



**SUBMISSION TO THE TANKER
SAFETY EXPERT PANEL**

BY OCEAN GROUP

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1. EXECUTIVE SUMMARY

OCEAN GROUP's core services include harbour towing, dredging, shipbuilding, ship repair, marine transportation, fire fighting and marine salvage, as well as specialized marine equipment rental and installation. With approximately 750 employees in Quebec and Ontario, OCEAN is one of the main suppliers of integrated marine services in Canada. OCEAN's particular areas of expertise focus on the St. Lawrence River and Seaway.

It goes without saying that OCEAN has a vested interest in the marine industry's development, progress and growth. To help achieve this, the industry's activities shall not jeopardize the quality, safety and navigability of the waters of the St. Lawrence River, but further promote and safeguard this irreplaceable natural wealth and priceless resource. A single oil spill could endanger the vitality of the marine industry. OCEAN has proven marine technical expertise and believes it is its duty to submit recommendations to the Tanker Safety Expert Panel.

Natural Resources Canada expects an increase in tanker movements and tanker size in Canada.¹ One finding of the Office of the Auditor General of Canada in its 2012 Spring *Report of the Commissioner of the Environment and Sustainable Development* is that "[...] tankers have a capacity significantly greater than the 10,000 tonne oil spill response capacity, within 72 hours, mandated by Transport Canada for ship-based oil spills in Canadian waters."²

We therefore believe that Canadian authorities should prioritize oil spill prevention over oil spill preparedness and response, that is, prevention before oil spill impact mitigation and remediation (which can only be partial) of contaminated sites. Far from underestimating the relevance of increasing requirements of the current regime for oil handling facilities and ship-source oil spill preparedness and response, OCEAN believes that prevention measures such as those being implemented in other comparable countries would rapidly and significantly help prevent an oil spill and bring Canada's tanker safety system to a world-class status.

In the next pages, OCEAN sets out the rationale for its recommendations for prevention measures, based on reports from various Canadian and foreign experts, government departments and agencies.³

OCEAN's recommendations:

- Active escorting;
- Independent study to identify navigational risk areas;
- Berthing standards in harbours;
- Vessel traffic regulation and routing.

¹ http://www.oag-bvg.gc.ca/internet/English/parl_cesd_201212_02_e_37711.html#ex6

² http://www.oag-bvg.gc.ca/internet/English/oss_20130226_e_37882.html

³ (TC, EC, TSB, NRCAN, MPO, GCC, Office of the Auditor General of Canada, MTQ, MDDEFP, MRN, SODES, Tourisme Québec, AMQ, UN-IMO, the Nautical Institute, Washington Department of Ecology, OCIMF, etc.)

2. BACKGROUND INFORMATION

2.1. The St. Lawrence River

2.1.1. Its Peculiarities

The St. Lawrence River system is one of the major modes of transportation into the interior of the continent, as far as Chicago. Inland navigation therefore has become a major issue, as sailing was originally possible only up to Québec City for ocean-going ships.

The St. Lawrence River is the primary drainage conveyor of the Great Lakes Basin. The majority of the population in the Provinces of Quebec and Ontario live close to the St. Lawrence River system, and the Windsor-Québec City Corridor is one of the most densely populated areas of North America.

Navigational professionals unanimously agree that the St. Lawrence River is one of the most dangerous rivers to sail in the world. The section between Les Escoumins and Québec City (129 nautical miles or 224 km) is also considered one of the most unpredictable sailing areas. According to the Canadian Coast Guard, “current direction and velocity changes every hour”, and sudden weather changes (wind, fog, mist), shoal areas, and the presence of ice five months a year pose a number of challenges for vessels sailing upstream or downstream.⁴

“The River is one of the most dangerous in the world because it’s not linear as many other major rivers. Between Montréal and Québec City, a vessel must change its course 55 times.”⁵

To this is added a passage in the *Traverse du Nord*, a 32-km section, 305 metres wide in certain areas, with water levels of 12.5 m below chart datum. The maximum authorized draft for vessels is 15.5 meters. Including safety margins, most tankers must therefore take advantage of a high tide, that is, high enough to clear this section of the River. Enhanced prevention measures would allow an increase of the authorized draft to 16 m, thus giving an economic advantage to the industry.

Furthermore, deep-draft vessels, which need a high tide to clear the *Traverse du Nord*, must keep a minimum speed of 9 to 10 knots in order to be able to clear this section safely. Once a vessel has moved into the *Traverse du Nord*, it cannot turn and go back in the event of a mechanical failure and must clear the *Traverse* completely during a high tide, otherwise it will run aground. In the event of a loss of control, these factors—high speed and high tide—will bring the vessel far aground, far from navigable

⁴ Canadian Coast Guard, *Nautical Instructions*

⁵ Nathalie Letendre, Canadian Coast Guard, Quebec Region

waters. Once aground, the pressure when the tide ebbs would fracture the hull (see APPENDIX E). In such a case, a double hull is of no use, and an oil spill is almost unavoidable. Refloating attempts for grounded vessels may take a long time, sometimes lasting hours, days, and even weeks.

As a matter of fact, it is in this section of the River that the bulk carrier *Alcor* ran aground in 1999. The *Alcor* sustained major hull damage near midships due to bending forces incurred during successive low-tide cycles. This accident illustrates the extremely dangerous conditions prevailing in this area (see in APPENDIX E for photos and the complete Marine Investigation Report *Grounding and Constructive Total Loss - The Bulk Carrier Alcor Traverse du Nord, St. Lawrence River - 09 November 1999 and Subsequent Near-Collision between the Tanker Eternity and The Container Ship Canmar Pride on December 5, 1999*).

2.1.2. Its Economic Importance

The geographic location and physical characteristics of the St. Lawrence make it a major economic asset for Quebec, Canada and the industrial heartland of the United States. The economic value of its various uses—marine transportation, industrial activities, harvesting activities, and recreational activities—is estimated at **\$165 billion** over 20 years.⁶

Economic Benefits of the Quebec Marine Industry

The total operation expenses of the Quebec Marine industry are estimated, for 2010, at almost **3 billion dollars**, of which one third is paid in wages. These wages, combined with the supplier chain wages and remunerations, support **27,349 jobs** at the direct, indirect, and induced levels. An industry's economic impact can also be measured in terms of its contribution to the Gross Domestic Product (GDP). Direct, indirect and induced impacts of this **\$3 billion** expense therefore result in a **\$2.3 billion** contribution to the Quebec GDP.

