Summary: Guide to Oil Spill Response in snow and Ice Conditions in the Arctic

EPPR Emergency Prevention Preparedness and Response
A working group of the Arctic Council

ARCTIC COUNCIL

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INTRODUCTION

The Arctic is a dynamic and changing region. With an environment that is both fragile and resilient, Arctic inhabitants understand that it takes cooperation among circumpolar neighbors to safeguard resources that are key to their culture and way of life. As northern waters become more accessible as a result of a warming climate, offshore oil and gas operations, and shipping may well increase. It is within this context of increasing operational risks that the International Maritime Organization (IMO) and the Arctic Council working group for Emergency, Prevention, Preparedness and Response (EPPR) have joined together to produce the *Guide to Oil Spill Response in Ice and Snow Conditions* (hereafter "the Guide").

Originally a task for the IMO, in May 2013, Norway offered to lead the development of the Guide with support from the IMO, other Arctic states, and interested stakeholders. It was subsequently agreed that EPPR would develop the Guide and – when ready – refer it back to IMO. In October 2013, Arctic Council Senior Arctic Officials approved this approach, noting that it fit well within EPPR's mandate to deal with prevention, preparedness and response to environmental emergencies in the Arctic through projects that develop guidance methodologies.

Under the leadership of Norway and Canada, the consulting firm Owens Coastal Consultations was awarded the contract to compile the Guide. The Guide went through various rounds of consultation with Arctic Council states, New Zealand, the International Tanker Owners' Pollution Federation, the International Association of Oil and Gas Producers and the International Spill Control Organization. While the IMO Guide deals with oil spill response in ice and snow conditions in both the Arctic and Antarctic, it was agreed that an Arctic-specific version of the Guide would be produced for consideration by Arctic Council Ministers in April 2015.

The Guide is a technical document that is meant to identify and describe those aspects of planning and operations that are directly associated with response to an Arctic oil spill in ice and/or snow conditions. It is EPPR's hope that the Guide will be a resource for responders that helps them rapidly select and apply the most effective and environmentally beneficial strategy to ensure the success of any spill response. The work that EPPR has undertaken is closely linked with the need for thorough contingency planning and drills in advance. In this regard, EPPR continues to work in project areas related to oil spill response. Notably, EPPR is responsible for the maintenance of the Operating Guidelines for the *Agreement on Cooperation on Marine Oil Pollution Preparedness and Response*, negotiated under the auspices of the Arctic Council and signed by Ministers in Kiruna in May 2013. The first functional exercise of the Agreement was led by Canada in 2014, and the next exercise is being organized by the United States during their Chairmanship of the Arctic Council, 2015-2017.

The Arctic *Guide to Oil Spill Response in Ice and Snow Conditions* is just one of many important tool available to responders faced with spill response with oil in ice and snow conditions. The full report can be found on the EPPR website at: http://www.arctic-council.org/eppr

EXECUTIVE SUMMARY

The objective of the Arctic version of the Guide is to identify and describe those aspects of planning and operations that are directly associated with a response to an Arctic oil spill in ice and snow conditions. Response strategies to deal with Arctic oil spills in summer open water conditions are not considered in the Guide.

The Guide encompasses a wide range of concepts and information that would be too unwieldy to condense in their entirety in this Executive Summary. Rather, the contents and key points are summarised where they are useful in a box at the beginning of each Part, Chapter and subsection of this Guide.

This Executive Summary is presented in two parts that reflect the very different, but linked, components of 1) Planning and Preparation for an incident, and 2) the Implementation of Response Strategies. These summary points are not presented in an order of importance: in fact, for the most part they are all important, as one component cannot be considered in isolation for planning, preparedness, and implementation.

