Crude Oil Exports Through Second NArrows

A Presentation To The Oil Tanker Expert's PAnel - Vancouver City Council

(v1-61 - JULY 5, 2010)

Peter Baker, M.Sc., Oceanography
pbakerster@GMAIL.com

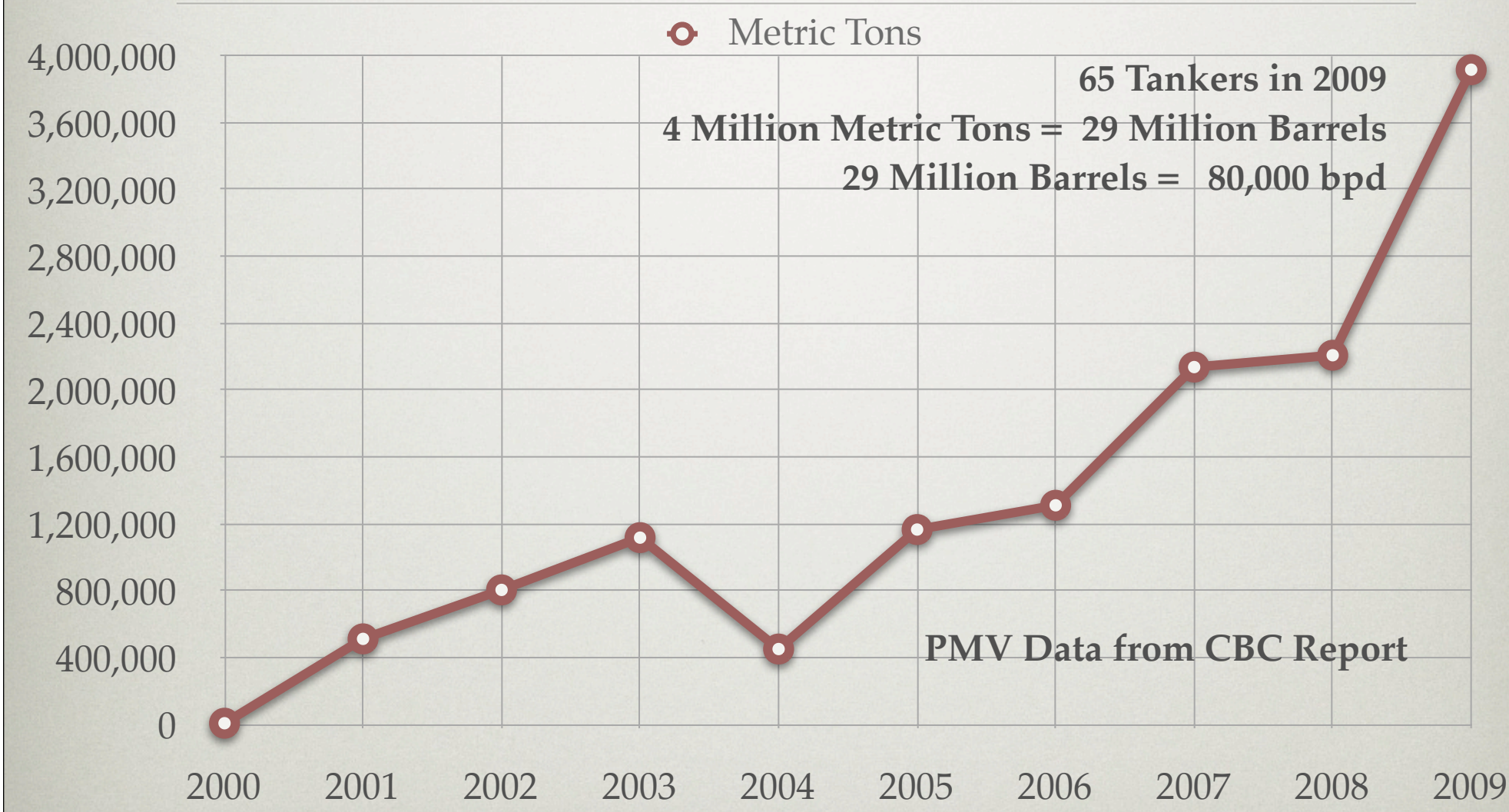
- "Where I was wrong was in my belief that they had their act together when it came to worst case scenarios"

