence from previous site surveys has shown that polychaete species dominate the infaunal taxa. Epifauna observed previously has included Cnidaria and Crustacea. Evidence of bioturbation in the form of burrows has also been observed. Comparable benthic results are expected from the Noble environmental survey results in FIST13 at similar depths and with similar sediments. A degree of variation between sampling sites is expected due to the marked variety of depths and sediments across the area. Even in light of the variable depths and sediments, the macrofaunal analysis is expected to comprise mainly of polychaete species, as previous results have shown that the variation in sediments in this area had only a small effect on the apparent distribution and abundance of macrofaunal species.

Across the FINA13 area (northern license area), previous surveys have shown that the most abundant colonial epifauna encountered were Cnidaria, which included at least two species of gorgonian (soft corals) and at least one species of scleractinian (hard or stony coral). Given the similarity of results observed between the existing surveys in the FINA13 region so far, similar epifaunal and macrofaunal observations are expected at similar depths and sediments.

Fish

Fish species known to spawn in the vicinity of the Noble license areas include Patagonian toothfish (*Dissostichus eleginoides*) (peaks in occurrence in May and July through to August), and grenadier (peaks in occurrence during March-April) in more northerly areas. Other species occurring regularly across the Noble license areas include skates and rays (*Rajidae*).

Marine Mammals

The results of the marine mammal observations that occurred during the seismic surveys conducted in FISA12 and FIST13 (RPS, 2013) correlate well with the Joint Nature Conservation Committee (JNCC) survey results (White et al., 2002). Both data sets suggest that the species most frequently encountered across the Noble license areas include: sei whale (*Balaenoptera borealis*), fin whale (*Balaenoptera physalus*), Antarctic minke whale (*Balaenoptera bonaerensis*), sperm whale (*Physeter macrocephalus*), southern bottlenose whale (*Hyperoodon planifrons*), long finned pilot whale (*Globicephala melas*), southern right whale (*Eubalaena australis*), killer whale (*Orcinus orca*), Commerson's dolphin (*Cephalorhynchus*

commersonii), Peale's dolphin (*Lagenorhynchus australis*) and hourglass dolphin (*Lagenorhynchus cruciger*).

Pinnipeds

Pinnipeds of the wider Falkland Islands region include the South American sea lion (*Otaria flavescens*), southern elephant seal (*Mirounga leonina*), South American fur seal (*Arctocephalus australis*) and the leopard seal (*Hydrurga leptonyx*). With the exception of the leopard seal, which is an occasional visitor to the Falkland Islands, these species spend some time during the summer months ashore on the Falkland Islands to breed. Of these, the South American fur seal has been sighted within the vicinity of the Noble license areas. Sightings of other species are unlikely, but may be possible in the event of long foraging trips that the animals sometimes make.

Sea Birds

Of the penguin species recorded offshore the Falkland Islands, king penguin (*Aptenodytes patagonicus*), rockhopper penguin (*Eudyptes chrysocome*), magellanic penguin (*Spheniscus magellanicus*), macaroni penguin (*Eudyptes chrysolophus*) and chinstrap penguin (*Pygoscelis antarctica*) may be present across the Noble license areas. Penguins can forage far offshore, but predominantly stay closer to the shore.

The following species of albatross are likely to be present in the vicinity of Noble licenses throughout the year: black-browed albatross (*Thalassarche melanophris*), grey-headed albatross (*Thalassarche chrysostoma*), northern and southern royal albatross (*Diomedea sanfordi* and *Diomedea epomophora*), yellow-nosed albatross (*Thalassarche chlororhynchos*), light-mantled sooty albatross (*Phoebastria palpebrata*), wandering albatross (*Diomedea exulans*) and sooty albatross (*Phoebastria fusca*).

Petrels known to be present in the vicinity of the Noble license areas include: southern giant petrel (*Macronectes giganteus*), northern giant petrel (*Macronectes halli*), Antarctic petrel (*Thalassoica antarctica*), cape petrel (*Daption capense*), blue petrel (*Halobaena caerulea*), Kerguelen petrel (*Pterodroma brevirostris*), soft-plumaged petrel (*Pterodroma mollis*), Atlantic petrel (*Pterodroma incerta*), grey petrel (*Procellaria cinerea*), white-chinned petrel (*Procellaria aequinoctialis*), Wilson's storm petrel (*Oceanites oceanicus*), grey-backed storm petrel (*Garrodia nereis*), black and white bellied storm petrel (*Fregetta tropica* and *F. grallaria*), magellanic diving petrel (*Pelecanoides magellani*), common diving petrel (*Pelecanoides urinatrix*), great shearwater (*Puffinus gravis*) and sooty shearwater (*Puffinus griseus*). The great shearwater and cape petrel were the most frequently observed species during recent Noble commissioned seismic surveys.

Other seabird species that may be present across the Noble license areas include: various prion species; skua species including *Catharacta* skuas, long-tailed skua (*Stercorarius longicaudus*); gull species including kelp gull (*Larus dominicanus*); and tern species including Arctic tern (*Sterna paradisea*).

Protected Areas

Numerous sensitive areas exist on the Falkland Islands coastline related to seabirds and seal colonies. The closest of these to the Noble license areas are Beauchêne Island (approximately 62 kilometres from the FIST13 area), Cape Pembroke (approximately 100 kilometres from the FISA12 area), Sea Lion Islands group (approximately 110 kilometres from the FIST13 area) and Bull Point on the East Falkland mainland (approximately 125 kilometres from the FIST13 area).

To date, there are no offshore protected or designated marine areas in the Falkland Islands, although there are a number of draft Important Bird Areas (IBAs) in the water around the Falkland Islands, including two which cover the FIST13 and FINA13 licence blocks (Atlantic, Southwest 4 – Marine and Atlantic, Southwest 3 – marine, respectively). There are however several protected areas in shallow waters around the Falkland Islands coastline and a number of coastal IBAs.

Human Environment

The Gross Domestic Product (GDP) of the Falkland Islands is approximately £100 million a year. The total population of the Falkland Islands was calculated to be 2,931, as recorded during the most recent 2012 Census (FIG, 2013). Stanley is the main town and capital in the Falkland Islands, with a population of 2,120 (FIG, 2013).

The economy of the Falkland Islands is limited by its small population and remote location. Since the conflict with Argentina ended in 1982 the economy has grown rapidly, initially as a result of UK aid but more recently from the development of the fishing industry.

A workforce of over 2,000 exists in the Falkland Islands, with FIG being the largest employer (employing around 600 people). The three largest industries are commercial fisheries, agriculture and tourism, while the construction and retail industry are currently experiencing periods of growth.

Waste Management Facilities

Waste disposal options on the Falkland Islands are extremely limited. There is no capability for the disposal of hazardous waste.

Commercial Fisheries

Commercial fisheries are currently the largest source of income for the Falkland Islands. All fishing within 200 nautical miles of the Falkland Islands is subject to licensing by FIG. Fisheries typically generate £15 to £20 million per annum in license fees, roughly half of the government annual revenue.

Commercial fisheries are active across all of the Noble license areas, with the key species being Patagonian toothfish. Catches of rock cod, grenadiers, skates, rays and other by-catch species are also made across the license areas.

Commercial Shipping

The commercial shipping traffic within the Noble license areas is closely aligned with the commercial fishing activities. There are some commercial shipping routes that traverse the Noble license areas; however, shipping activity in general is very low.