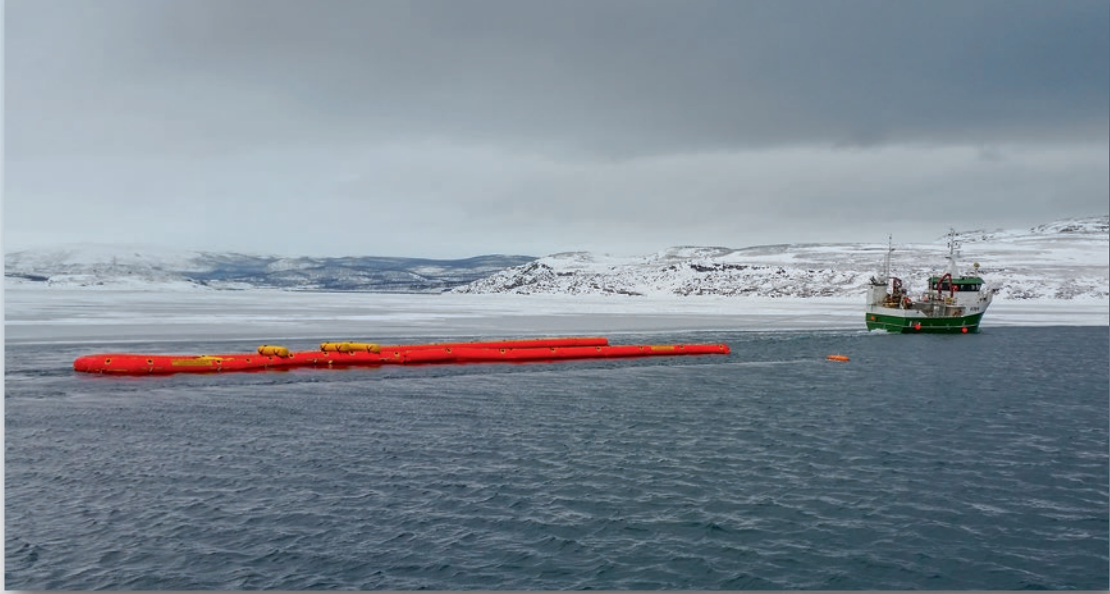
One summary point deserves special attention for remote Arctic areas: the need to have a rigorous, scientifically defensible, streamlined process in place to rapidly assess the environmental trade-offs and process the necessary approvals related to the use of dispersants and *in situ* burning. The goal is to maximise all the available options in an emergency, including mechanical recovery, where they are appropriate and effective.

Giving responders the flexibility to rapidly select and apply the most effective and environmentally beneficial strategy is crucial to ensuring success of any spill response; linked with the need for thorough contingency planning and drills in advance.

Planning and Preparation

1. Oil spill response management, organisation, planning, decision and notification concepts and principles are not uniform worldwide, but frequently follow best practice guidelines

Drilling through ice to detect subsurface oil.



(for example, ITOPF TIP #9). Planning, preparation and training for a response to oil spills in ice and snow typically have different goals and objectives to global recommended best practices depending on (a) the ice regime and ice cycle in a given area, and (b) the extent of supporting infrastructure (IPIECA/OGP 2014).

2. Many Arctic areas have challenging weather conditions and low populations with limited infrastructure.

3. Multiple sources of oil spills in ice-affected areas include marine activities connected with oil and gas exploration and production, cargo vessels, research vessels, cruise ships, drilling operations and pipelines. Although still small in absolute numbers compared with other world trade routes (Suez, Panama, Straits of Malacca, etc.), the gradual increase in vessel traffic along the Northern Sea Route (NSR) and other Arctic areas, gives rise to an associated increase in spill risk. Assuming that the potential for spills from vessel accidents are directly related to traffic intensity, the Baltic Sea stands out with the highest risk of any region covered in this Guide in terms of the numbers of vessels engaged in regular operations in ice.

4. Planning for the credible worst-case discharge is a primary requirement for new drilling applications but the frequency of such events is extremely remote compared to smaller Tier 1 or 2 spills. In 40 years of offshore drilling in Arctic waters, there has not been a Tier 3 incident. Of course, this is no indicator of a future where many more wells could be drilled in these areas, but it does point out that large spills occur infrequently. The probability of an extended loss of control event will continue to decrease with improved drilling technologies developed over the past decade; for example, well capping devices engineered following the Macondo incident in 2010 and enhanced BOPs in combination with devices such as the Alternative Well Kill System (AWKS). Areas in this Guide with the highest current concentration of offshore year-round oil production in ice include: Sakhalin Island, Alaska North Slope, and the Pechora Sea. All of the presently planned oil exploration programmes are designed and permitted for completion during the summer open water period and spills from those activities are unlikely to occur with ice present under normal circumstances.

5. When choosing a response strategy, key factors to be considered include local environmental conditions which, in areas such as the Baltic Sea, may lead to a regionally preferred response option of mechanical recovery rather than alternative response methods.

6. Sea ice structure, morphology and properties span a wide range of conditions, including ice formed in brackish low salinity water ice off major river deltas (e.g., Lena, Colville, Mackenzie), freshwater ice in Arctic rivers, and ice formed from very low salinity waters in the Baltic Sea. Differences in behaviour of oil in ice at different times in the ice cycle and in different areas affect every aspect of response planning and preparation. These include key characteristics such as: ice concentration or coverage, stability, drift rate, roughness, and timing of the spill relative to freeze-up or break-up. Planning response

Stena Drillmax Ice, an example of a modern Arctic, ice class drillship.

objectives, strategies, and tactics must reflect the timing of a response within the regional and local seasonal ice/snow cycle.