President Obama at his press conference about the 2010 Gulf Oil Spill

Business Week, “Obama Defends Spill Response”, May 27, 2010

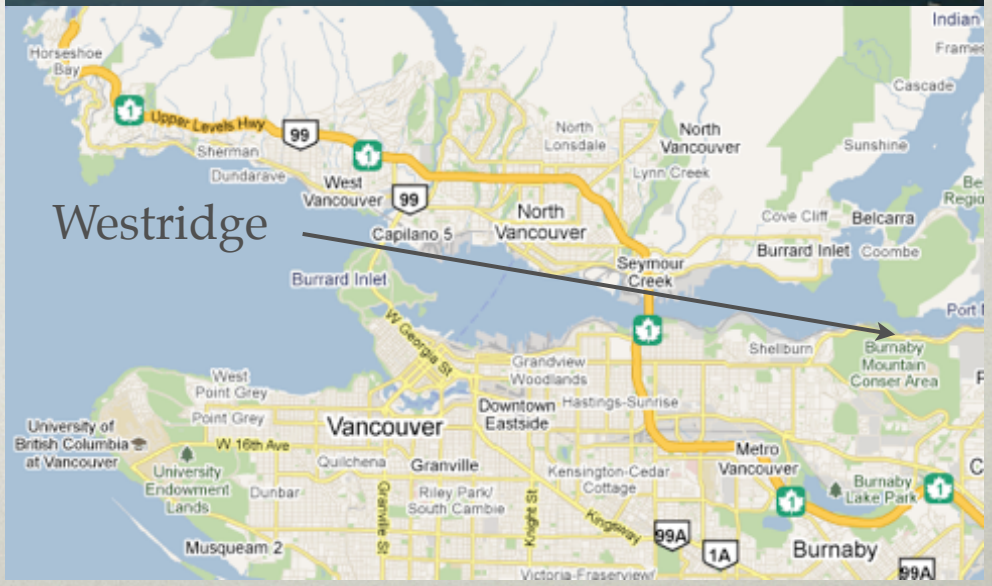
Port Metro Vancouver

Metric Tons Exported



Kinder Morgan Westridge Oil Terminal

- *Crude Oil export capacity of 300,000 bpd*
- *Inside First AND Second Narrows*
  Loading:
  Panamax/Aframax Tankers
- **3 Refinery Closures in the 1990s**
  (Ioco, PetroCan, Shellburn)
- **Recent TMX-1 upgrade (2009)**
- **Expansion plans to 700,000 bpd** with a Second Berth
- **From 65 (2009) to over 200+ Tankers**



Oil Tanker Accident Stats

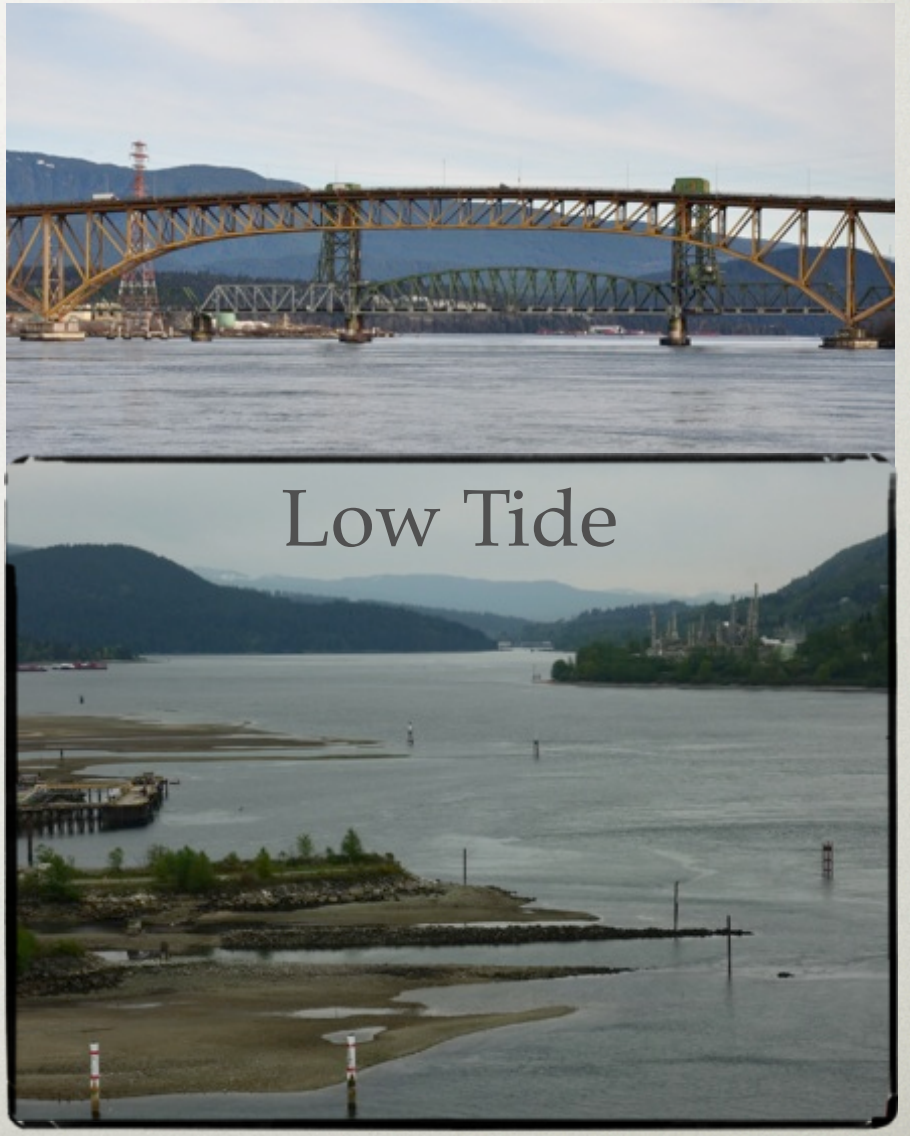
- **A catastrophic spill (> 10,000 tonnes) is predicted every 15 years**
  - + 100 small, 10 moderate, 1 major spill per year is predicted based on current Oil Tanker traffic in Canada
    (Pembina Institute Report, from Environment Canada Research)
- **Human Factors**, Steering Failure, Engine Failure, Blackouts
  "80% of oil spills and marine accidents are the result of human error." "Improved technology does nothing to break the chain of events that lead to an oil spill ...."
  Prince William Sound RCAC commissioned study "An Assessment of the Role of Human Factors in Oil Spills from Vessels", September 2006, Nuka Research.
- **Illustrative B.C. Coast Accidents**:
  - "**Japan Erica**", 20,738 dwt Freighter , October 1978, took out the Second Narrows CN Railway Bridge
  - "**Petersfield**" , 41,000 dwt Freighter, September 2009, hit the beach in Douglas Channel because of gyro failure.