Cultural Heritage

The best known location of two shipwrecks, designated as 'war graves', are positioned within the FISA12 area; *SMS Scharnhorst* and *SMS Gneisenau*. These two wrecks are uncharted and there is a degree of uncertainty about their exact location on the seabed, due to the way in which the vessels sank. Attempts were made during the environmental baseline surveys to positively locate these wrecks; however, they were not identified with the survey equipment. It is thought that an anomaly seen during the bathymetry survey is highly likely to be the wreck of the *Atlantic Conveyor* in FINA13, but the survey was unable to obtain seabed photographs so a positive identification was not possible. An additional charted wreck, the wreck of the *RFA Sir Galahad*, is located within license PL011 approximately 12 kilometres from the FISA12 area.

Tourism

Over the last 5 years, the tourism industry has grown rapidly, with large numbers of passengers arriving in Stanley each year from cruise ships during the main tourist season (from October to early April). The main attractions are the Falkland Islands' unique environment and wildlife. Up to 2,500 passengers can arrive on a single cruise ship.

Military

After the 1982 conflict in the Falkland Islands, the UK established a garrison consisting of naval, land and air elements. It is based at the Mount Pleasant Airport (MPA) Complex, which is based approximately 35 miles from Stanley. UK military assets are drawn from all three services and include infantry and specialist troops, air defence assets, a maritime patrol capability and RAF Typhoon aircraft. The British Forces South Atlantic Islands (BFSAI) is based at MPA; it consists of approximately 1,300 service personnel plus around 50 MOD civil servants.

The Environmental Impact Statement

Noble has prepared an Environmental Impact Statement (EIS) meeting the requirements of the *Offshore Minerals Ordinance 1994 (as amended)*, including the *Offshore Minerals (Amendment) Ordinance 2011*.

The EIS document will be submitted to the FIG Department of Mineral Resources (DMR) for review and approval.

The EIA process presented in this EIS document has systematically identified and assessed all potential environmental impacts associated with the project. The main aspects and their residual impacts, following the implementation of mitigation measures, are shown in Table A and Table B below. Table A presents a summary of the potential impacts for routine hazards and Table B presents a summary of the hazards, effects and mitigation measures for non-routine hazards.

Table A: Summary of hazards, effects and mitigation measures for routine hazards (scores given represent the worst case for each impact)

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
<u>Physical Presence</u>	Removal of small area of seabed for well construction The impacts include the permanent removal of a small area of seabed, sediment and any macrofauna associated with that sediment. There is also the potential for disturbance of sensitive species that may be present.	Certain	Negligible	Low	<ul style="list-style-type: none"> As this impact is an inevitable consequence of well construction, there are no mitigation measures that can be used to reduce the impact. However, the mitigation measures described below under 'Discharges to Sea' in relation to pre-drilling, during drilling and post-drilling environmental surveys will allow close monitoring of the impacts in situ. During pre-drilling monitoring of the wellhead location the presence of habitats of conservation importance will be established. Should any important habitats be observed prior to commencement of drilling, the wellhead will be re-located in order to avoid these habitats. 	Certain	Negligible	Low
	Navigation risk The physical presence of the drilling rig represents a physical obstruction in the sea and an associated increased risk of collision with a third-party vessel. There is also a small risk of collision from icebergs that may be in the area, although this risk is very low.	Possible	Major	High	<ul style="list-style-type: none"> A 500 metre radial safety zone will be implemented around the drilling unit whilst on location which will be applicable to all third-party vessels, to reduce the potential for a collision with the drilling unit to occur. The 500 metre safety zone will be patrolled and enforced by the a Safety Stand-by Vessel (SSV), which will be in attendance in the vicinity of the drilling unit at all times. Up to 3 OSVs will be used throughout the drilling programme. At all times, the role of SSV will be undertaken by one of these OSVs to patrol the safety zone and warn of the presence of the drilling unit and vessel safety zone. All OSVs will be equipped with modern radar and radio equipment. A set of procedures will be established so that vessel masters, who need to deviate from their planned route based on their current sea passage trajectory, will be asked by the SSV via VHF radio to confirm that they intend to follow the requirements of the drilling rig Automatic Identification System (AIS) 	Remote	Moderate	Low

POTENTIAL NEGATIVE ROUTINE IMPACT

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					<p>warnings. The SSV will maintain close contact with the third-party vessel until they have changed their course away from entering the safety zone.</p> <ul style="list-style-type: none"> • Due regard will also be given by the officers on watch on board the OSVs to fellow sea users at all times, in line with the International Regulations for Preventing Collisions at Sea (COLREGs). Any fishing vessel encountered by the OSVs in transit to/from the drilling unit shall be given a wide berth in full cooperation with any flags, symbols or other instructions that the fishing vessel may be displaying or may issue via VHF. • The emergency response plans and procedures of the drilling unit and OSVs will be verified by Noble for adequacy to respond to a potential collision threat. This shall include the threat of collision from icebergs. • The Falkland Islands Fishing Companies Association (FIFCA), Consolidated Fisheries Limited (CFL) and Falkland Islands Government (FIG) will be notified, in writing, a minimum of 30 calendar days before the start of drilling activities, so that fishing vessels can plot the drilling location on marine charts, avoid the safety zone and plan their sea passage to/from any favoured fishing grounds accordingly. • Noble will liaise with the Fisheries Department and CFL with regard to the issue of navigation warnings advertising the presence of the drilling rig through the existing Fisheries Department Daily Shipping Forecast system. The information provided will include details on the current position of the drilling rig, presence of the OSVs, description of the 500 metre radial safety zone and the need for vessels to stay outside of this zone at all times. • A message will be attached to the drilling unit's 			

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					<p>AIS to provide an identical set of information to the Daily Shipping Forecast as described above.</p> <ul style="list-style-type: none"> The drilling rig will be fitted with navigational lighting and a radar transponder to show its position to third-party vessels visually, and also through the use of radar equipment. Standard Marking Schedule provisions or International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) recommendations and guidelines will be adhered to during operations and transit to and from Stanley Harbour and the rig location by OSVs. Any complaints associated with the temporary loss of access to the sea will be recorded and monitored, in accordance with the Noble Energy Community Feedback Mechanism. Details of the as-built well locations will be provided to FIG and to hydrographic organisations to enable the location of the wells to be plotted onto navigational charts. 			
	<p>Interference with other users</p> <p>During the drilling programme, a safety exclusion zone will be in place to prevent third-party vessels from travelling in close proximity to the drilling rig, which could potentially be a threat to both the safety of the drilling unit and the safety of passing vessels. The safety exclusion zone will comprise a radial area of 500 metres around the perimeter of the drilling unit.</p> <p>This temporary restriction of access to the sea to third-parties has the potential to disrupt regional marine activities such as commercial</p>	Moderate	Possible	Medium	<ul style="list-style-type: none"> Up to 3 OSVs will be used throughout the drilling programme. At all times, the role of SSV will be undertaken by one of these OSVs to patrol the safety zone and warn other users of the sea about the presence of the drilling unit and safety zone. All OSVs will be equipped with modern radar and radio equipment. A set of procedures will be established so that vessel masters, who need to deviate from their planned route based on their current sea passage trajectory, will be asked by the SSV via VHF radio to confirm that they intend to follow the requirements of the drilling rig AIS warnings. The SSV will maintain close contact with the third-party vessel until they have changed their course away from entering the safety zone. 	Moderate	Remote	Low

POTENTIAL NEGATIVE ROUTINE IMPACT

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
	shipping and fishing, from the restriction in access to the sea and the financial cost from the extra time (and fuel) required to deviate around the exclusion zone.				<ul style="list-style-type: none"> FIFCA, CFL and FIG will be notified, in writing, a minimum of 30 calendar days before the start of drilling activities, so that fishing vessels can plot the drilling location on marine charts, avoid the safety zone and plan their sea passage to/from any favoured fishing grounds and their fishing activities accordingly. Noble will liaise with the Fisheries Department and CFL with regard to the issue of navigation warnings advertising the presence of the drilling rig through the existing Fisheries Department Daily Shipping Forecast system. The information provided will include details on the current position of the drilling rig, presence of the OSVs, description of the 500 metre radial safety zone and the need for vessels to stay outside of this zone at all times. A message will be attached to the drilling unit's AIS to provide an identical set of information to the Daily Shipping Forecast described above. The drilling rig will be fitted with navigational lighting and a radar transponder to show its position to third-party vessels visually, and also through the use of radar equipment. Any complaints associated with the temporary loss of access to the sea will be recorded and monitored, in accordance with the Noble Energy Community Feedback Mechanism. Details of the as-built well locations will be provided to FIG and to hydrographic organisations to enable the location of the wells to be plotted onto navigational charts. Noble will comply with FIG regulatory requirements on the removal of the wellhead and near seabed casing to three metres below the seabed. 			

