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House of Commons  
Ottawa, Ontario  
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Indian Affairs & Northern Development  
House of Commons  
Ottawa, Ontario  
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Dear Ministers:

On behalf of the Environmental Studies Research Funds Management Board, it is my pleasure to submit the 2001 Annual Report for the Environmental Studies Research Funds in accordance with the *Canada Petroleum Resources Act*, paragraph 79(1)d.

Sincerely yours,

Bonnie J. Gray  
Chair  
Environmental Studies Research Funds  
Management Board

**ENVIRONMENTAL STUDIES RESEARCH FUNDS**

**ANNUAL REPORT**

**2001**

**FEBRUARY 2002**

## **Environmental Studies Research Funds Profile**

The Environmental Studies Research Funds (ESRF) is a research program that sponsors environmental and social studies designed to assist government decision-making related to oil and gas exploration and development on Canada's frontier lands. The ESRF program, which was initiated in 1983 under the *Canada Oil and Gas Act* (COGA), now receives its legislated mandate through the superseding legislation, the *Canada Petroleum Resources Act* (CPRA) proclaimed in February 1987. Funding for the ESRF is provided by industry through levies on exploration and production properties on frontier lands. The ESRF is directed by a joint government / industry / public Management Board and is administered by a secretariat through which resides within the Operations Business Unit of the National Energy Board office in Calgary, Alberta.

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## **Background on the Structure and Operation of the Funds**

The Environmental Studies Research Funds (ESRF) finance environmental and social studies pertaining to the manner in which, and the terms and conditions under which, petroleum exploration, development and production activities on frontier lands should be conducted. Section 101(1) of the *Canada Petroleum Resources Act (CPRA)* defines an environmental study as Awork pertaining to the measurement or statistical evaluation of the physical, chemical, and biological elements of the lands, oceans, or coastal zones, including winds, waves, tides, currents, precipitation, ice cover and movement, icebergs, pollution effects, flora and fauna, both onshore and offshore, human activity and habitation, and any related matter@.

The Environmental Studies Research Funds (ESRF) are directed by a twelve-member Management Board which has representation from the federal government, the regional petroleum boards, the oil and gas industry, and the general public. Bonnie J. Gray, Professional Leader, Environment of the National Energy Board, is the current chairperson of the ESRF Management Board.

The ESRF Management Board directs the conduct of the business of the ESRF, sets priorities for study topics, determines the program budget, and facilitates the development of study proposals on behalf of the Minister of Natural Resources Canada and the Minister of Indian Affairs and Northern Development.

The program operates on a calendar year basis. The Board generally meets on a quarterly basis; however, the frequency of meetings is adjusted as circumstances dictate. The Board assesses the information requirements of government and industry to determine priorities for the study program for the coming year. The budget to support the study program and its administration forms the basis for the calculation of the levy rate schedule. The budget and levy rates are submitted to the Ministers for approval by November 1 of each year. The projects under the study program are initiated following the collection of the levies which generally occurs in the first quarter of the calendar year.

### **Activities in 2001**

The ESRF undertook an ambitious program of activity for 2001. The ESRF Management Board met six6 times during the year. Eight new studies were approved for 2001 with a total value of \$875,885. The 2001 ESRF operations budget of \$52,400 supported the management of the ongoing study program and provided administrative support to the ESRF Management Board.

Funding for the 2001 studies and administration program was raised by means of Levy #13 (see Refer to Table 1). Levy #13 raised in total \$1,087,147 which covered the new study program, the administration budget, and the continued funding of ongoing studies.

Upon issue of levy invoices, the interest holders have 30 days to either pay the levy or release the land holding license to which the levy is assigned.

