



Lines of Inquiry Panel Review Phase II: Arctic Ship-source Spills

ITOPF has been invited to participate in Transport Canada's Panel Review of Canadian preparedness and response capability for Arctic ship-source spills. The background to the project is reproduced in italics below, followed by the Lines of Inquiry questions in each sub-section, with ITOPF's comments in blue. Only those sections that are relevant to ITOPF's role and expertise have been considered.

These Lines of Inquiry are intended to provide general structure to the Panel's review and draw out information and perspectives through written submissions or face-to-face discussions that will be useful in the Panel's deliberations. The Panel is not limited to considering questions outlined in these Lines of Inquiry.

For the purposes of gathering views and information for the Arctic review, the Panel is considering the waters north of 60° north latitude, including the Mackenzie River and Delta, as well as Great Slave Lake, Hudson Bay, James Bay and Ungava Bay. Throughout this document, these waters may be referred to as 'the Arctic'. The review extends to both Arctic ship-source oil spills and ship-source releases of hazardous and noxious substances (HNS) (i.e., HNS incidents). The review does not extend to preparedness and response to spills that may result from oil and gas exploration or drilling.

The Arctic Environment

1. The Arctic provides a unique operating environment, both for navigators and regulators. What factors, including future considerations, should be considered while developing spill prevention, preparedness and response requirements for the Arctic?

ITOPF considers that the key factors that should be considered when developing spill prevention, preparedness and response requirements for the Arctic relate to the lack of infrastructure, low population density, and remoteness of potential spills from population centres/sources of equipment and manpower etc. ITOPF notes that technological advances have been and continue to be made to respond to oil spills in ice, but without the logistical infrastructure to mount and manage a response, capability will always be limited. Efforts should therefore be focussed on defining the risk (bearing in mind that this, and the sensitivity and vulnerability of resources, is likely to vary seasonally) and tailoring prevention, preparedness and response arrangements accordingly, bearing in mind what can realistically be achieved given the level of infrastructure, etc.

Given the logistical challenges that will be faced during a response in the Arctic, it is likely that cooperation will be needed between government, industry and local populations. International cooperation may also be called for in the event of a larger scale incident or one that threatens the territorial waters of more than one State.

2. Are there particularities and/or differences between regions of the Canadian Arctic that should be considered?

Not within ITOPF's remit to comment.

THE INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION LIMITED (ITOPF)

1, Oliver's Yard, 55 City Road, London EC1Y 1HQ, United Kingdom
Tel: +44 (0)20 7566 6999, Fax: +44 (0)20 7566 6950, 24hr Pager: +44 (0)762 398 4606
Email: central@itopf.com Web: www.itopf.com

Registered in England No. 944863. Registered Office as above.



However, in general ITOPF does not consider it logical to have one generic approach for such a vast area that encompasses a range of different habitats, environments, conditions etc., or given the differences in infrastructure and accessibility.

3. Are there sensitive areas where vessel traffic presents particular concerns? Where are they? What makes them sensitive areas?

ITOPF is aware of several useful resources which identify sensitive areas and allow these to be compared to vessel traffic information. Specific to Canada, ITOPF understands that Environment Canada has produced sensitivity maps for certain sections of the coastline.

The freely available online resources ArkGIS (WWF, <http://arkgis.org/>) and DNV's Arctic Risk Map (<http://gis.dnv.com/arcticriskmap/>) enable sensitive resources to be overlaid with vessel traffic information.

4. What mechanisms are in place for outreach and engagement of Northern communities in spill preparedness and response?

Not within ITOPF's remit to comment.

Prevention

5. What measures and resources are currently in place to prevent marine spills in the Arctic?

ITOPF is not aware of all the formal requirements currently in place to prevent marine spills in the Arctic, but notes that operators with experience in Arctic shipping often have their own procedures in place to minimise risks (e.g. the use of ice navigators).

In Russia, the NSR Administration (http://www.nsra.ru/en/celi_funktsii/) issues permits for NSR transits and impose various constraints according to the vessel type and crew experience (e.g. ice-breaker accompaniment, Russian ice pilots, the use of convoys).

The Polar Code seeks to improve the safety of Arctic shipping generally, but is not yet in force.

6. What additional navigation support and resources are needed for safe shipping in the Arctic?

Not within ITOPF's remit to comment.