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
	Collision risk with marine mammals The physical presence of vessels transiting has the potential to present a collision risk to marine mammals.	Possible	Minor	Medium	<ul style="list-style-type: none"> Noble agrees to place a 10 kilometre avoidance area around both Beauchêne and Sea Lion Islands to avoid disturbance to sensitive species that may be present within the vicinity of these islands. This will also reduce any potential collision risk (however small) with marine mammals within shallower areas. Whilst transiting near coastal areas (i.e., within the vicinity of the approaches to Port William, and whilst within Port William and Stanley Harbour), vessel speed will be reduced in order to minimise the chance of vessel strike with any species that may be present. All other applicable vessel speed limits shall also be observed when within the approaches to Port William and whilst within Port William and Stanley Harbour. 	Unlikely	Minor	Low
	Interference with wrecks and archaeological remains The drilling of an exploration well in close proximity to a wreck has the potential to disturb it, either by direct contact with the wreck itself by drilling equipment, or by discharges associated with the drilling project, such as the discharge of drill cuttings.	Possible	Moderate	Medium	<ul style="list-style-type: none"> Well locations will be chosen so that existing and reported wreck locations are avoided. Any subsequent changes to top-hole well locations will also actively avoid areas of existing wreck sites. Changes to the top-hole locations will be reported within subsequent addenda to this EIS (as required), and the impacts with respect to existing wrecks will be reassessed if necessary. No accurate positions of the shipwrecks within FISA12 are known. It is likely that the positions reported by Wrecksite.eu are inaccurate. The environmental survey of the FISA12 area put considerable effort into attempting to positively identify the un-charted wrecks during the survey; however, the wrecks were not identified. Noble will therefore avoid drilling within the immediate vicinity of the reported wreck locations by placing a 10 kilometre safety zone around the current reported Wrecksite.eu locations. 	Remote	Moderate	Low

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					<ul style="list-style-type: none"> The absence of wrecks in the vicinity of the well locations will also be confirmed through the pre-drilling site specific environmental seabed surveys with a remotely operated vehicle (ROV). Should the wreck sites be identified during the pre-drilling survey their location will be noted and reported to FIG and the well location relocated to avoid the wreck sites. A reporting protocol will be instigated for the accidental discovery of archaeological material during drilling activity and all appropriate notifications will be completed. 			
	<p>Potential for conflict between workers requiring temporary accommodation in Stanley and local residents</p> <p>There is a risk that incoming workers could cause conflict with local residents in Stanley from anti-social behaviour, problems arising from alcohol abuse, or public disorder/violence incidents.</p>	Possible	Minor	Medium	<ul style="list-style-type: none"> Noble will use the locally available work force where possible. This will minimise the need for contractors to bring in workers from outside the Falkland Islands into Stanley. All Noble contractors, including the drilling contractor, will monitor individuals that are part of their work force and ensure they are made fully aware of the standards of behaviour expected, examples as to what constitutes a breach of their own Behavioural Code of Conduct, a description of the disciplinary and appeal processes and procedures to be followed for alleged misconduct. Contractors will ensure that these aspects are clearly outlined in the workers' contracts so that any termination of employment due to a breach is legally enforceable. In addition, the contractors and Noble will limit the amount of time offshore employees spend in Stanley during crew change periods. All complaints associated with the behaviour of workers will be recorded and monitored, in accordance with the Noble Energy Community Feedback Mechanism. 	Unlikely	Minor	Low

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
<u>Atmospheric Emissions and Air Quality</u>	Atmospheric emissions from power generation by rig, OSVs/SSV and helicopter(s) Atmospheric emissions have the potential to contribute to the pool of greenhouse gasses in the atmosphere (CH ₄ , CO ₂) and increase the risk of acid effects (SO _x , NO _x) potentially causing a short term localised impact on air quality.	Certain	Minor	Medium	<ul style="list-style-type: none"> Noble will undertake extensive pre-project planning in order to ensure that the project operations are conducted efficiently, to minimise the duration of project activities as far as possible. This will also assist in optimising the number of trips for OSVs and helicopters between the rig and onshore. Emissions generated from the proposed drilling programme will be controlled through the use of modern and well maintained power generation equipment. The equipment shall be maintained in accordance with the written procedures based on manufacturer's guidelines, applicable industry code, or engineering standard to ensure efficient and reliable operation. Contracted vessels will be required to control fuel use, efficiently manage energy and to plan voyages efficiently. 	Certain	Negligible	Low
	Fugitive emissions (e.g. volatile organic compounds - VOCs) associated with (for example), leaks, vents and fuel bunkering Atmospheric emissions have the potential to contribute to the pool of greenhouse gasses in the atmosphere (CH ₄ , CO ₂) and increase the risk of acid effects (SO _x , NO _x) potentially causing a short term localised impact on air quality.	Possible	Minor	Medium	<ul style="list-style-type: none"> To control fugitive emissions, operational and maintenance procedures will be implemented, which include all environmentally critical valves, flanges, fittings and seals in use on the drilling rig, to eliminate or reduce as far as possible the capacity for gas leaks and fugitive emissions. A gas/leak detection system and repair program will be in operation on the rig (requirement of rig Safety Case). 	Unlikely	Minor	Low
<u>Discharges to Sea</u>	Discharge of drilling mud and associated chemicals Discharges of drilling mud have the potential to cause smothering of the seabed in the vicinity of the well, increased localised turbidity, potential depletion of oxygen in	Likely	Moderate	Medium	<ul style="list-style-type: none"> It is proposed that water based mud (WBM) is used for drilling all sections of the exploration wells. The design of the drilling programme, to include the use of dedicated water based mud systems, negates the use of oil based mud (OBM), which, even after the required thermal cuttings cleaning treatment to FIG PON10 standards, would have a higher toxicity upon 	Remote	Moderate	Low

POTENTIAL NEGATIVE ROUTINE IMPACT

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
	surface sediments and potential loss of seafloor habitat. There is also the potential for cumulative impacts with other wells drilled in the area.				<p>discharge to the marine environment than WBM.</p> <ul style="list-style-type: none"> All drilling mud components will be selected on the basis of environmental performance, as much as possible, within the mud programme, so as to reduce any potential environmental impacts upon the release of the drilling mud. A Discharge Management Programme (DMPO) will be in place for the drilling operations. The purpose of the DMPO will be to provide a consistent set of discharge requirements for the exploration drilling programme. The prohibitions, limitations and monitoring requirements in the document will be based on recognized standards and regulations that have been developed to protect the environment. The DMPO will include provisions for the discharge of drilling mud. Chemical use and discharge will be closely monitored throughout the drilling program through the rig chemicals tracking system and minimised by the drill crew and mud engineers where practicable, without compromising well safety. All chemical use and discharge will be controlled through the DMPO through the detailing of the reporting procedures for chemical use and discharge. The DMPO will provide a consistent set of discharge requirements for the exploration drilling programme. Batch discharges of drilling mud will be minimised, as far as possible. All drilling mud will be recycled and used on other well sections, as much as possible, without compromising well safety. The DMPO will be in place for the drilling operations, as described above in Section 6.3.1, and will include provisions for the discharge of drilling mud. 			

