

7.0 Summary and Conclusions

The EA examined the physical environment and its potential effects on the Project, and the effects of routine activities and accidental spills on the environment of the Laurentian Sub-basin and its environs.

7.1. Effects of Environment on the Project

A review of available data and information on the bathymetry, geology, weather, waves, currents, temperature, salinity, and ice and icebergs concluded that aside from some greater water depths in the Laurentian Sub-basin, environmental conditions are within the range of those encountered by the offshore industry on the Grand Banks. With the potential exception of munitions dump sites, none of the environmental variables analyzed would preclude offshore drilling or significantly affect operations given appropriate project planning, timing, procedures, technology, personnel and training. It was predicted that there would be *no significant effect* of the environment on the Project.

7.2. Scoping and Methods

Scoping for the EA was conducted by consultations with fishery interests, government regulators, and environmental groups (Table 7.1, Appendix 2). Information on the biological environment was reviewed including the 2003 strategic environmental assessment (SEA) conducted by the C-NLOPB and the C-NSOPB (JWEL 2003), and the 2004 2-D seismic EA (Buchanan et al. 2004) and the associated 2005 3-D seismic EA Update (Christian et al. 2005) and monitoring report (Moulton et al. 2006a) prepared for ConocoPhillips and partners. Based on the scoping exercise and reviews, the following valued ecosystem components (VECs) were selected:

- Fish and fish habitat
- Commercial fisheries
- Marine birds
- Marine mammals
- Sea turtles
- “Species at risk” as defined by Canada’s *Species at Risk Act*, with the most relevant species being wolffish, Ivory Gull, leatherback sea turtle, and blue whale

Effects were assessed using methodology commonly used for offshore EAs on the East Coast to satisfy requirements of the *Canadian Environmental Assessment Act* whereby potential effects within defined boundaries are evaluated for significance using criteria such as magnitude, geographic extent, duration and frequency, reversibility, and ecological, socio-cultural and economic context.

Table 7.1. Industry and Agency Consultations Summary.

Organization	Location	Date	Issues/Observations
Fisheries and Oceans Canada	Marystown St. John's Grand Bank	March March June	<p>DFO asked about the size of these cuttings and it was noted that drill cuttings are typically < 0.5 in diameter and that the larger pieces deposit closer to the well site. Silty material (“fines”) will also be deposited.</p> <p>With respect to CPC’s proposed exploratory drilling program, there were a few questions about the proposed locations of initial wells within the Project Area. CPC noted that it is considering other possible well-site locations in the Project Area. The first well will most likely be in one of two identified locations (the eastern location in EL1087 is most likely). If hydrocarbons are found at that location, additional exploratory or appraisal wells may be drilled as detailed in the Project Description.</p> <p>DFO scientists suggested that CPC activities might encounter corals even at 2,300 m depths, and it was noted that these resources are considered quite sensitive and important, (i.e. they are “high on the political radar screen”). As such, it was suggested that CPC would need to consider potential effects of an accidental oil spill on the area’s coral resources. CPC noted that its spill modelling is focused on the premise that gas is more likely to be encountered than oil.</p> <p>DFO noted that its intention to deploy several deep-water sensors in the Laurentian Sub-Basin area this year. DFO scientists noted that the marine mammal sensors to be deployed this year might well pick up transmission noise from a dynamically-positioned drill rig. There is some concern about these deep-water sound transmissions and their potential effects on whales. DFO managers noted that the exact locations of the sensors to be deployed this year have not yet been decided, but they may be placed in locations as deep as 2,200 m.</p>
FFAWU/Fishers	Marystown	March	<p>FFAWU asked if the environmental assessment would be examining the potential impacts of exploratory drilling activities on the fisheries resources in this particular area (as opposed to an assessment of known general effects from other regions in the world). It was also noted that information obtained from environmental effects monitoring programs elsewhere has been used to assess changes in benthos, etc., and that similar programs would be established for this area in order to monitor any changes which might take place over time.</p> <p>Fishers asked if the report would look at what changes have taken place in catch levels or what might take place over time, particularly with respect to the species that are important for this area. In response, CPC’s fisheries consultants noted that the EA would provide data about catch levels over time but noted that there are many factors that could potentially cause changes in levels of fish harvested.</p> <p>FFAWU asked if the EA would be covering only the two proposed drilling areas. CPC managers stated that the EA would cover the entire Project Area and that as specific drilling targets are identified, updates on these additional locations would be provided. It was noted that fishers would want the opportunity to review and comment on any proposed well locations outside of the two areas presently identified.</p> <p>A question was raised about the size of the “safety zone” for the drilling activities, and whether this would be a “non-steaming” zone, or a “no fishing” zone. CPC managers noted that there would be a 500 metre safety zone around each drill site and that this would be an area in which no fishing would be permitted.</p>