Governments also benefit from the economic activity generated by the Quebec marine industry by levying taxes (income taxes, taxes on profit, incidental taxation, sales taxes, etc.). The Government of Quebec collects a total of **501.3 million dollars** annually in tax revenues, and the Government of Canada collects **\$181.1 million**. Table 2 (APPENDIX B) shows a summary of the main impacts of the economic benefits of the Quebec marine industry.

2.1.3. Recent Investments in the St. Lawrence River

⁶ Boulanger, F. et coll., 1998. Étude économique du programme SLV 2000 : un exemple concret de développement durable.

In the last 20 years, considerable efforts have made it possible to significantly reduce the River's pollution levels, so that it is now possible to swim upstream of the eastern end of the Island of Montréal most of the time, and downstream of Lake St-Pierre. A vast municipal wastewater cleaning program was launched in 1978 under the Québec Wastewater Treatment Program (PAEQ), a **\$7 billion** investment.⁷

Through the *Canada-Quebec Agreement on the St. Lawrence*, the governments of Canada and Quebec alone have invested over **\$1.24 billion**⁸ since 1988 in the St. Lawrence Action Plan to reduce pollution; protect human health; preserve, restore and create wildlife and flora habitats; and promote sustainable management of navigation and community awareness and engagement. The Plan comprises a record 18 governmental departments and agencies.

Considering what has been done to protect the St. Lawrence River and its economic and social significance, it is all the more important to preserve this important seaway and protect it against any marine occurrence that would be detrimental to its use or development.

2.2. Marine Traffic on the St. Lawrence River

2.2.1. Type of Vessel

For centuries, the St. Lawrence River has played a fundamental role in the economic life of Canada. Today, it remains a vital transportation link, crowded with commercial vessels of all kinds and purpose. These include bulk carriers filled with mineral ores and grain; tankers carrying oil and petroleum products; and container ships loaded with consumer goods, industrial supplies and, in some cases, nuclear material. There are also passenger and vehicle ferries, fishing boats, pleasure craft, cruise ships and sightseeing boats.⁹ Each year, 80 million tonnes of oil are shipped off Canada's east and west coasts¹⁰ and 29 million tonnes of crude petroleum and 2 million tonnes of fuel oil are imported into Canada on tankers.¹¹

2.2.2. Marine Pilots' Work

Despite navigational aids placed on its shorelines and the use of modern technology (GPS, radar, etc.), the St. Lawrence River remains one of the most dangerous waterways in the world. Tides can exceed seven meters, currents are strong and multi-directional, shoals are numerous, visibility is often severely reduced, particularly in

⁷ MDDEFP Website, May 16, 2013.

⁸ Anne Gauthier, Manager, St. Lawrence Action Plan, Environment Canada, May 17, 2013

⁹ Canadian Marine Pilots' Association <http://www.marinepilots.ca/en/laurentian-region.html>

¹⁰ <http://www.tc.gc.ca/eng/marinesafety/menu-4100.htm>

¹¹ <http://www.northerngateway.ca/environmental-responsibility/marine-assessment-and-our-first-response-plan/>

winter, while ice creates dangers of its own¹². As a result, it is easy to understand why pilotage is compulsory between Les Escoumins and Montréal for commercial vessels longer than 100 feet navigating the St. Lawrence River. Each qualified pilot is specially trained to navigate only one of the three pilotage sections of the River: Les Escoumins-Québec, Québec-Trois-Rivières, and Trois-Rivières-Montréal.¹³

Increasing tanker size is becoming the global trend, and navigation in some sections of the St. Lawrence Seaway is getting more dangerous given the reduced width and depth of the Seaway and local environmental forces.

Nevertheless, it is important to note that OCEAN does not in any way question the pilots' role and the context of their work. OCEAN acknowledges here the Marine Pilots' excellent work and the need for their presence. OCEAN's recommendations are complementary to the pilots' essential work on the St. Lawrence River, and OCEAN even hopes to see them play a more important role in higher risk areas.

2.2.3. Statistics on Reported Marine Occurrences (Incidents and Accidents)

From 2002 to 2011, 90 marine occurrences involving tankers only were reported to Canadian authorities (APPENDIX B - Table 4). Taking into account that the Canadian oil spill response capacity is inadequate, one oil spill alone could have led to a national disaster. This data does not include barges and bulk carriers loaded with oil.

In the Laurentian Region alone (including roughly the Province of Quebec), 53 marine occurrences involving tankers took place from 2002 to 2011 (APPENDIX B - Table 4). One single oil spill could have spoiled the whole St. Lawrence Valley and have consequences in the Maritime Region and in the Atlantic Canadian waters and beyond for decades, as it was the case of the *Exxon Valdez* in 1989.

Including OBOs (ore/bulk/oil carriers), statistics from the Transportation Safety Board of Canada (TSB) indicate that 322 marine occurrences were reported in Canada in 2011 alone. Over the past 10 years, almost 90% of marine accidents have been shipping accidents¹⁴ which, by nature, are very difficult to anticipate (APPENDIX C); it therefore is of importance to implement proactive prevention measures for vessels loaded with oil.

¹² Canadian Marine Pilots' Association <http://www.marinepilots.ca/en/laurentian-region.html>

¹³ Sciencepresse, [Les pilotes du Saint-Laurent](#)

¹⁴ <http://www.tsb.gc.ca/eng/stats/marine/2012/ss12.asp>

3. OIL SPILL IMPACTS

3.1. Economic Impacts

An oil spill could have dramatic effects. There would be not only damages to vessels, cargoes or bridges and other infrastructure, not to mention the potential loss of human life, but also a possible stoppage of marine traffic potentially causing considerable impacts on economic activity at the local, national and even continental levels. A prolonged stoppage of the marine shipping industry would have major impacts on various economic sectors.