POTENTIAL NEGATIVE ROUTINE IMPACT

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					<ul style="list-style-type: none"> Seabed features and habitats at the well sites will be confirmed through site specific environmental seabed surveys, which will include pre-drilling, during drilling and post-drilling elements as follows: <ul style="list-style-type: none"> The pre-drilling survey will include a 100 metre radius (centred on the well location) remotely operated vehicle (ROV) inspection of the seabed, using an environmental specialist to interpret for habitats and species. Additional features showing important species (e.g. rocks with epifaunal communities or the presence of corals) will be marked and re-visited after drilling is completed. Seabed sampling will be carried out upstream and downstream of the prevailing currents at 50, 100 and 200 metre offset locations, using a specialist environmental ROV corer (89mm outside diameter). At each station, 2 x physico-chemical samples will be taken from the top 10 cm of sediment, and 5 x biological samples will be taken from the top 20 cm of sediment, and processed through a 500 µm mesh sieve. During drilling, specially designed sediment traps will be deployed at each of the above environmental stations for the purposes of logging the settlement of any cuttings material deposited on the seabed. The post-drilling survey will repeat the survey undertaken pre-drilling. Any additional features showing important species marked during the pre-drilling survey will be re-visited. 			

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					In addition, a 1.5 metre ROV corer will be used to assess the vertical profile of the sediments in the thickest part of the cuttings pile, expected to be approximately 10 metres from the wellhead. This will record the settlement regime of discharged material over the duration of the drilling, with discrete layers identified, measured and analysed for their physico-chemical properties.			
	Discharge of drill cuttings Discharges of drill cuttings have the potential to cause smothering of the seabed in the vicinity of the well by drill cuttings, increased localised turbidity, potential depletion of oxygen in surface sediments and potential loss of seafloor habitat. There is also the potential for cumulative impacts with other wells drilled in the area.	Likely	Moderate	Medium	<ul style="list-style-type: none"> All mitigation measures as described above for the release of drilling mud. Should any habitats of conservation importance be identified during pre-drilling surveys, Noble will look to relocate the well location to avoid these habitats. Should either the SMS Scharnhorst or SMS Gneisenau be identified during the pre-drilling surveys, Noble will look to relocate the well location to avoid these wrecks The results of the post drilling surveys will be used to verify the accuracy of the cuttings dispersion modelling. The DMPO will be in place for the drilling operations, as described above, and will include provisions for the discharge of drilling cuttings. 	Remote	Moderate	Low
	Potential discharge of cement and associated chemicals (including potentially large volumes of cement in the unlikely event of mixing and/or mechanical problems) The discharge of cement has the potential to cause smothering of the seabed in the vicinity of the well, increased localised turbidity,	Likely	Moderate	Medium	<ul style="list-style-type: none"> Cement volumes used will be minimised, where practicable, to limit any possible discharge of cement and associated chemicals, without compromise to well safety and integrity. All cement components will be selected on the basis of environmental performance, so as to reduce any potential environmental impacts upon the potential release of the cement. 	Likely	Negligible	Low

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
	potential depletion of oxygen in surface sediments and potential loss of seafloor habitat. There is also the potential for cumulative impacts with other wells drilled in the area.				<ul style="list-style-type: none"> Chemical use and discharge will be closely monitored throughout the drilling program through the rig chemical tracking system and minimised by the drill crew and cement engineers where practicable, without compromising well safety. All chemical use and discharge will be controlled through the DMPO. Batch discharges of cement will be minimised, as far as possible. Great care will be taken when mixing cement on board the rig for use during cementing operations, ensuring that the potential need to discharge batches of cement due to technical and/or mixing problems is minimised. All cement discharge will be controlled through the DMPO. 			
	<p>Discharges of domestic wastewater and food waste</p> <p>Discharges of domestic wastewater and food waste from the drilling rig and OSVs have the potential to cause a localised effect on water quality. The increased biological oxygen demand (BOD) in the water column could potentially disrupt biodiversity in the region, potentially giving rise to a temporary boom in opportunistic species.</p>	Certain	Minor	Moderate	<ul style="list-style-type: none"> On board the drilling rig and OSVs, black (sewage) and grey water will be collected on board the rig and OSVs and treated in accordance with the requirements of the MARPOL Convention prior to being discharged to sea. Food waste will also be collected and treated (macerated) in accordance with the requirements of the MARPOL Convention. The discharge of sewage is only authorised if the ship/installation is equipped with authorised sewage treatment equipment, and the results of the tests of this equipment are documented and the effluent leaves no visible floating solids and does not discolour the surrounding water. The discharge of rubbish is prohibited, with the exception of food waste that is ground and passed through a sieve with a mesh size no greater than 25 millimetres for facilities that are more than 12 nautical miles from the coast. 	Certain	Negligible	Low

POTENTIAL NEGATIVE ROUTINE IMPACT

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					<ul style="list-style-type: none"> The DMPO will be in place for the drilling operations and will include provisions for the discharge of domestic wastewater and food waste; both from the drilling rig and OSVs. 			
	<p>Discharge of deck drainage water</p> <p>Water quality has the potential to be reduced if chemicals and/or hydrocarbons contaminate drainage water from the rig and OSVs. Fish may avoid any contaminated areas, which could potentially reduce their foraging areas. Contaminated effluents could potentially cause discomfort and/or disturbance to fish and benthic dwelling species.</p>	Likely	Minor	Moderate	<ul style="list-style-type: none"> Deck areas will be kept clean of debris and any hydrocarbon materials. Any unintentional releases will be thoroughly cleaned up as soon as they occur before they have the chance to be washed overboard. Waste materials (absorbent pads, etc.) will be segregated. Hazardous waste will be disposed of according to established waste oil/chemical disposal procedures. Spill kits will be readily available on deck for mopping up any minor unintentional releases. Personnel will be trained in the use of spill kits. The drilling rig and OSVs will be fitted with closed drainage containment and monitoring systems in all environmentally critical areas as part of their specification. An oily water bilge system in accordance with MARPOL regulations and an oily water separator (OWS) in accordance with International Maritime Organisation (IMO) Marine Environment Protection Committee (MEPC) 107(49) (Guidelines and Specifications for Pollution Prevention Equipment for Machinery Space Bilges of Ships) will also be present. Procedures for drainage water will be addressed within both the drilling contractor's and OSV contractor's documentation. Oily water treatment systems on board the drilling rig and OSVs must have oil discharge monitoring and control equipment installed to ensure an oil concentration in water exiting the treatment systems of less than 15 parts per million (ppm) as required under MARPOL regulations and in accordance with IMO MEPC 107(49). Records of the oil content of water 	Possible	Negligible	Low