Organization	Location	Date	Issues/Observations
			<p>Fishers asked how long it would take to drill each well and if it would be possible to schedule these activities around the key fisheries. CPC's drilling manager stated that each well would likely take about three months to drill and that, ideally, CPC would like to undertake its drilling program during the summer months. It was noted that, with respect to the drilling schedule and timing, the key consideration is the availability of a drill rig.</p> <p>FFAWU asked what volume of cuttings would be generated. CPC managers responded that each well would generate approximately 800 m³ of cuttings. CPC's environmental consultants commented that the biological zone of influence, as defined by the area with at least 1 cm of mud deposition, is typically 500-1,000 m from the well, and rarely more than 1 km² in area. He added that based on observations at other drilling locations around the world, smothering effects are typically unobservable after about one year.</p>
Environment Canada	St. John's	March	<p>Most of the points and questions raised by EC managers concerned CPC's plans for seabird observation and monitoring, and of the potential effects of an accidental spill on seabird populations. CPC managers indicated that a member of the rig's crew, rather than a dedicated observer would undertake the observation program, and that person would have the necessary training in seabird monitoring.</p> <p>EC managers noted that CWS has some concerns about the potential effects of an accidental release of oil on Sable Island bird populations, especially if CPC's spill scenarios indicate an overlap with those for existing production facilities near Sable Island. CPC managers noted that the company's expectation is to discover gas rather than oil. As such, the spill analysis will be for gas and condensate with modelling similar to that typically seen to date in Nova Scotia.</p> <p>There were also some questions about CPC's plans for service vessel supply routes, the use of helicopters for crew changes, and the location of a shore base for the storage and deployment of spill response equipment. CPC noted that decisions on supply routes and any onshore supply base had not yet been decided.</p> <p>EC managers said they would be interested in obtaining sea bird observation data from the drilling program, especially for the winter months if drilling operations are undertaken during this period of the year.</p>
One Ocean	Marystown	March	<p>One Ocean representatives did not have any specific comments or concerns about the proposed exploratory drilling program.</p>
Natural History Society/Alder Institute	St. John's	March	<p>In the meeting with NHS and AI representatives, questions were raised about the range of topics and issues to be covered in the EA and whether CPC intended to establish a monitoring program for its drilling activities.</p> <p>With respect to the northern Gulf of Mexico area, an NHS representative noted that researchers at the Texas A&M University had been involved in an overall ecological assessment of that region. This study had recommended a list of topics and issues that should be covered and addressed prior to the issuance of any exploration leases. It was suggested that offshore companies, or the Board, might look at these findings and consider whether some of the topics identified in the Texas A&M study were worth including in CPC's EA analysis. The High Energy Benthic Boundary Layer Experiment (HEBBLE) was also highlighted by the NHS as a possible source of information on deepwater benthic communities.</p>