3.2. Environmental Impacts

3.2.1. The St. Lawrence hydrographic system

The St. Lawrence hydrographic system, including the Great Lakes, is one of the largest in the world. Its surface area of 1.6 million km² is the third largest in North America, after the Mississippi and Mackenzie rivers. It drains more than 25% of the Earth's freshwater reserves and influences the environmental processes of the entire North American continent. Over 30 million Americans and 15 million Canadians live in this immense basin.¹⁵

Moreover, the St. Lawrence is the source of drinking water for dozens of communities along its shores; a marine accident involving vessels carrying toxic cargo or a puncture of a fuel tank could have a disastrous impact on the local population's well-being. The destruction of fish stocks and the damage, perhaps irreparable, to fragile marine and shoreline ecosystems would also likely bear consequences.¹⁶

From the Ontario-Quebec border to Gaspé, the St. Lawrence River holds more than 750 protected areas for a total 652,000 hectares (6,520 km²),¹⁷ a surface area 17 times that of the Island of Montréal. This includes waterfowl gathering areas, habitats for marine mammals or other water dependant mammals, Voluntary Natural Conservation Areas, National Parks, Migratory Bird Sanctuaries, Wildlife Sanctuaries, Ecological Reserves, National Wildlife Areas and Nature Reserves.

¹⁵ <http://www.ec.gc.ca/stl/default.asp?lang=En&n=F46CF5F8-1>

¹⁶ Overview of the State of the St. Lawrence River 2008 Environment Canada, ministère du Développement durable, de l'Environnement et des Parcs du Québec,
<http://www.ec.gc.ca/Publications/default.asp?lang=En&xml=1E8CDD4C-114B-41F6-BF90-655085AA5C76>

¹⁷ Protected Areas located on the St. Lawrence River (including islands and the St. Lawrence Estuary) and the ones adjacent to the first kilometer of shore, from the Ontario-Quebec frontier line to Natashquan on the north shore and Gaspé on the south shore. Source: Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs, Base de données du Registre des aires protégées au Québec, March 31, 2013.

3.2.2. Three UNESCO World Biosphere Reserves

The St. Lawrence River houses three UNESCO World Biosphere Reserves: The **Charlevoix World Biosphere Reserve**, Lake Saint-Pierre and Manicouagan-Uapishka. The first includes a river zone and an island (L'Isle-aux-Coudres). This Reserve shelters very diversified fauna and flora in a biologically rich marine area, a Wetland of International Significance, populations of at-risk cetaceans, as well as locally threatened ecosystems.

The **Lake Saint-Pierre World Biosphere Reserve** is a major component of the St. Lawrence ecosystem. Lake Saint-Pierre holds a unique place in the St. Lawrence Lowlands and is bordered by the most expansive freshwater floodplain in Quebec. During springtime, water floods more than 7,000 ha (70 km²) of natural prairies, shrubs, riparian forests and 4,000 ha (40 km²) of croplands, which shelter more than 800,000 birds during spring migration. This makes it the largest waterfowl staging area in eastern Canada. Aquatic grass beds occupy 62 km² with a significant presence of fauna. Lake Saint-Pierre has the largest freshwater floodplain on the St. Lawrence River and hosts 288 (72%) of the 400 bird species observed in Quebec. The reserve is also the first spring staging site for snow geese on the St. Lawrence and contains the largest heron colony in North America, with over 1,300 nests inventoried. In 1998, Lake Saint-Pierre was recognized as a Wetland of International Significance under the Ramsar Convention.

The **Manicouagan-Uapishka World Biosphere Reserve** is a biosphere reserve of the second generation of this appellation, focusing on the human being and sustainable development. It covers roughly the regional county municipality of Manicouagan and stretches from Tadoussac to Baie-Comeau on the St. Lawrence River.

3.3. Social Impacts

One can easily understand the impact an oil spill caused by a marine occurrence would have on public opinion in regards to marine oil shipping. The St. Lawrence remains a difficult area to navigate, and is known as such internationally. Furthermore, an oil spill could, under the pressure of public opinion, compel governments to adopt much more restrictive measures than those that have already been enforced in other countries.

3.4. Marine Transportation, an Efficient and Sustainable Mode of Transportation

It is important to remember marine transportation's comparative advantage over ground transportation. It is the most sustainable way to transport commodities. It produces the lowest greenhouse gas (GHG) emissions of all of possible modes of transportation: two times less than by rail and three times less than road

transportation, according to data published by the St. Lawrence Seaway System, citing a study conducted in the United States.¹⁸ An average-sized ship is equivalent to 870 trucks or 225 railway cars. According to Transport Canada, “the marine sector contributes marginally to emissions of air pollutants [...] such as volatile organic compounds (VOCs) and greenhouse gases (GHG).¹⁹”

4. RISK MANAGEMENT

4.1. Prevention

Prevention is a key factor in averting environmental damage from oil spills. The fact remains that, despite vast technological improvements and training, oil spills are still extremely difficult to clean up. For instance, only 10% of the original amount of oil released from the *Exxon Valdez* grounding event was recovered.²⁰

A preventive approach including active escorting of tankers by escort tugs specifically designed for this type of manoeuvring (APPENDIX F) represents a world-class risk management policy that can rapidly be implemented before an accident occurs. As demonstrated by the American and European experience, active escorting is part of a comprehensive tanker security plan involving all stakeholders and including escort standards and guidelines as well as increasing the oil spill response capacity.

The tragedy of the *Exxon Valdez*, a tanker that ran aground on the coast of Alaska in 1989, causing a large marine oil spill that made a great stir in the United States, led to significant changes to the American legislation on marine transportation, especially marine transportation of oil (Oil Pollution Act, 1990).

According to Art Sterrit, Executive Director of the Coastal First Nations, costs related to damage caused by a major oil spill similar to the *Exxon Valdez* could cost as much as 23 billion dollars to British Columbia taxpayers today, and destroy 4,300 tourism and fishing jobs. The oil spill in Alaska cost approximately 2 billion dollars during the first years, but the non-monetary costs were also very high. Some wildlife and fish populations have never recovered.²¹

According to the magazine *Tanker Operator*, “escort tugs can reduce the risk of tanker accidents in port approaches by 80%” and “As a first step it is now commonplace for

¹⁸ <http://www.ledevoir.com/environnement/actualites-sur-l-environnement/363937/sur-la-seule-138-140-000-camions-passent-annuellement>

¹⁹ <http://www.tc.gc.ca/eng/policy/anre-menu-3019.htm>

²⁰ Skinner, Samuel K; Reilly, William K. (May 1989). *The Exxon Valdez Oil Spill*. National Response Team. Retrieved March 9, 2008.