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					<p>discharged and calibration of equipment must be maintained in accordance with the MARPOL Convention, in the form of an Oil Record Book.</p> <ul style="list-style-type: none"> On the drilling rig, no direct overboard discharge of deck drainage water from environmentally critical areas (e.g. the drill floor) is to take place. All direct deck drainage on the drilling rig (e.g., walkway gratings) shall be used in clean, non-environmentally critical areas only. Rainwater runoff from the drilling rig will be routinely monitored for any residual hydrocarbon content. The DMPO will include provisions for the discharge of drainage water. 			
Bio-security	Discharge of ballast water The discharge of ballast water has the potential for the introduction of invasive species leading to a potential change in the local ecosystem and possibly the wider ecosystem.	Possible	Moderate	Medium	<ul style="list-style-type: none"> All vessels associated with the drilling operations (including the drilling rig itself), will undertake ballast exchange operations well clear of the Falkland Islands in offshore waters outside of the 12 nautical mile limit. The drilling rig and OSVs will all have procedures in place for ballast water management as part of both the drilling contractor's and OSV contractor's specification. These procedures will be subject to audit/assessment by Noble. 	Remote	Moderate	Low
Underwater noise	Noise from drilling operations (rig and OSVs on site) Noise from the drilling operations at the well locations has the potential for disturbance of marine mammals, fish and seabirds. This could cause potential behavioural changes in fish and marine mammals due to the increase in background marine noise levels.	Likely	Negligible	Low	<ul style="list-style-type: none"> Drilling operations inevitably give rise to noise. The drilling rig will be on location for the minimum period of time required to conduct the drilling operations, thus minimising the duration of potential noise impacts as far as possible. The operational and maintenance procedures on the drilling rig will also aim to optimise the efficiency of the equipment and the schedule of operations. 	Likely	Negligible	Low

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
	Noise from OSVs on sea passage Noise from the OSVs travelling to and from Stanley and the drilling rig has the potential for disturbance of marine mammals, fish and seabirds. This could cause potential behavioural changes in fish and marine mammals due to the increase in background marine noise levels.	Possible	Negligible	Low	<ul style="list-style-type: none"> Vessel movements will avoid coastal areas (with the exception of the approaches to Port William and Stanley Harbour) where sensitive species, such as penguin colonies, may be present. Whilst transiting near beach areas (i.e. within the vicinity of the approaches to Port William, and whilst within Port William and Stanley Harbour), vessel speed will be reduced in order to minimise the chance of vessel strike with any species that may be present. Such a reduced speed would also limit noise impact from the vessels. All other applicable vessel speed limits shall also be observed when within the approaches to Port William and whilst within Port William and Stanley Harbour. Noble agrees to place a 10 kilometre avoidance area around both Beauchêne and Sea Lion Islands to avoid disturbance to sensitive species present within the vicinity of these islands. 	Possible	Negligible	Low
	Underwater noise from helicopters in transit Noise from the helicopter flights on the helicopter route between Stanley Airport and the rig has the potential to disturb marine mammals, fish, seabirds, and coastal populations. This has the potential to cause behavioural changes in marine mammals, fish, and offshore and coastal seabirds due to the increase in background noise levels.	Certain	Negligible	Low	<ul style="list-style-type: none"> The aviation contractor will be prohibited from circling or hovering over marine mammals or sites identified as sensitive for seabird colonies in accordance with the Falkland Islands low flying avoidance maps and the Falkland Islands Low Flying Handbook. The aviation contractor will pay particular attention to paragraphs 37 to 40 and 54 to 60 of the Low Flying Handbook. Noble agrees to place a 10 kilometre avoidance area around both Beauchêne and Sea Lion Islands to avoid disturbance to sensitive species present within the vicinity of these islands. 	Certain	Negligible	Low
	Noise from Vertical Seismic Profiling (VSP) operations Noise from VSP operations (a	Likely	Moderate	Medium	<ul style="list-style-type: none"> VSP operations will be strictly controlled in line with the JNCC <i>Guidelines (2010) for minimising the risk of injury and disturbance to marine mammals from seismic surveys</i>. 	Possible	Minor	Medium

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
	<p>seismic operation performed after drilling of a well) has the potential to cause disturbance to marine mammals and fish, and potential physical damage to plankton, fish eggs and larvae in immediate proximity to the VSP energy source.</p> <p>The VSP operations also have the potential to cause behavioural changes in marine mammals and fish due to the sharp temporal increase in background marine noise levels.</p>				<ul style="list-style-type: none"> A qualified Marine Mammal Observer (MMO) will be on site during VSP operations. The MMO will monitor the 500 metre safety zone for 60 minutes (due to the operations occurring in water deeper than 200m) prior to commencement of VSP operations to ensure that no marine mammals are present within the area. Soft-start ramp up of the seismic source during VSP operations, of no less than 20 minutes and no more than 40 minutes, will then be undertaken in line with the above JNCC guidelines. This enables fish and marine mammals in the area disturbed by the sound levels to move away from the noise source before being subject to the full force of the seismic array, thus minimising the potential for adverse impacts on these species. If marine mammals are observed within the 500 metre zone after the VSP has started, then they are deemed to be unaffected by the noise. A record of the sighting should be kept, but no further action will be taken. VSP operations will be started during daylight hours only. 			
<u>Airborne noise</u>	<p>Airborne noise from helicopters in transit.</p> <p>Potential disturbance to coastal populations on the helicopter route between Stanley Airport and the rig.</p>	Likely	Minor	Medium	<ul style="list-style-type: none"> The aviation contractor will be prohibited from circling or hovering over marine mammals or sites identified as sensitive for seabird colonies unless essential for safety or operational purposes in accordance with the Falkland Islands low flying avoidance maps and the Falkland Islands Low Flying Handbook. The aviation contractor will pay particular attention to paragraphs 37 to 40 and 54 to 60 of the Low Flying Handbook.. Routing over built up areas will be avoided, unless in an emergency and/or on the grounds of safety in accordance with paragraph 32 of the Falkland Islands Low Flying Handbook. 	Unlikely	Negligible	Low

POTENTIAL NEGATIVE ROUTINE IMPACT

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					<ul style="list-style-type: none"> Noble agrees to place a 10 kilometre avoidance area around both Beauchêne and Sea Lion Islands to avoid disturbance to sensitive species present within the vicinity of these islands. Helicopter flight planning will be undertaken in coordination with the appropriate Falkland Island authorities (Civil Aviation Department). Under normal operations, helicopter flights will only occur during daylight hours, in order to minimise potential disturbance to the local population. 			
	<p>Airborne noise from OSVs on sea passage.</p> <p>Potential disturbance to marine mammals, fish and seabirds. Potential behavioural changes in fish and marine mammals due to increase in background marine noise levels.</p>	Possible	Minor	Medium	<ul style="list-style-type: none"> Vessel movements will avoid coastal areas (with the exception of the approaches to Port William and Stanley Harbour) where sensitive species, such as penguin colonies, may be present. Whilst transiting near beach areas (i.e., within the vicinity of the approaches to Port William, and whilst within Port William and Stanley Harbour), vessel speed will be reduced in order to minimise the chance of vessel strike with any species that may be present. Such a reduced speed would also limit noise impact from the vessels. All other applicable vessel speed limits shall also be observed when within the approaches to Port William and whilst within Port William and Stanley Harbour. In addition, Noble agrees to place a 10 kilometre avoidance area around both Beauchêne and Sea Lion Islands to avoid disturbance to sensitive species present within the vicinity of these islands. 	Unlikely	Negligible	Low
Waste Management	<p>Treatment and disposal of non-hazardous waste generated from drilling operations.</p> <p>The effects of disposal of controlled wastes associated with onshore</p>	Certain	Minor	Medium	<ul style="list-style-type: none"> Noble will develop and implement a Waste Management Plan (WMPA) for the proposed drilling programme that encompasses the drilling rig, OSVs and onshore support. The WMPA will cover the storage, transport and treatment of waste generated as part of the 	Certain	Negligible	Low