**TABLE 1**  
**ESRF LEVY #13**

REGION	LEVY #13 \$/hect 2001	TOTAL LEVIES INVOICED 2001	TOTAL LEVIES COLLECTED 2001	BACK LEVIES COLLECTED 2001	TOTAL REVENUES COLLECTED 2001
1 Queen Charlottes North	0.0000				
2 Hecate Strait	0.0000				
3 Queen Charlottes South	0.0000				
4 Vancouver Island	0.0000				
5 Labrador North	0.0000				
6 Labrador Central	0.0000				
7 Labrador South	0.0000				
8 Northeast Newfoundland	0.1890	\$13,076.22	\$13,076.22		\$13,076.22
9 Newfoundland Slope	0.0501	\$42,800.43	\$42,800.43		\$42,800.43
10 Grand Banks North	0.1958	\$191,101.95	\$159,980.19	\$17,170.81	\$171,151.00
11 Grand Banks South	0.1085	\$342,174.90	\$21,298.93	\$179,472.09	\$200,771.02
12 Scotian Shelf East	0.0878	\$169,462.47	\$116,995.38		\$116,995.38
13 Scotian Shelf West	0.0878	\$50,525.37	\$50,525.37		\$50,525.37
14 Scotian Shelf	0.0596	\$404,849.43	\$258,296.46	\$146,552.97	\$404,849.43
15 Gulf of St. Lawrence	0.0202	\$75,925.32	\$54,375.89	\$3,780.98	\$58,156.87
16 Hudson Bay	0.0000				
17 Beaufort South	0.1207	\$77,080.28	\$77,080.28		\$77,080.28
18 Beaufort North	0.0871	\$2,619.95	\$2,619.95		\$2,619.95
19 Western Archipelago-Offshore	0.0789	\$588.98	\$588.98		\$588.98
20 Central Archipelago-Offshore	0.0789	\$18,994.46	\$18,994.46		\$18,994.46
21 Eastern Archipelago-Offshore	0.0000				
22 Baffin Bay	0.0000				
23 Yukon North	0.0000				
24 Yukon South	0.0000				
25 Mackenzie Delta	0.0849	\$71,946.48	\$53,770.41		\$53,770.41
26 Mackenzie North	0.0850	\$63,350.59	\$53,542.10		\$53,542.10
27 Mackenzie Central	0.0867	\$83,587.37	\$47,214.04		\$47,214.04
28 Mackenzie South	0.0789	\$22,151.84	\$17,728.87		\$17,728.87
29 Western Archipelago-Onshore	0.0788	\$125.74	\$125.74		\$125.74
30 Central Archipelago-Onshore	0.0789	\$3,762.97	\$3,762.97		\$3,762.97
31 Eastern Archipelago-Onshore	0.0000				
<b>TOTAL</b>		<b>\$1,287,147.90</b>	<b>\$992,776.67</b>	<b>\$346,976.85</b>	<b>\$1,339,753.52</b>

## **2001 Study Program**

The 2001 study program comprised four continuing studies and eight new studies. The following are brief descriptions of the projects' objectives:

### Effects of Seismic Exploration on the East Coast Fishery

This is a one-year study valued at \$267,500.00

ESRF report #139, *Proceedings of a Workshop to Develop Methodologies for Conducting Research on the Effects of Seismic Exploration on the Canadian East Coast Fishery, Halifax, Nova Scotia, 7-8 September 2000* was published in April 2001. As a result of this workshop, the ESRF Management Board issued a request for proposal and subsequently awarded a contract to determine whether commercial-sized snow crab can detect seismic sounds and whether or not there are any discernible changes in their behaviour or physiology. Phase II of this contract will be to take the lessons learned from the experimental phase to design and conduct a field study to determine the effects of seismic pulses on the snow crab fishery.

### Update the CSA Offshore Structure Standards

This is the second year of a three year study with a total value of \$200,000.00.

The ESRF Management Board has entered into an agreement with Canadian Standards Association to assist with the updating of the CSA Offshore Structure Standards. The global nature of the offshore structures industry requires the CSA Offshore Structures Standards to harmonize with those of ISO for the benefit of Canadian industry, and to ensure the ISO Standards account for the challenging environment conditions offshore Canada. These standards were originally written by several CSA Technical Committees and verified by several ESRF sponsored projects. This study has two main components:

*Phase 1:* Review and update the CSA Offshore Structures Standards, including the associated commentaries and supplements.

*Phase 2:* Harmonize all the CSA Offshore Structures Standards with those of ISO

The new editions of the CSA Offshore Structures Standards will be published in 2002.

### Identification of Ecologically and Commercially Important Areas in the Southern Gulf of St. Lawrence

This is a one-year study valued at \$50,000.00.