7. What preventative practices could be undertaken at HNS and oil handling facilities and/or during HNS and oil transfers?

Not within ITOPF's remit to comment.

8. What more can shipowners and/or oil handling facility operators do to prevent or reduce potential impacts of incidents?

ITOPF notes that it is more common for facility operators to develop a spill mitigation capability, rather than ships that may only occasionally visit the facilities. Such a capability may include containment booming (if appropriate according to product characteristics and operational considerations), a stockpile of equipment (e.g. sorbents, personal protective equipment), and appropriate training and exercising.

THE INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION LIMITED (ITOPF)

1, Oliver's Yard, 55 City Road, London EC1Y 1HQ, United Kingdom
Tel: +44 (0)20 7566 6999, Fax: +44 (0)20 7566 6950, 24hr Pager: +44 (0)762 398 4606
Email: central@itopf.com Web: www.itopf.com

Registered in England No. 944863. Registered Office as above.



9. Should the current practice of overwintering fuel in barges in landfast ice be reconsidered? Why or why not?

Not within ITOPF's remit to comment.

Existing Response Capacities

10. Are the vessels currently operating in the Arctic capable of responding to a spill of their bunkers or oil/HNS cargos? If not what do they need?

It is ITOPF's understanding that there are no requirements under any Arctic State legislation for the vessels themselves to carry any equipment beyond what is specified in their Shipboard Marine Pollution Emergency Plan (SOPEP), which is aimed at responding to minor spills on deck. Storage capacity would be a major limitation, even if containment and recovery equipment were available.

ITOPF understands that within the US and Canada, shipowners are required to have a contract with an approved oil spill response organisation (OSRO). However, the infrastructure to facilitate a timely response (i.e. airstrips, roads, rail network) is apparently limited. ITOPF is not aware of the public sector resources available to respond to a spill from a vessel in the Canadian Arctic.

In Russia, ITOPF understands that limited equipment is stored on the Rosatomflot icebreakers which operate along the Northern Sea Route (NSR). The storage capacity available to support a containment and recovery operation is not known.

As in any remote location, it is unlikely that adequate waste management facilities will be available to deal with oiled waste close to the site of a spill. Short and longer term storage facilities, transport, and disposal facilities should therefore be considered when developing a response capability for the Arctic.

ITOPF notes that currently the only pre-approved strategy for responding to an oil spill in the Arctic is containment and recovery. Chemical dispersant use and *in situ* burning (ISB) have shown promise in this context, but are not currently pre-approved by any Arctic State.

11. What private-sector and public-sector resources are available currently to respond to ship-source spills in the Arctic?

Private sector resources in the US and Canada are available via OSROs such as Alaska Clean Seas, Alaska Chadux, Eastern Canada Response Corporation, and Western Canada Marine Response Corporation. Greenland Oil Spill Response also maintains equipment stockpiles. Oil companies operating in the Arctic may have resources available to respond to ship-source spills, either themselves or via a cooperative organisation (e.g. NOFO in Norway).

With regard to public-sector resources, ITOPF understands that this information is not generally in the public domain, but may be available from the various national agencies tasked with responding to ship-source spills (e.g. Canadian Coast Guard (CG), USCG, Iceland CG, Norwegian Coastal Administration, Danish Admiral Fleet Arctic Command, NSR Administration, Rosatomflot).

THE INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION LIMITED (ITOPF)

1, Oliver's Yard, 55 City Road, London EC1Y 1HQ, United Kingdom
Tel: +44 (0)20 7566 6999, Fax: +44 (0)20 7566 6950, 24hr Pager: +44 (0)762 398 4606
Email: central@itopf.com Web: www.itopf.com

Registered in England No. 944863. Registered Office as above.



12. Are there facilities in place in the Arctic to treat or dispose of waste from an oil spill or release of HNS? How could these waste products be dealt with in the event of a spill?

ITOPF is not aware of the availability or capability of oil waste treatment/disposal facilities in the Arctic, but these are likely to be extremely limited and potentially very distant from an incident location. For example, following the 2004 oil spill from SELENDANG AYU off Unalaska Island, Alaska, liquid waste was airlifted to Dutch Harbor by helicopter, and then shipped to Seattle; solid waste was gathered in small bags, then shipped to Dutch Harbor before being forwarded to Seattle and then Arlington, Oregon.

