



Canada's Marine Spill Preparedness and Response Regime

...the HNS outlook!

Presented by

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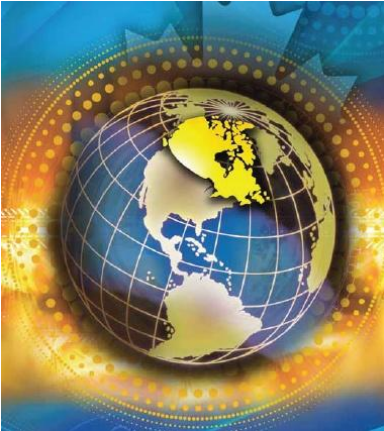




OBJECTIVES

Inform participants about the development of a Canadian marine preparedness and response program for hazardous and noxious substances.

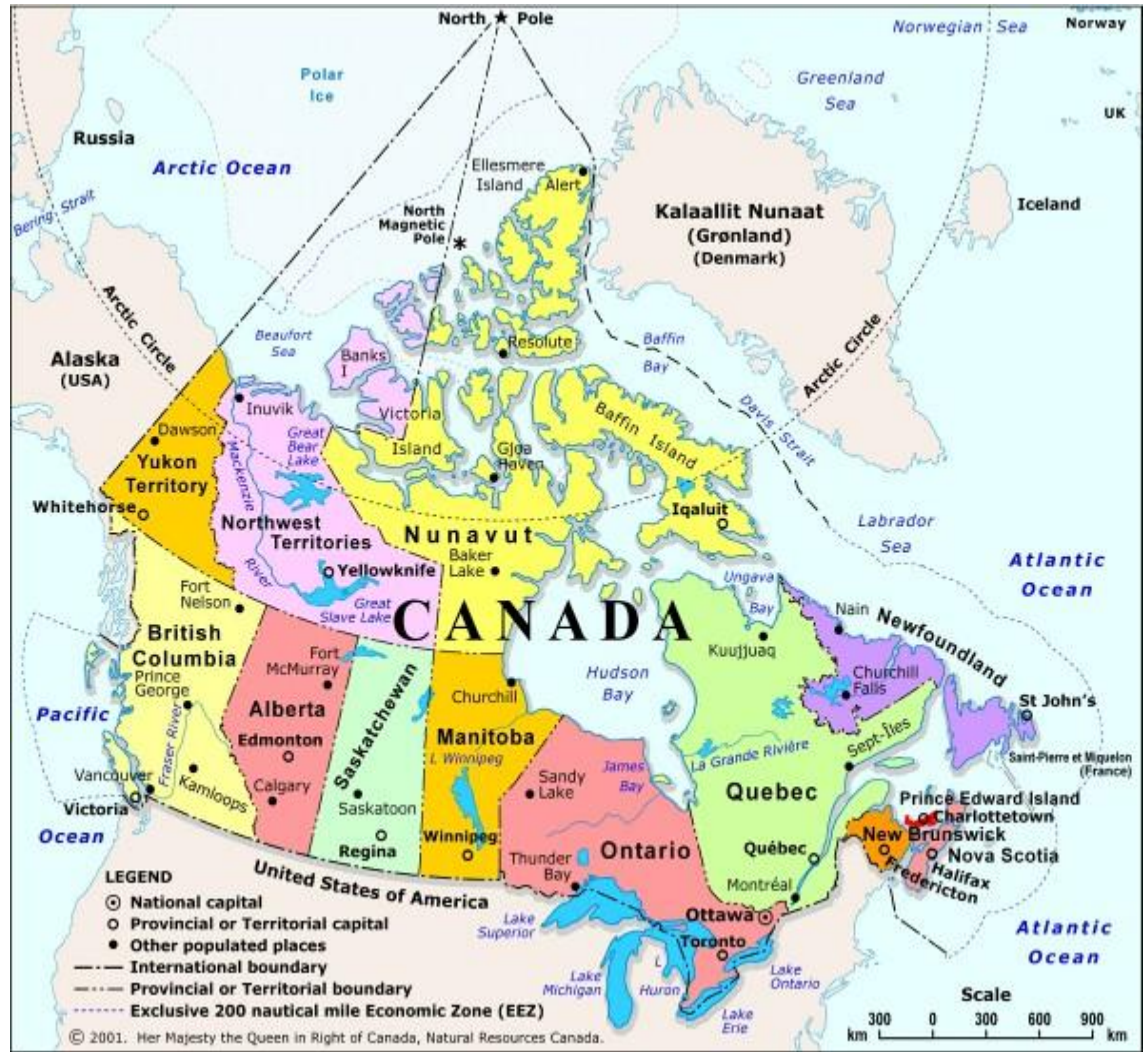
1. Overview
 - Canada's energy and transportation sector
 - Federal Department of Transport
2. Preparedness and response
 - Existing marine response regime
 - HNS program
3. Tanker Safety Expert Panel
 - Risk assessment
4. Next steps/Conclusion





OVERVIEW

- Canada is a maritime nation!
- It's surrounded by 3 oceans (Pacific, Atlantic & Arctic).
- Eight of the ten provinces border the ocean.
- Canada has the longest coastline in the world (243,000 km).
- The Great Lakes are the biggest body of fresh water on Earth (~21% of planetary reserves).



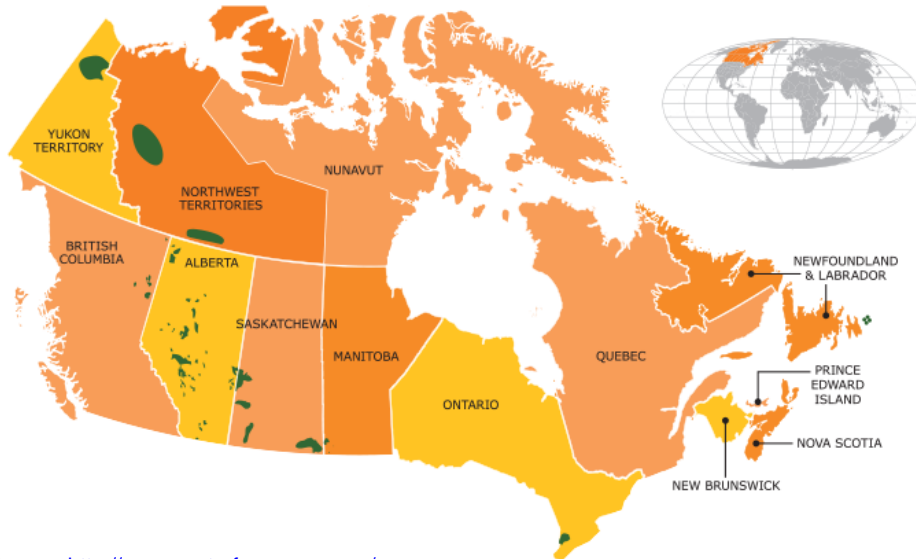


OVERVIEW (cont'd)

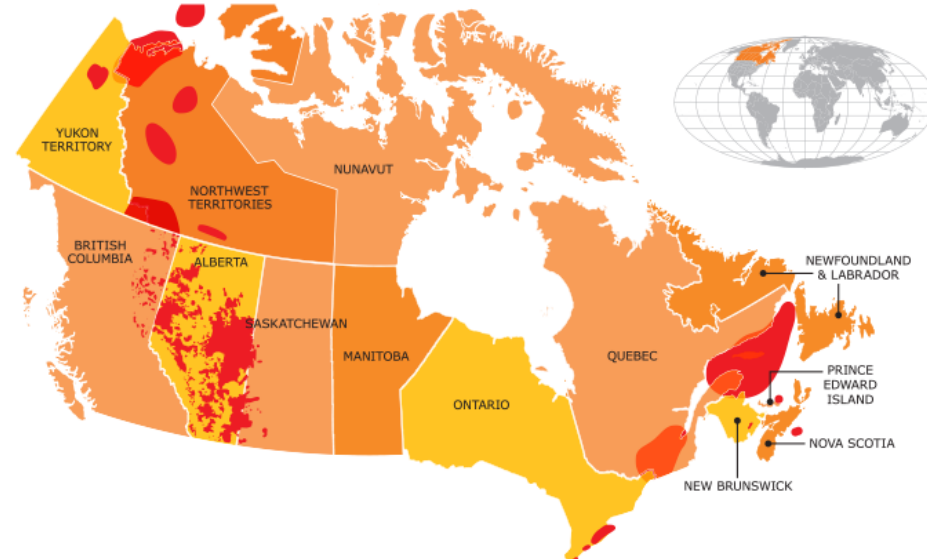
Statistics – Energy sector

- Canada is 3rd in the world for a) reserves of hydrocarbons, with 13%, and b) natural gas production.
- 97% of Canada's hydrocarbon reserves are in the oil sands.

Reserves of oil



Reserves of natural gas

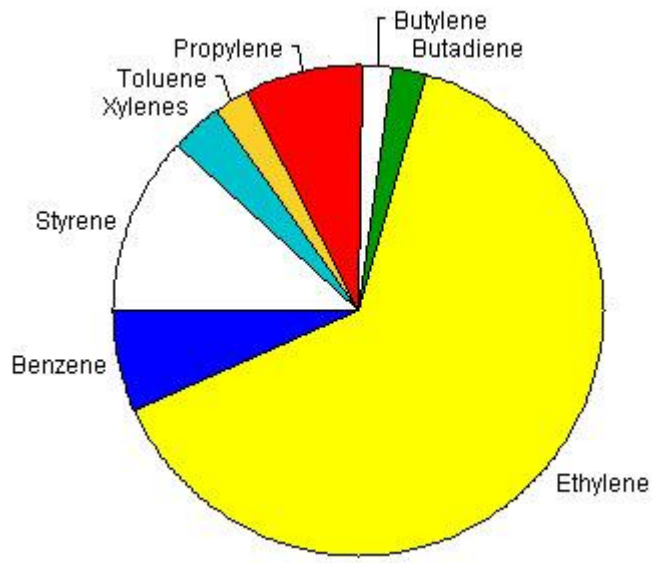


Source: <http://www.centreforenergy.com/>

OVERVIEW (cont'd)

Statistics – Chemical/petrochemical industry

- Canada is the biggest exporter in the world of sodium chlorate and sulfuric acid, the second biggest exporter of ethylene glycol, and the fourth biggest of polyethylene.
- In 2012, the Canadian industry exported chemicals worth over \$30 billion (€19 billion).
- Of the primary petrochemicals, ethylene has the biggest share.