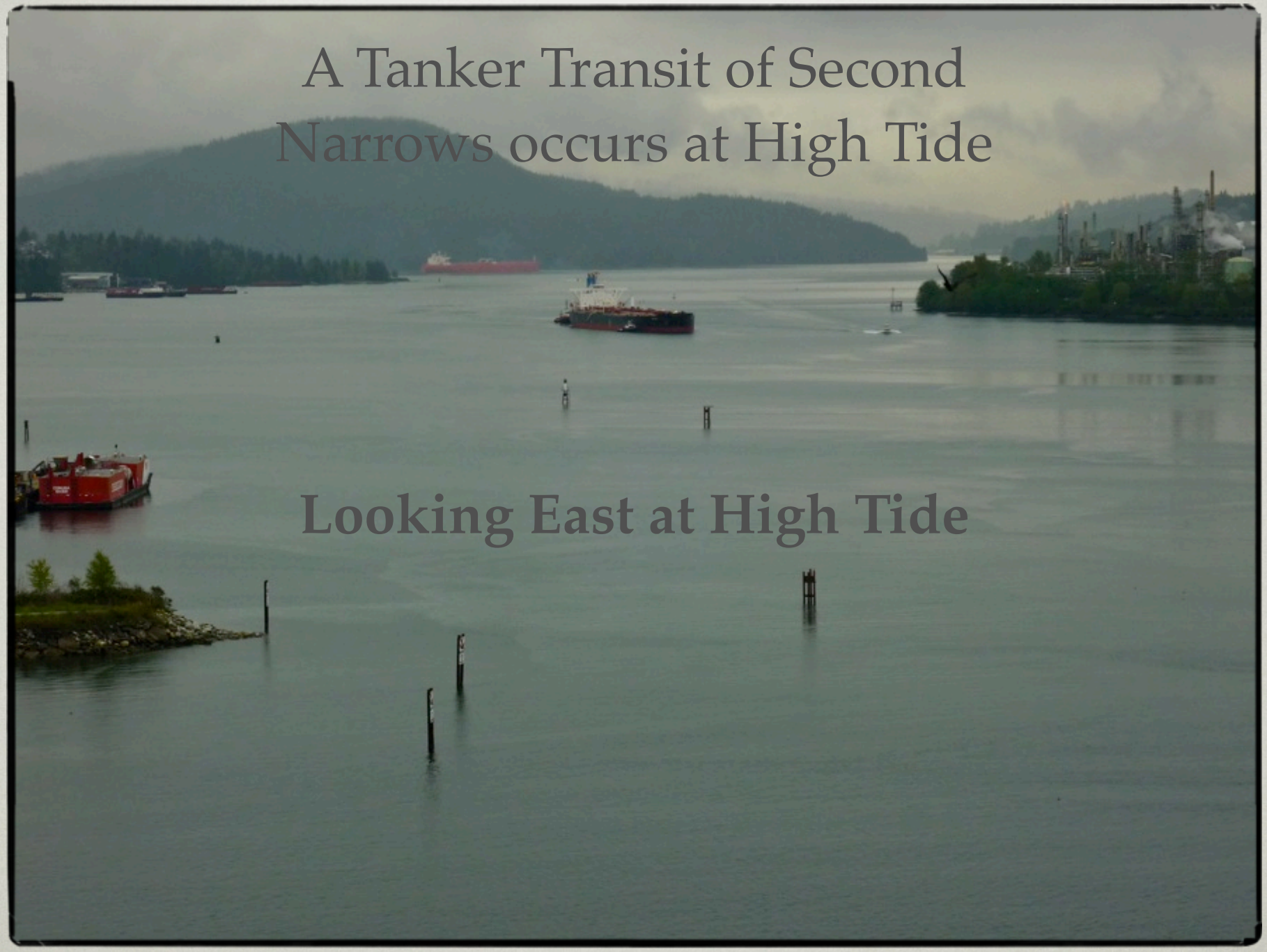
Plans for Second Narrows

- **"The goal is to be able to have an AFRAmax, fully loaded at 15 metres (transit Second Narrows"**
  Yoss LeClerc, Port Metro Vancouver Harbour Master, in Vancouver Sun, Dec. 2009
- **"We can grow the pipeline over time (to 700,000 bpd), look to add the (larger) Suezmax and offer a more cost-effective route to Asia if that market grows"**
  Norm Rinne, Sr. Director for Business Development Kinder-Morgan, Vancouver Sun, Dec. 2009
- **"Suezmax is not impossible. We have the width, the depth, and we have plans for dredging ... There is a possibility for Suezmax at 18 m draught"**
  Yoss LeClerc, Port Metro Vancouver Harbour Master, in Vancouver Sun, Dec. 2009

Second Narrows
A few details

- **High Vulnerability Rating (7) in CCG's "Vulnerability of Bridges in Canadian Waters"**
- **Narrow Railway Bridge**
  Unprotected piers: 137 m (500 ft)
- **Navigable Channel:**
  121 m (397 ft)
- **Shallow**
  16 m (52.5 ft) at 0 tide - datum
- **Strong Flood and Ebb Tides Inundating Port Moody - Indian Arm**
  High tides of 5 m are not unusual
- **Turbulent Tidal Currents**
  > 5 knots that flood and ebb, 2x/day
- **Long fingers of mud flats**
  extending from the North Shore
- **Dogleg eastern approach**
  Outgoing transit from inside