Jacques Whitford Environment Limited has completed the identification and mapping of the location and critical timing of ecologically important areas such as spawning grounds, feeding areas, migration routes, larval retention areas, nursery areas and other concentrations of fish, invertebrates, marine mammals and seabirds; identifying the location of coastal parks and conservation areas (i.e. migratory bird sanctuaries), sites of cultural or aboriginal significance and

important areas for tourism/ecotourism; identifying the location, timing and gear types for southern Gulf fisheries (both current and for 1985 as a pre-moratorium period for species which may recover in future to commercial levels); identifying the location of important coastal areas such as aquaculture sites, beaches, marine plant harvesting areas and important shoreline characteristics; and compiling the results into a series of digital maps on appropriate hydrographic charts (or topographic maps) with accompanying brief written descriptions of each area in ESRF Report # 140, *Atlas of Ecologically and Commercially Important Areas in the Southern Gulf of St. Lawrence*. This report is available on the ESRF website and in cd-rom format.

Abstracting of Existing Studies and Reports Related to the Oil & Gas Development in the North.  
This is a one-year study valued at \$100,000.00

The ESRF Management Board has approved funding to the Arctic Institute of North America to further their ongoing project of abstracting existing studies and reports related to the Oil and Gas Development in the North. The completion of these abstracts will provide a starting point for the ESRF Management Board's approved 2001 project - Gap Analysis in the North. As of December 2001, a total of 585 reports have been completed and added to the ASTIS data base.

Airshed Monitoring on Sable Island  
This is a one-year study valued at \$100,000.00.

At the December 2000 meeting of the Waste Treatment Guidelines Group general consensus was reached that there is interest in reporting emissions released to air from offshore oil and gas activity. As part of emissions to air the "Contaminants of Concern" will include oxides of nitrogen, volatile organic compounds, methane and oxides of Sulphur. Industry is also interested in sampling fine particulate matter. Airshed monitoring on Sable Island will sample the above pollutants. The monitoring will be valuable for validation of pollutant models, end point impact, pollutant concentration trends and exposures. The ESRF Management Board assisted Environment Canada Atlantic Region with equipment acquisition and the set up & calibration of this equipment on Sable Island. The information obtained will be used to better inform scientists who could present and interpret this information objectively in various forms.

Field Verification of Benthic Boundary Layer Modelling Effects  
This is the first year of a two year study with a total value of \$120,000.00.

The ESRF Management Board has provided funding to the Department of Fisheries and Oceans to support this study. The fate and environmental impacts of discharged drilling muds are ongoing issues to operators, regulators, government agencies and environmentalists, particularly with multiple development sites in proximity to each other. Sound scientific assessments of the fate and impacts for different mud/discharge scenarios can provide a basis for cost-effective strategies that minimize both real and perceived adverse impacts. Validated or calibrated dispersion models can be an effective tool in a generic assessment approach as is presently being developed by C-NSOPB, and in waste management planning.

### Deep Water Benthic Community Study

This is the first year of a two year study with a total value of \$285,000.00.

The ESRF Management Board has provided funding to the Department of Fisheries and Oceans to support this study. The study will: 1) Analyse and interpret **existing** data collected by DFO during groundfish trawl surveys and using video and photographic equipment on research cruises, as well as similar data that are available from other sources; and 2) Collect **new** data using video and photographic equipment at deepwater sites along the continental slope and in canyons of prime interest to the oil and gas industry.

### Documentation of Iceberg Scouring and Degradation Processes Based on Recent Grounding Events

This is the first year of a two year study with a total value of \$200,000.00.

The ESRF Management Board has provided funding to Geological Survey of Canada, Atlantic Region for this study. The objectives for this study are:

- \$ To conduct seabed survey programs to document seabed impact features produced by icebergs reported to have grounded on northeastern Grand Banks in 2000 including but not limited to scour type, morphology, depth, effects of sediment and seabed relief variations, and sediment texture and strength.
- \$ To develop case studies of the grounding events to refine our understanding of ice scouring processes and to constrain existing (C-CORE) and proposed (NRC) scour force models.
- \$ To collect base line data to allow subsequent monitoring of the processes and rates of biological re-colonization and scour degradation (biological, mechanical).

Knowing how icebergs scour and damage the seabed is of critical importance for design engineers who must develop safe and cost-effective sub-sea facilities. Understanding scouring processes and calculating loads imposed on the seabed would be significantly improved by identifying grounded icebergs and conducting follow-up seabed mapping surveys.

### Mesocosm and Laboratory Study of Effects of Drill Cuttings

This is the first year of a two year study with a total value of \$155,000.00.