Organization	Location	Date	Issues/Observations
			<p>In response to NHS comment on the Texas A&M study, CPC managers noted that the Board prescribes the topics to be included in an EA, and that CPC's assessment will essentially involve a Comprehensive Study process, even though it is a Screening-level document. It was also noted that the Scoping Document for this project asks for several additional topics to be examined (e.g., analysis of DFO research survey data as requested by the FFAWU).</p> <p>NHS representatives noted that there are some differences in the Laurentian Sub-Basin area compared to other offshore areas (e.g. the Orphan Basin) that should be considered. (e.g., corals in the "Stone Fence" area). They noted that while there is some amount of (fisheries) observer and DFO RV data, there is not a great deal of information available on corals in deep-water locations such as the area in which CPC intends to drill. It was noted that perhaps CPC might usefully obtain further information/data on coral resources via any planned ROV seabed surveys. A representative of the AI said that her group was interested in the benthos of this area and wanted to know if CPC intended to establish a long-term monitoring program to assess any potential effects on the benthos. This was especially important given that this is a new and different area.</p> <p>The NHS also asked if CPC would be conducting an acoustic survey (using multi-beam technology) to assess seabed bottom/substrate conditions and collecting any data on bottom currents. CPC noted that some level of seabed survey would likely be conducted prior to drilling..</p> <p>There was some discussion of the deposition of cuttings and discharges, and of CPC's plans for dealing with accidental spills. NHS representatives also noted the problem of "slope stability" in the Laurentian Sub-Basin area and mentioned that this zone has a "history of instability". CPC said it was aware that this is an area of naturally occurring seismic activity and noted that the EA would be addressing this issue.</p> <p>NHS representatives stressed the fact that CPC's project activities offer an opportunity to establish a monitoring program to gather important baseline data. Such information would be very useful for any future environmental assessment if there was further development of oil and gas resources in this area. It was suggested that the industry as a whole should agree on a standardized approach to environmental monitoring programs, and that any new data should be immediately available rather than remaining inaccessible for five years.</p>
Fishery Products International	Marystown	March June	<p>Due to corporate financial difficulties FPI is currently (June 2006) experiencing a major shutdown of its normal groundfish harvesting operations. However, assuming a resolution of these matters in the next few months, managers provided information about the firm's likely 2006 and 2007 activities. They indicated that, as in previous years, FPI vessels may be expected to be harvesting cod (and some greysole/witch flounder) within the Project Area this year and in 2007. If so, future harvesting will likely take place in January and involve two vessels: one harvesting cod, and the other greysole. These activities would still be concentrated in two locations within the Project Area: along the 200-m contour line in the vicinity of 55 00W and 45 00N, and in shallower water close to the northern boundary of the Project Area, just to the east of the French corridor. FPI managers noted that their directed cod fishery generally takes place in January and February, while greysole activities occur from January to March. These two species are generally found in the same areas with greysole in somewhat deeper water (D. Fudge, pers comm., June 2006 and FPI meeting, June 2004). (As discussed below, FPI vessels are also involved in the annual research survey for 3PS cod.).</p>