POTENTIAL NEGATIVE ROUTINE IMPACT

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
	disposal are dependent on the nature of the site or process. This has the potential to produce limitations on future land use and the potential to cause small scale land and air contamination.				<p>drilling programme. The WMPA will cover both offshore and onshore aspects of the exploration drilling operations (i.e., will cover both offshore and onshore elements of the waste streams). The WMPA will identify measures to reduce waste generated during drilling and how waste will be handled and disposed of safely and responsibly. The WMPA will:</p> <ul style="list-style-type: none"> ○ Promote minimisation of the amounts of waste generated at source; ○ Require segregation of waste by type; ○ Require appropriate storage to prevent emissions and leaks; ○ Promote recycling or re-use where possible, in particular for scrap metal, waste oil and surplus chemicals; ○ Require that waste be sent to authorised landfills or incineration facilities, depending on its precise nature, when no other option is possible; ○ Minimise and manage cumulative waste generation from the drilling campaign; and ○ Ensure a clear chain of ownership for all waste through the use of waste manifests until final disposal, particularly relating to trans-boundary matters. <ul style="list-style-type: none"> • Noble will work closely with FIG prior to drilling operations to determine acceptable options for onshore non-hazardous waste disposal. The following measures will be included in the Waste Management Plan: 			

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					<ul style="list-style-type: none"> No un-combusted wastes arising from the drilling programme will be landfilled in the Falkland Islands; Some non-hazardous combustible waste will be segregated and sent to a local incinerator for incineration in the Falkland Islands; and The waste ash arising from this incineration will be landfilled in the Falkland Islands along with other incinerator waste at an existing landfill facility (Eliza Cove or Mary Hill Quarry). <ul style="list-style-type: none"> Noble will confirm all waste management and disposal routes within the WMPA (to be approved by FIG) prior to drilling operations commencing. All contractors will be required to adhere to the requirements outlined within the WMPA. 			
	<p>Treatment and disposal of hazardous waste generated from drilling operations.</p> <p>Potential trans-boundary impacts due to the trans-boundary movement (TBM) of hazardous waste.</p>	Certain	Moderate	High	<ul style="list-style-type: none"> Special arrangements will be in place for hazardous wastes and will be detailed within the WMPA. As no suitable onshore facilities exist in the Falkland Islands for the treatment and disposal of hazardous waste, the waste will be exported in accordance with the Basel Convention. Under the Basel Convention, a trans-boundary movement (TBM) means any movement of hazardous wastes or other wastes: <ul style="list-style-type: none"> From an area under the national jurisdiction of one State; and To or through an area under the national jurisdiction of another State, or to or through an area not under the national jurisdiction of any State. The Basel Convention requires that the standard of "environmentally sound 	Certain	Negligible	Low

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					<p>management" (ESM) of hazardous wastes or other wastes is met. ESM means taking all practicable steps to ensure hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes. The final stage in the TBM procedure is for the generator and country of export to receive confirmation that the wastes moved across borders have been disposed of by the disposer as planned and in an environmentally sound manner.</p> <ul style="list-style-type: none"> Noble will ensure that a dedicated waste specialist is appointed to: <ul style="list-style-type: none"> Receive and handle waste (including hazardous waste) at the TDF; Arrange for local recycling or disposal of non-hazardous waste; Safely store any hazardous waste; Arrange appropriate export of hazardous waste in accordance with the Basel Convention; and Ensure confirmation from the disposer that the wastes moved have been disposed of as planned and in an environmentally sound manner in accordance with the Basel Convention. Noble will conduct an audit/assessment of any selected waste specialist and processing facilities to ensure their compliance with local and international best practice and the WMPA. 			
Light	<p>Use of artificial lighting on board the drilling rig and OSVs</p> <p>The use of artificial lighting on board the drilling rig and OSVs has the potential to disturb offshore</p>	Likely	Minor	Medium	<ul style="list-style-type: none"> Heli-deck landing lights will be switched off when not in use (if not required to be left on for safety reasons, such as during an emergency incident) to reduce potential impacts of these skyward facing lights on any bird species that may be present. Night time helicopter flights will only be 	Possible	Negligible	Low

POTENTIAL NEGATIVE ROUTINE IMPACT

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
	seabirds during hours of darkness.				<p>conducted during emergency situations and are not planned to be part of normal operations during drilling activities. Under normal operations, Helicopter flights will only occur during daylight hours so requirements for heli-deck lighting will be minimal if at all.</p> <ul style="list-style-type: none"> In addition, the OSV and SSV deck lighting will be switched off when not in use (if not required to be left on for safety reasons, such as during resupplying of the rig at night). The precise details of the bird monitoring on the rig are yet to be finalised. Noble will monitor the number of birds found on the rig throughout the exploration drilling programme and will report monthly to an advisory group the findings of this monitoring. In the event that it is considered that significant and unacceptable numbers of seabirds have been attracted to the rig at night this will immediately be reported to FIG. Noble will then investigate whether further measures can be implemented and will work with FIG and their advisors to develop suitable measures. However, based on the experience of a previous study offshore the Falklands (albeit in northern waters) it should be noted that an event such as this is considered highly unlikely to occur. As part of the monitoring programme, a protocol will be established for the identification and recording of species involved in the event of mortality. Species present on the rig, involved in collisions or observed attracted to the rig will be recorded, including species name, numbers observed, behaviour and location on the rig. Photographs of species observed will be taken as part of the recording procedure. However, based on the experience of a previous study offshore the Falklands (albeit in northern waters) it should be noted that mortality due to association is expected to be highly unlikely to occur. The finalised protocol for recording species observed will be developed prior to drilling operations 			

POTENTIAL NEGATIVE ROUTINE IMPACT								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
<u>Seascape, Landscape and Visual</u>	<p>Physical presence of the drilling rig, OSVs, helicopter flights and shore base</p> <p>The various elements of the drilling project have the potential to cause a temporary change in seascape, landscape and visual setting due to the presence of the drilling rig, OSVs, helicopter flights and shore base.</p>	Certain	Minor	Medium	<p>occurring and will be agreed with FIG.</p> <ul style="list-style-type: none"> The duration of OSVs at the TDF and within Stanley Harbour will be minimised to the extent possible through project planning activities. The number of helicopter flights and the time spent in the air near Stanley Airport will be minimised, to the extent possible through appropriate planning measures. Any land-based equipment and materials not in active use will be stored at Noble's shore base, whenever possible. All working areas will be maintained in a tidy condition with the aim of minimising the potential visual impact. All complaints associated with the effects on the seascape, landscape and visual setting of Stanley will be recorded and monitored, in accordance with the Noble Energy Community Feedback Mechanism. 	Certain	Negligible	Low
<u>Utilities, Transport Networks, Communications and Local Resources</u>	<p>Presence of drilling operations workers during peak tourist season</p> <p>The presence of drilling workers in Stanley has the potential to place additional demand on local guest houses and hotel accommodation during the drilling programme, especially during the tourist season</p>	Certain	Moderate	Medium	<ul style="list-style-type: none"> Noble will adhere to the FIG "Procurement Code of Practice by Oil and Gas Companies and their Subcontractors Operating in the Falkland Islands" (Code) which is currently under development (available as a draft only and not yet approved). This Code aims to maximise the use of businesses registered on the Falkland Islands by the oil and gas industry and minimise the need for contractors to bring in workers who will subsequently require temporary accommodation. Noble will utilise the local work force, where possible, in order to reduce the need for additional accommodation. Noble continues to work with FIG on the progress of this code of practice. Disturbance to local accommodation facilities will be minimised through advanced consultation with 	Possible	Negligible	Low