Petrochemicals	Share of total, %
Ethylene	51.60
Styrene	9.50
Propylene	6.40
Benzene	5.50
Xylenes	2.80
Butadiene	1.80
Toluene	1.80
Butylene	1.60

Source: <http://canadianchemistry.ca/index.php/en/fact-sheets-brochures>
<http://www.ic.gc.ca/eic/site/chemicals-chimiques.nsf/eng/bt01135.html#figure1>



OVERVIEW (cont'd)

Statistics - Marine transportation sector

Every year, Canada's shipping industry accounts for:

- Economic spinoffs worth \$10 billion (~€6.5 billion)
- 100,000 jobs
- 404 Mt of freight shipped (2011)
- The shipping industry handled over \$205 billion (~€ 136 billion) worth of Canada's international trade.
- 97% of international shipping trade is with countries other than the U.S.
- Shipping is the second most used mode of transportation.



OVERVIEW (cont'd)

Statistics – Shipping (hydrocarbons)

Regional Breakdown for Oil Transported as Cargo in Canadian Waters
Approximate annual average over last ten years in million tonnes



Data Sources: Transport Canada and Nuka Research & Planning Group, LLC — West Coast Spill Response Study, 2013

Source: <http://www.tc.gc.ca/eng/tankersafetyexpertpanel/reports-110.html>



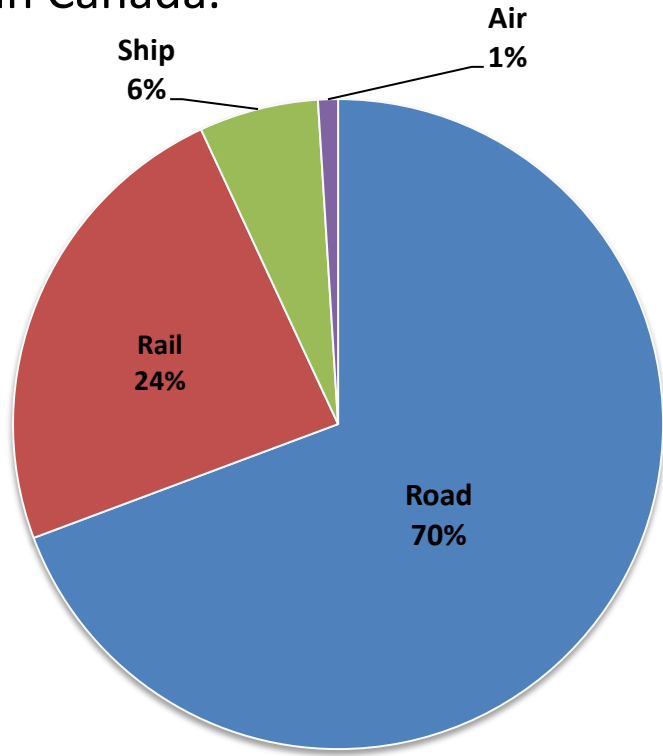
OVERVIEW (cont'd)

Statistics – Shipping (dangerous goods)

It is estimated that in 2011, over \$24 billion (€15.6 billion) worth of chemicals were manufactured and transported in Canada.

Transportation of dangerous goods

- 70% road
- 24% rail
- **6% ship**
- <1% air



Source: http://www.tc.gc.ca/media/documents/policy/Transportation_in_Canada_2012_eng_ACCESS.pdf



OVERVIEW (cont'd)

Statistics – Shipping of hazardous and noxious substances (2012)

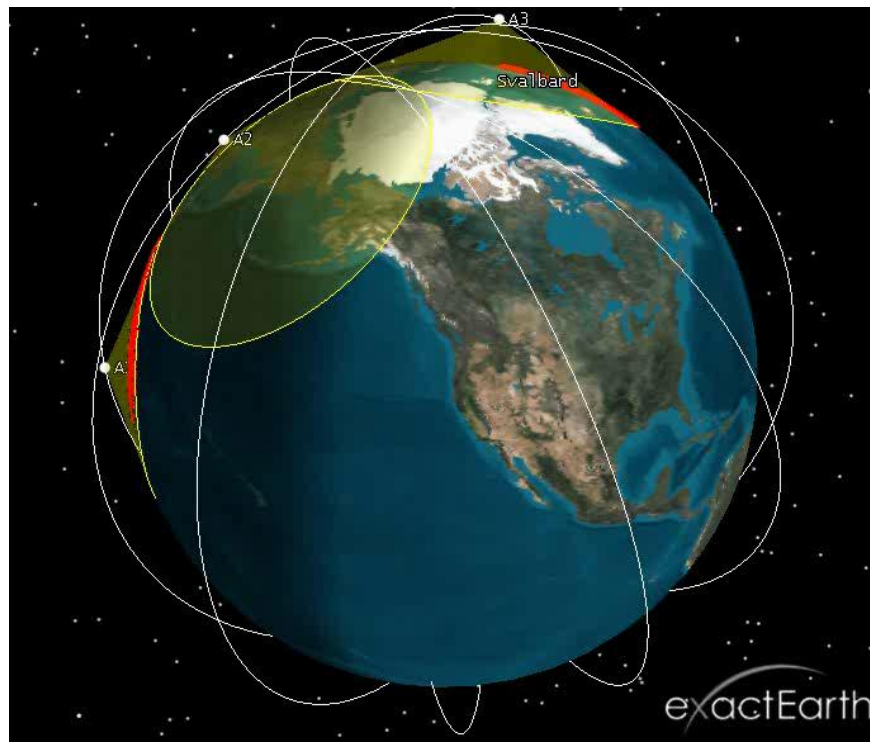
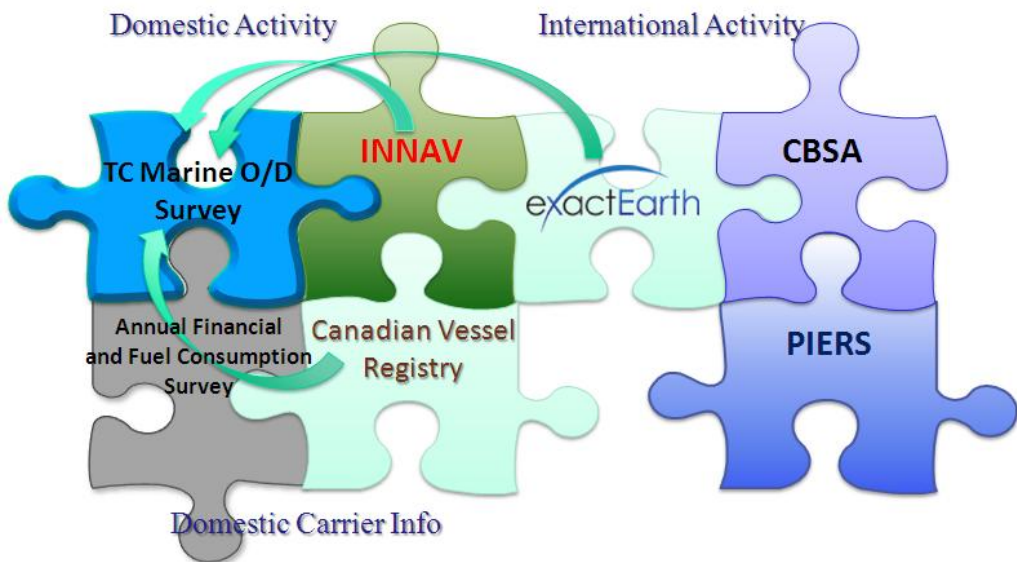
Rank	Product	Quantity (kg)
LIQUID GAS		
1	LNG	1 041 257 898
2	LPG	85 410 473
FERTILIZERS		
3	Urea aqueous solution	769 507 361
4	Urea/ammonium nitrate in aqueous or ammoniac sol	218 254 694
5	Ammonium nitrate	218 879 813
OTHER HNS		
6	Animal & vegetable oil	899 616 087
7	Ethylene glycol	443 331 203
8	Sodium chlorate	215 451 364
9	Caustic soda - Sodium Hydroxide	163 245 439
10	Styrene monomer	157 888 677
11	Methanol	120 323 102
12	Benzene	112 282 314
13	Calcium chloride – Bromide	96 997 705
14	Disodium carbonate (Soda Ash)	86 053 773
15	Asphalt (Carbon disulphide)	84 947 606
16	Phosphoric acid	44 607 735
17	Xylene	41 215 081
18	Isoprene	29 895 884
19	Sulfuric acid	25 310 551
20	Phenol	24 838 816



OVERVIEW (cont'd)

Statistics – Shipping

The Marine Data Framework



SIGTM-INNAV: Vessel Traffic Management Information System – Canadian Coast Guard (www.innav.gc.ca)
PIERS: US/Canada import/export shipping data – BM Global Trade Inc.
CBSA: Canada Border Services Agency - Data on international shipping trade

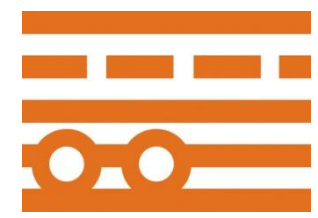
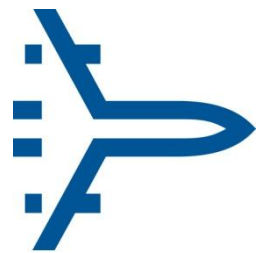


OVERVIEW (cont'd)

Federal Department of Transport (Transport Canada)