Organization	Location	Date	Issues/Observations
Schooner Regional Development Corporation	Marystown	March	No specific comment.
Association of Seafood Producers	Halifax	March	No specific comment.
Groundfish Enterprise Allocation Council (GEAC)	Ottawa Marystown (FPI)	March June	<p>GEAC has also been involved in conducting fisheries research in the general area of the Project in recent years. FPI vessels have been involved in GEAC's annual redfish and multispecies research surveys in the area. While no surveys are planned in the area in 2006, FPI company managers expect they, or other GEAC member companies, will be undertaking these activities again in 2007.</p> <p>FPI expects GEAC to complete its Unit 2 redfish index research survey in September of 2007. FPI managers noted that the Unit 2 redfish survey generally takes about 12 days to complete, and there are many survey locations (stations) within the proposed Study Area. The vessel proceeds to a particular station, tows its gear for about two hours and then proceeds on to the next station.</p> <p>In previous years, the FPI vessel MV <i>Penny Smart</i> has been involved in the 3PS GEAC multi-species grid survey and in 3PS cod tagging (cod, American plaice, witch flounder and yellow tail flounder). These survey activities involve approximately 100 sets (tows) as well as tagging of individual fish. Research stations are located throughout the entire 3PS zone, but FPI indicated that most of the stations are located within the Study Area. The 3PS GEAC multi-specie survey usually takes place during late November and early December and generally takes about 12 days to complete. (D. Fudge, pers comm., June 2006 and FPI meeting, June 2004).</p> <p>In the past, FPI has noted its concern that noise (i.e. seismic survey activities) might affect the results of its research survey work, especially the September redfish survey. The concern is that noise might influence fish behaviour such that the data collected might vary from previous research surveys.</p>
Clearwater Seafoods Limited Partnership	Halifax	March	Clearwater Seafoods Limited Partnership (Clearwater) did not provide any update of its planned harvesting activities for 2006 and 2007 but, based on previous discussions with the firm, it is likely that company vessels would be operating within the Project Area at some point during the proposed drilling activities. For example, in 2004, Clearwater managers reported that the firm would have two vessels harvesting cod and halibut with longline gear during the summer and fall months at various locations within the Project Area (C. Penney, pers. comm., June 2004).
Icewater Seafoods	Halifax	March	No specific comment.
W. T. Grover Fisheries Ltd.	Torbay, NS	April	In previous years, this operator harvested skate resources along the "Stone Fence" and was the only enterprise with an allocation for this species. However, he reports that DFO recently closed this fishery entirely as skate has now been placed on the endangered list. Consequently, there will be no skate fishery this year. The W. T. Grover vessel will continue its annual harvest of flounder resources in the same general area for a brief period in the early spring (1-15 April). The firm did not pursue this fishery in 2006. The operator noted that the only fishery he is aware of in the Stone Fence area is for redfish and added that Clearwater vessels usually harvest that species during July and August.
Seafood Producers of Nova Scotia (SPANS)	Halifax	April	The Association noted that redfish harvesting patterns in the May-October period (when most of the seismic survey activities have taken place) are different than those which occur in the November-April period when some of the drilling may occur. However, the Association noted that the proposed well site locations are likely outside of the areas

Organization	Location	Date	Issues/Observations
Nova Scotia Swordfish Association	Halifax	June	<p>where redfish are generally taken. Relevant fisheries maps were subsequently sent to the Association for their review and for them to confirm that this was indeed the case (J. Lugar, pers. comm., April 2006).</p> <p>The Association advises that, based on previous years' fishing patterns, the swordfish fleet has fished this area in the past and thus there is a potential that it may do so in future. Association representatives discussed this matter further with its members and noted that these fishers have the same concerns that they have raised in the past: namely that they are never happy to hear about any offshore operations that might interfere with their normal fishing activities. However, fishers realize that these exploration activities will be taking place in any case, and there is not much they can do to prevent them.</p> <p>The Association reiterated that the harvesting of large pelagics is closely connected to water temperature, i.e. these fish seek certain temperatures, and the fleet tries to locate that warmer water. As such, swordfish fishing is not predictable with pinpoint accuracy from year to year; if the water temperature in the area near a drill is favourable for swordfish, they will be in the vicinity and so will swordfishermen.</p> <p>Obviously, if there is a rig in their fishing area, fishermen will not be setting gear as would not wish to run afoul of the exclusion order. Nor would they wish to run the potential risk of losing expensive fishing gear. However, they will not be happy about being restricted from fishing a very illusive prey that may be present in significant numbers.</p> <p>In other words, if the water temperature in or near the drilling area is favourable for fishing, the fleet will be in the vicinity and so there could be some interference. If that is the case, we could well have incidents of interaction between the two operations. The Association notes that, hopefully this will not be the case; however, the potential is there and if it does happen, fishermen will likely express their dissatisfaction.</p> <p>Association representatives noted that, although the regulated area around a drill rig is relatively small, i.e. 500 m, the "effective exclusion area" is potentially much larger due to the nature of the swordfish fishery and the type and quantity of gear deployed during the harvest of this species. Swordfishermen put out miles of gear, which drifts considerably over several hours. The amount and direction of the drift can often be unpredictable due to tides and changing currents and winds. In order to be certain to avoid the 500 metre exclusion zone, fishermen need to allow a much larger margin of error, thus creating a larger exclusion area for them ((J. Angel and T. Atkinson, pers comm., June and August 2006).</p>

Note: Additional meetings were also held with the above groups to discuss CPC's seismic program.