²¹ <http://www.radio-canada.ca/nouvelles/environnement/2013/03/24/001-pub-exxon-valdez.shtml>

the tug to be tethered to the tanker throughout the escorted passage. Tugs are tethered at the stern of the tanker.”²²

According to Transport Canada, “this risk has decreased over the years, primarily due to increased preventative measures that have been implemented, including the phase-in of double-hulled tankers, the requirement to have contracts with response organizations [such as Tug Operators] and increased monitoring and inspections”.²³

“Government of Canada is responsible for fostering the national transportation system’s efficiency, safety, security and sustainability in all modes ...and positioning Canada to compete and prosper in the global economy.”²⁴ The St. Lawrence-Great Lakes corridor must be a privileged and efficient, safe and world-class channel to ensure this policy is successful.

OCEAN believes it is of importance to note that current oil spill response plans are little known, and there is not necessarily coordination between the various players. Better linkage between stakeholders would be a benefit, and a definition of each of their roles could lead to better unfolding of response actions. For now, we note that response actions are at each stakeholder’s discretion, and there is no authority in charge of coordinating a response plan. For instance, OCEAN has oil spill and fire response equipment, such as water cannons and fire-retardant foam, but there is currently no quick and sufficient supplying plan for such products.

5. ESCORT REGULATION AND PRACTICE IN VARIOUS PORTS

Before making recommendations that could have an influence on tanker traffic in Canada, it is important to provide an overview of the increasing number of positive initiatives being implemented worldwide. As demonstrated in the overview of safety measures adopted by several ports around the world, it is possible to establish standards in line with those being implemented abroad while still ensuring efficient oil transportation, and active escorting of tankers is the trend. Data on existing regulations and practices in North America and Europe are from the Study of Tug Escorts in Puget Sound prepared for the Washington State Department of Ecology in 2004.

²² Tanker Operator is the only international magazine dedicated to the tanker industry and is read by the leading tanker operators, owners, managers, charterers, brokers and equipment manufacturers:
www.tankeroperator.com/AboutUs.aspx

²³ <http://www.tc.gc.ca/eng/marinesafety/tp-tp15039-bground-3179.htm>

5.1. North American East Coast Ports

Placentia Bay, Newfoundland

At the time of the study, only one port on the North American East Coast conducted tanker escorting. This escorting is the voluntary practice of the owners of the Whiffen Head Transshipment Terminal in Newfoundland.

The terminal receives crude oil shuttle tankers from offshore fields. Two Voith tractor tugs, each having 5,600 horsepower and about 55 tons bollard pull, perform escorting, docking and firefighting duties.

Laden tankers, either departing or arriving at the terminal, are required to be escorted by at least one tractor tug. Inbound tankers are escorted from the pilot station to the terminal or safe anchorage (about 28 nautical miles). Outbound loaded tankers are escorted from the terminal to the southern ridge, south tip of the Merasheen Banks (about 48 nautical miles).

The maximum inbound and outbound speed limit for tethered tankers is 6 and 8 knots, respectively. Tethering of the escort tugs is not mandatory but is assessed based on environmental and tanker conditions.

5.2. North American West Coast Ports

Puget Sound, Washington State

The Washington State Pilotage Act under the Revised Code of Washington (RCW 88.16.170) prevents laden oil tankers and any vessel designed for carrying cargo of liquefied natural or propane gas greater than 125,000 deadweight tons from entering Puget Sound. The latter is a waterway in American waters serving important cities such as Seattle and whose river mouth is located at 50 km south of Victoria in British Columbia. The Act requires certain safety features that the above mentioned types of vessels over 40,000 gross tons must comply with in order to be unescorted. These safety features include minimum horsepower requirements, twin propellers, double bottoms and dual radar. But due to the high horsepower requirement - on the order of twice the horsepower typically installed - no vessel satisfies this rule.

To summarize, any sizable oil, natural gas or propane tanker transiting Puget Sound cannot transport more than 125,000 deadweight tons, and must have an escort tug (or tugs) with horsepower equal to at least 5% of escorted tanker's deadweight.

Prince William Sound, Alaska

Part 168 of 33 CFR, "Escort Requirements for Certain Tankers" is applicable in these waters. This regulation requires at least two escort vessels be immediately available for single hull tankers over 5,000 gross tons. The escort vessels must be able to influence the tankers' speed and course in the event of a steering or propulsion equipment failure. The regulation outlines the requirements for the escort vessels.

Through the Valdez Narrows, one of the escorts must be tethered to the tanker's stern. At the north end of the Sound (from the Valdez Marine Terminal to the Bligh Reef light) and at the south end, where tankers enter the Gulf of Alaska via Hinchinbrook Entrance, all escorts must stay within a quarter nautical mile of the tanker.

In the central part of the sound (from the Bligh Reef light to the Hinchinbrook Entrance) there is more sea room and only one of the escorts is required to stay within a quarter nautical mile of the tanker. The other escort (called a "Sentinel") may be stationed a few miles away at one of three points along the route, close enough to be able to provide a quick response.

Two close escorts are required through Hinchinbrook Entrance. After a tanker leaves Prince William Sound, a rescue tug must stay on station near Hinchinbrook Entrance until the tanker is at least 17 miles out to sea.

The VERP²⁵ manual describes speed limits for laden and ballast tankers in various areas or zones of Prince William Sound. It also requires the use of combinations of specific tugs based on tanker deadweight tonnage and weather conditions. When wind speed is above 40 knots, transit of any size tanker is prohibited.

In 2010, an amendment to 1990's *Oil Pollution Act* was included in the *Coast Guard Authorization Act of 2010*. Signed into law by President Barack Obama on October 15, 2010, the two tug escort system now applies also to double-hull tankers.²⁶

²⁵ *Vessel Escort and Response Plan*, created by Alyeska Pipeline Services

²⁶ <http://www.pwsrca.org/programs/maritime/tanker-escort-system/>

"...The requirement ... relating to single hulled tankers in Prince William Sound, Alaska, ... being escorted by at least 2 towing vessels or other vessels considered to be appropriate ... shall apply to double hulled tankers over 5,000 gross tons transporting oil in bulk in Prince William Sound, Alaska."