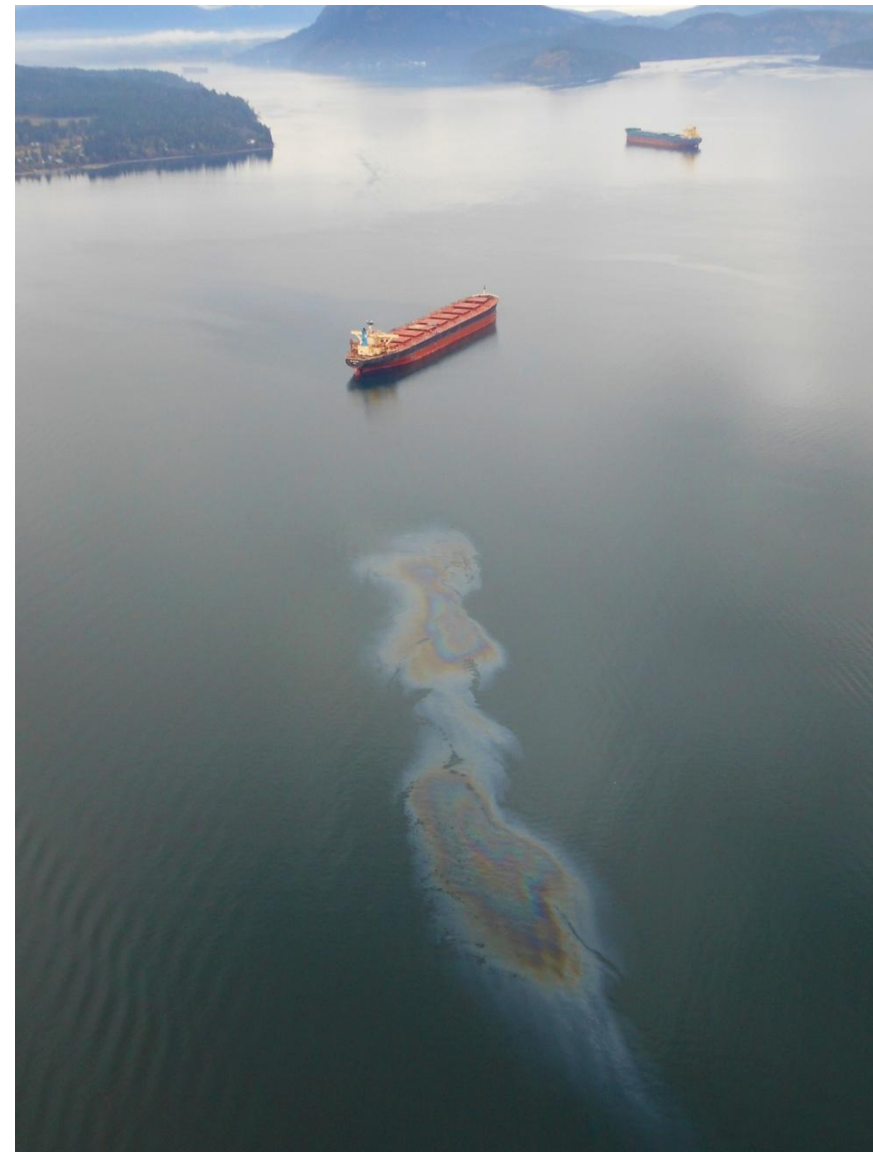
- Transport Canada is responsible for transportation policies and programs. It fosters an efficient, clean, safe and secure transportation system.
- The Department employs 4,700 people at its headquarters in Ottawa and in five regional offices across the country.
- Policy, Safety and Security, Airport and Port Programs, Surface Infrastructure, etc.:

1. Air
2. Marine
3. Rail
4. Road



Canada's Marine Spill Preparedness and Response Regime...

- ... was established in 1995 after several large-scale incidents in or near Canadian waters.
- Basic principle: “*polluter pays*”!
 - Polluters are responsible for any pollution they cause, as set out in the:
- Canada Shipping Act, 2001 (Part 8)
- Does not apply to the offshore oil and gas industry, and to spills from land-based facilities.



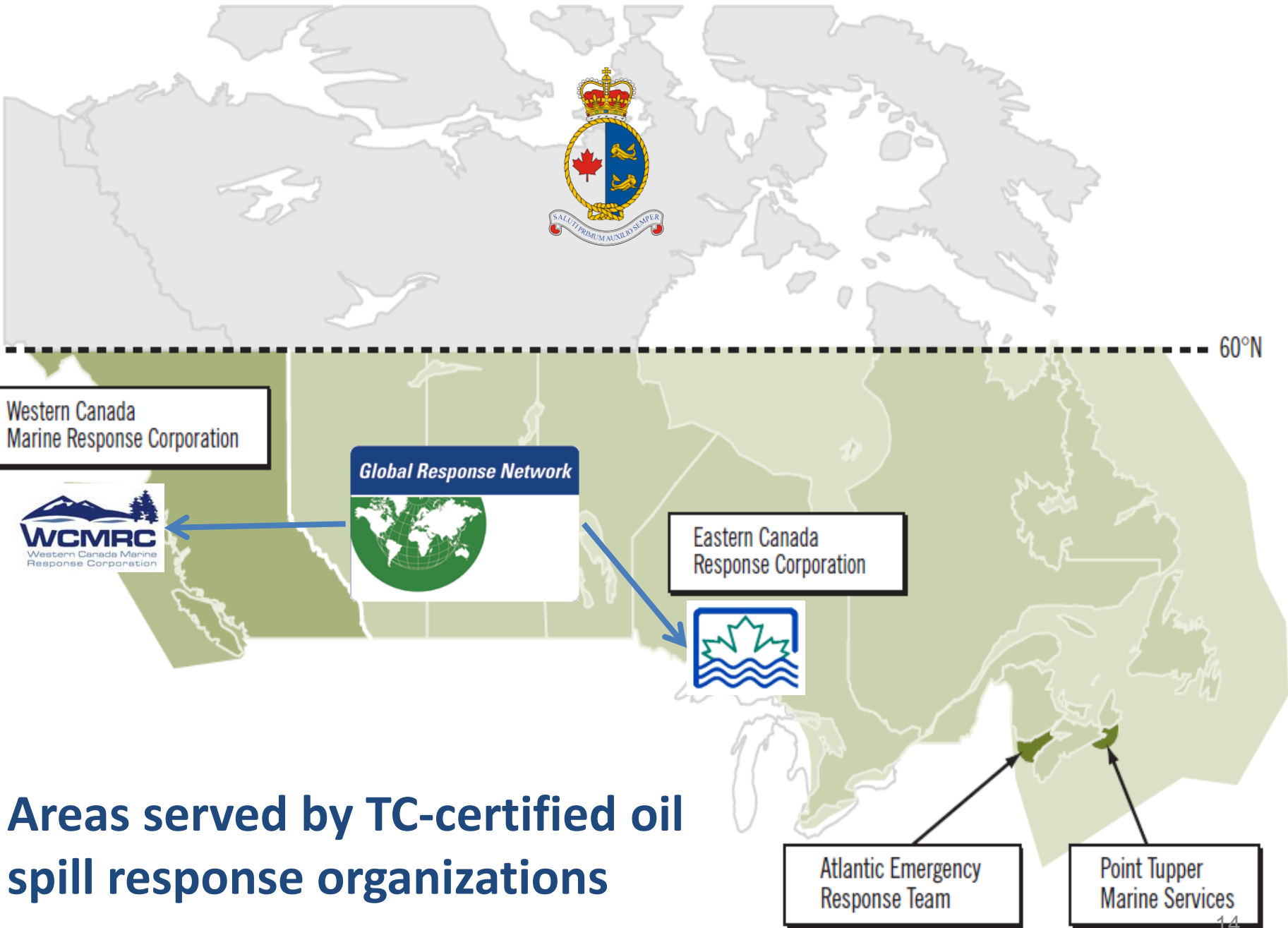
OVERVIEW (cont'd)

Department of Transport – Environmental Response

Main activities:

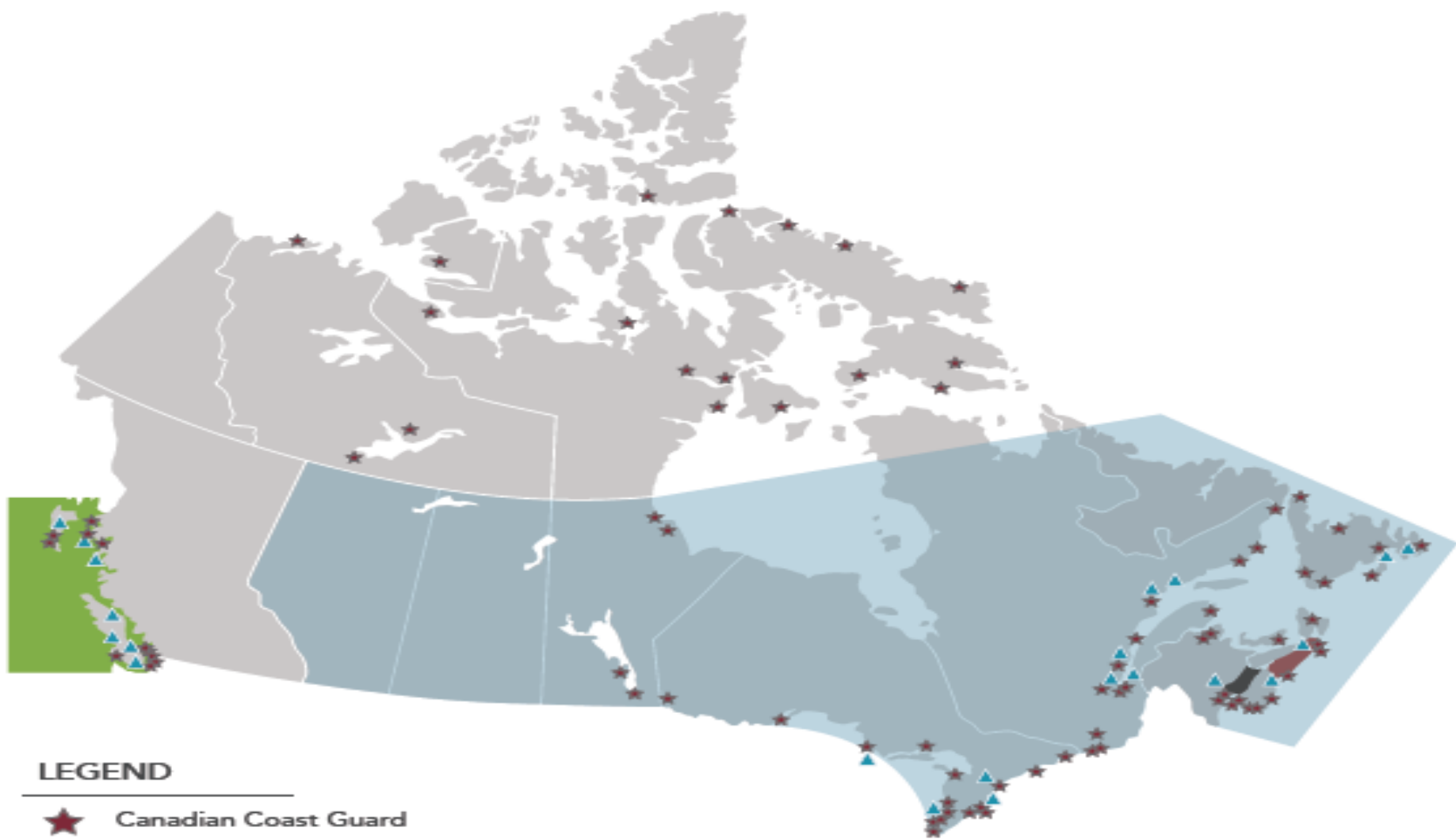
- Certification of oil spill response organizations
- National Aerial Surveillance Program (NASP)
- National Places of Refuge Contingency Plan
- Heads delegation to IMO's OPRC-HNS working group
- Member of Arctic Council and working groups (EPPR, PAME, etc)
- Development of hazardous and noxious substances program...





