

Section 10

Mitigation and monitoring

10 Mitigation and monitoring

As seen in the previous assessment sections, without any controls or mitigation, the proposed Draft Plan has the potential to impact the marine offshore environment in a number of ways. The exact nature of the impacts cannot be assessed in detail since this is a high level plan being considered at a regional level. Certain impacts (or data gaps) will be relatively easily mitigated through control measures (or data gathering), whilst for others this will not be the case. The mitigating measures first proposed for avoidance and/or reduction of the key environmental impacts assessed in Sections 7 and 8 are brought together below.

10.1 Seismic survey

10.1.1 Noise generation

Existing measures

Reducing the noise entering the marine environment is the main measure in minimising the impacts of seismic survey operations. Subcontractor, vessel and equipment selection would be a part of this.

Operators are required to submit an Application for Approval to DCENR prior to conducting any Geophysical or Other Exploration Survey, Site Survey or Route Survey. Conditions that apply with any permit include the obligation to ensure that current best industry practices for the environment are applied with regard to impact mitigation and monitoring measures in relation to marine mammals. The NPWS has issued guidelines for this purpose entitled 'Code of Practice for the Protection of Marine Mammals during Acoustic Seafloor Surveys in Irish Waters Version 1.1' (NPWS, 2007) and it is a DCENR requirement that all operators incorporate these into seismic survey plans. The guideline requirements include:

- a qualified and experienced MMO to be on the seismic vessel;
- that seismic operations should use the lowest practicable power levels throughout the survey and only discharge pressure waves into the marine environment when necessary;
- if marine mammals are present, seismic operations must be delayed until the animals move out of range. The power in the air guns will be built up slowly over at least 20 minutes (but no longer than 40 minutes) to give marine mammals adequate time to hear the noise and leave the vicinity. This 'soft' start process should be adopted every time air guns are used, even if no marine mammals are seen, and if air guns have stopped and not restarted after 5 minutes.

In the event that there is a requirement for multiple surveys in the same area and at the same time, it is advised these are combined into consecutive surveys through planning and co-operation with other operators and with the regulator. If large commercial 2D and 3D surveys must be carried out simultaneously, consideration should be given to the location of surveys in relation to each other in order to maintain a 100 km separation, so that marine mammals can avoid these areas where necessary and migration routes are not impeded.

Potential additional measures

The timing and location of cetacean calving and potential migrations should be considered when planning seismic survey work, and if possible avoided. This will have to be assessed at a later stage, on a location-specific case-by-case basis as current knowledge of these sensitivities is very limited and is still developing.

In addition, the possible location, prevalence and timing of beaked whale concentrations in deep-water canyon systems within the IOSEA3 area requires consideration during survey planning. Available data suggest that beaked whales are likely to occur in the IOSEA3 area throughout the year. Again, there are insufficient data to improve on existing mitigation measures, and these will require re-evaluation as knowledge of these sensitivities develops, monitoring techniques improve and as location-specific proposals demand.

As fish eggs and larvae are most at risk from the impacts of seismic activities, sensitive fish spawning areas or species (eg areas of restricted in geographic extent, or species that spawn only in specific restricted habitats) should be avoided at known breeding times. Based on information from Coull *et al* (1998), mackerel in the Atlantic spawn in a large elongated strip along the shelf edge and slope,



including the eastern side of the IOSEA3 area, whilst blue whiting are also indicated as spawning over a wide area that includes most of the IOSEA3 area. Both of these species therefore spawn over a large area and for a long spawning season, and in this context neither species can be regarded as particularly sensitive to localised noise disturbance.

The NPWS guidelines are regularly reviewed, alongside other similar guidelines from other countries, as new data emerge in order to ensure their continuing status as embodying best practice. In addition, all means of assessing cetacean presence or absence in an area (eg passive acoustic monitoring and other acoustic systems) are being assessed continuously through research programmes and workshops.

The impact of noise generated by seismic surveys on other users of the sea is generally not considered to be a significant issue, and is regulated through the normal process of notifying the appropriate authorities and liaising with the respective industry organisations where necessary. However, carbonate mound and seamount sites in and around the Rockall Basin are areas of long-term marine research and therefore there is a need for the central co-ordination of seismic survey activity to take account of marine scientific research activity also.