7.3. Mitigations

Potential residual effects were predicted for routine drilling activities including regulated discharges, air and light emissions, noise, and vertical seismic profiling (VSP). A summary of Project mitigations is contained in Table 7.2. Emissions and discharges will be mitigated through selection of low emission equipment (if these are available), adherence to *Offshore Chemical Selection Guidelines* and the *Offshore Waste Treatment Guidelines*. Drill cuttings may smother some benthic organisms within 10s of metres of the drill hole. Key benthic species such as deepwater corals will be avoided, if in fact they occur at the drill sites, through elimination of bottom anchors (in the case of deep water drilling with DP rigs) and preliminary sea bottom reconnaissance. The VSP will be the strongest source of underwater sound but will only occur for a few hours or days and can be mitigated through standard procedures of monitoring for presence of marine mammals and sea turtles, delayed start-ups, ramp-ups, and shut-downs. The operators will adhere to the C-NLOPB's *Geophysical, Geological, Environmental and Geotechnical Program Guidelines*.

Table 7.2. Summary of Mitigations.

Project Activities	Mitigations
Cuttings/drilling fluid discharges	Selection of no/low toxicity drill fluids Use of <i>Offshore Chemical Selection Guidelines</i> Recycle SBMs Pre-spud ROV survey and move rig if concentrations of corals are found Treat mud/cuttings according to C-NLOPB polices and the <i>OWTG</i>
Produced water (if testing occurs)	Flaring and/or treat to <i>OWTG</i>
Black water	<u>Maceration</u> to < 6 mm size
Galley waste (organic)	Maceration and/or skip to shore
Solid waste	Return to shore; recycle, handling by licensed waste handler
Other regulated discharges (BOP fluid, etc.)	Use of <i>Offshore Chemical Selection Guidelines</i> Adherence to <i>OWTG</i>
Hazardous waste (waste lubricants, paints, solvents)	Packaged, labelled and handled by licensed waste handler to shore
Air emissions	Use of well-maintained equipment
Lights and flares	Minimize without compromising human safety Release stranded birds according to CWS protocols
VSP surveys	Safety zone – delayed start-up Ramp-up procedures Shut-down for SARA species Single point of contact (SPOC) and communications Fishery broadcasts Adherence to <i>Geophysical Survey Guidelines</i>
Accidental events	Oil spill response plan (OSRP) Oil spill countermeasures Seabird rehabilitation Compensation to fishers
General	Utilization of environmental monitors Project planning Helicopter flights to avoid bird colonies Minimum altitudes for helicopters Communication with fishery interests

The drill rig will be a source of continuous underwater broadband sound for which there is presently no mitigation but any effects on biota should be limited to behavioural ones and limited in geographic extent. Some seabirds, mostly storm petrels, may be attracted to the rig's lights on foggy nights; mortalities will be eliminated or at least minimized by special handling and release procedures following Canadian Wildlife Service protocols. There is little or no potential for overlapping cumulative effects with other offshore projects given the distance from Laurentian Sub-basin to the Grand Banks developments. It was concluded that routine activities of the Laurentian Sub-basin Exploratory Drilling Program *will not result in any significant impacts* on the VECs of the area.