The ESRF Management Board has provided funding to the Department of Fisheries and Oceans to support this study. Modelling studies in association with oil development applications provide a level of predictive information on cutting dispersion and thickness, but the key questions requiring a level of predictability in relation to cumulative effects are biological in nature and include the following: What level of cutting thickness produces significant impacts on sediment habitat? How much of the impact is simply physical as opposed to chemical? What are projected recovery rates in relation to cutting thickness? Will major impact zones be mostly physical (smothering and anaerobiosis) and restricted to a maximum of a km or so of rig sites or will some oil fields have potential for overlap and cumulative effects through a combination of physical and chemical factors.

Research Gaps: Natural Gas Exploration and Development in the Canadian Mackenzie Delta

This is a one-year study valued at \$98,700.00.

The ESRF Management Board awarded a contract for this study in 2001. There are three primary objectives for this work:

- \$ document past and ongoing research in relation to the potential environmental impacts of natural gas exploration, development and gathering systems in the Canadian Mackenzie Delta and near-shore Beaufort Sea.
- \$ review the current state of this knowledge in part by organizing, facilitating and reporting on a workshop of key stakeholders which includes the expert researchers, scientists and decision- makers involved in northern natural gas development in the above geographic region.
- \$ analyse the existing database and the results of the workshop, and provide a report which includes a summary of the information gaps and potential priority areas for further research to facilitate the comprehensive assessment of natural gas exploration, development and gathering systems in the Canadian Mackenzie Delta and near-shore Beaufort Sea.

Marine Bird and Mammal Monitoring Study

This is a one-year study valued at \$60,000.00.

The ESRF Management Board awarded a contract to Memorial University of Newfoundland for this study area. Seabirds are the most visible and most easily surveyed animals in marine ecosystems. They are also the most vulnerable marine animals to oil pollution at sea and once oiled are the most detectable animal indicators of marine pollution events. The study will monitor regional aggregations and distributions of marine birds on the northern Grand Bank. A major objective is to identify gaps in knowledge about marine birds and mammals that will be of benefit to oil spill response and sensitivity mapping.

The principal objective of the project is to carry out an effective and comprehensive program of year-round surveys for marine birds and mammals on the Grand Banks using offshore supply vessels of opportunity.

Oil Pollution Seabird Mortality Assessment on the Sable Island Bank with Applications on the Grand Banks

This is a one-year study valued at \$60,000.00.

The study will be undertaken to determine if regular beached bird surveys conducted on Sable Island can effectively monitor mortality of seabirds due to oil releases from oil rigs, through the use of specially calibrated drift blocks released from rigs at the Sable Island Bank. Further drift block releases will be made from rigs on the Grand Banks and along the Newfoundland shore at several times of year. Regular beach surveys on Sable Island will be conducted (Environment Canada will carry out regular beached bird surveys on the Avalon Peninsula and the Government of France will participate with parallel surveys on St.Pierre and Miquelon). In addition, beached birds and tar balls will be recorded and collected using standardized techniques, and the oil

analyzed to determine its source. Finally, using drift trajectories of the released blocks, a seabird carcass drift trajectory model as well as a mortality assessment model will be created, and tested on the Scotian Shelf and Grand Banks.

**Financial Statement**

<b>ESRF Regions South (NRCan) 1-16 North (IAND) 17-31</b>	<b>Revenue Forwarded Jan 1, '01</b>	<b>Administrative Expenditures 2001</b>	<b>Study Payments 2001</b>	<b>Levy Revenues &amp; Adjustments</b>	<b>Outstanding Study Commitments</b>	<b>Uncommitted Funds as of Dec 31, '01</b>
South	\$781,712.42	\$ 31,440.00	\$660,662.10	\$1,604,325.82	\$586,548.81	\$1,107,387.33
North	\$ 51,964.69	\$ 20,960.00	\$ 58,309.00	\$ 275,427.80	\$204,518.09	\$ 43,605.40
Total	\$833,677.11	\$ 52,400.00	\$718,971.10	\$1,339,753.62	\$891,066.92	\$1,150,992.73

**Plans for 2002**

In October 2001, ESRF Management Board established the content and budget for the 2002 program. This program was recommended by the Management Board and has been approved by the Minister of Natural Resources Canada and the Minister of Indian Affairs and Northern Development. The program has an estimated value of \$1.5 million which includes continuing funding for the CSA Offshore Standards, Deepwater Benthic Communities, Field Verification of Benthic Boundary Layer Modeling Effects, Documentation of Iceberg Scouring and Degradation Processes Based on Recent Grounding Events, Mesocosm and Laboratory Study of Effects of Drill Cuttings, Marine Bird and Marine Mammal Monitoring, and Oil Pollution Seabird Mortality Assessment on the Sable Island Bank with Applications on the Grand Banks.