10.1.2 Atmospheric emissions

While the emission levels likely to arise from implementing the Draft Plan are small and not significant, their acceptability overall needs to be considered in the context of the national energy policy, the national policy for the management of greenhouse gases, and commitments to the EU and the Kyoto Protocol. Under the Kyoto Protocol, Ireland is committed to limiting its greenhouse gas emissions to 13% above 1990 levels for the period 2008 to 2012 (DoEHLG, 2007c). Future reduction targets for Ireland are likely to be set at below 1990 levels to contribute to the EU target of a cut of 20% below 1990 levels by the year 2020, or a potential 30% reduction if global agreement is reached on comparable reductions elsewhere. Current emission level projections show that Ireland will emit an average of 70.204 million tonnes of CO₂ equivalent per year over the period 2008 to 2012, which is approximately 11.7% above the target set under Kyoto of 62.843 million tonnes CO₂ equivalent.

Forthcoming regulations to transpose EU Directive 2005/33/EC into Irish law are expected later in 2007. EU Directive 2005/33/EC amends Directive 1999/32/EC which relates to the reduction of sulphur in liquid fuels and incorporates the requirements set out in Annex VI of MARPOL. The new regulations will effectively ensure that most, if not all, survey vessels operating in the IOSEA3 area, from 2010 onwards, will run on diesel with a maximum sulphur content of 1.5%.

Another limit set under Annex VI of MARPOL is the amount of nitrogen oxide (NO_x) emissions from ship exhausts. Annex VI also prohibits deliberate emissions of ozone depleting substances. Incineration onboard ship of certain products, such as contaminated packaging materials and polychlorinated biphenyls (PCBs) is also prohibited under the Annex.

10.1.3 Physical presence

Most of the mitigation measures here relate to existing control measures and best practice.

The oil and gas industry operators shall check in advance with the Maritime Safety Directorate, the MRCC of the Irish Coast Guard, and Sea Fisheries Protection Agency of the DCENR regarding activities which may impinge on shipping and fishing operations, including both floating and stationary gear, with consequential disruption of both such activities. In addition, in the case of a survey planned in an area of intensive fishing, discussions with Sea Fisheries Protection Agency of the DCENR shall be initiated as early as possible, and, in any case, at least 45 days before the planned date in order that the implications can be fully considered. Marine Notices advertising such operations are published by the Maritime Safety Directorate. Also marine navigation warnings are issued while the survey is taking place, for the duration of the survey.

According to the DCENR Rules and Procedures Manual (PAD, 2007a), it is recommended best practice that a fisheries liaison officer, with a knowledge of fisheries local to the survey area, is onboard seismic vessels during survey work.

The risk of impacts to marine mammals from the physical presence of vessels can be mitigated by avoiding areas where densities of marine mammals are known to be high (Harwood & Wilson, 2001). Such information is not always available so the risk of collisions can be reduced by carrying out

preliminary surveys for marine mammals in the vicinity of proposed seismic activity. Having a marine mammal observer on board to detect whales in conjunction with cautious vessel operation can also reduce the risk of ship strikes (ISRP, 2005).

In the event that there is a requirement for multiple surveys in the same area and at the same time, these should be combined through appropriate planning and co-operation between operators and regulator.

10.1.4 Accidental events

The following are mitigation measures already in place as part of the PAD Rules and Procedures (PAD, 2007a).

Selection of a survey contractor with demonstrable planned preventative maintenance procedures will lead to fewer emissions and equipment failures. In addition, training of staff at all levels in environmental awareness will encourage best practice.

A full risk assessment should be performed as part of survey design.

Procedural controls, stemming from industry-standard guidelines and best practice procedures, will limit the possibility of accidental events. Quality procedures apply, incorporating the tenet of continuous improvement, and should be considered at the contractor selection stage.

10.2 Drilling

10.2.1 Noise generation

Depending on the type of facility and their moorings, it is known that certain drilling facilities generate more underwater noise than others, with drill ships and semi-submersibles operating on DP being the noisiest. The selection of drilling facility can, therefore, be used to reduce the amount of sound entering the marine environment. However, it is understood that the choice of drilling rig is generally dictated by other factors. The only other practical way of minimising the amount of noise entering the marine environment is by reducing the drilling time where possible.

Consideration should be given to the timing of drilling periods in relation to seasonal environmental sensitivities. In addition, the well design and engineering process should minimise the duration of drilling.

10.2.2 Disposal of OBM cuttings onshore

One approach to mitigating the issue of onshore disposal of cuttings contaminated with OBM is to develop ways in which the cleaned material can be re-used or re-cycled. This issue will become more pressing as landfill availability becomes more constrained. Developing the potential either for cuttings re-injection downhole, or for improved cleaning of OBM-contaminated cuttings offshore to a level where offshore disposal is permissible (1% oil content or less), are other avenues.