Accidental events were analyzed for probability of occurrence, fate and behaviour, and potential effects on biota. Accident scenarios included gas blowouts (906 m³ per day condensate and 17,811 m³/m³ of gas) (surface) and 1,351 m³ per day condensate with 17,811 m³/m³ gas (subsea) and batch spills of diesel (10 and 100 bbls) during summer and winter for releases on the shelf (near surface), slope (750-m depth) and deep basin (2,300-m depth) sites. It was predicted that, for offshore drilling with state-of-the-art equipment and procedures, the chance of a very large blowout (>10,000 bbl) is very low, probably about 0.02%. It was predicted, based on the fate and behaviour modeling that any surface slicks would be relatively small and not long-lasting. For the most part, surface winds and currents will drive any slicks that do form to the south and east of the drill sites. Because of unknowns such as the specific chemical make-up of any petroleum hydrocarbons that may be present and the specific behaviour of a deep sea blowout (one has never occurred), in addition to the many variables that influence spill characteristics, it is difficult to predict with precision the effects on biota, especially as they relate to the geographic extent of the effects. While it may be possible under calm conditions to clean up a large proportion of spilled condensate or diesel, most likely only a small percentage offshore can be retrieved under typical wind and wave conditions, especially in winter. Any hydrocarbons that are retrieved will of course lessen any impact. Nonetheless, based on present knowledge of the Laurentian Sub-basin ecosystem, the modeling exercises, and on past monitoring experience with large spills with much worse scenarios than offshore Laurentian Sub-basin (e.g., ExxonValdez, Arrow, Torrey Canyon and others), it can be predicted with confidence that an oil spill in the Laurentian Sub-basin, with the possible exception of seabirds, *will not result in any significant residual impacts* to biota of the Laurentian Sub-basin. There could be adverse effects on the fishery, mostly in terms of market perception *viz a viz* potential tainting of the product. A large part of the Project Area is not subject to fishing pressure and where fishing does occur it is often with mobile gear (i.e., trawlers) that could avoid an impacted area. In any event, losses to the fishery can be mitigated through a financial compensation program to a *not significant* level. There is some potential for *significant effects* from condensate or diesel spills on those seabirds that spend a large proportion of their time on the water. Actual effects of a large spill could range from relatively few mortalities to very large numbers depending upon the hydrocarbon type, amount, and distribution relative to the species, location and timing of concentrations of seabirds, and other factors. Thus, erring on the precautionary side, it was predicted that significant effects could occur although mitigations such as oil spill clean-up and bird rehabilitation may help on a small scale. Any effects at the population level would be reversible over time. Therefore, because the significant negative effect is reversible, in the unlikely event that an extremely large spill (< 0.01% chance) occurs, the population of marine birds, which is a renewable resource, will be able to meet future needs of resource users.

7.4. Summary of Cumulative Effects

Projects and activities considered in the cumulative effects assessment included:

- Drilling program within-project cumulative impacts. For the most part, and unless otherwise indicated, within-project cumulative effects were fully integrated within this assessment;
- Hibernia and Terra Nova (existing offshore oil developments);
- White Rose Oilfield Development (in progress);
- Hebron – Ben Nevis (potential oil development);
- Other offshore oil exploration activities (seismic surveys and exploratory drilling).
- Commercial fisheries;
- Marine transportation; and
- Hunting activities (marine birds and seals).

Cumulative effects can be viewed as additive on an individual level (for example when an individual migratory animal is exposed to an effect more than once) or a population level where different individuals from the same population may be exposed once. In some cases, effects may be synergistic where, for example, the effects of two activities acting together may be greater than effects from each activity in isolation.

The following is a brief summary of potential cumulative effects by activity and VEC (fish, fishery, sea turtles, seabirds, marine mammals).

7.4.1. Safety Zones

At present, it appears that there would only be one drill rig safety zone (area of about 0.8 km², assuming a 500-m radius) within the Study Area at any particular time. If other developments to the north are considered, they have the additive cumulative effect of about 50 km² (Hibernia, Terra Nova, White Rose, Hebron-Ben Nevis).