7. Ice often extends the time available to plan and execute an offshore response by containing, concentrating, and trapping the oil for long periods in a close to fresh state. At the same time, low temperatures, snow cover, and increased oil thickness can reduce the rate of evaporation and lead to longer persistence. While ice in sufficient concentrations may reduce the oil spreading and weathering rate, it will also greatly complicate the detection and mechanical recovery of spilled oil. Intermediate pack ice concentrations often referred "broken ice" may prove particularly challenging.

8. Landfast ice in many areas can act as an impenetrable barrier and protect the shoreline from direct oiling following an offshore spill for much of the year.

Burning crude oil spilled into a field of small ice cakes collected in a fire-resistant boom – Norway 2009.

9. In terms of fate and behaviour, spills in ice are fundamentally different from spills in open water. Understanding this difference is critical for detection, trajectory analyses and strategic planning. Response techniques that work in open water and temperate regions may be ineffective or provide much reduced effectiveness in cold, snow, and ice.

10. The sensitivity and vulnerability of potential resources at risk vary significantly in time and space in areas with seasonal ice cover and snow. Many Arctic species are highly mobile or only present during the spring, summer, and fall: such as migratory waterfowl, bowhead and beluga whales. Fewer resources may be at risk when ice and snow are present through the winter.

11. The coastal environment is the breeding and nursery ground for many species upon which subsistence coastal inhabitants depend. From a human perspective, this coastal/nearshore zone is generally the most sensitive and vulnerable environment in the Arctic. Two primary objectives of regional and local response strategies are to prevent oil from reaching the coast and to protect those resources at risk. Responders should be aware that pelagic ecosystems and resources are critical in the Arctic and that response priorities and objectives should be developed using up- to-date "resource at risk" information, and in consultation with local experts.

12. Some shore processes and shore types are unique to the presence of ice and snow. Seasonal or year-round shore ice can be a dynamic process or a stable feature and the presence of ice and snow can completely alter the shore zone character.

Response and implementation

1. Although, in theory, there are several strategic tools in the responder toolkit, using these effectively in a real incident could be

extremely challenging depending on many factors, such as: coping with the dynamic nature and unpredictability of ice; the remoteness and great distances that are often involved in responding in areas like the Arctic; the impacts of cold temperatures, ice and a harsh operating environment on response personnel and equipment; and the frequent lack of shore-side infrastructure and communications to support and sustain a major response effort.

2. Any significant ice concentrations can severely limit the effectiveness of mechanical containment and recovery in dealing with large spills. At the same time, the presence of ice can potentially increase the window of opportunity for successful burning and/or dispersant applications (that period when the oil remains unemulsified, thick and relatively fresh).

3. The availability of a scientifically defensible, streamlined process to rapidly assess the environmental trade-offs and process the necessary approvals related to the use of dispersants and *in situ* burning can provide the key to response success, especially in remote areas such as the Arctic. Maximizing the utilization of potentially limited operational windows, when the oil is still in a form amenable to recovery or removal, is an important objective of strategic and contingency planning.

4. Detection of oil in ice and under snow is challenging and may require a mix of sensors and platforms including satellite, airborne, surface and subsea.

5. Logistics limitations and sparse infrastructure in many remote areas with ice may favour response strategies built around air support.

6. Operational and safety challenges posed by long periods of darkness and extreme temperatures, that are typical in marine and coastal environments with ice and snow, require a continuous process of risk assessment: safety of personnel is always paramount.

7. The selection of response strategies should be based on scientific principles embodied within the process of Net Environmental Benefit Analysis (NEBA): including the option of natural recovery. Responders also should be mindful that spills and response strategies can have significant effects on local and indigenous communities and subsistence users and that these concerns need to be considered in parallel with the NEBA.

8. Decisions on strategies for remote area oiled shoreline operations should focus on the use of *in situ* treatment options to minimise manpower requirements and waste generation.

9. Shoreline processes and shoreline character change with the seasons so that different strategies and tactics are necessary at times and in places where ice and/or snow are present.

10. The application of proven response decision-making through some form of Unified Command and spill management structure is no different for a spill in ice than in more temperate waters: the fundamental precepts and priorities remain the same. Subsistence issues may have a higher priority than in temperate zones.

Low-level aerial view in June 1980 showing oil on surface melt pools after migrating from trapped oil layers within the ice after a series of under-ice simulated blowouts during the winter of 1979-80, McKinley Bay in the Canadian Beaufort Sea (note people on the ice for scale).

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