POTENTIAL NEGATIVE ROUTINE IMPACT

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					<p>local hotels being used for overnight accommodation. Noble intends to have a permanent arrangement for housing and leasing rooms in local hotels in place in advance of drilling operations commencing and well in advance of the rooms being required.</p> <ul style="list-style-type: none"> In addition to the above accommodation arrangements, Noble, in conjunction with other operators, has initial plans to build temporary accommodation in the Stanley area. This accommodation will have a capacity of 80 rooms. Plans for this temporary accommodation have yet to be finalised. Expressions of interest for the provision of this accommodation have been released. Noble will minimise, where possible, the number of their own management staff in the Falkland Islands needed to manage the exploration drilling programme (without compromising safety and quality). The Emergency Response Plan (ERP) developed by Noble will include arrangements for the provision of emergency accommodation in Stanley, either at local hotel accommodation and/or Falkland Islands Defence Force (FIDF) that can be used in the event of an emergency rig evacuation. Each of the 80 rooms within the temporary accommodation described above will have an extra bunk to assist in emergency evacuation situations. It is also noted that the Falkland Islands Defence Force (FIDF) based in Stanley could accommodate up to 200 persons in the event of an emergency, although no guarantees of available space can be made. However, the use of this facility for emergency situations will be discussed in advance with FIG and FIDF prior to any inclusion in the ERP. 			
	<p>Use of potable water from the municipal water supply in Stanley</p> <p>The drilling programme will require</p>	Certain	Moderate	Medium	<ul style="list-style-type: none"> The storage tanks on the TDF, which will be utilised for the storage of drill water, will be trickle filled from the municipal water supply, which will 	Certain	Negligible	Low

POTENTIAL NEGATIVE ROUTINE IMPACT

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
	large volumes of water from the municipal water supply in Stanley. The water will be used to supply the drilling unit (via the OSVs) with drill water, and to supply the OSVs with drinking water. The use of water has the potential to place pressure on the available water resources within Stanley.				<p>mitigate against the potential for sudden, high-volume 'shock' demands being placed on the local water supply network.</p> <ul style="list-style-type: none"> During the exploration drilling programme, Noble will provide written notification to the FIG Public Works Department (PWD) a minimum of 10 calendar days before drill water is required to be taken from the municipal water supply. The written communiqué shall confirm the expected quantity of water to be taken from the regional supply network, the expected date and start/end time and the telephone contact details of the relevant Noble supervisor. 			
	<p>Use of local road network to transport rig workers to/from Stanley, Stanley Airport and Mount Pleasant Airport (MPA) during drilling</p> <p>Increased traffic and potential increased risk to community health and safety and other road users.</p>	Certain	Minor	Medium	<ul style="list-style-type: none"> Local transport companies will be used for all road transfers of offshore personnel. This will reduce health and safety risks, as local drivers will be familiar with local roads and local conditions. Careful planning of transportation will be undertaken to ensure efficient use of vehicles and to reduce the number of trips required. Onshore personnel will be given driving training appropriate to the local roads. Complaints associated with the transport of work force and increased traffic will be monitored and dealt with through the Noble Community Feedback Mechanism. Should any major issues be identified that are causing community concern they will be raised with FIG and alternative solutions proposed and discussed. 	Certain	Negligible	Low

Table B: Summary of hazards, effects and mitigation measures for non-routine hazards

NON-ROUTINE HAZARDS								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
Accidental Events	Potential uncontrolled gas release during drilling Atmospheric emissions have the potential to contribute to the pool of greenhouse gasses in the atmosphere (CH ₄ , CO ₂) and increase the risk of acid effects (SO _x , NO _x), potentially causing a short term localised impact on air quality. If flammable gasses are involved, there will be a potential risk of fire and explosion.	Unlikely	Moderate	Medium	<ul style="list-style-type: none"> Well control mitigations to be implemented as described below under 'Uncontrolled release of reservoir hydrocarbons'. To control fugitive emissions, operational and maintenance procedures will be implemented, which include all environmentally critical valves, flanges, fittings and seals in use on the drilling rig, to eliminate or reduce as far as possible the capacity for gas leaks and fugitive emissions. A gas/leak detection system and repair program will be in operation on the rig (requirement of rig Safety Case). 	Remote	Negligible	Low
	Potential unintentional releases of fuel or other fluids (e.g. diesel, drilling mud, hydraulic oil or lubricants) during day-to-day operations (including re-fuelling) During general operations associated with the drilling programme, there is the potential for unintentional releases. These releases have the potential to cause localised toxic effects on marine fauna and flora and localised pollution, which may impact local marine wildlife and rafting	Possible	Major	Medium	<ul style="list-style-type: none"> The drilling rig will be fitted with closed drainage containment, treatment and monitoring systems in all environmentally critical areas as part of the rig specification. Procedures for drainage water management will be addressed within the drilling contractor's documentation and the Noble DMPO. Noble will ensure that the drilling and OSV contractors have procedures for fuel bunkering. These procedures will be subject to audit/assessment prior to drilling operations commencing. Offshore bulk materials and fluid transfers will be minimised, where possible, making efficient use of OSV loads and voyages. Where practicable, re-fuelling and transfer of bulk fluids will be undertaken during daylight hours only. Fluid transfer and crane operations will take place only in suitable weather conditions. Transfer operations will be supervised at all times both from the OSVs and drilling rig. 	Unlikely	Minor	Low

NON-ROUTINE HAZARDS

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
	seabirds on the sea surface.				<ul style="list-style-type: none"> Non-return valves will be installed on bulk fluid transfer hoses. Hoses will be tested and inspected as a part of the drilling contractor's planned maintenance system/procedures. Spill kits will be readily available on deck for mopping up any minor spills. Personnel will be trained in unintentional release prevention and the use of spill kits. Regular drills will be held to contain and clean up deck spills. To prevent losses of drilling mud, the marine riser system will be operated and maintained in good order as per Noble and drilling contractor policies, including: <ul style="list-style-type: none"> Lower Marine Riser Package (LMRP) to have integrated Remotely Operated Vehicle (ROV) remote interfaces for emergency use; Use of low pressure alarms in the riser system; Rig Emergency Disconnect System (EDS) locked-out in normal operation; Regular LMRP inspection with rig ROV; and Regular riser-tensioner system inspection. All contracted vessels will have a Ship-board Oil Pollution Emergency Plan (SOPEP) in place to define their response procedures in the event of a pollution incident. Drilling chemicals will be selected on the basis of environmental performance, as much as possible, within the mud programme, so as to reduce any potential environmental impacts. Noble will have Tier 1 response packages available in order to provide a timely and efficient Tier 1 spill response effort (refer to Tier 1 Response below). An Oil Spill Response Plan (OSRP) will be developed and implemented prior to drilling operations commencing. All instances of unintentional release will be handled in accordance with Falkland Islands Government Petroleum Operations Notice 8, May 2012 Revision (hereafter referred to as PON 8). In particular, the use of dispersants will be 			