ITOPF notes that oiled waste transport following an incident in the Arctic is likely to be by sea, unless rail links are available.

13. Is there any existing capability in the Arctic to treat wildlife affected by HNS or oil?

With regard to the US Arctic, ITOPF understands that International Bird Rescue maintain a turnkey facility in Anchorage, and that Alaska Clean Seas have some trained wildlife responders. ITOPF is not aware of any facilities or capability in Arctic Canada or Russia. It should also be noted that euthanasia may be the preferred national strategy for dealing with oiled wildlife rather than rehabilitation.

Preparedness and Response

14. What preparedness and response requirements are necessary for the Arctic?

The preparedness and response requirements necessary for the Arctic should be identified based on a risk assessment and gap analysis. Existing national contingency plans should include specific consideration of Arctic requirements and define appropriate strategies. Given their remoteness, some areas would require military-style logistics, i.e. self-sufficient deployment of manpower and equipment (shore-based or ship-based).

15. To whom should these requirements apply?

ITOPF considers that this would depend on the relevant regulatory context.

16. Should the Arctic be treated differently than the parts of the country south of 60° in terms of response capacity and response time requirements? Why or why not?

In ITOPF's opinion it is the logistical challenges that will drive response capacity and time requirements; whilst the 'Arctic' is certainly characterised by limited infrastructure, low population density, and harsh environmental conditions, these can also impact response capability south of 60°, and as such it may not be logical to have different requirements purely based on latitude. ITOPF also notes that several definitions exist for the 'Arctic', and that any preparedness and response regime would need to clearly define this.

17. How should the placement of spill response equipment be determined for the Arctic?

Equipment stockpiles should be located on the basis of a thorough risk assessment, which considers the risk of spills in relation to sensitive resources/priorities for protection, and the feasibility of mounting a response within a reasonable timeframe taking advantage of existing infrastructures. Consideration should be given to the implications of stockpiling equipment under harsh conditions in terms of maintenance needs and

THE INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION LIMITED (ITOPF)

1, Oliver's Yard, 55 City Road, London EC1Y 1HQ, United Kingdom
Tel: +44 (0)20 7566 6999, Fax: +44 (0)20 7566 6950, 24hr Pager: +44 (0)762 398 4606
Email: central@itopf.com Web: www.itopf.com

Registered in England No. 944863. Registered Office as above.



lifespan. The alternative of maintaining stockpiles in less remote areas, with proper infrastructures and development of transport capabilities, should also be considered.

18. What spill response techniques are appropriate and effective for oil spills and HNS incidents in Arctic waters?

ITOPF recommends that oil and HNS should be considered separately when planning response capability and strategy. The health and safety concerns associated with an HNS incidents may preclude any response beyond modelling the fate of a released product, monitoring, and ensuring the safety of other vessels and local populations.

With regard to oil spills, three main approaches can be considered for responding in Arctic waters. These are containment and mechanical recovery, chemical dispersion, and *in situ* burning. Mechanical recovery of oil in the Arctic will need to overcome several physical challenges, including the presence of ice that is likely to prevent the use of booms and rigid sweeping arms, the extreme cold that may hinder the operation of skimmers and pumps, and the increased viscosity of oil under Arctic conditions. However, the action of ice to contain oil and restrict spreading, and the limitation of weathering processes (especially the reduction in emulsification), may aid containment and recovery operations. Specialised Arctic skimmers and 'winterised' pumps and power packs have been developed by internationally-recognised manufacturers that claim to be able to operate efficiently in Arctic conditions. Arctic skimmers are similar to the stiff brush skimmers that are commonly used to recover highly viscous oils at lower latitudes, and are designed to cope with up to approximately 30% ice cover, above which mechanical recovery becomes a less practicable technique. Specialised skimming vessels for oil recovery in ice may incorporate oil and ice separators in order to screen out ice chunks and reduce the volume of water collected.