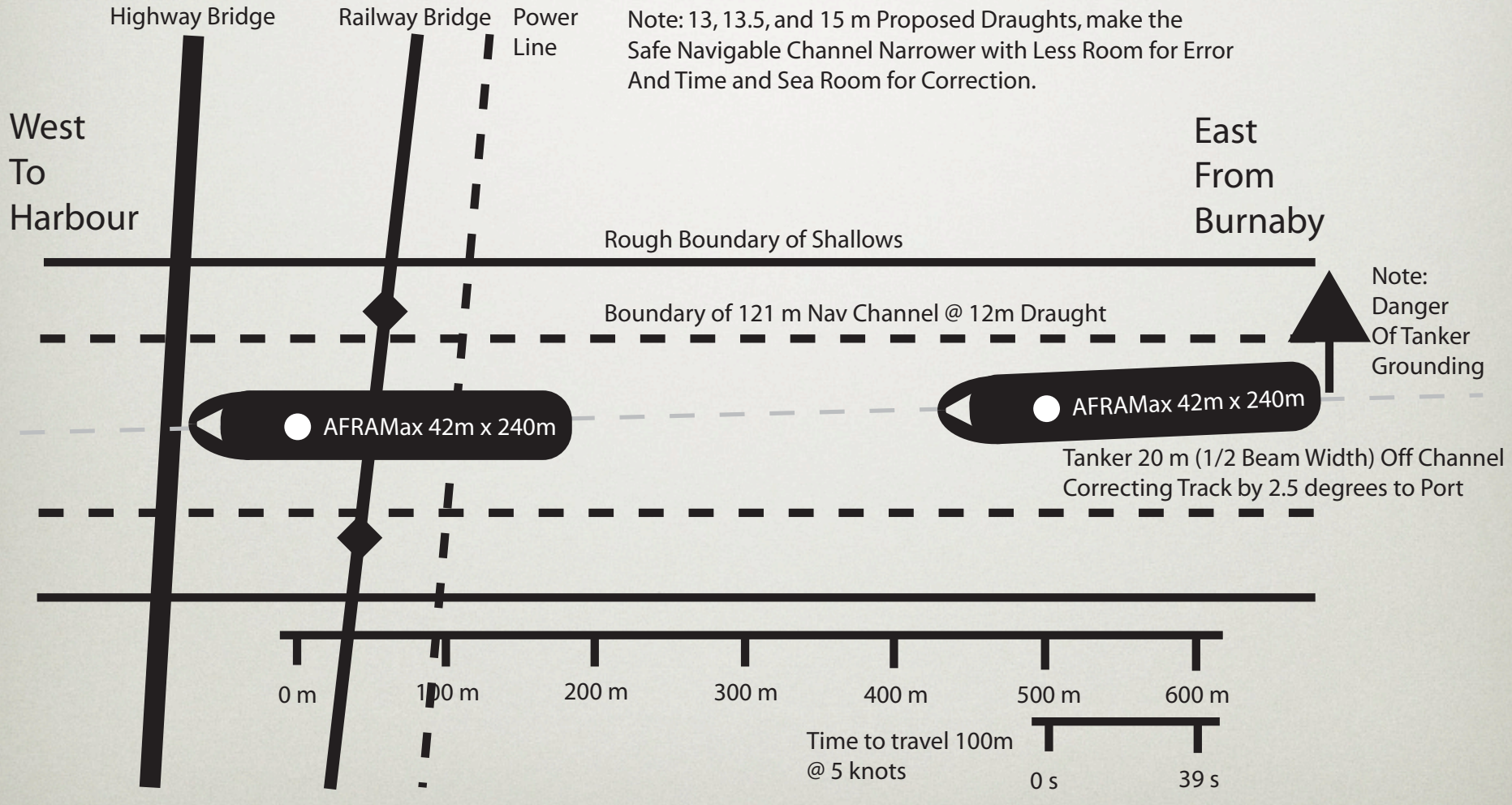



A Tanker Transit of Second Narrows occurs at High Tide
Looking East at High Tide


HELLESPONT TATINA
MAJURO

Birds Eye

AFRAmax Tanker In Second Narrows



A Worst Case Scenario

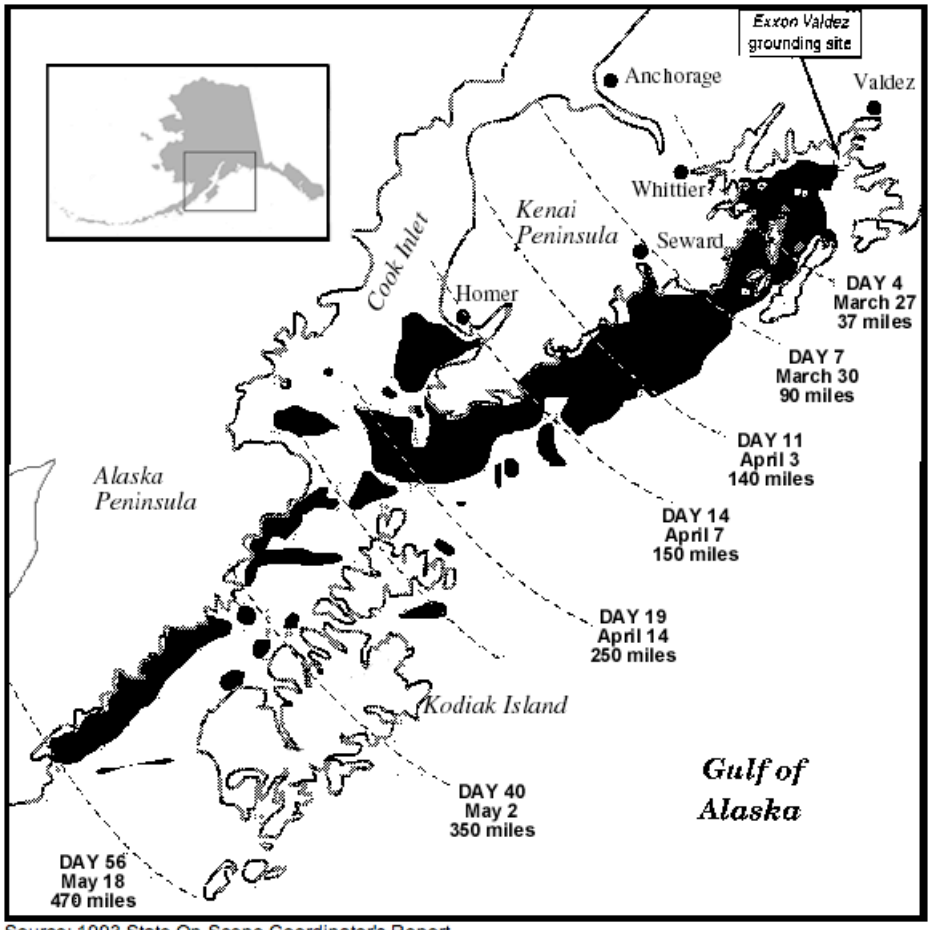
- A tanker leaves the channel for any of a number of realistic reasons and grounds
- As transits occur at high water, the tide almost immediately starts to drop
- Chances of re-floating the tanker rapidly diminish
- The tanker hull is severely stressed as the tide drops as much as 5m
- This ruptures tanks, releasing crude during a strong (5 knt) outflowing ebb tide
- Most of the oil is spilt in the first 6 hours, limiting response time
- Another tanker cannot be brought alongside offload cargo because of the narrows. There are no crude capable oil barges in Vancouver Harbour.
- Oil barriers may be deployed at the narrows, but the tidal currents are strong enough to render them ineffective by pulling the crude under them.
- ***Net estuarine flow is outward towards the sea, fouling will reach the main harbour, all of Indian Arm, Howe Sound, and to Georgia Strait beyond.***
- ***Fraser river currents, Wind driven currents and tides distribute throughout the Gulf.***
- ***Each AFRAmax carries enough oil to exceed the Exxon Valdez spill by several times***