Areas served by TC-certified oil spill response organizations

Marine Spills Response Depots



LEGEND

- ★ Canadian Coast Guard
- ▲ Marine Response Corporations
- Eastern Canada Response Corporation
- Point Tupper Marine Services
- Atlantic Emergency Response Team
- Western Canada Marine Response Corporation

Source: Canadian Coast Guard, map prepared by the Library of Parliament



Canada's Ship-Source Hazardous and Noxious Substances (HNS) Incident Preparedness and Response Regime



MARINE SAFETY DIRECTORATE



HNS PROGRAM

Rationale

- The existing Regime was established and developed for one kind of product (hydrocarbons).
- Shortfalls in Canada's ability to effectively manage marine HNS incidents are mainly due to:
 - Undefined roles and responsibilities
 - Limited expertise and response capacity for HNS (exercises, training)
 - Lack of accurate information on movements of HNS by sea
- Increased marine transportation of hazardous goods;
- Environmental/marine risks largely unknown;
- Risk of terrorist attack on Canadian infrastructure;
- Human error!

HNS PROGRAM

HNS spills (>100 litres) in marine environment from 2001 to 2012

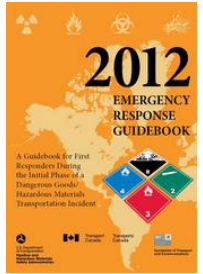
Region	Year	Chemical name	Suspected cause	Volume, m ³	Vessel type
Pacific	2001	Aluminum Sulphate	Sinking/Foundering	2.5	Fishing
Quebec	2001	Phenol	Cargo Transfer	0.5	Tanker
Maritimes	2002	Ethylene Glycol	Mechanical Failure	7.3	Oil Platform
Nfld	2002	Sodium Chlorate	Mechanical Failure	0.2	Oil Platform
Pacific	2002	Ethylene Glycol	Negligence/Human Error	2.3	Tanker
Central	2003	Ethylene Glycol	Damage Container/Tank	205	Tug
Maritimes	2003	Ethylene Glycol	Unknown/Mystery	20.0	Oil Platform
Nfld	2003	Unknown	Damage Container/Tank	205	Offshore
Central	2004	Calcium Chlorite	Grounding/Contact	50.0	Barge
Maritimes	2004	Ammonium Phosphate	Cargo Transfer	5.7	Bulk Carrier
Maritimes	2004	Ammonium Phosphate	Bilge Discharge	5.7	Fishing
Maritimes	2006	Sulfuric Acid	Weather Condition	0.8	Container
Pacific	2007	Calcium Carbonate	Cargo Transfer	3.9	Barge
Quebec	2007	Caustic Soda	Bilge Discharge	3.0	Tanker
Quebec	2007	Flammable Liquid	Mechanical Failure	0.1	Tanker
Nfld	2008	Ethylene Glycol	Unknown/Mystery	10.0	Oil Platform
Maritimes	2009	Ethylene Glycol	Refueling/Bunkering	0.1	Offshore
Nfld	2009	Ethylene Glycol	Mechanical Failure	0.1	Oil Platform
Nfld	2010	Ethylene Glycol	Mechanical Failure	0.3	Oil Platform
Nfld	2010	Cleaning Solvents	Mechanical Failure	3.2	Oil Platform
Quebec	2010	Ethylene Glycol	Negligence/Human Error	0.2	Bulk Carrier
Maritimes	2011	Hydrogen peroxyde	Contamination	25	Fishing vessel
Maritimes	2011	Hydrazine	Mechanical failure	3.6	Nuclear facility
Pacific	2012	Vegetable oil	Unknown	1.0	Tanker
Quebec	2012	Sulfuric acid	Negligence/Human Error	0.2	Bulk Carrier
Central	2012	Magnesium chloride	Mechanical Failure	640	Tanker



HNS PROGRAM

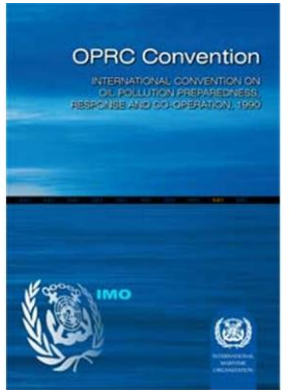
In case of marine pollution involving HNS:

- Canadian Coast Guard
- Oil spill response organizations
- CANUTEC
- Municipal fire departments
- Private response organizations
- Environment Canada
- Transportation of Dangerous Goods (TDG)
- International assistance (ITOPF, Cedre, US Coast Guard, etc)



Environment Canada

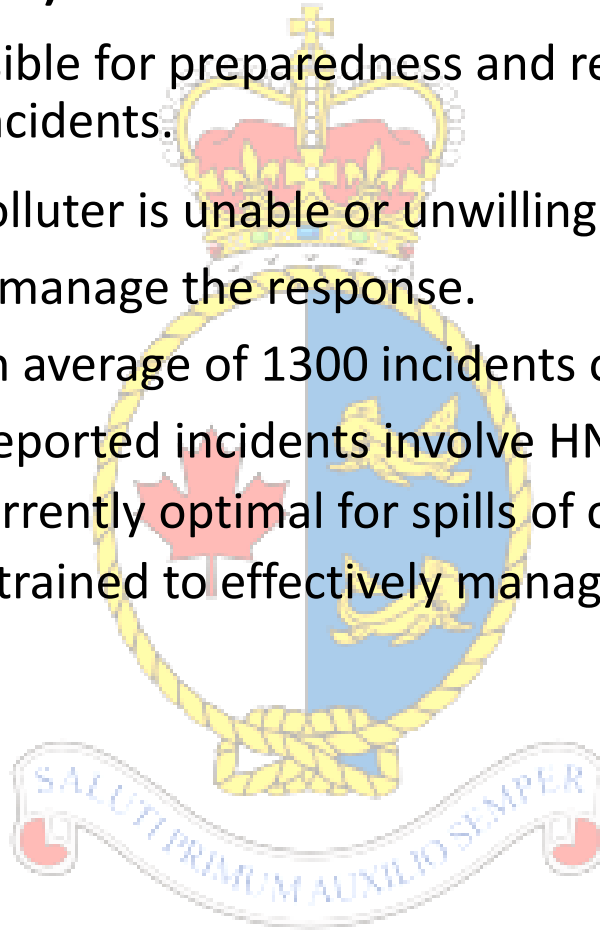
Environnement Canada



HNS PROGRAM

Canadian Coast Guard (CCG)

- Federal agency responsible for preparedness and response capacity for all ship-source pollution incidents.
- In the event that the polluter is unable or unwilling to respond or is unknown, the CCG will manage the response.
- The CCG investigates an average of 1300 incidents of marine pollution a year.
- Fewer than 1% of the reported incidents involve HNS.
- CCG preparedness is currently optimal for spills of oil, not HNS.
- CCG personnel are not trained to effectively manage HNS incidents.



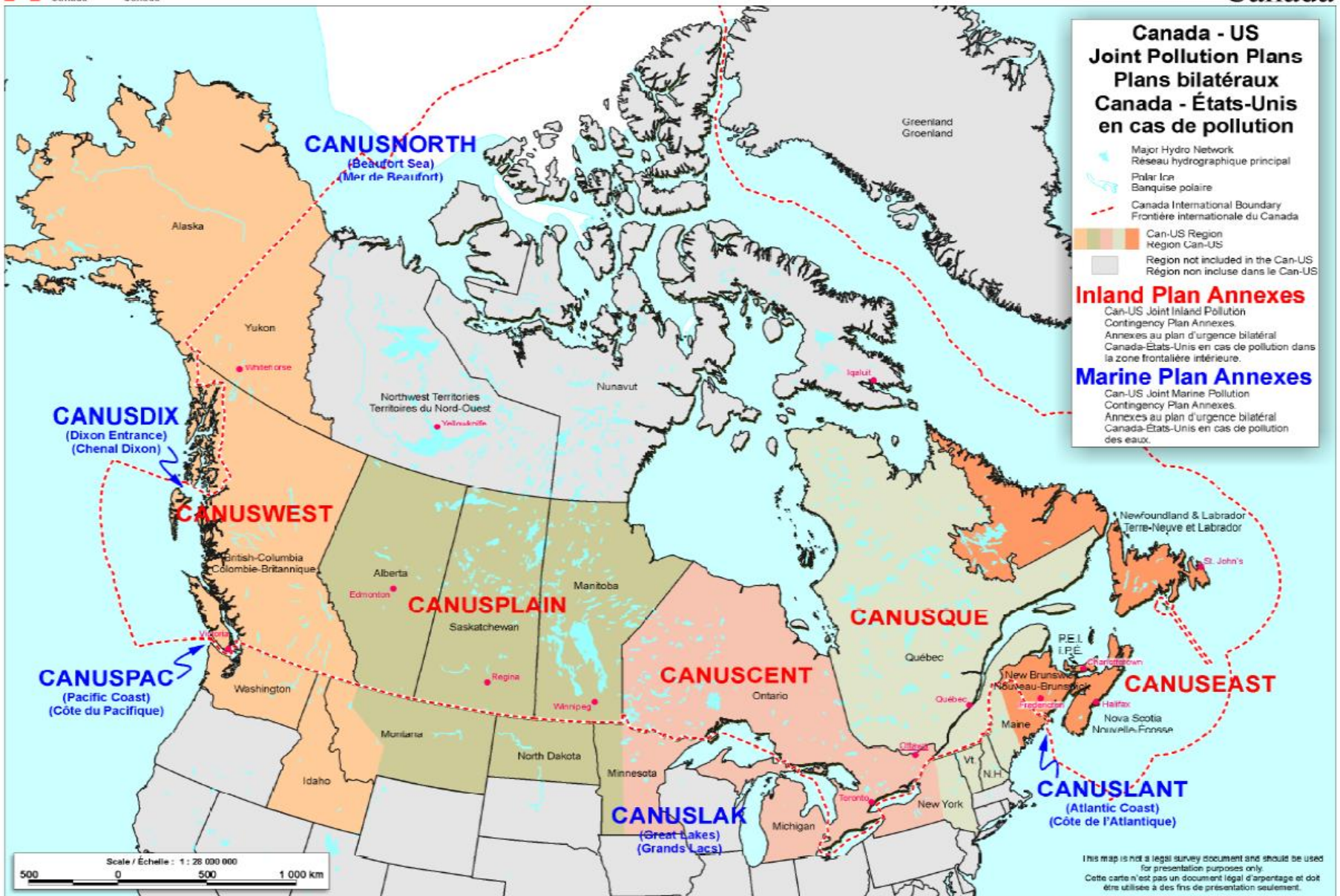
HNS PROGRAM

Environment Canada (EC)

- In the event of a serious environmental incident, EC may host a *scientific roundtable*.
- Enforcement Branch
- Meteorological Service of Canada
- Environment Canada provides scientific and technical advice 24/7 and identifies environmental protection priorities at the request of the National Environmental Emergencies Centre in Montreal:

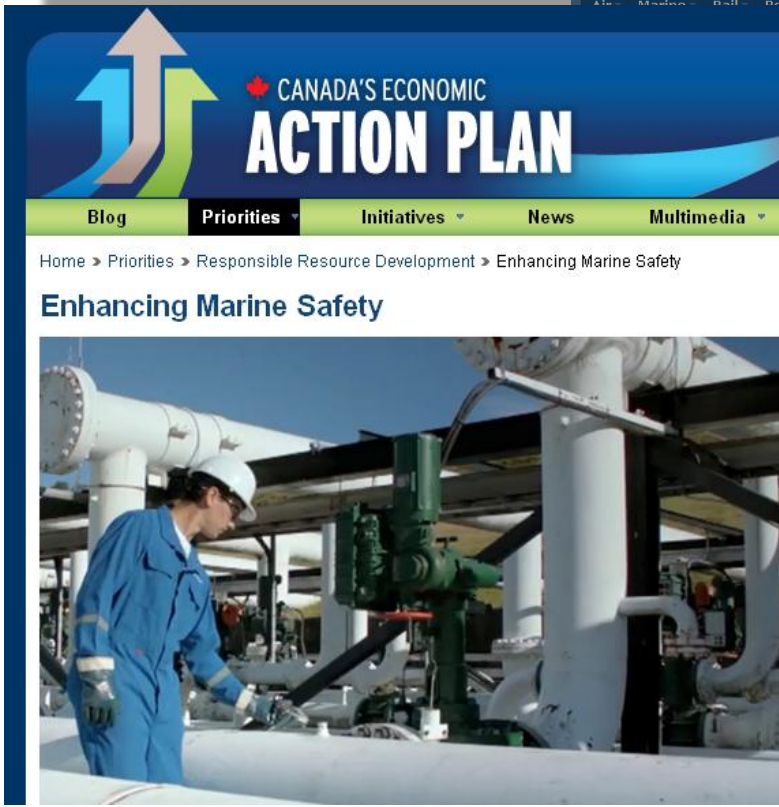


- Behaviour and fate of spilled substances, **modelling** of their dispersion and trajectory;
- Location and **sensitivity** of wildlife and ecosystems;
- Scientific support group made up of people skilled in response and equipped with portable instrumentation and mobile laboratories;
- Post-emergency analyses and advice on **ecosystem recovery** objectives;
- Shoreline Cleanup and Assessment Technique (**SCAT**)





TANKER SAFETY EXPERT PANEL





TANKER SAFETY EXPERT PANEL

Scope of the review

(i) Regime's current preparedness (for 10,000 tonnes)

Make recommendations about this regulatory requirement: Is it enough for future requirements? What quantity would be best?

(ii) Regime's structure and key components

How effective is the current governance structure? How are preparedness and response linked to liability and compensation?

(iii) Regime's coverage

Is it necessary to extend coverage to hazardous and noxious substances? Is it necessary to established a preparedness and response system in Northern Canada?

TANKER SAFETY EXPERT PANEL

The review by the panel has two phases:

1. **Phase I** was focused on the existing Regime (for oil spills) south of 60° North latitude.
2. **Phase II** will look at preparedness and response for oil spills from ships in the Arctic and at criteria for a system to deal with HNS.





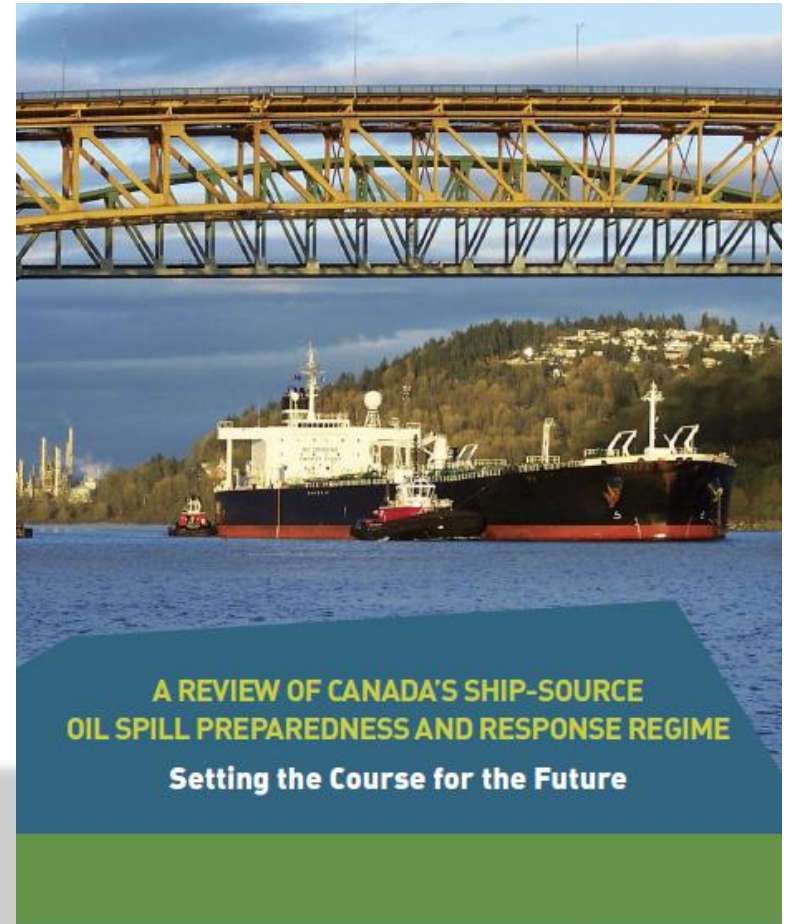
TANKER SAFETY EXPERT PANEL

Final Report

Phase 1 – **COMPLETED (Nov 2013)**

Final report (45 recommendations):

- a) Strengthen Canada's preparedness and response capability, based on risk;
- b) Strengthen Canada's liability and compensation regime for ship-source oil spills;
- c) Improve leadership and stewardship in relation to the Regime and improve communications and engagement with Canadians on these important matters.





TANKER SAFETY EXPERT PANEL

Final Report

Phase 2 (HNS) - **UNDERWAY**

Is it necessary to establish a preparedness and response program in the North and to extend the existing Regime to cover hazardous and noxious substances? What would be the conceptual and financial impacts?

Areas for research:

- Scope/coverage - Prevention, Existing response capability - Preparedness and response - Roles, responsibilities and legal framework - Research & Development

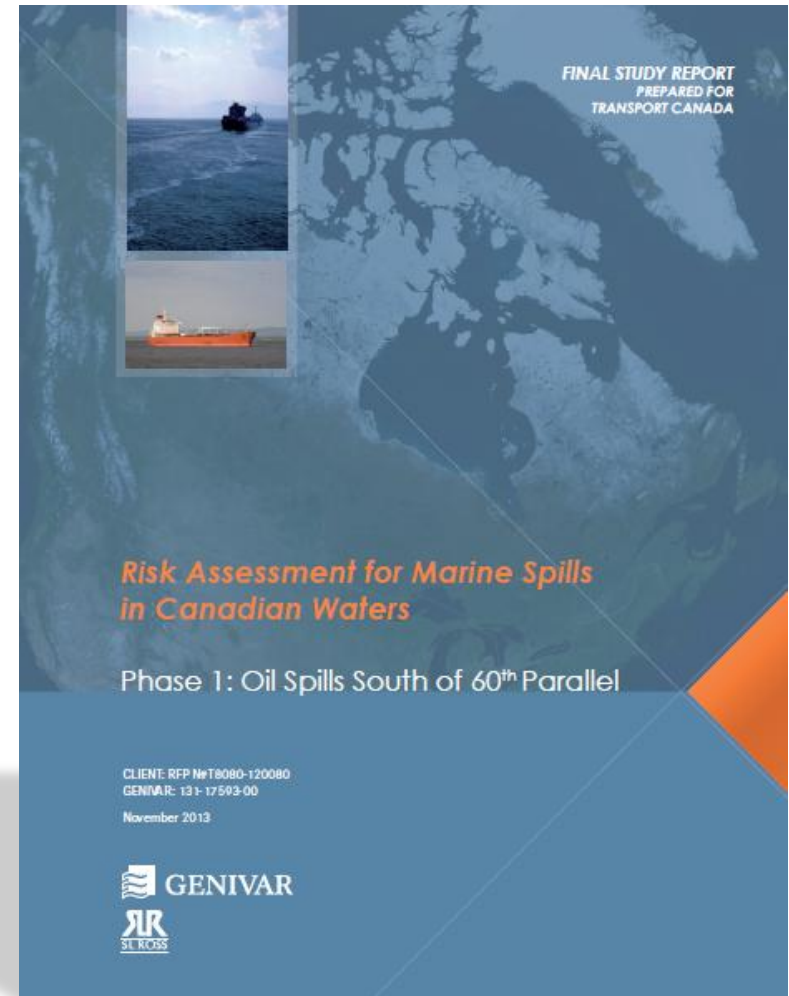
To be completed by **September 2014**

PAN-CANADIAN ASSESSMENT OF SPILL-RELATED RISKS

Phase 1 - Oil

COMPLETED (Nov 2013)

Examined the likelihood and potential impacts of oil spills in Canadian waters south of 60° North latitude.