10.2.3 Disposal of drill cuttings and disturbance to the seabed

Impacts from drilling discharges are unlikely to be significant, but various mitigation measures are either required or can be taken by operators to further reduce impacts, as summarised below. The significance of impacts resulting from direct physical disturbance of the seabed depends on the occurrence of sensitive features (eg of ecological or archaeological conservation importance) in the immediate vicinity of the operations.

Existing measures

- All chemicals used are regulated under the OSPAR HOCNF scheme and approved by use of a PUDAC (see Sections 3.3.4 and 3.3.5). Selection of all chemicals that may be used in drilling the proposed wells should be based upon both their technical specifications and their environmental performance, and the use of all chemicals minimised where practicable.
- Actual mud and chemical usage must be monitored during drilling operations, and subsequently reported to the PAD (see Sections 3.3.6 and 3.3.8).



- The discharge of cuttings contaminated with OBM or SBM to sea is prohibited. Cuttings shipped to shore for treatment and disposal will be dealt with under the local authority waste management plan.
- Best practice should be followed to minimise the amount of excess cement deposited on the seabed.
- Mud recovery systems should be used, thus minimising the amount of drill fluids eventually discharged.
- Site surveys are undertaken with regard to geological hazards such as seabed stability, shallow gas and gas hydrates.
- In addition to the Appropriate Assessment undertaken for IOSEA3, site specific Appropriate Assessments may be required for operations in or adjacent to the coldwater coral cSACs in conjunction with EAA.
- Best practice should be followed in order to limit dragging of anchors and chains.
- An environmental area assessment (EAA) is required with any application for drilling, and therefore is carried out prior to all exploration drilling activities. Any subsequent field development will be subject to full environmental impact assessment and reported in an EIS. The EAA, using available information and where necessary site-specific surveys, should describe the existing environmental conditions in sufficient detail to permit assessment of spatial and temporal changes in contamination of the sea bed, water column and biota resulting from subsequent exploration and production development activities.
- Site-specific surveys as part of EAA should be carried out in advance of drilling in accordance with the OSPAR Guidelines for Monitoring the Environmental Impact of Offshore Oil and Gas Activities (Agreement 2004-11). These should describe the existing physical, chemical and biological conditions and where necessary archaeology. Archaeological impact assessment should follow the format detailed in the guidelines *Acquisition and interpretation of geophysical data for archaeological assessment during oil industry geophysical route and site surveys in water depths exceeding 50 m* (Quinn, 2005). Any shipwrecks or objects of potential archaeological interest should be reported to the Director of the National Museum of Ireland within four days. If wreckage found is more than 100 years old, the Underwater Archaeology Unit and the Garda Síochána must also be notified within four days.

Potential additional measures

- Consideration should be given to drilling slimhole wells (ie thinner than usual wellbore) where possible. These generate fewer cuttings, require less drilling fluid and chemicals, and are generally faster than a conventional drilling programme.
- Consideration should be given to requesting that modelling of the dispersion of discharged drill cuttings be undertaken for sensitive locations. This would necessitate collection of tidal stream information at different depths through the water column, depending on the overall water depth, and validation of the predictions once drilling was complete.
- As insufficient information is available on the precise occurrence and distribution of key habitats, megafaunal species and historic wreck sites, site-specific survey data will be required in order to assess the impacts resulting from direct disturbance during the installation and removal of drilling structures. This could be carried out as part of the site survey normally undertaken prior to all drilling activities. Careful consideration needs to be given to the design of such surveys, making use of non-destructive survey methods where appropriate.
- Given there is very little information on the interaction of fishing gear and cutting piles, there is a need to be able to assess potential hazards of interaction with fishing gear, including the physical effects on fishing gear of impacting cuttings piles. Trawl warps and bridles have the ability to cut through the base of the cuttings pile and are then likely to cause the net or a trawl door to wedge firmly in the material on impact (ICES, 2005a).

10.2.4 Atmospheric emissions

The main sources of atmospheric emissions from drilling activity to address will be fuel use and from flaring during well clean-up and well testing.

In terms of fuel use, measures can be taken from an early stage to include fuel efficiency in the selection process for drilling rigs, support ships and helicopters, and to use low sulphur fuel for example. The Sulphur Content of Heavy Fuel Oil, Gas Oil, and Marine Fuels Regulations 2008 (SI no 119 of 2008) transposes EU Directive 2005/33/EC, which controls the sulphur content of marine

fuels. As described in Section 7.3.5, these regulations limit the maximum level of sulphur in marine diesel sold within the EU to 1.5% from 2010 onwards.