Spill Coverage

Guesstimate of 20 mi/Day - 1mph

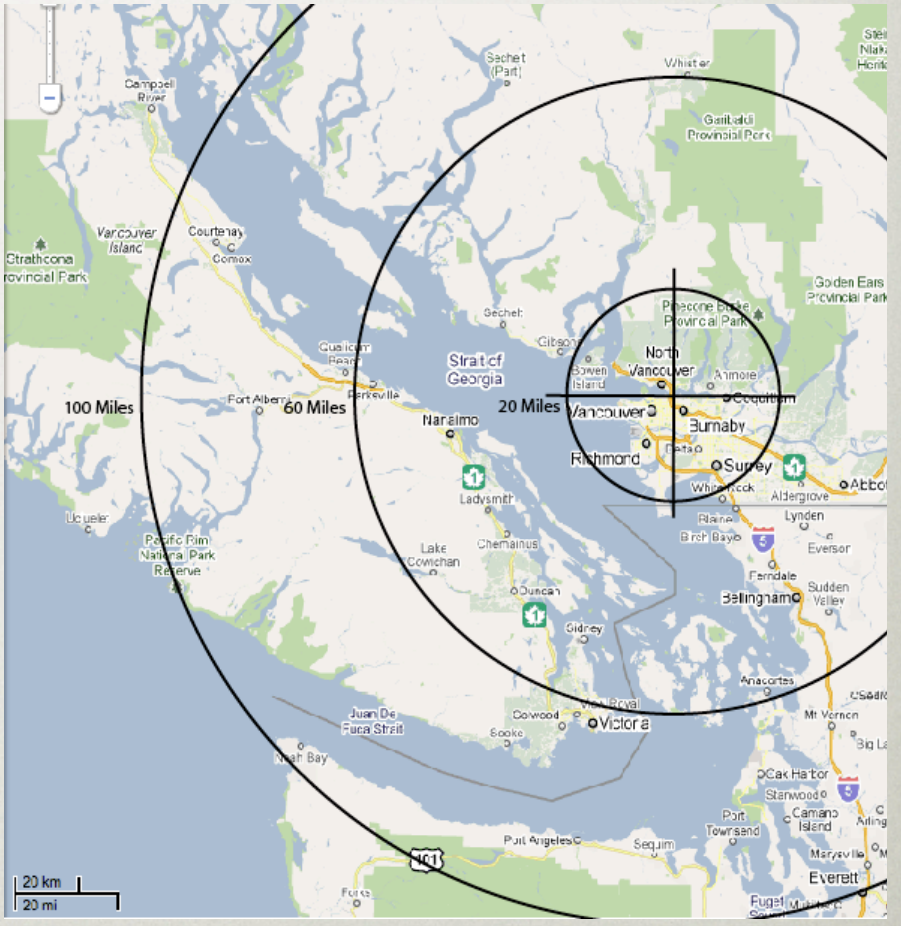
Depending on Tidal Currents, Winds

Map of the *Exxon Valdez* Oil Spill



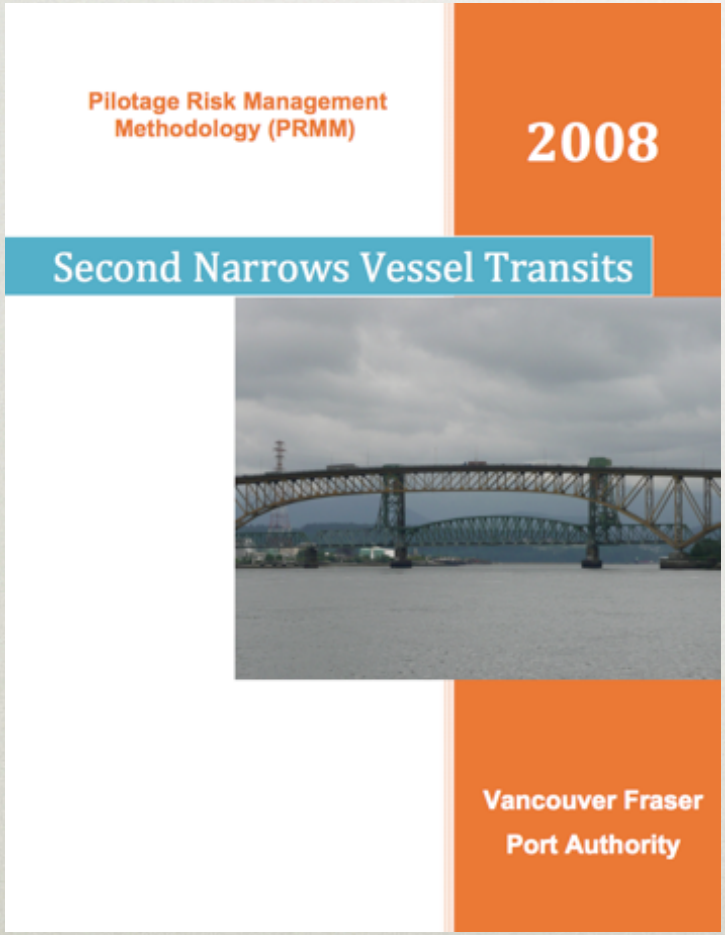
Source: 1993 State On-Scene Coordinator's Report

Map of Georgia Strait with Spill Range



Second Narrows Risk Management Study

Risk management - the systematic application of management policies, procedures, and practices to the tasks of **analyzing, evaluating**, controlling, and **communicating** about risk issues. TC-TP 1374E Definitions, p. 2



- Transport Canada

  "Stakeholder - any individual, group, or organization able to affect, be affected by, or believe it might be affected by, a decision or activity. The decision-maker (s) is a stakeholder." Definitions, p. 2

- Stakeholders?

  "Other potential stakeholders were considered such as **communities bordering the harbour**, the railway, **Burrard Clean**, other government organizations etc. **These were not considered to be primary stakeholders at this time.**

  Some may be consulted as risk mitigation strategies are developed, others will be advised if changes are made that will impact them." 2nd Narrows PRMM p. 13

Questions To Others

- **Is a Risk Management Study that ignores obvious stakeholders considered valid by Transport Canada/Pacific Pilotage Authority?**
- **In the event of a oil spill disaster who is liable?** There does not seem to be an Exxon or BP to hold accountable.
- **Who covers the economic damage incurred by other businesses in addition to the direct cleanup costs?**
- **Is a major spill able to be cleaned up?** The area impacted will be large and the time short. The majority of the Exxon Valdez spill occurred in just 6 hours. The examples from Prince William Sound and the Gulf Oil crisis are not encouraging.
- **When an existing oil terminal dramatically expands should not the same regulatory safeguards be considered?** For example, Transport Canada TERMPOL and Ports and Waterways requirements.