San Francisco Bay

Within the *California Code of Regulations*, 14.4.4.1 "Tank Vessel Escort Regulations for the San Francisco Bay Region" requires that tank vessels carrying 5,000 or more long tons of oil as cargo shall be escorted by a suitable escort tug or tugs. The concerned area includes San Francisco Bay, San Pablo Bay and Suisun Bay. These areas are broken up into six zones. Zones 1 and 2 are grouped together and require minimal escort tug breaking force due to channel width, depth, traffic and environmental forces. Zones 4 and 6 are grouped together and require escort tugs with more severe breaking force. Zones 3 and 5 do not require escorting.

All tank vessel masters shall use an approved escort plan for transit through zones 1, 2, 4 or 6. No more than three tugs are permitted for the escort. All tank vessels must comply with a 10-knot speed limit through zones 1, 2, 3 and 5; and an 8-knot speed limit through zones 4 and 6.

Sufficient tug performance is achieved by referring to a table provided in the Regulations. The table matches tug braking pull to tanker size in deadweight tons, taking into account up to 4-knot currents commonly found in San Francisco waters. The measurement must be conducted by an approved marine architect or engineer and submitted to the administration for approval.

If a tanker has a double hull, a fully redundant steering and propulsion system, a bow thruster and a federally compliant navigation system, then it is exempt from the state escort requirements.

Barges fall under different requirements. The escort tug(s) must have a total astern static bollard pull in pounds equal to or greater than the barge's deadweight tonnage.

Los Angeles/Long Beach

Within the *California Code of Regulations*, 14.1.4.4.2, "Tank Vessel Escort Program for the Los Angeles / Long Beach Harbor" requires that tank vessels carrying 5,000 or more long tons of oil as cargo be escorted by a suitable escort tug (or tugs).

The applicable nautical area includes any area inside the Federal Breakwater and within the pilot operating area for inbound vessels only. Tanker and escort tugs must be matched using a force selection table provided in the regulations. Tractor tugs shall be tethered at all times and conventional tugs need only be tethered going outbound, but can also be tethered inbound.

If a tanker has a double hull, a fully redundant steering and propulsion system, a bow thruster and a federally compliant navigation system, then it is exempt from the escort requirements stated above. All tank vessels of 60,000 displacement tons and

less must comply with an 8-knot speed limit. Vessels exceeding this displacement must comply with a 6-knot speed limit.

Barges fall under different requirements. Barges with less than or equal to 20,000 displacement tons shall have a tethered or untethered escort tug (or tugs) having a minimum bollard pull equal to 10 or 15 short tons, respectively. If the barge is over the 20,000 deadweight tons limit, the total tonnage of the barges and towing tug must be less than or equal to the total astern bollard pull of a tethered escort tug (or tugs). In either case, no more than two escort tugs are permitted to provide the breaking force specified.

5.3 European Ports

At the time of the Study, throughout Norway, Sweden, Finland and the UK, no governmental regulations required escorting in specific ports. However, many ports in these areas perform tanker escorting initiated by port authorities, terminals, refineries and, in the case of Norway, the Coastal Directorate.

Norway

There were, at the time the Study was conducted, two ports performing escorting of laden tankers in Norway. These are Mongstad and Rafsnes, which contain oil terminals owned respectively by Statoil and Norsk Hydro. Agreement to escort and the practice to be adopted have been developed by the Port Authority, terminal owners and the Coastal Directorate.

In addition, it is specified in escort agreements that all tankers must meet the Oil Companies International Marine Forum (OCIMF) recommendations²⁷ for fastening devices for escort tug tether attachment point. Norwegian ports of Sture and Snoehvit had plans to start tanker escorting, at the time the Study was conducted.

Sweden

At the time of the study, the two ports of Brofjorden and Gothenburg in Sweden practiced tanker escorting. Brofjorden was the first port in Sweden to develop a tanker escorting policy in 1998, passed as a law in by the Environmental Court in 2005. In addition to the above, other ports were considering escorting tankers in the future. Practice and escorting agreements are essentially the same as those of Norway. Norwegian tugs commonly serve ports in Sweden.

²⁷ OCIMF, Mooring Equipment Guidelines 3rd Edition, section 3.4

As of January 13, 2013, the Port of Gothenburg's website states that the Swedish Maritime Administration has guidelines for ordering the number of tugs required on arrival at and departure from the Port of Gothenburg.²⁸ The Swedish Maritime Administration also requires that tanker bollards comply with OCIMF recommendations; otherwise, non-compliant tankers need one more tug at their side.

Finland

At least one port in Finland would escort tankers at the time of the Study. Porvoo refinery is owned by Fortum Oil Company and located in Porvoo, Finland. All inbound and outbound laden tankers are escorted to and from the refinery by Z-drive DNV escort tugs rated at 70 tons bollard pull with an ice class 1A notation.

United Kingdom

Like the Scandinavian countries, the U.K. does not have specific governmental requirements for laden tanker escorting and individual ports have adopted this practice to mitigate oil spill risk. Sullom Voe, Milford Haven and Liverpool on the Mersey River all practice tanker escorting of varying degrees. Sullom Voe has the longest history of tanker escorting and an advanced oil spill response plan.

A tug escort simulator has been built near Liverpool and is currently operational. The simulator is being used to ensure safer transit of vessels on the Mersey River and transit to Shell's Tranmere Oil Terminal.

As of 2010, the port of Milford Haven had 10 tractor tugs permanently on station in the Haven. All the tugs are equipped for fire fighting.

6. OCEAN'S RECOMMENDATIONS

The introduction of new generations of tankers equipped with double hulls, redundant propulsion and navigation systems (dual and totally independent), and dual radars is a major technological advance enhancing the safety level of marine oil transportation in Canada and around the world. However, very few tankers are equipped with all these features.

- Since almost 90% of marine accidents are navigation accidents (groundings, sinkings, collisions, fires, and explosions) and their consequences difficult to control, it is important to implement an active prevention plan during tanker transit in risk areas.
- OCEAN's recommendations are based on Canadian and international data and best practices in place around the world to provide Canada with a world-class tanker safety plan.