Source: <http://www.tc.gc.ca/eng/marinesafety/menu-4100.htm#abs>

Secteurs côtiers canadiens

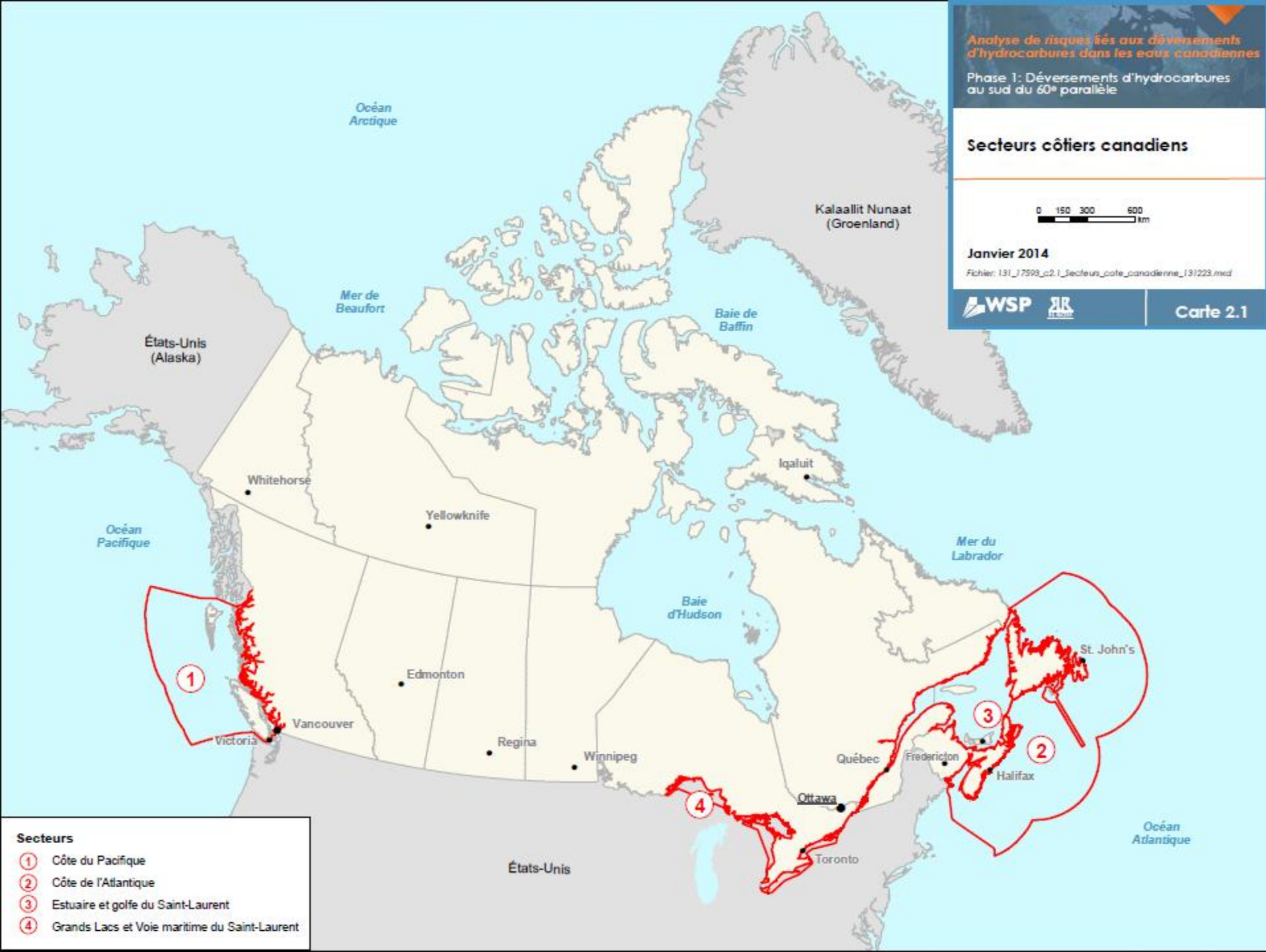
0 150 300 600
km

Janvier 2014

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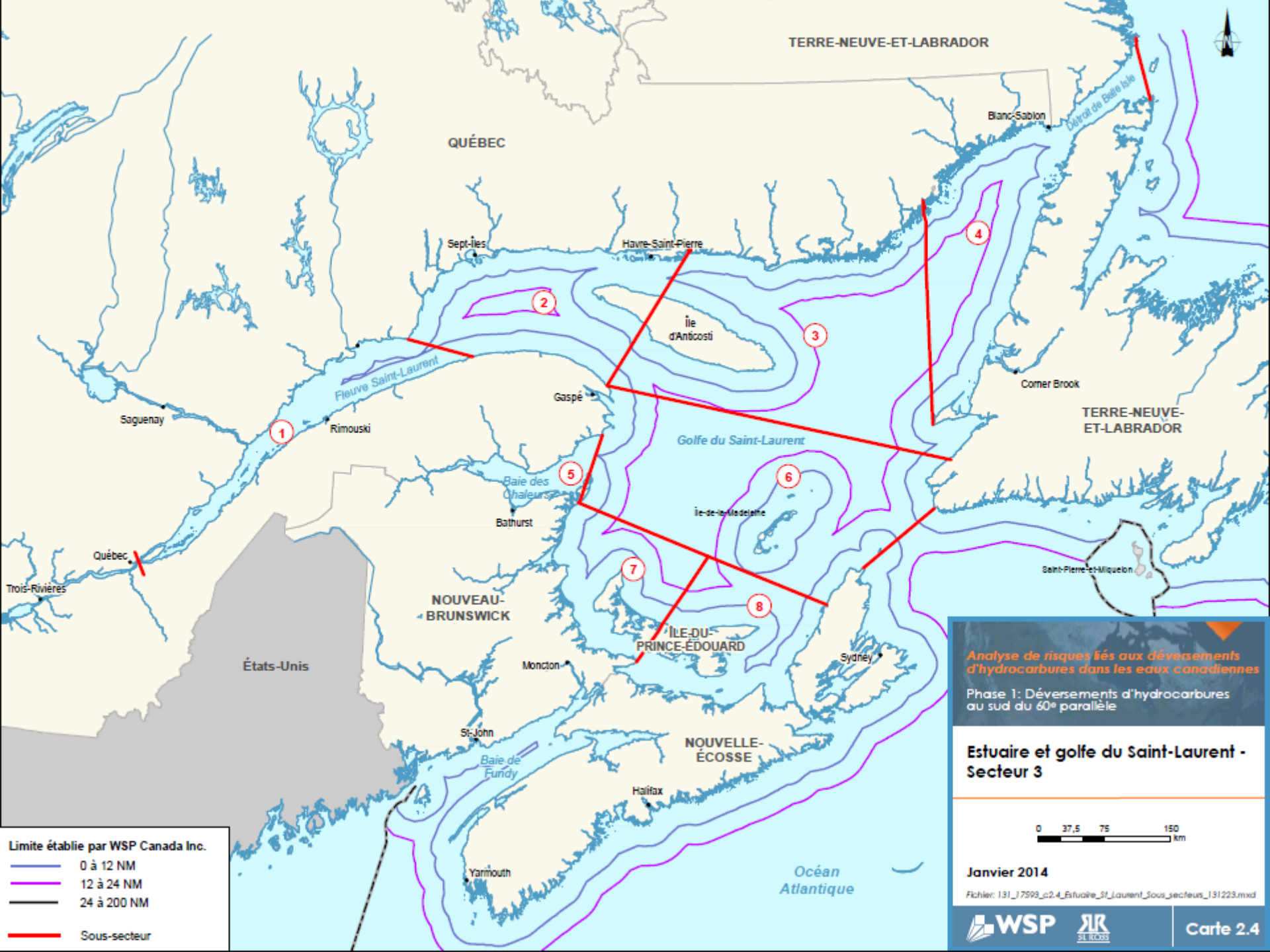


Carte 2.1



Secteurs

- ① Côte du Pacifique
- ② Côte de l'Atlantique
- ③ Estuaire et golfe du Saint-Laurent
- ④ Grands Lacs et Voie maritime du Saint-Laurent



TERRE-NEUVE-ET-LABRADOR

QUÉBEC

Blanc-Sablon

Détroit de Belle-Ile

Sept-Îles

Havre-Saint-Pierre

Île d'Anticosti

Comer Brook

TERRE-NEUVE-ET-LABRADOR

Fleuve Saint-Laurent

Golfe du Saint-Laurent

Saguenay

Rimouski

Gaspé

Baie des Chaleurs

Bathurst

Île-de-la-Madeleine

Saint-Pierre-et-Miquelon

Québec

Trois-Rivières

NOUVEAU-BRUNSWICK

ÎLE-DU-PRINCE-ÉDOUARD

Sydney

États-Unis

Moncton

NOUVELLE-ÉCOSSE

St-John

Baie de Fundy

Halifax

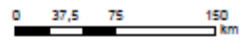
Yarmouth

Océan Atlantique

Analyse de risques liés aux déversements d'hydrocarbures dans les eaux canadiennes

Phase 1: Déversements d'hydrocarbures au sud du 60^e parallèle

Estuaire et golfe du Saint-Laurent - Secteur 3



Janvier 2014

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Limite établie par WSP Canada Inc.

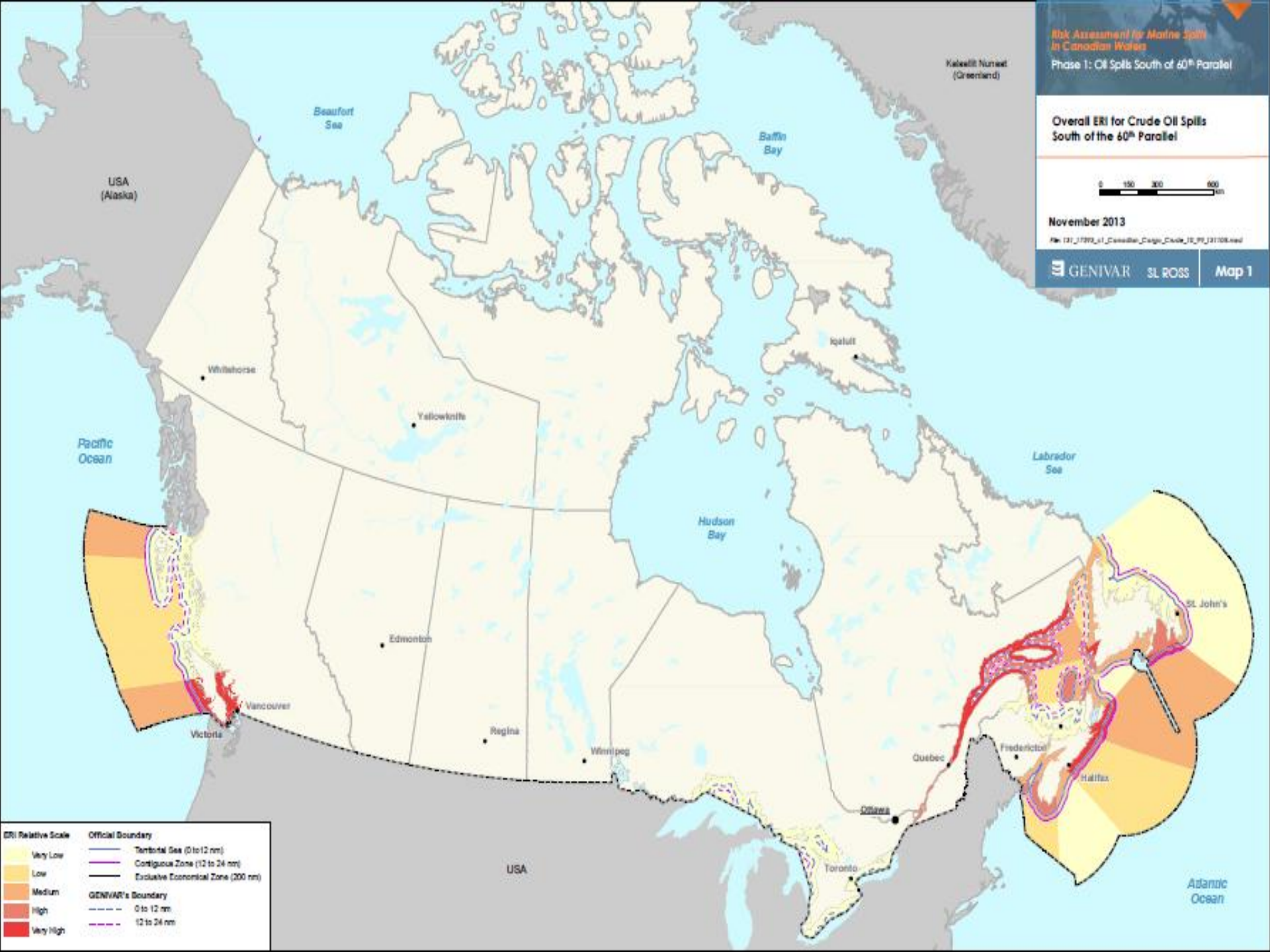
- 0 à 12 NM
- 12 à 24 NM
- 24 à 200 NM
- Sous-secteur