Work in the following study areas will be initiated in 2002 pending the collection of Levy #14: Northern Gap Analysis Follow- On Study, Waste Discharges, Spawning Map Follow On Study, Heritage Resources, Cumulative Effects, Catchability (fish) and Hearing Structures - Fish.

A budget of \$140,00 was approved for 2001 to cover the administrative costs of the ESRF Secretariat and to support travel by some members of the Management Board.

In 2001, a number of appointments to the Management Board were renewed and new appointments were made to fill vacancies created by resignations and retirements.

## **Publication of Reports**

All ESRF studies are subject to a scientific/technical peer review. Reports that are deemed to be scientifically or technically significant are published in the ESRF Technical Report Series. Reports are distributed to oil and gas companies, universities, federal, provincial and territorial government libraries, and research institutes. The series is documented on several international databases including the Canadian Institute for Scientific and Technical Information (CISTI).

In addition to the technical report series, the ESRF publishes a newsletter, UPDATE, that contains information on the status of the program. This includes notification of requests for proposals for studies, and brief descriptions of study results. UPDATE is circulated to a broad audience of about 1400 across Canada and selected international institutes. Should you wish to have your name or organization added to the general distribution list, please contact the ESRF Secretariat (below).

## **List of ESRF Reports**

Since its inception in 1983, the ESRF has published 140 reports which are distributed free of charge. The latest reports have been posted on the ESRF website. You may obtain copies of reports by visiting the website at [www.esrfunds.org](http://www.esrfunds.org) or contacting: contacting:

**ESRF Secretariat**  
**National Energy Board**  
**444 - 7th Avenue S.W.**  
**Calgary, Alberta**  
**T2P 0X8**  
**Telephone: (403) 292-4800**  
**Facsimile : (403) 292-5503**

## **SEDIMENT TRANSPORT**

017 Keith Philpott Consulting Ltd. with Acres Consulting Services Ltd. **Scour Around Seafloor Structures.** April 1986. 225 p.

027 Hodgins, D.O., D.A. Huntley, W.D. Liam Finn, B. Long, G. Drapeau and A.J. Bowen. **Sediment Transport - Present Knowledge and Industry Needs.** April 1986. 394 p.

029 Plasse, D. **Surficial Geology Surveys on the Scotian Shelf: Compilation of Maps from Government, Industry, University & Foreign Sources.** April 1986. 47 p.

041 Hodgins, D.O., G. Drapeau and L.H. King. **Field Measurements of Sediment Transport on the Scotian Shelf - Volume I. The Radio-isotope Experiment.** June 1986. 160 p.  
Hodgins, D.O. and O.J. Sayao - **Volume II. Boundary Layer Measurement and Sand Transport Prediction.** August 1986. 222 p.

054 Hodgins, D.O., O.J. Sayao, E.D. Kinsella and P.W. Morgan. **Nearshore Sediment Dynamics -Beaufort Sea.** December 1986. 195 p.

061 Judge, J.T., R.K. Watanabe and J.L. Warner. **Seafloor Stability Study, Inner Scotian Shelf.** May 1987. 88 p.

096 Gillie, R.D. **Beaufort Sea Artificial Island Erosion Data.** May 1988. 119 p.

## **ENVIRONMENTAL EFFECTS AND MONITORING**

001 McLaren, P.L. and R.A. Davis. **Distribution of Bowhead Whales in the Beaufort Sea.** Summer 1983. February 1985. 62 p.

005 Thomas, D.J., W.S. Duval, C.S. Johnston, G.S. Lewbel, A. Birdsall, M.S. Hutcheson, G.D. Greene, R.A. Buchanan and J.W. MacDonald. **Effects Monitoring Strategies and Program for Canada's East Coast.** May 1985. 88 p.

009 Harwood, L.A. and A. Borstad. **Bowhead Whale Monitoring Study in the Southeast Beaufort Sea.** July-September 1984. August 1985. 99 p.