²⁸ <http://portgot.epipro.se/en/About-the-port/Maritime/Towage-and-escort-tugs/>

Recommendation 1 – Active escorting

All the considerations in this report lead OCEAN to recommend that all tankers transporting oil, or any vessel transporting over 5,000 tonnes of heavy petroleum products in its double bottom, navigate under active escorting tugs adapted and developed for these types of manoeuvres in risk areas in Canadian navigable waterways. (See the definition of “active escorting” in APPENDIX F.)

Recommendation 2 – Independent study to identify navigational risk areas

Some areas of Canadian navigable waterways are dangerous, as demonstrated by the statistics on marine occurrences. OCEAN considers it pertinent that a group of experts examine the issue and identify the highest risk areas, where it would be appropriate to implement world-class safety measures under the supervision of an executive authority.

Recommendation 3 – Berthing standards in harbours

Although some terminals have adopted standards, no federal regulations on berthing rules currently exist for Canadian oil ports and terminals. The captain of a tanker may attempt to dock in a Canadian port without the assistance of a tug. OCEAN believes this is currently an area of weakness and that regulations should require any vessel transporting oil to seek assistance from tugs for berthing. OCEAN believes it is important that world-class standards be enacted by government authorities.

Recommendation 4 – Vessel traffic regulation and routing

OCEAN recommends a clearer definition of which world marine stakeholder should hold exclusive authority over organizing and regulating all marine traffic. The activities of this agency with the power to apply the legislation would reduce the risk of unplanned and dangerous manoeuvres. OCEAN is of the opinion that the world of marine transportation should aim to organize traffic, as is the case with air transportation. This task currently falls by default to pilots and is an additional burden for them. Current technology makes it easy to regulate traffic through a supervising agency. The trend is to increase tonnage and size of tankers, already limited by their large drafts. Establishing such an agency would meet a real need.

APPENDIX A – Acronyms

AMQ	Quebec Maritime Association
CCG	Canadian Coast Guard
DFO	Fisheries and Oceans Canada
Dwt	Dead Weight Tonnage
EC	Environment Canada
FRINA	Fellow of the Royal Institution of Naval Architects (RINA), London
FSNAME	Fellow of the Society of Naval Architects and Marine Engineers (SNAME)
MDDEFP	Ministère du Développement durable, de l'Environnement, de la Faune et des Parcs (Quebec) – <i>Department of Sustainable Development, Environment, Fauna and Parks</i>
MRN	Department of Natural resources (Québec)
MTQ	Quebec Department of Transport
NRCAN	Natural Resources Canada
OBO	Oil-bulk-ore (OBO Carrier)
SLSMC	St. Lawrence Seaway Management Corporation
OCIMF	Oil Companies International Marine Forum
SODES	Organization for the St. Lawrence Economic Development
TC	Transport Canada
TSB	Transportation Safety Board of Canada
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-IMO	United Nations International Maritime Organization

APPENDIX B – Tables

Table 1

Quebec Marine Industry Figures

Number of Ports	20
Number of vessel movements	10,889
Cruise ship passengers	116,300
Ferry users	5,613,482
Tonnes of cargo loaded (2009)	110,000,000

Sources: Statistics Canada, 2011 Shipping in Canada 2009, Table 11-12.

Société des traversiers du Québec, 2011, Rapport annuel de gestion 2010-2011, page 18.

Gamache, Clément, 2009, Bulletin économique du Transport, juin 2009, numéro 42

Table 2

Economic Impact of the Marine Industry Operating Expenses, in Quebec in 2010

	Marine transport	Shipping activities in Quebec ports	Support services	Total
Expense amount (M\$)	1,650.8	1,016.2	302.1	2,969.2
Workforce (year-person)	9,163	13,321	4,865	27,349
Value added at market price (M\$)	853.8	1,101.8	350.4	2,306.0
Imports (M\$)	1,025.0	260.7	79.9	1,365.6
Govt. of Quebec revenues (M\$)	219.8	206.6	74.8	501.3
Govt. of Canada revenues (M\$)	73.9	78.1	29.1	181.1
Multiplier*	1.242	1.284	1.362	

Source: Institut de la statistique du Québec and ADEC compilation. Due to rounding, totals might not add up to 100.

*The multiplier is calculated as follows from the value added at market prices: Direct & indirect impacts / Direct, indirect & induced impacts

Table 3

**Economic Impact of the Marine Industry Investment Expenses,
in Quebec in 2010**

	Marine transport	Shipping activities in Quebec ports	Support services	Total
Expense amount (M\$)	85.4	330.8	42.9	459.1
Workforce (year-person)	590	2,562	123	3,275
Value added at market price (M\$)	53.9	224.3	10.7	288.9
Imports (M\$)	45.9	166.8	35.1	247.8
Govt. of Quebec revenues (M\$)	8.3	34.0	1.5	43.7
Govt. of Canada revenues (M\$)	2.9	12.0	0.5	15.4
Multiplier*	1.209	1.212	1.209	

Source: Institut de la statistique du Québec and ADEC compilation. Due to rounding, totals might not add up to 100.

Table 4

Occurrences Involving Tankers 2002-2011, by region											
	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Total
Western Region	0	0	0	0	0	0	0	1	0	0	1
Central Region	2	4	1	4	2	1	2	3	2	5	26
Laurentian Region	4	5	4	11	7	7	4	4	4	3	53
Maritimes Region	2	3	0	0	2	0	0	1	0	2	10
TOTAL	8	12	5	15	11	8	6	9	6	10	90

Data published on February 16, 2012.
Source: Transportation Safety Board of Canada

APPENDIX C - Definitions

The following definitions apply to marine occurrences that are required to be reported pursuant to the *Canadian Transportation Accident Investigation and Safety Board Act and the associated regulations*.²⁹

Marine Occurrence

1. any accident or incident associated with the operation of a ship³⁰ and
2. any situation or condition that the Board has reasonable grounds to believe could, if left unattended, induce an accident or incident described in paragraph a) above.

The Act applies

1. in Canada; and
2. in any other place, including waters described in paragraph c), if
 1. Canada is requested to investigate the marine occurrence by an appropriate authority,
 2. the marine occurrence involves a ship registered or licensed in Canada, or
 3. a competent witness to, or person having information concerning a matter that may have contributed to, the marine occurrence arrives or is found at any place in Canada.
3. This Act also applies in respect of marine occurrences related to an activity concerning the exploration or exploitation of the continental shelf.