Overall ERI for Crude Oil Spills
South of the 60° Parallel



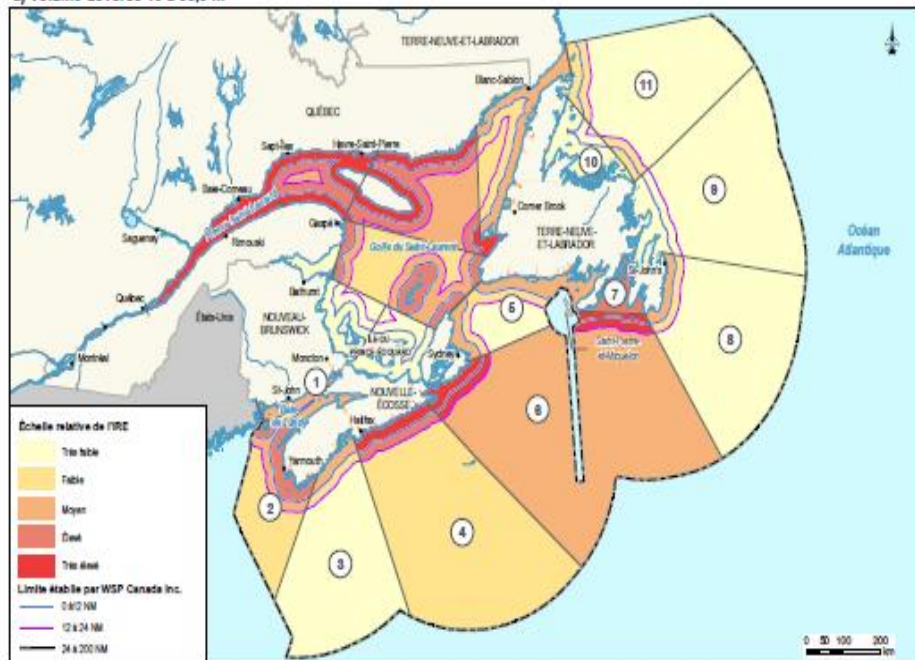
November 2013

File: 131_17992_e1_Canadian_Coastal_Choke_10_F0_131108.mxd

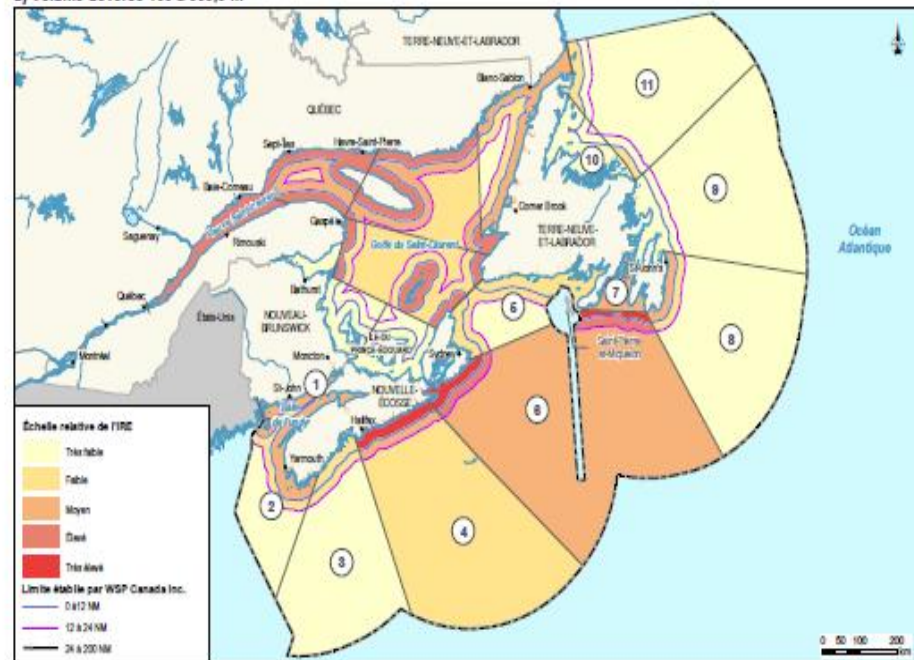


ERI Relative Scale	Official Boundary
Very Low	Territorial Sea (0 to 12 nm)
Low	Contiguous Zone (12 to 24 nm)
Medium	Exclusive Economic Zone (200 nm)
High	GENIVAR's Boundary
Very High	0 to 12 nm
	12 to 24 nm

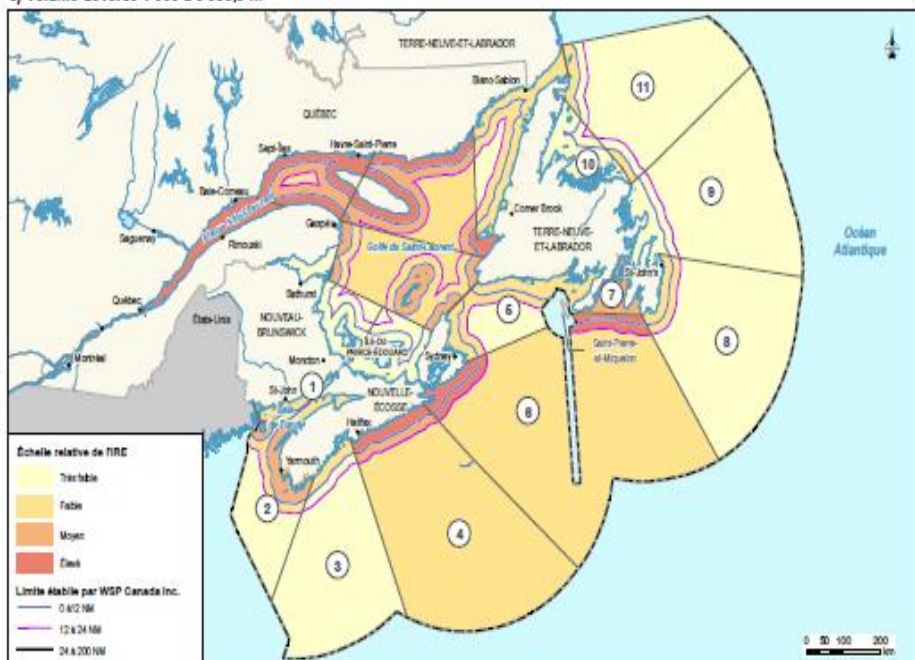
a) Volume déversé 10 à 99,9 m³



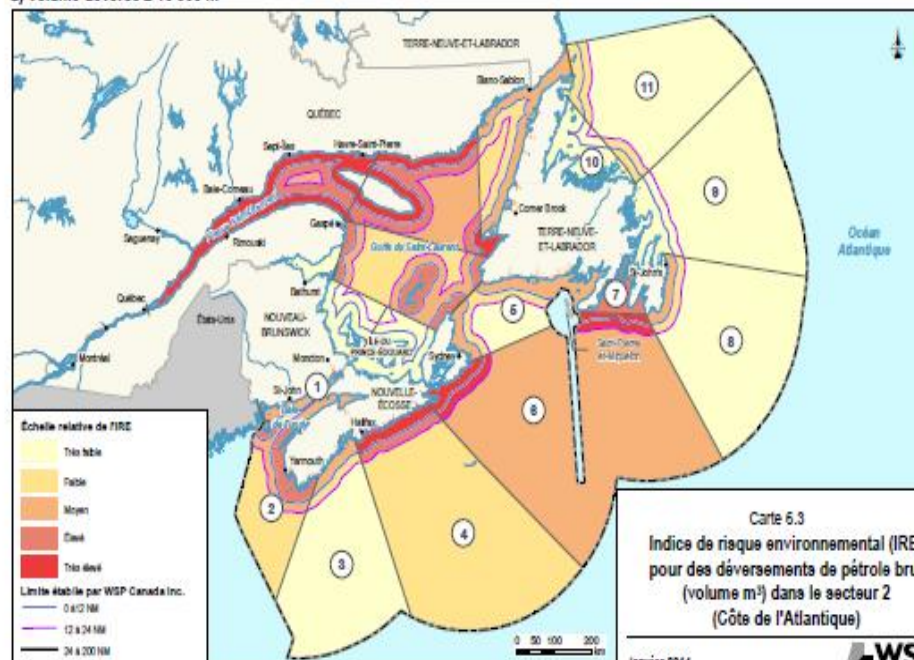
b) Volume déversé 100 à 999,9 m³



c) Volume déversé 1 000 à 9 999,9 m³



d) Volume déversé ≥ 10 000 m³



Carte 6.3
Indice de risque environnemental (IRE)
pour des déversements de pétrole brut
(volume m³) dans le secteur 2
(Côte de l'Atlantique)



PAN-CANADIAN ASSESSMENT OF SPILL-RELATED RISKS

Phase 2 (Arctic & HNS)

UNDERWAY

Risks related to oil spills in the Arctic and to spills of hazardous and noxious substances in Canadian waters

Will provide credible information which the panel will be able to use when reviewing existing preparedness and response arrangements.

Preliminary report: **March 2014**

Release to public: **Autumn 2014**



PAN-CANADIAN ASSESSMENT OF SPILL-RELATED RISKS (preliminary report)

- The HNS-related risk analysis draws on large-scale data and thus provides a relative estimate of risk for the whole of Canada.
- Generally speaking, the risk values reflect tonnages transported.
- Five categories of goods transported in bulk:
 1. Petroleum coke and asphalt
 2. Compressed and liquified gases
 3. Organic substances
 4. Inorganic substances
 5. Animal and vegetable oils



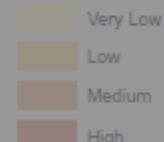
PAN-CANADIAN ASSESSMENT OF SPILL- RELATED RISKS (preliminary report)

Selected HNS for the Risk Assessment.