In general, any cumulative effects from the Safety Zones can be considered positive for fish (including any present and future SARA-listed species) because they are protected from mortality caused by the fishery but can be considered negative for the fishery. Nonetheless, any effects from one drilling program will be on such a small geographic and temporal scale as to be considered *negligible*. Any cumulative effects on the other VECs would range from *no effect* to *negligible additive effect*.

7.4.2. Structures and Lights

Fish (particularly juveniles), squid and seabirds (e.g., Leach's Storm Petrel) may be attracted to drill rigs or other vessels and thus suffer some effects such as increased predation or in the case of petrels, some stranding. Any increased predation would be very small scale and likely result in decreased predation

elsewhere and thus can be considered to range from *no effect* to *negligible effect*. The stranding of birds is largely mitigated by bird handling and release protocols so that any cumulative effects, if they occur, would be low and certainly *not significant*.

7.4.3. Air Emissions

The Project will add emissions to the atmosphere through fugitive emissions from storage tanks, operation of diesel generators and engines, and flaring, if it occurs. Air emissions from one drilling operation will be relatively small scale and within the range of other offshore marine activities such as marine shipping. Emissions will very rapidly dissipate in the windy offshore environment and will not endanger human health or air-breathing VECs such as seabirds, sea turtles or marine mammals because their exposure concentrations and times would be so low. Any cumulative effects on VECs were considered *negligible*.

7.4.4. Drill Mud/Cuttings

Most modern drill muds are virtually non-toxic and their selection and use in Newfoundland and Labrador waters are subject to the *Offshore Chemical Selection Guidelines* and the *Offshore Waste Treatment Guidelines (OWTG)*. Water-based mud can be discharged to the marine environment. Synthetic-based mud (SBM) is typically recycled and not discharged in bulk except under special provision. There are few, if any, pathways for drill mud/cuttings discharges to affect pelagic fish, sea turtles, seabirds (with one potential exception if a sheen occurred from SBM under flat calm conditions), marine mammals or the fishery. However, the discharge of mud and cuttings to the seabed can affect the benthos. Based on modeling and monitoring studies, including ROV observations, any effects on benthos may range from radii of 10's of metres to 800 m from the drill hole, with estimates at the low end of the scale for deep water wells such as some of those proposed for the Project. Thus, the Project will have an additive cumulative effect on the benthos of the NW Atlantic but any effects will not overlap for wells within the Project or with the Grand Banks wells some distance to the northeast. Any cumulative effect will be small scale and thus *not significant*.

7.4.5. Other Regulated Discharges

Other regulated discharges such as cooling, sanitary, and BOP fluid are subject to the *OWTG* and the quantities involved, geographic extents and magnitudes are small and most effects were considered *negligible*. Cumulative effects would be additive but *negligible* and thus *not significant*.

7.4.6. Underwater Sound

Underwater sound will emanate from the Project's propulsion systems and thrusters on the drill rig and attendant vessels, and associated machinery and helicopters. Drill rig sound will depend on the type of rig with dynamically positioned rigs being noisier than anchored or bottom-founded rigs. The highest

source levels will be produced during vertical seismic surveys (VSP, essentially small scale seismic surveys) by a seismic array but activities will be of short duration (few hours or days) over a small geographic area (several km) and mitigations such as ramp-ups are used.

Fish appear to acclimate to drill rigs and in fact may associate with them to some degree. Their behaviour could be affected by VSP surveys which could overlap with any seismic surveys in the area but any effects would be short term. Overall, cumulative effects of underwater sound on fish, including SARA-listed wolffish, are predicted to be minor and *not significant* and not overlapping with other offshore projects with the exception of future Laurentian Sub-basin 3-D surveys if they occur.

Seabirds that spend significant time underwater (e.g., murres) are more likely to be affected by underwater sound than other species. However, although data are scarce, seabirds as a group appear to be relatively insensitive to sound and cumulative effects were predicted to be *negligible* and thus *not significant*.