The logistical challenges of sourcing suitable vessels/equipment and facilities for the storage and disposal of recovered oil mean that techniques that treat spilled oil *in situ* may be preferable. Chemical dispersants are widely used to respond to oil spills at lower latitudes, and specific formulations are being developed that are suited to Arctic conditions. Dispersants consist of a surfactant and a solvent; the solvent delivers the surfactant molecules to the oil-water interface, where they act to reduce the interfacial tension and cause the oil slick to break up into smaller droplets. Provided there is sufficient mixing energy, these become suspended in the water column where they are broken down by naturally occurring micro-organisms; this biodegradation is accelerated thanks to the increased surface area of oil exposed to microbial action with smaller droplets. Although biodegradation is known to be slower under cold climates, if the water is sufficiently deep (e.g. at least 20 m), oil concentrations in the water column rapidly fall to very low levels (parts per billion). The presence of ice and the cold air and water temperatures in the Arctic can act to decrease oil weathering and emulsification, and thereby potentially expand the window of opportunity for dispersant application from a few hours after the spillage (typical of lower latitude response conditions) to days or even weeks. However, the dampening effect that sea ice has on wave action means that it would most likely be necessary to artificially increase mixing energy in the water column for successful dispersion; the Norwegian institute SINTEF has found that agitation using vessel propeller wash can facilitate the action of dispersants. Chemical dispersants will only be effective in removing oil slicks from the sea surface if they

THE INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION LIMITED (ITOPF)

1, Oliver's Yard, 55 City Road, London EC1Y 1HQ, United Kingdom
Tel: +44 (0)20 7566 6999, Fax: +44 (0)20 7566 6950, 24hr Pager: +44 (0)762 398 4606
Email: central@itopf.com Web: www.itopf.com

Registered in England No. 944863. Registered Office as above.



come into contact with the oil; applying dispersants to oil contained in leads in the pack ice for example may be difficult. To this end, SINTEF has developed vessel-mounted manoeuvrable spray arms for targeted application of dispersants to oil within the pack ice. A number of oils such as high pour point crude oils or heavy fuel oil used as ship fuels are known not to be amenable to chemical dispersion in temperate conditions and would therefore be even less so in Arctic conditions. It should be noted that the application of chemical dispersants is not currently pre-approved for Arctic waters; approval would need to be sought from the relevant regulatory authority, and may be difficult to obtain in shallow, nearshore waters or in the vicinity of sensitive benthic resources or fish spawning grounds, for example. Delays in getting approval could lead to the technique becoming ineffective or inefficient.

In situ burning of oil (ISB) was trialled extensively during the response to the Macondo well incident in the Gulf of Mexico (DEEPWATER HORIZON), as it is capable of removing large volumes of oil from the water surface with relatively little effort in terms of manpower or vessels, and only minimal waste generation. ISB requires a minimum slick thickness of 1 mm for freshly spilled crude oil (or 2–5 mm for weathered crude, diesel oils, and heavy fuel oil) in order to support an efficient and sustainable burn; in the Macondo response this was achieved by containment within fire-resistant boom or the use of chemical herders (which act to constrict the spread of a slick). In the Arctic, the action of ice to contain oil may allow efficient burns to be sustained without the need for booms or herders. ISB can also be used to remove oil that has surfaced from under the ice during the spring melt to form pools on top of the ice. Whilst experimental burns have reported oil removal efficiencies of upwards of 90%, a thick and tar-like residue will remain that has the potential to sink as it cools (due to the increased density) and may need to be recovered. The toxicity of such residues on Arctic flora and fauna has not yet been tested, although they are known to have a high PAH (polyaromatic hydrocarbon) content. Another issue with ISB is that it creates a dense smoke plume, which will restrict burns in close proximity to settlements and sensitive coastal resources. In Arctic conditions, or with more heavily weathered or higher viscosity oils, ignition or combustion aids may be required to start and sustain a burn. However, once spilled at sea, a number of oils cannot sustain a combustion efficient enough to allow for a significant removal rate from the water surface and the use of ISB should therefore be avoided. As with chemical dispersion, ISB is not a pre-approved response technique for Arctic oil spills; the highly visible smoke plume generated and concerns over the health and safety of not only responders igniting and monitoring the burns, but also indigenous populations and wildlife in the area mean that in some locations its use might not be recommended or approved. As with dispersants, delays in getting approval could render the use of ISB ineffective or inefficient.