NON-ROUTINE HAZARDS								
Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
					coordinated with Incident Command as defined in the National Oil Spill Contingency Plan (NOSCP) as noted in Section 3 of PON 8 for approval and usage conditions.			
	An emergency incident (e.g. vessel collision), leading to potential unintentional releases An emergency incident, such as a collision or catastrophic failure of equipment, could potentially cause a total loss of containment of entire inventories of diesel, utility fuels and chemicals from either the drilling rig or OSVs. This has the potential to cause significant hydrocarbon and/or chemical pollution, which will have detrimental impacts on water quality and marine wildlife in the affected area.	Possible	Severe	High	<ul style="list-style-type: none"> All mitigation measures associated with collision avoidance as defined in 1.2 (Physical Presence). Pre-mobilisation audits/assessments will be undertaken on all vessels. Vessels will be selected which comply with IMO codes for pollution prevention. All contracted vessels will have a SOPEP in place to enable fast and effective response to any potential pollution incident. An Emergency Response Plan (ERP) and Oil Spill Response Plan (OSRP) will be developed and implemented prior to drilling operations commencing. All instances of unintentional release will be handled in accordance with Falkland Islands Government Petroleum Operations Notice 8, May 2012 Revision (hereafter referred to as PON 8). In particular, the use of dispersants will be coordinated with Incident Command as defined in the National Oil Spill Contingency Plan (NOSCP) as noted in Section 3 of PON 8 for approval and usage conditions. 	Remote	Major	Medium
	Uncontrolled release of reservoir hydrocarbons (blow-out) In the event of a serious well control incident, there is the potential for a significant unintentional release of hydrocarbons due to uncontrolled well flow. A significant release of hydrocarbons has the potential to cause physical oiling and toxicity impacts to marine wildlife, and potential contamination of	Unlikely	Catastrophic	High	<ul style="list-style-type: none"> The drilling operations will follow established drilling safety standards to minimise the risk of loss of well control. Well control systems and procedures will be in place as per all Noble and drilling contractor well control guidelines. The drilling crews will be adequately experienced, trained in well control techniques and supervised at all times. Emergency drills will be held regularly. Well designs will be reviewed by an independent well examiner. A Blow-out Preventer (BOP) will be in place and will be subject to regular maintenance and testing. BOP equipment/controls and emergency/contingency controls will be tested both prior to and immediately after deployment onto the wellhead. 	Remote	Severe	Medium

NON-ROUTINE HAZARDS

Area of Concern	Aspects	Likelihood	Severity	Potential Impact	Mitigation measures	Likelihood	Severity	Residual Impact
	<p>coastal habitats.</p> <p>Indirect impacts could potentially include: habitat loss, impact on tourism and fisheries, issues associated with waste disposal, trans-boundary issues, accumulation of oil and chemicals in ecosystem food chains and in sediments, loss of biodiversity and loss of revenue to local businesses and fisheries.</p>				<ul style="list-style-type: none"> The BOP will be subject to a third party verification and audit prior to drilling operations commencing. The BOP specification will include one (1) shear ram, one (1) casing shear ram and a ROV remote interface to key BOP functions for emergency use. All key offshore personnel will have International Well Control Forum (IWCF) well control certification. Noble is a FULL member of Oil Spill Response Limited (OSRL), providing an enhanced Tier 2/3 oil spill response capability. Noble is a member of the Global Dispersant Stockpile provided by OSRL for the purpose of responding to unintentional releases. An Emergency Response Plan (ERP) and Oil Spill Response Plan (OSRP) will be developed and implemented prior to drilling operations commencing. All instances of unintentional release will be handled in accordance with Falkland Islands Government Petroleum Operations Notice 8, May 2012 Revision (hereafter referred to as PON 8). In particular, the use of dispersants will be coordinated with Incident Command as defined in the National Oil Spill Contingency Plan (NOSCP) as noted in Section 3 of PON 8 for approval and usage conditions. 			

Conclusion

Noble is proposing to conduct exploration drilling activities offshore of the Falkland Islands. Noble will ensure that operations throughout the exploration drilling programme will follow applicable laws, regulations, standards; and environmental, socio-economic, health and safety best practices (such as effective waste management, staff awareness of environmental issues and training in pollution prevention procedures and emergency response).

Although there will be some environmental impacts during each phase of the project life cycle, adverse long-term environmental impacts from the exploration drilling programme have been assessed as **low**, and incremental cumulative impacts of the development will be minimal. Furthermore, due to the implementation of control and mitigation measures, the majority of residual impacts are considered to be **low**.

There is the potential for disturbance from planned exploration drilling operations to significantly affect the two existing shipwrecks lying within the southern region of FISA12. It is thought that an anomaly seen on the bathymetry is highly likely to be the wreck of the Atlantic Conveyor in FINA13 but the survey was unable to obtain seabed photographs so a positive identification was not possible. However, Noble has proposed the following mitigation measures to ensure these important wreck sites remain unaffected:

1. Placing an exclusion zone around the best known 'as reported' wreck locations;
2. Choosing well locations that avoid existing wrecks; and
3. Re-locating the wellhead should the location of the wrecks be found during pre-drilling surveys.

With the implementation of the above measures residual impacts to wreck sites from the proposed drilling activity will be reduced to **low**.

Underwater noise during Vertical Seismic Profiling (VSP) operations has the potential to cause injury and behavioural disturbance to marine mammals and fish. The injury and behavioural noise levels for cetaceans will be exceeded during the potential VSP operations, although only within three metres (permanent threshold shift [PTS] criteria) and six metres (temporary threshold shift [TTS] criteria) of the VSP equipment noise source.

Without mitigation, there is the potential for these impacts to be considerable to marine mammals that may be in the location during VSP operations. JNCC guidelines for minimising risk to marine mammals from VSP noise emissions and the employment of soft-start procedures will be implemented to reduce potential impacts. However, due to the uncertainty related to the distribution and abundance of marine mammals in the area the residual impact will remain **medium**. Monitoring of marine mammal populations during VSP operations will be utilised to ensure that the measures employed reduce the impact as much as possible and to ensure (as far as possible) that firing of seismic equipment occurs when marine mammals are not in the vicinity of the seismic source.

For fish species, there is potential for injury within very close proximity to the VSP energy source, although this is significantly reduced beyond 300 metres. Through the use of soft start procedures any fish that are present will be alerted to the sound and will gradually move further away from the source as the sound increases. As a result, the likelihood and severity of the impact is reduced although the residual impact is **medium**. However, it should be noted that this is a precautionary assessment and that the main fish species likely to be present (e.g., Patagonian toothfish, *Dissostichus eleginoides*) are hearing generalists and are less affected by sound and the assessment was undertaken on a precautionary basis.

Accidental events involving unintentional releases of hydrocarbons or chemicals are of **medium** impact. They require control measures to reduce the potential impacts as much as possible, including:

- Stringent well control procedures;
- Oil spill response procedures, including:
 - a. the provision of Tier 1 response capability; and

- b. development of an Oil Spill Response Plan (OSRP),
 - Membership with a reputable international oil spill response organisation; and
 - Emergency response procedures (including the production of an Emergency Response Plan [ERP]).

Noble operates under a Global Environmental, Health and Safety (EHS) Management System (GMS). Noble is committed to conducting its business in a manner that protects the environment, health and safety of employees and communities. To achieve this, Noble strives to comply with EHS laws and minimize injuries and incidents whilst protecting the environment. Noble's GMS is a consistent framework for the management of EHS issues and is instrumental in protecting the environment and the health and safety of our employees and communities.

For the Falklands Exploration drilling programme, the main method for converting the GMS policies and principles into action will be the EMPA presented in Section 7. These commitments are captured through the Noble tracking system and carried through to detailed design and operations. The plan identifies monitoring, management measures and responsibilities to be implemented.

In turn the EMPA will be transposed into the contractual obligations of contractors employed by Noble to deliver the project. The Environmental Management Systems (EMS) of each contractor will be audited to ensure compliance with the Noble GMS and as necessary bridging documents will be put in place to ensure compatibility between systems. In cases where the Noble GMS and a contractor EMS differ, the more stringent measure will apply.

Moving forward, the creation and implementation of the procedures and documents outlined in Section 7 will ensure that mitigation measures identified in the Environmental Management Plan (EMPA) and proposed within this EIS are adhered to throughout the lifetime of the exploration drilling project and will ensure that any potential impacts to the environment are minimised.