Marine mammals, particularly cetaceans, are believed to be sensitive to underwater sound because they use sound to carry out their life processes. Most species will be able to hear the Project's continuous sounds, if they are close enough, and will be able to avoid them if they so choose. The VSP will be the loudest source level but mitigations such as delayed start-up and ramp-up (for all species) and shut-downs (for SARA species, likely only the occasional blue whale in the Study Area) mitigation should prevent harm. Individual animals migrating through both the Laurentian Sub-basin and the Grand Banks could be subject to cumulative effects but these are believed to be most likely limited to behavioural effects, given the mitigations employed off the East Coast. Based on surveys to date, the Laurentian Sub-basin in general does not appear to contain large concentrations of marine mammals or sea turtles although numbers of blue whale were higher than expected given their supposed rarity. Cumulative effects are predicted to be *not significant*.

7.4.7. Accidental Events

A major spill or blowout in Laurentian Sub-basin could affect fish, fish habitat, seabirds, sea turtles (if they occur there), and marine mammals to varying degrees depending upon type, size, location, timing, and species and life stages involved. A major spill is statistically very unlikely and even more so if it coincided with one on the Grand Banks. Nonetheless, cumulative effects could occur from chronic (and illegal) discharge of oil bilges at sea by ships transiting the area or from other activities that could affect these VECs. Overall, cumulative effects on the above VECs were determined to be *not significant*. A major spill could adversely affect the fishery by fouling gear and affecting marketability but economic losses would be compensated to a *not significant* level. A major oil spill could significantly affect seabirds in Laurentian Sub-basin and thus result in a *significant cumulative effect* in addition to other stressors on the populations such as hunting, mortality due to entrapment in fishing gear, or oiling from illegal bilge dumping. Mitigating factors would include Laurentian Sub-basin seabird abundance appears lower than the Grand Banks or closer inshore based on surveys to date, condensate from a deepwater blowout may be significantly reduced when it reaches the surface, and typical high wind and

wave conditions will disperse the condensate relatively rapidly. Furthermore, spill countermeasures and seabird rehabilitation would be conducted by the Operators.

7.5. Monitoring and Follow-up

Environmental Observers will conduct seabird and marine mammal observations on a daily basis in accordance with established protocols. The data compiled from these observations will be provided to the C-NLOPB, the Canadian Wildlife Service, the Department of Fisheries and Oceans, the Natural History Society and any other groups or individuals who request the report. In addition, an Oceanographic Monitoring Program will be conducted in accordance with the C-NLOPB *Guidelines Respecting Physical Environment Programs*.

All regulated discharges will be monitored for compliance under the *Offshore Waste Treatment Guidelines*. CPC and partners will also monitor other aspects of the Project. Environmental observers will be on board the rig to record weather and ice conditions and to oversee mitigations such as seabird handling and documentation. Current metre data will be collected during the drilling program and data archived at BIO. Marine mammal observers will be present during VSP operations and seabird and marine mammal data may be collected from the rig or from vessels of opportunity. ROV or other bottom survey will be conducted before and after drilling to assess sea bottom conditions, the presence of deep water corals and the extent of cuttings piles.

All Project vessels will document and report any damaged fishing gear attributable to the Project. Reports on all of the above will be submitted to the C-NLOPB in timely fashion.

7.6. Residual Effects from the Project

In summary, after mitigation measures have been implemented, the overall predicted residual effects of the Project on the biophysical environment and the fishery are assessed as *not significant*. The only potential exceptions are the effects of a large offshore spill on marine birds and on the marketability of offshore commercial fish. However, the likelihood of such an event is, as discussed previously, very low and seabird populations would eventually recover in all likelihood. In the event of an accidental blowout with release of oil, in calm conditions, some mitigation may be possible through oil spill response measures and seabird rehabilitation; however, these mitigations are recognized as being limited. The Operators' emphasis will be on accident prevention. Also, in the case of fishery losses directly attributable to the exploration program, actual loss would be mitigated through compensation. The capacity of renewable resources to meet present and future needs will not be significantly affected by the proposed project.