021 Tidmarsh, W.G., R. Ernst, R. Ackman and T. Farquharson. **Tainting of Fishery Resources.** January 1986. 174 p.

025 Kingsley, M.C.S. **Distribution and Abundance of Seals in the Beaufort Sea, Amundsen Gulf & Prince Albert Sound.** 1984. February 1986. 16 p.

028 Thomson, D.H., D.B. Fissel, J.R. Marko, R.A. Davis and G.A. Borstad. **Distribution of Bowhead Whales in Relation to Hydrometeorological Events in the Beaufort Sea.** March 1986. 119 p.

036 Norton, P. and L.A. Harwood. **Distribution, Abundance and Behavior of White Whales in the Mackenzie Estuary.** June 1986. 73 p.

057 Duval, W.S. (ed.) **Distribution, Abundance and Age Segregation of Bowhead Whales Relative to Industry Activities and Oceanographic Features in the Beaufort Sea, August-September 1985.** March 1987. 117 p.

060 Yunker, M.B. and R.W. Drinnan. **Dispersion and Fate of Oil from Oil-based Drilling Muds near Sable Island, N.S.** January 1987. 169 p.

063 Drinnan, R.W., M. Yunker, A. Gillam, N. Charchuk and S.R.H. Davis. **Options for Treatment and Disposal of Oil-based Mud Cuttings in the Canadian Arctic.** February 1987. 167 p.

066 Nenninger, R.D. **Monitoring a Sump Containing Drilling Mud with High Salt Content.** March 1987. 47 p.

- 075 Cross, W.E. and B. Humphrey. **Monitoring the Long-Term Fate and Effects of Spilled Oil in an Arctic Marine Subtidal Environment.** August 1987. 120 p.
- 080 Ernst, R.J., W.M.N. Ratnayake, T.E. Farquharson, R.G. Ackman and W.G. Tidmarsh. **Tainting of Finfish by Petroleum Hydrocarbons.** September 1987. 150 p.
- 089 Ford, J.K.B., J.C. Cabbage and P. Norton. **Distribution, Abundance, and Age Segregation of Bowhead Whales in the Southeast Beaufort Sea, August-September, 1986.** November 1987. 53 p.
- 090 Wainwright, P.F. and B. Humphrey. **Analysis of Sediment Data from the Beaufort Shorebase Monitoring Program, 1982-1984.** March 1988. 78 p.
- 093 Hardy BBT Limited and Stanley Associates Engineering Ltd. **Handling and Disposal of Waste Drilling Fluids from On-Land Sumps in the Northwest Territories and Yukon.** February 1988. 58 p.
- 101 Erickson, P., B. Fowler, and D. Thomas. **Oil-based Drilling Muds: Off Structure Monitoring-Beaufort Sea.** June 1988. 188 p.
- 102 Nakashima, D.J. and D.J. Murray. **The Common Eider of Eastern Hudson Bay: A Survey of Nest Colonies and Inuit Ecological Knowledge.** November 1988. 174 p.
- 109 Lawrence, M.J. (ed.) and S.L. Davies (ed.) **Wildlife and Wildlife Habitat Restoration and Compensation in the Event of an Oil Spill in the Beaufort Sea.** March 1993. 88 p.
- 110 Hurlbut, S.E., D.P. French and B.J. Taylor. **Evaluation of the Potential Effects of Major Oil Spills on Grand Banks Commercial Fish Species as a Result of Impacts on Eggs and Larvae.** January 1991. 53 p.
- 117 Sekerak, A.D., N. Stallard and W.B. Griffiths. **Distribution of Fish and Fish Harvests in the Nearshore Beaufort Sea and Mackenzie Delta During Ice Covered Periods, October-June.** November 1992. 157 p.
- 118 Thomas, D.J. **Considerations in the Design of Effects Monitoring Strategies: Beaufort Sea Case Study.** January 1992. 54 p.
- 121 S.L. Ross Environmental Research Limited and Ledrew, Fudge and Associates. **The Risk of Tainting Flatfish Stocks During Offshore Oil Spills.** January 1993. 67 p.
- 122 Mackinnon, D.S. and P.A. Lane. **Saltmarsh Revisited - The Long-Term Effects of Oil and Dispersant on Saltmarsh Vegetation.** September 1993. 24 p.