Reportable Marine Accident

An accident resulting directly from the operation of a ship other than a pleasure craft,⁵ where

1. a person sustains a serious injury or is killed as a result of
 1. being on board the ship or falling overboard from the ship, or
 2. coming into contact with any part of the ship or its contents, or
2. the ship:
 1. sinks, founders or capsizes,
 2. is involved in a collision (which includes collisions, strikings and contacts),
 3. sustains a fire or an explosion,
 4. goes aground,
 5. sustains damage that affects its seaworthiness or renders it unfit for its purpose, or
 6. is missing or abandoned.

For statistical purposes, accidents defined in paragraph a) are classified as "Accidents Aboard Ship" and accidents defined in paragraph b) are classified as "Shipping Accidents."

²⁹ http://www.bst-tsb.gc.ca/eng/stats/marine/2008/ss08.asp#annexe_b

³⁰ Ship includes:

a) every description of vessel, boat or craft designed, used or capable of being used solely or partly for marine navigation without regard to method or lack of propulsion, and
b) a dynamically supported craft.

Reportable Marine Incident

An incident resulting directly from the operation of a ship, other than a pleasure craft, where:

1. a person falls overboard from the ship;
2. the ship, of 100 gross tons or more, unintentionally makes contact with the bottom without going aground;
3. the ship fouls a utility cable or pipe, or underwater pipeline;
4. the ship is involved in a risk of collision;
5. the ship sustains a total failure of any machinery;
6. the ship sustains a shifting of cargo or a loss of cargo overboard;
7. the ship is intentionally grounded or beached to avoid an accident;
8. any crew member whose duties are directly related to the safe operation of the ship is unable to perform the crew member's duties as a result of a physical incapacitation that poses a threat to the safety of any person, property or the environment; or
9. any dangerous goods are released on board or from the ship.

Vessels Covered

This report covers commercial vessels that include all vessels either registered or licensed to operate commercially. Pleasure craft occurrences are not normally included unless they also involved a commercial vessel.

Vessel Categories

- **Commercial vessels:** include cargo vessels, ferries, tankers, passenger vessels, tugs and barges.
- **Fishing vessels:** include vessels involved in commercial fishing.
- **Other vessels:** include research vessels, oil exploration, exploitation and support vessels, government vessels and pleasure craft.

Type of Vessel

Cargo: Ship designed for the carriage of various types and forms of cargo and the combined carriage of general cargo and passengers with 12 or less fare-paying passengers.

Bulk Carrier: Ships specifically designed for bulk carriage of ore or other dry cargo.

OBO (Oil/Bulk/Ore Carrier): Ships specifically designed for bulk carriage of ore with additional facilities for alternative, but not simultaneous, carriage of oil or loose dry cargo.

Tanker: Propelled ships designed and constructed for the bulk carriage of liquids.

Tug: Vessels designed for the towing and pushing of ships or other floating structures. Additional activity may include salvage, fire-fighting and work duties of a general nature.

Barge: Vessels designed as non-propelled units for the carriage of cargo in holds or in tanks or weather deck cargo space only for the carriage of non-perishable cargo, or specially outfitted for specific operations.

Ferry: Ships that follow a regular scheduled service of relatively short duration, designed for the carriage of passengers and vehicles. There is usually no cabin accommodation for passengers or not all passengers are accommodated in cabins where cabins are provided.

Passenger: Vessels designed for the carriage of passengers.

Fishing: Vessels designed for fishing operations and support.

Service: Vessels designed for supporting marine transportation such as icebreakers, buoy tenders, search and rescue vessels, pilot boats and fireboats.

Non-commercial: Vessels designed to conduct non-commercial activities such as pleasure craft, seaplanes and naval vessels.

Other: Vessels designed for other functions such as laying and repair of sea-bed cables, dredging, training, patrolling as well as ships and platforms designed for the extraction, processing, and storage of oil/gas from offshore wells; ships designed for the carriage of stores and cargo to offshore installations; ships outfitted for support activities related to offshore oil and gas exploration; and vessels designed for research work such as seismic research, oceanic and hydrographic survey.

Type of Accident

Collision: An impact between two or more vessels under way.

Capsizing: To turn over.

Foundering: To fill from above the waterline and sink.

Sinking: To become submerged from water intake below the waterline and settle to the bottom.

Fire: Where a fire is the first event reported.

Explosion: Where an explosion is the first event reported.

Grounding: To touch bottom and remain stranded.

Striking: A hard impact with a stationary object or a vessel not under way.

Ice Damage: Damage sustained as a consequence of contact with ice.

Propeller Damage: Damage to a vessel propeller, propeller portion or propeller adjoining parts affecting a vessel's seaworthiness or rendering the vessel unfit for its purpose.

Rudder Damage: Damage to a vessel rudder or rudder adjoining parts affecting a vessel's seaworthiness or rendering the vessel unfit for its purpose.

Structural Damage: Hull damage, such as cracks and fractures, sustained by a vessel affecting its seaworthiness or rendering the vessel unfit for its purpose.

Flooding: To fill a compartment below the waterline with water admitted from the sea.

Other: Vessels lost or damaged for other reasons, including contact defined as a lateral/light impact with another vessel or an object (that is, bottom contact affecting a vessel's seaworthiness or rendering the vessel unfit for its purpose).

Miscellaneous

Gross tons (grt): A measure of vessel capacity in cubic feet of the spaces within the hull, and of enclosed spaces above deck available for cargo, stores, fuel, passengers and crew, with certain exclusions. One hundred cubic feet is equivalent to one gross ton.

Movement: A vessel's travel segment between ports with at least one port being a domestic port.

Under way: Vessel not at anchor or made fast to shore or aground.

APPENDIX D – Grounding of the Joseph-Savard ferry in St-Joseph-de-la-Rive

A demonstration of the dangerousness of the stretch between Les Escoumins and Québec, particularly from Cap-aux-Oies to Deschaillons: if a vessel that follows the same course of 2 nautical miles over 12,000 times per year runs aground, significant environmental forces must be at work in the area.

The Joseph-Savard transports 583,000 passengers and over 291,000 vehicles annually (2012). The ferry makes 12,478 crossings annually between St-Joseph-de-la-rive and L'Isle-aux-Coudres.