Even under optimal conditions for responding at sea, it is unlikely that more than a small percentage of the oil spilled will be recovered or removed from the sea surface. Depending on the location of the spill and the oceanographic conditions, shoreline impact will often be inevitable. In the Arctic, shoreline clean-up will be extremely challenging from both a logistical and a health and safety perspective. The sensitive shoreline types and seasonal variability in the location and vulnerability of coastal resources will likely necessitate a case-by-case net environmental benefit analysis (NEBA) approach to determine if, when, and how it is best to respond. The aim of shoreline clean-up should always be to promote natural recovery, whilst avoiding secondary damage. The environmental conditions at the time of an incident will dictate the fate of oil on the

THE INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION LIMITED (ITOPF)

1, Oliver's Yard, 55 City Road, London EC1Y 1HQ, United Kingdom
Tel: +44 (0)20 7566 6999, Fax: +44 (0)20 7566 6950, 24hr Pager: +44 (0)762 398 4606
Email: central@itopf.com Web: www.itopf.com

Registered in England No. 944863. Registered Office as above.



shore, and therefore the most appropriate response strategy, affecting oil persistence and also the permeability and the load-bearing capacity of the substrate. For example, oil frozen into coastal sediments may be easier to recover following the spring thaw, when it is more accessible, but in the case of sensitive peat and tundra shorelines clean-up during the frozen winter months could minimise damage to the soft substrate.

19. Should the use of dispersants, in-situ burning and other response techniques be permitted in the Arctic if they yield a net environmental benefit?

Given the logistical difficulties of responding in the Arctic, ITOPF considers it sensible to maximise the toolkit available to responders. Having in place a procedure for approving the use of a particular technique either in advance (subject to certain criteria, e.g. water depth, location, season etc.) or rapidly following an incident will facilitate an effective and timely response.

20. Are the availability, the frequency and the quality of training and exercises in the Arctic adequate? Who should participate in training and exercises?

ITOPF is not aware of the current training and exercising procedures in the Arctic, but notes that multi-agency/multi-lateral exercises are likely to be necessary to build the foundations for an effective response given the logistical difficulties an Arctic incident would pose.

Roles, Responsibilities and Legal Framework

21. Should the regime(s) for Arctic oil spill and HNS incident preparedness and response be structured the same way as the Ship-source Oil Spill Preparedness and Response Regime in place south of 60°?

As mentioned previously, the challenges facing responders within the Arctic can also apply south of 60°, and as such it may not be logical to structure a regime purely based on latitude.

22. What should be the role of private stakeholders (e.g., potential polluters, response contractors) in terms of ship-source oil spill or HNS incident preparedness and response in the Arctic?

ITOPF notes that in order to ensure an adequate response capability in the event of an offshore installation or shipping incident, according to regulatory framework and requirements for each type of operator, the inclusion of private stakeholders is likely to be necessary. In ITOPF's experience, it is relatively common for such private resources to be centrally coordinated to varying degrees under a national agency.

23. What should be the role of the Canadian Coast Guard (CCG) in ship-source oil spills or HNS incidents in the Arctic?

As described above, in ITOPF's experience a national agency such as CCG is commonly responsible for the coordination of private sector resources, and also international assistance, to ensure clear command and control of a response, and to coordinate preparedness (training, exercising etc.).

24. To what extent and how should local communities participate in spill preparedness and response?

Given the remoteness of many potential spill locations in the Arctic, and the time that may be needed to mobilise specialised equipment and trained personnel etc., ITOPF considers it logical for emergency

THE INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION LIMITED (ITOPF)

1, Oliver's Yard, 55 City Road, London EC1Y 1HQ, United Kingdom
Tel: +44 (0)20 7566 6999, Fax: +44 (0)20 7566 6950, 24hr Pager: +44 (0)762 398 4606
Email: central@itopf.com Web: www.itopf.com

Registered in England No. 944863. Registered Office as above.



stockpiles to be staged with local communities and for basic training to be provided to support first response until backup arrives. Local knowledge of sensitive resources, environmental conditions etc. will also be key.

25. Are there roles for other local parties to play in the response to an oil spill or HNS incident in the Arctic?

In any oil or HNS spill response, many stakeholders are likely to be involved; for example, local administrations, indigenous populations, fisheries interests etc. The roles and responsibilities of all involved should be carefully considered and defined at the contingency planning stage, and relationships tested through exercises.

26. Do the *Arctic Waters Pollution Prevention Act, Canada Shipping Act 2001, and Marine Liability Act* provide an effective basis for a ship-source preparedness and response regime in the Arctic? Are there changes required to create a coherent spill preparedness and response regime?