- 123 Duval, W.S. **Proceedings of a Workshop on Beaufort Sea Beluga February 3-6, 1992, Vancouver, B.C.** March 1993. 26 p.
- 134 Richard, P.R., A.R. Martin and J.R. Orr. **Study of Summer and Fall Movements and Dive Behaviour of Beaufort Sea Belugas, Using Satellite Telemetry.** 1992-1995. 34 p.
- 137 Hatch Associates Limited and Griffiths Muecke Associates. **Workshop on Cumulative Environmental Effects Assessment and Monitoring on the Grand Banks and Scotia Shelf.** 2000. 61 p.
- 138 W.A. Montevecchi, F.K. Wiese, G. Davoren, A.W. Diamond, F. Huettmann, J. Linke **Seabird Attraction to Offshore Platforms and Seabird Monitoring from Offshore Support Vessels and other Ships Literature Review and Monitoring Design.** 1999. 56 p.
- 139 Denis H. Thomson, Jack W. Lawson and Anne Muecke: **Proceedings of a Workshop to Develop Methodologies for Conducting Research on the Effects of Seismic Exploration on the Canadian East Coast Fishery, Halifax, Nova Scotia, 7-8 September 2000.** April 2001. 92 p.

#### **OIL SPILL RESEARCH AND COUNTERMEASURES**

- 006 Belore, R.C. **Effectiveness of the Repeat Application of Chemical Dispersants on Oil.** June 1985. 66 p.
- 012 Harper, J.R. and E.H. Owens. **Shoreline Monitoring Programs for Oil Spills-of-Opportunity.** September 1985. 50 p.
- 013 Abdelnour, R., T. Johnstone, D. Howard and V. Nisbett. **Laboratory Testing of an Oil-Skimming Bow in Broken Ice.** January 1986. 60 p.
- 018 S.L. Ross Environmental Research Ltd. **Testing of an Oil Recovery Concept for Use in Brash and Mulched Ice.** January 1986. 43 p.
- 019 Witherspoon, P., J. Swiss, R. Kowalchuk and J. Armstrong. **Oil in Ice Computer Model.** December 1985. 129 p.
- 031 Harper, J.R. and B. Humphrey. **Stranded Oil in Coastal Sediments: Permeation in Tidal Flats.** April 1986. 23 p.
- 033 Harper, J.R. **Practical Insights into Decision-making for Shoreline Cleanup of Oilspills.** May 1986. 44 p.
- 034 Belore, R.C. **Development of a High Pressure Water Mixing Concept for Use with Ship-based Dispersant Application.** May 1986. 51 p.

- 051 S.L. Ross Environmental Research Ltd. and Energetex Engineering. **Decision-making Aids for Igniting or Extinguishing Well Blowouts to Minimize Environmental Impacts.** November 1986. 119 p.
- 053 MacNeill, M.R. and R.H. Goodman. **Oil Motion During Lead Closure.** January 1987. 13 p.
- 058 S.L. Ross Environmental Research Ltd. and Hatfield Consultants Ltd. **Countermeasures for Dealing with Spills of Viscous, Waxy Crude Oils.** October 1986. 59 p.
- 062 S.L. Ross Environmental Research Ltd. and D.F. Dickins Associates Limited. **Field Research Spills to Investigate the Physical and Chemical State of Oil in Pack Ice.** February 1987. 116 p.
- 064 Brown, H.M. and R.H. Goodman. **In Situ Burning of Oil in Ice Infested Waters.** February 1987. 27 p.
- 068 Belore, R.C. **Mid-Scale Testing of Dispersant Effectiveness.** April 1987. 82 p.
- 069 Hatfield Consultants Ltd. **Spills-of-Opportunity Research.** February 1987. 124 p.
- 070 Lane, P., M.J. Crowell, D.G. Patriquin and I. Buist. **The Use of Chemical Dispersants in Salt Marshes.** May 1987. 100 p.
- 072 Nawwar, A., A. Godon, H.W. Jones, E. Yeatman, J. Ohuja, M.B. Frish and I. Arvin. **Acoustical Methods for Measuring Thickness of Oil on Water.** April 1987. 57 p.
- 074 Bennett, J., I.R. McAllister, L. Pertile and D. McQuillan. **Removal of Stranded Oil from Remote Beaches by In-Situ Combustion.** March 1987. 122 p.
- 077 Comfort, G. **Analytical Modelling of Oil and Gas Spreading Under Ice.** August 1987. 57 p.
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