- **Can any stakeholder ask for a review of the decisions made to date in the light of an inadequate process to date?.**

Final Remark

- A major oil spill anywhere on the BC Coast would be an environmental catastrophe.

  A major oil spill inside Second Narrows would also be an economic disaster for the entire province.

For Further Reading

- "Concern Rising Over Oil Tankers in Vancouver Waters", CBC News, May 7, 2010:
  http://www.cbc.ca/canada/british-columbia/story/2010/05/07/bc-vancouver-tankers-oil-spill.html
- "Big Jump in Oil Tankers in Vancouver's Port", The Tyee, June 3, 2010
  http://thetyee.ca/News/2010/06/03/VancouverOilTankers/
- "Responses to The Tar Sands and Us", Rafe Mair Online, March 28, 2010:
  http://rafeonline.com/2010/03/the-tar-sands-and-us/
- "Dirty Little Secret", BC Business, March 20, 2009:
  http://www.bcbusinessonline.ca/bcb/top-stories/2009/03/20/dirty-little-secret
- "Oil Tankers pose Threat to Inlet", WestEnder, May 14, 2009:
  http://www.westender.com/articles/entry/oil-tankers-pose-threat-to-inlet
- "Oil exports to Asia drive expansion at B.C. Ports in Vancouver and Kitimat", Vancouver Sun, December 1, 2009:
  http://www.vancouversun.com/business/exports+Asia+drive+expansion+plans+ports+Vancouver+Kitimat/2291515/story.htmlt
- Enbridge Northern Gateway:
  http://www.northerngateway.ca/
- Kinder-Morgan Westridge Terminal:
  http://www.kne.com/business/canada/TMX_Documentation/brochure_single_page.pdf
- International Tanker Owner's Pollution Federation Limited (ITOPF)
  http://www.itopf.com/information-services/data-and-statistics/statistics/#major
- Tromedy (CTX - The Centre for Tank Ship Excellence):
  http://www.c4tx.org/ctx/pub/tromedy2.pdf
- "Safety Lapses Plague Oil Tankers - Post Exxon Vladez changes in operations being evaded, underminded", Seattle Post-Intelligencer, March 22, 2005
  http://www.seattlepi.com/specials/oiltankers/216976_polar22.asp
- "An Assesment of the Role of Human Factors in Oil Spills from Vessels"
  http://www.pwsrcac.org/docs/d0028900.pdf