ITOPF recommends that the best assessment of the effectiveness of the existing regime, and the best way to identify changes required, would be to apply the lessons learnt from previous incidents and exercises, regardless of their location (i.e. whether north or south of 60°).

27. How could a spill preparedness and response regime for the Arctic be funded?

Not within ITOPF's remit to comment.

28. How could a regulatory preparedness and response regime for the Arctic be overseen and enforced?

Not within ITOPF's remit to comment.

29. What opportunities exist for bilateral, multilateral, or circumpolar cooperation in the Arctic (e.g., Denmark, Alaska, and Arctic Council)? How should this influence Canada's regime?

In ITOPF's experience, there is always room for international cooperation in an oil spill response. Such cooperation is best initiated and implemented in 'peace-time' however, and requires political willingness. The table below summarises the international agreements relevant to the Arctic of which ITOPF is aware.

Agreement	Signatories
CANDEN Agreement	Canada & Denmark (incl. Greenland)
The Convention on the Protection of the Marine Environment of North-East Atlantic (OSPAR)	Denmark, Finland, Iceland, Norway, Sweden
The Convention on the Protection of the Marine Environment of the Baltic Sea Area (Helsinki Convention)	Denmark, Estonia, Finland, Latvia, Lithuania, Norway, Russia, Sweden
Copenhagen Agreement	Denmark (including Greenland), Finland, Iceland, Norway, Sweden
Agreement Concerning Cooperation on the Combatment of Oil Pollution in the Barents Sea	Norway & Russia
Agreement Concerning Cooperation in Combating Pollution in the Bering and Chukchi Seas	Russia & USA
Joint Marine Pollution Contingency Plan	Canada & USA
Finnish-Estonian agreement on the cooperation in combating against pollution incidents at sea	Finland & Estonia

THE INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION LIMITED (ITOPF)

1, Oliver's Yard, 55 City Road, London EC1Y 1HQ, United Kingdom
Tel: +44 (0)20 7566 6999, Fax: +44 (0)20 7566 6950, 24hr Pager: +44 (0)762 398 4606
Email: central@itopf.com Web: www.itopf.com

Registered in England No. 944863. Registered Office as above.



SWEDENGER Plan	Sweden, Denmark, Germany
Agreement on Cooperation in Combating Pollution of the Baltic Sea in Accidents Involving Oil & Other Harmful Substances	Finland & Russia

30. Are there international best practices (ship-source or other) that should be considered when creating a regime in the Arctic?

ITOPF recommends that the International Convention on Oil Pollution Preparedness, Response and Co-operation (OPRC) should be used as the reference point for international best practice in relation to preparedness and response planning.

Research and Development

31. Are there gaps in knowledge on the behaviour, fate and effects of oils and HNS in icy waters?

ITOPF considers the following areas to represent the major knowledge gaps in relation to the behaviour, fate and effects of oils and HNS in icy waters: fate and trajectory modelling for oil and HNS; behaviour of non-crude oils in Arctic conditions; toxicity of *in situ* burn residues to Arctic resources; behaviour of HNS.

32. Are there gaps in knowledge on response techniques to address these spills in icy waters?

From ITOPF's perspective, knowledge gaps exist in relation to the chemical dispersion and burning of non-crude oils, and the detecting and tracking oil in or under ice/snow.

33. Who should be responsible for funding and conducting this research?

ITOPF understands that a combination of State and private (industry) funding is generally used to conduct such research. In the case of crude oils, exploration and production licensing requirements may include research into the fate and effects of the oils in question. ITOPF is aware of existing laboratories (e.g. SINTEF in Norway) conducting such research. In particular, in recent years the oil and gas industry has funded several research projects through the Arctic Oil Spill Response Technology Joint Industry Programme (<http://www.arcticresponsetechnology.org/>).

THE INTERNATIONAL TANKER OWNERS POLLUTION FEDERATION LIMITED (ITOPF)

1, Oliver's Yard, 55 City Road, London EC1Y 1HQ, United Kingdom
Tel: +44 (0)20 7566 6999, Fax: +44 (0)20 7566 6950, 24hr Pager: +44 (0)762 398 4606
Email: central@itopf.com Web: www.itopf.com

Registered in England No. 944863. Registered Office as above.