With regard to well testing, emissions may also be influenced by careful selection of drilling rig and contractors and by the use of maximum efficiency 'green' burners (in the case of oil or condensate wells). The amount of flaring can also be minimised by appropriate design of the test programme. If appropriate, well testing systems that do without the need for flaring at all (eg closed chamber well tests) can be built into the test programme.

10.2.5 Physical presence

At the time of submitting a well plan for approval, operators are obliged to inform fishermen by means of the established Irish Offshore Operators Association (IOOA) procedures. In addition, in the case of a well planned in an area of intensive fishing, discussions with the Sea Fisheries Protection Agency of the Department of Communications, Energy and Natural Resources must be initiated as early as possible, and in any case at least 90 days before planned commencement of drilling. Procedures are in place between IOOA members and the fishing industry to resolve possible disputes over damaged equipment.

In the event of a well being suspended, over-trawlable protection should be considered for areas most frequently used for demersal fishing activities. Such protection should meet guidelines used by the Norwegian and UK petrochemical industries as reported in ICES (2005a). It should be noted that these standards and guidelines are based on trawl equipment and tests done pre-1996. With the changes in gear design (eg twin-rig gear with clump weights) and improvements in vessel equipment the oil and gas industries in UK and Norway have acknowledged the need to update these recommended practices. Consultation with the UK Fisheries and Offshore Oil Consultative Group (FOOCG which is an offshoot of UKOG) is encouraged to take account of new recommendations that are forthcoming.

10.2.6 Accidental events

The following are mitigation measures already in place as part of the DCENR Rules and Procedures (PAD, 2007a).

- The crew of the drilling rig/ship should undergo environmental awareness and safety training. All equipment used on the rig/ship should have safety measures built in to minimise the risks of any oil spillage.
- A two-barrier well control policy should be implemented at all times as a minimum. Primary well control (ie mud hydrostatic) and secondary well control (blow-out preventers or BOPs) should be maintained throughout the drilling of a well. A full risk assessment should be performed as part of the planning phase of the well.
- The drilling rig or ship should have built-in safety measures to minimise the risk of an oil spillage, notably blow-out preventers, and fuel-transfer hoses.
- As the highest risk of diesel spillage occurs during re-fuelling (bunkering) operations at sea, all bunkering should take place during suitable weather conditions, preferably in daylight hours, and a continuous watch should be posted during the operations. The bunkering hoses should be segmented and have pressure valves that, in the event of a drop in pressure within the line as a result of loss of diesel, will close, preventing the further release of diesel.
- An OSCP is required under the Sea Pollution (Amendment) Act 1999, and this requirement is restated in the PAD Rules and Procedures Manual (PAD, 2007a). The OSCP is designed to assist the decision-making process during an oil spill and should include location-specific modelling, indicate what resources are required to combat the spill, minimise any further discharges and mitigate its effects. The OSCP must be submitted to the Irish Coastguard for approval.
- Any oil spill must be reported immediately, however small. The level and manner of the required oil spill response will be overseen by the Irish Coast Guard, and determined by the volume and type of oil spilled, and the weather and sea conditions at the time.
- Any oil spill likely to have impacts in UK waters will be reported by the Irish Coast Guard to the relevant UK authorities. The Irish Coast Guard has a close working relationship with the UK Maritime and Coast Guard Agency (MCA) and the two have a draft Service Level Agreement for



co-operation on search and rescue and oil spill response in place. The Irish Coast Guard and the UK MCA also regularly conduct joint search and rescue and oil spill response exercises.

With regard to chemical use, the following measures are already in place, either integral with good practice, or with regulatory systems, or both.

- Storage and transportation of chemicals on the drilling rig will be in line with industry-standard procedures and best practice, which have been designed to minimise the risk of loss of containment and impacts upon human health and the environment.
- The approved OSCP will also address procedures in the event of chemical spillages.
- All chemicals used are regulated under the OSPAR HOCNF scheme and approved by use of a PUDAC (see Sections 3.3.4 and 3.3.5). Selection of all chemicals that may be used in drilling the proposed wells should be based upon both their technical specifications and their environmental performance, and the use of all chemicals minimised where practicable.

With regard to gas wells, the following measures are already in place, either integral with good practice, or with regulatory systems, or both.