Exxon Valdez Spill

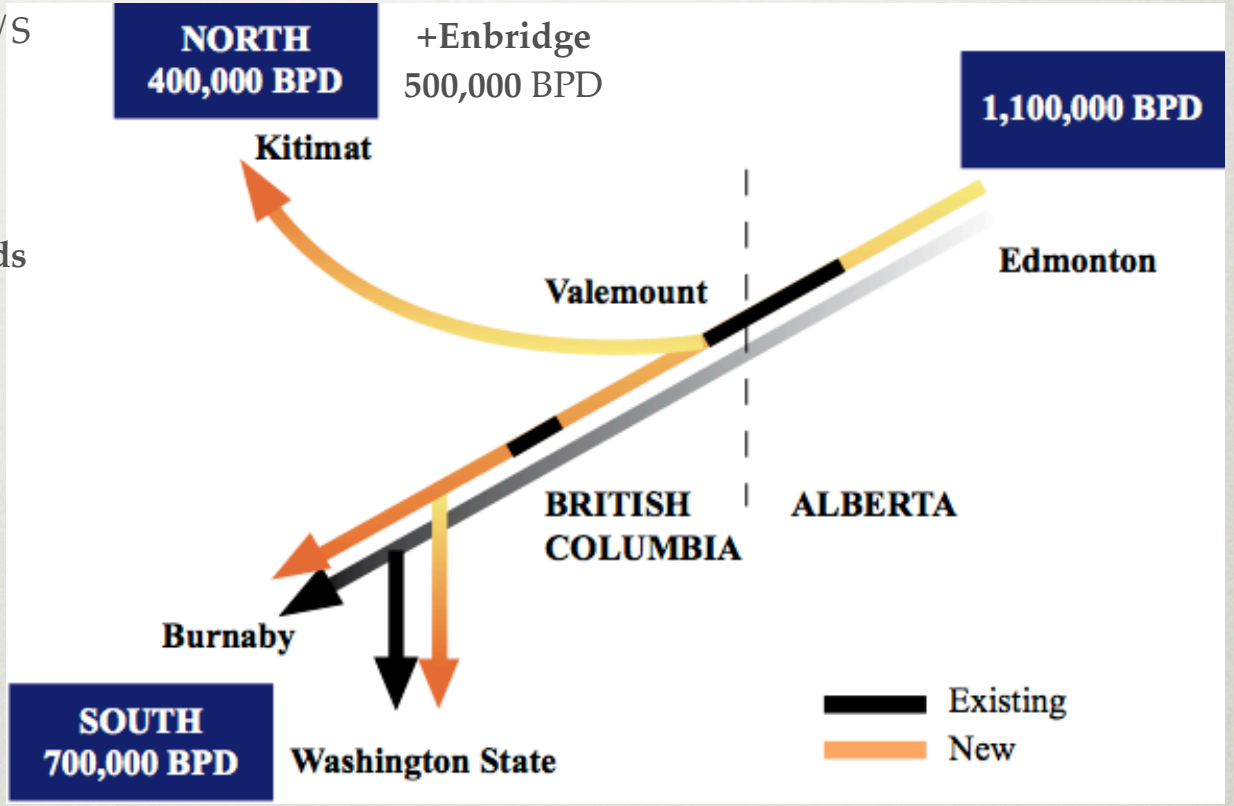
One of the largest spills and ecological disasters in US history

Prince William Sound, March 24, 1989: 20 % Spill (37,000 tons - 230,000 bbl)

- ***But only 35th world wide ...***
  37,000 t out of 180,929 t of cargo
- **Grounding on Bligh Reef**,
  human factors combined with alcohol, inadequate rest, training, malfunctioning radar, ...
- **Single Hull:** Double Hull might have made spill smaller.
- **Remaining cargo transferred off** to tanker brought alongside
- **Unprepared for a spill.**
  And Mitigation Measures took to long to put in place and did little.
  Dispersants did not work, slick-lickers but no barges.
  Much money spent on clean up, cleaning beaches etc., but generally harm is done rapidly.
- **U.S. Flag and Oil Company Fleet**
  While U.S. Flagged tankers still used to transport Alaska oil but
  Foreign flagged tankers routinely call at U.S. terminals in the Southern Gulf of Georgia.
- **20 years later impacts are still present**
  Herring not recovered, Sea birds and other dependant species not recovered.
  Oil is still being found in ducks in the spill area.
- ***In 2006, Seattle PI found Rules and procedures put in place after the accident were relaxed***

Westridge Terminal Further Expansion

- **TMX-2** - Second Pipeline dedicated to crude oil
- **800,000 bpd** to split N/S
- Total of 700,000 bpd of crude oil to Westridge, **approx 650,000 bpd in excess of refinery needs**
- **2nd Berth planned**
- **Requires more and larger tankers**
- **Big Oil's Dream:** Total export from west coast is: 650,000 bpd (South) + 925,000 bpd (North) = **1.6 m bpd**
- **(x $100+/b) = $ 157.5 Million $/day**



What About The Smaller Spills?