HNS Category	Product
Coke and Asphalt	Coke products
	Asphalt
	Reformate
Liquefied or Compressed Gas	Acetylene
	Ethylene
	Natural gas
	Propylene
Organic Substances	Benzene
	Isooctane
	Linear alkylbenzene
	Methanol
	Octane
	Organic molecules
	Toluene
	Xylene
Inorganic Substances	Ammonium nitrate
	Calcium fluoride
	Caustic soda
	Fertilizer
	Lead concentrate
	Nickel sulphate
	Sulphur
	Sulphuric acid
Urea ammonium nitrate (UAN)	
Animal and Vegetable Oils	Animal and vegetable oils

Global Hazard Index for Each Sub-Sector in Sector 1 – Pacific Coast.

ERI Relative Scale

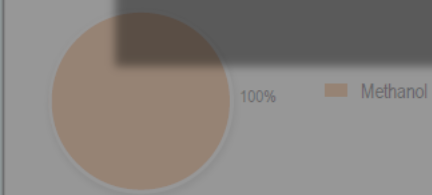
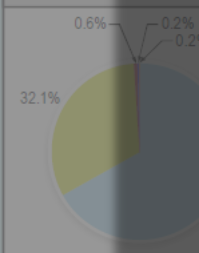
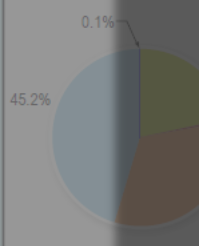


Global Hazard Index (HI)

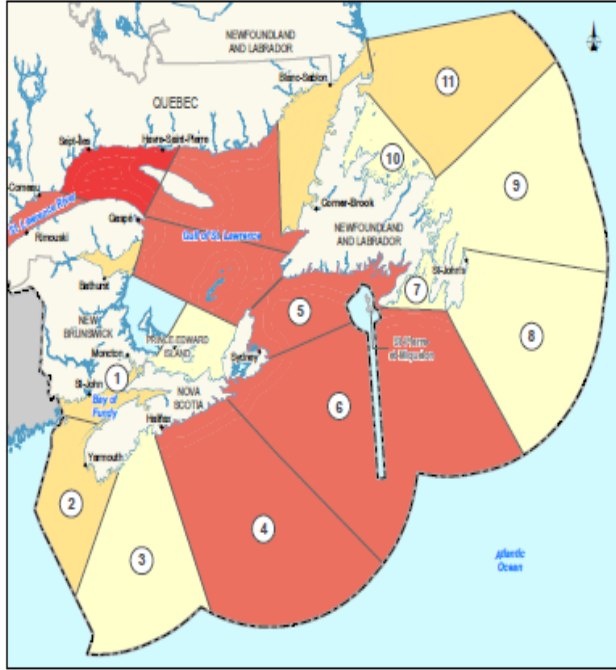
Sub-Sector Coke and Liquefied or Organic Inorganic Animal and

Hazard Index of Select HNS Transported as Bulk in Sector 1 – Pacific Coast.

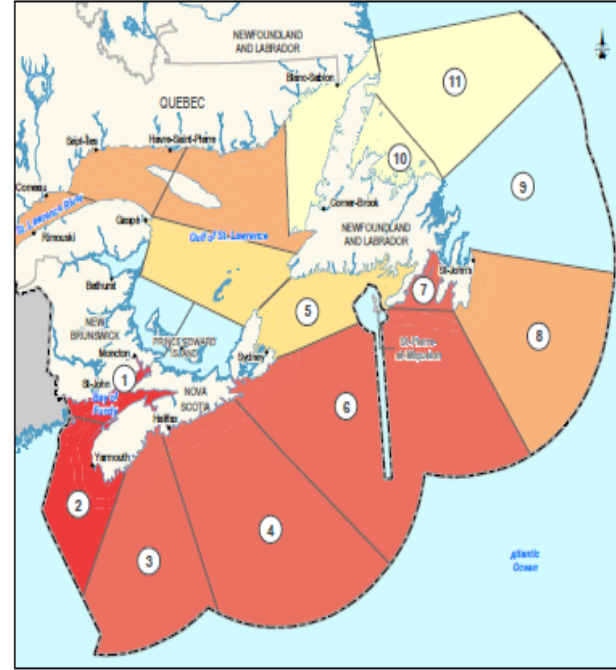
Category	Product	Hazard Index (HI)
Coke and asphalt	Asphalt	3
	Coke products	2
Liquefied or compressed gas	Acetylene	2
	Ethylene	4
Organic substances	Isooctane	3
	Linear alkylbenzene	2
	Methanol	3
	Octane	3
	Toluene	3
Inorganic substances	Ammonium nitrate	4
	Caustic soda	3
	Fertilizer	2.44
	Lead concentrate	3
	Sulphur	1
	Sulphuric acid	4
Animal and vegetable oil	Animal and vegetable oil	1



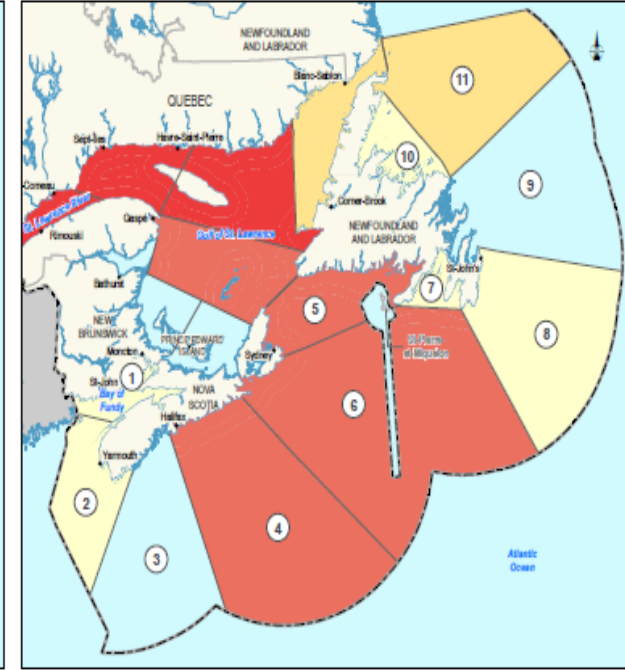
a) Coke and Asphalt Tonnage



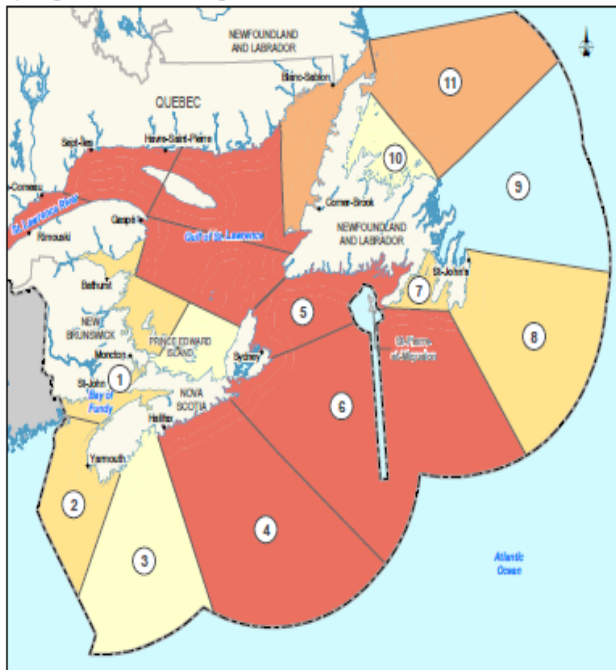
b) Liquefied or Compressed Gas Tonnage



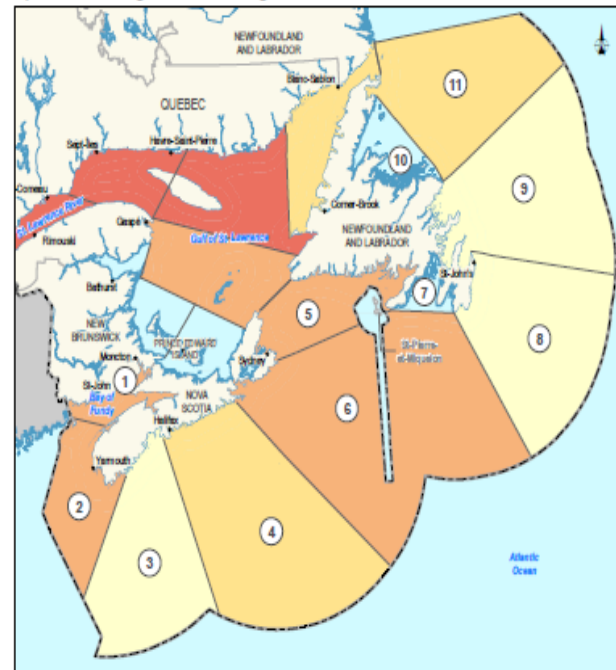
c) Organic Substance Tonnage



d) Inorganic Substance Tonnage



e) Animal and Vegetable Oil Tonnage



Risk Assessment for Marine Spills in Canadian Waters
 Phase 2, Part A: Spills of Select HNS Transported in Bulk South of the 60th Parallel

HNS Tonnage Transported in Bulk in Sector 2 - Atlantic

0 50 100 200 km

March 2014

PRELIMINARY

Relative Scale	
Light Blue	None
Yellow	Very Low
Orange	Low
Dark Orange	Medium
Red	High
Dark Red	Very High



NEXT STEPS

1. Develop a pan-Canadian data framework to manage and track the transportation of hazardous and noxious substances
2. Analyse the Phase 2 recommendations (on HNS) of the Tanker Safety Expert Panel AND implement the Panel's recommendations
3. Update the existing marine preparedness and response regime
4. Become a party to the OPRC-HNS Protocol
5. Cooperate internationally (HNS educational guide/web site, response manuals, Polluproof, etc)





Thank you!



USEFUL LINKS

Transport Canada – Environmental Response System

<http://www.tc.gc.ca/eng/marinesafety/oep-ers-framework-1469.htm>

Tanker Safety Expert Panel

<http://www.tc.gc.ca/eng/tankersafetyexpertpanel/menu.htm>

Canadian Coast Guard - Environmental Response

http://www.ccg-gcc.gc.ca/eng/Ccg/er_Home

Environment Canada - Environmental Emergency

<http://www.ec.gc.ca/ee-ue/default.asp?lang=En&n=8A6C8F31-1>



QUESTIONS?



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