- The potential for shallow gas should be identified and minimised by site survey prior to drilling.
- The BOP is installed to prevent gas blowout once drilling has progressed beyond the riserless stage.
- Gas detection systems are installed on mud shakers to give early indication of any potential for gas blowout
- Training in safety awareness and response procedures for drilling crews will ensure that the risk of a blowout will be minimised, and be able to make the appropriate response should one occur.

10.3 Monitoring

The DoEHLG and EPA Guidelines for implementation of the SEA Directive describe the requirement to monitor the significant environmental effects of the implementation of the Final Adopted Plan. The primary purpose of monitoring is to cross check significant environmental effects which arise during the implementation stage against those predicted during the plan preparation stage. The Directive leaves considerable flexibility as how monitoring shall be arranged. However, monitoring should concentrate on the likely significant effects that have been identified in the environmental report and the mitigative measures that have been proposed. Monitoring should ensure that the level of activities and subsequent impacts will be consistent with the scenarios developed within this report. This will enable identification by PAD of unforeseen impacts at an early stage and to take appropriate remedial action. The types of monitoring can therefore be thought of at two levels; monitoring the activity levels, and monitoring the impacts of the activities.

10.3.1 Monitoring activity levels

The oil and gas exploration and appraisal activities resulting from implementation of the PAD's Final Adopted Plan for the current Frontier Licensing Round will be monitored by the PAD. This is to ensure the delivery of exploration commitments made by operators in the agreed work programmes at the time of licensing. An activity scenario has been developed by the PAD for IOSEA3 as a basis for impact assessment. Actual activity levels over the area will therefore need to be compared with predicted levels, in order to monitor the basis for the conclusions in the Environmental Report.

A 6-monthly report is prepared by the PAD for the government, in line with other sectors, that summarises the activities of the oil and gas industry in Ireland, including a list of current licences, consents issued, wells drilled and surveys undertaken. This has been developed as the basis for the required monitoring of activity levels, and to confirm activity levels are in line with those predicted.

10.3.2 Monitoring the impacts of activities

As detailed in Article 10 of the SEA Directive, Member States shall monitor the significant environmental effects of the implementation of plans and programmes in order to identify at an early stage unforeseen adverse effects and to be able to undertake appropriate remedial action.

The licensing authority should ensure that an appropriate monitoring programme be devised for evaluating the environmental impacts and efficacy of mitigation measures relating to the key potential environmental issues that were identified as significant in Section 6, Table 6.4 of this report. This should be carried out in consultation with appropriate statutory bodies and specialists.

The licensing authority (PAD) will ensure that appropriate best practice guidelines where required are developed and implemented in consultation with other statutory authorities and relevant specialists.

The current Rules and Procedures for Offshore Petroleum Exploration and Appraisal Operations ('Rules and Procedures') are set out in accordance with the provisions of the Petroleum and Other Minerals Development Act, 1960 (no 7 of 1960), as applied by the Continental Shelf Act, 1968 (no 14 of 1968), as amended and pursuant to the Licensing Terms for Offshore Oil and Gas Exploration and Development, 1992 ('1992 Terms'). These are laid out in the *Rules and Procedures Manual for Offshore Petroleum Exploration and Appraisal Operations* (PAD, 2007a). PAD approval is required before commencement of certain operations, and such PAD approval may be dependent on prior satisfaction of the specific requirements of other responsible Departments, Agencies and Authorities.

A fuller outline of these procedures is given in Section 3, but provisions are in place for monitoring emissions and discharges, consent auditing, and for undertaking baseline studies and post-drilling impacts monitoring. Operators must report on compliance with legislation, progress made in achieving environmental goals and continual improvement in environmental performance.

In its role as regulator of the offshore oil and gas industry, the PAD is served by a number of agencies including the Marine Institute which carry out activities in relation to environmental monitoring:

- Provides advice on technical and scientific aspects of monitoring programmes for offshore installations and points of discharge.
- Examines the results of monitoring programmes.
- Assesses the chemicals/substances proposed for use in drilling, maintenance and production, in accordance with OSPAR Harmonised Mandatory Control System (HMCS).
- Assesses data from HOCNF.
- Advises oil and gas companies directly on alternative chemicals/substances for use in cases where potential environmental damage is deemed excessive.
- Provides observations on applications for surveys etc.
- Compiles data for the annual OSPAR report on discharges spills and emissions from offshore oil and gas installations.
- Plans for future drilling rig and production platform inspections for compliance monitoring and use of chemicals.

It is recommended that the DCENR consult with relevant bodies including the Marine Institute in order to review the environmental monitoring framework in light of the IOSEA3 assessment.