The Joseph-Savard ran aground at high tide on February 17, 1996, at 3:30 p.m. Passengers were evacuated by helicopter, and the vessel was salvaged the next day.

APPENDIX E – Marine Investigation Report M99L0126 (Alcor)

Marine Investigation Report *Grounding and Constructive Total Loss - The Bulk Carrier Alcor Traverse du Nord, St. Lawrence River – 09 November 1999 and Subsequent Near-Collision Between The Tanker Eternity and The Container Ship Canmar Pride.*

The complete Marine Investigation Report M99L0126 is available in French or English at the URL mentioned below.

Summary

On 09 November 1999, the loaded bulk carrier Alcor was upbound for Trois-Rivières, Quebec, on the St. Lawrence River, under the conduct of a pilot. At 1444 local time, while undertaking a course alteration to starboard, the vessel ran aground near the eastern end of Île d'Orléans. A refloating attempt the next evening succeeded in freeing the vessel, but only briefly, and the vessel grounded a second time near the initial grounding position. The Alcor sustained major hull damage near midships due to bending forces incurred during successive low-tide cycles.

The damaged hull was temporarily repaired and roughly half of the cargo was discharged onto smaller vessels. On December 5, the Alcor was refloated and conducted to the port of Québec. It was declared a constructive total loss.

While the Alcor was being refloated and later, while the vessel was upbound with the assistance of tugs, the Traverse du Nord section of the river was temporarily closed. The closure caused several downbound vessels to anchor upriver. The subsequent re-opening of the channel resulted in a confluence of vessels wishing to depart their anchorages. During this time, a near-collision occurred between the tanker Eternity, under way, and the container ship Canmar Pride, at anchor.

This report is also available at:

<http://www.tsb.gc.ca/eng/rapports-reports/marine/1999/m99l0126/m99l0126.asp>

SEE PHOTOS NEXT PAGE

APPENDIX E – Investigation Report on the *Alcor* Accident (Continued)

Hull Failure



Port side fracture



Starboard side fracture



Main deck fracture



Main deck fracture (at arrow)

APPENDIX F – A Description of Active Escort Towing

The deployment of a tug in a position from which it can rapidly and safely effect steering or braking control over a ship which has lost propulsion and/or steering control in a confined waterway, and (most critically), at a speed in excess of 6 – 7 knots.

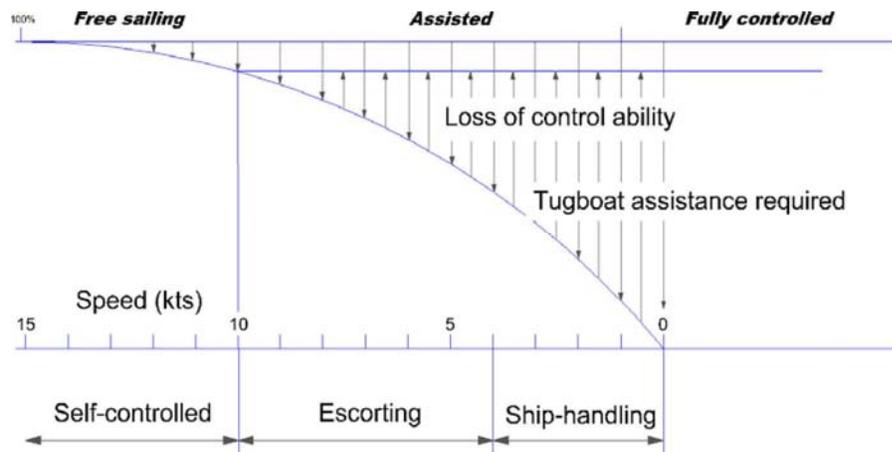
— Robert G. Allan, ing, FSNAME, FRINA

Active escorting must be carried out by tugs with hulls specially designed to perform this type of operation. Over the past few years, a great deal of research has been conducted, particularly on the dynamic effects and operation speeds to adjust not only the hull, but also the propulsion systems. Today, active escorting tugs are designed to provide safe and efficient service.

The tug's role is to be available to bring a disabled vessel rapidly and safely under control in the event of a machinery system failure. Since the risk of environmental impact due to grounding increases dramatically with proximity to a coastline, escort operations only occur within fairly confined waters and speeds up to 10 knots.

Short response times are critical to effectively limit the risks of grounding and/or collisions. Therefore tethered escort tugs are most effective and significantly reduce risks as the corrective response could obviously be initiated almost immediately.

The escort tugs ability to generate steering and braking forces within shortest possible time while tethered and changing position from port to starboard is of utmost importance. Maximum steering capability is required at speeds of 6-10 knots, while at speeds above 10 knots braking assistance will be predominant over steering.



The diagram above illustrates that the available steering capability of most vessels is reduced with reduced speed. At speeds below 5-6 knots they are more or less incapable of steering.

This is the reason why seagoing vessels have to maintain a speed of at least 6 knots, even in tricky channel bends and narrow inlets. The most economical speed of a seagoing vessel is most of the time the highest speed allowed or the highest speed possible for safe passage. This often means speeds in excess of 10 knots. Thus for many areas the required escort speed will be at least 10 knots, sometimes even in excess of that.

Thus as stated above, we can say that escort towing takes place at speeds in excess of 6 knots, often up to 10 or 12.

From a practical point of view it can be concluded that a maximum speed of 10-11 knots through the water is acceptable in some of the more open areas of the approach to/from ports. Braking has to be deployed initially to rapidly reduce the ship's speed to a more manageable speed of 6-8 knots (generally 2-3 ship lengths are required for this speed drop) and then the tug should generate steering forces to direct the ship safely away from danger. When the approach is dictated by width (bridges, etc.) the ship's speed should be reduced to 6-7 knots. In this case of restricted waters and lower speeds the tug must be tethered in order to be able to react immediately.³¹

We recommend watching the following short videos:

<http://www.youtube.com/watch?v=F-kTnSFx8K0>

http://www.youtube.com/watch?feature=player_embedded&v=zGp7xwyZs9E



³¹ Escort Tug Design Alternatives And A Comparison Of Their Hydrodynamic Performance Robert G. Allan, (FL), President, Robert Allan Ltd. & David Molyneux, (M), National Research Council of Canada