2009 NEWS: 200,000 litres (1,258 Barrels) spills from a Kinder Morgan Tank Farm (CBC)

- World wide a large number of small spills occur during the loading of crude.
- While large in number, the bulk of the oil spilled into water comes from large spills
- However they can severely impact localized areas if oil containment fails.
- Oil containment, even when properly deployed, often fails. Wind, waves, currents easily circumvents deployed booms and other clean up or skimming attempts.
- Estuaries and other high productivity areas are extremely sensitive.
- Much damage is caused by the higher volatile components that dissipate quickly after doing their damage. Usually spill response times are much longer than this.
- Cleaning of sea birds may save some individuals despite the stress, but the larger impact is unaffected.
- Impacts to salmon fry, herring eggs, and other life rising to feed on the plankton
- Steam cleaning of beaches looks impressive but basically sterilizes the beach and kills what life is there
- Effects are long term and threatened species may be made extinct

What Could The Consequences Be?

- **Ecological disaster:** Indian Arm, Vancouver Harbour, Howe Sound, and Georgia Strait and Puget Sound ... **This entire area is much smaller than the Exxon Valdez spill area**
- **Human Health:** High Volatiles evaporating from any spill or vapour release
- **Fisheries Impacts:** (Herring, Salmon, Steelhead, Shellfish, Crab, Prawn, Kelp ...)
- **Impacts on Birds:**
  - Direct on Seabirds, Shore birds, Water birds, Pacific Flyway
  - Indirect on Raptors (eagles, osprey) that feed on impacted species
- **Impact on Marine mammals:** (River Otters, Seals, Sea lions, Orca, whales ...)
- **Local First Nations cultural and financial impacts**
- **Port Closure:** Fouled ships and fouled water. Cargo will be rerouted to American ports for an indeterminate time. Perhaps forever. Railways and trucking impacted.
- **Bad Press:** Become known for the largest spill on the Pacific Coast.
- **Instant Evaporation of the "Supernatural" and "Green" image**
- **Tourism and Cruise Ships:** Cruise ships avoid Vancouver and perhaps the Strait of Georgia. Tourism and Conferences down as a main drawing feature is lost. For how long?
- **Real estate:** Who wants to buy a waterfront property now?
- **Huge public relations disaster for the oil industry**
- And ...

For Further Information And Action

- BC Waters Web Site
  Bill Gannon (CMA) Risk Management Study
  http://www.bcwaters.org
- No Tanks Web Site
  No Tanks Town Hall, Tue. June 8 2010, 7 p.m.
  Planned Pub Night, October Flotilla, ...
  http://www.notanks.org
- Rain Coast Conservation Foundation
  What's At Stake Report (North Coast)
  http://www.raincoast.org/publications/reports/whats-at-stake-the-cost-of-oil-on-british-columbias-priceless-coast/

Tanker Talk

Current Westridge Traffic: 2 - 3 Tankers/week
Aframax and some Panamax depending on Tides

Note: Current Transits are limited to 12.5 m Draught, 13 m expected in July 2010, with PMV stating further plans to progress to a full 15 m

Class	Typical Length	Typical Beam	Typical Draught	Typical Min DWT	Typical Max DWT	Typical Cargo Cap
Panamax	200 m (656 ft)	32 m (106 ft)	12 m (39.5 ft)	60,000	80,000	52,500 t 327,000 bbl
AFRAMax *(Average Freight Rate Assessment)*	245 m (803 ft)	42 m (137 ft)	15 m (49 ft)	80,000	120,000	80,000 t 500,000 bbl
Suezmax *(Proposed)*	285 m (935 ft)	45 m (148 ft)	18 m (59.0 ft)	120,000	200,000	150,000 t 935,000 bbl
Exxon Valdez	300 m (987 ft)	50 m (166 ft)	20 m (66 ft)	180,000	211,000	200,000 t 1,247,000 bbl
VLCC (Very Large Crude Carrier)	350 m (1,150 ft)	55 m (180 ft)	28 m (92 ft)	200,000	320,000	300,000 t 1,870,000 bbl
ULCC (Ultra Large Crude Carrier)	415 m (1,362 ft)	63 m (206 ft)	35 m (115 ft)	320,000	550,000	500,000 t 3,117,000 bbl

Useful Conversions For Crude Oil

Note 1: Crude Oil Density = 0.869 metric tonnes/cubic metre
Note 2: Barrels of Oil (bbl) are NOT U.S. Barrels = 31.5 U.S. gallons
Note 3: Displacement tons is a volume, Metric tonnes is a weight

1 Barrel (bbl)	0.159 cubic metres	159 litres	42 U.S. gallons	0.1604 Displacement tons	0.1382 Metric tonnes
6.29 Barrels (bbl)	1 cubic metre	1000 litres	264.2 U.S. gallons	1.009 Displacement tons	0.869 Metric tonnes
0.0068 Barrels (bbl)	0.001 cubic metres	1 litre	0.2642 U.S. gallons	0.001009 Displacement tons	0.000869 Metric tonnes
0.0238 Barrels (bbl)	0.003785 cubic metres	3.785 litres	1 U.S. gallon	0.003819 Displacement tons	0.00328916 Metric tonnes
6.234 Barrels (bbl)	0.9911 cubic metres	991.1 litres	261.8 U.S. gallons	1 Displacement ton	0.8613 Metric tonnes
7.24 Barrels (bbl)	1.151 cubic metres	1151 litres	304.1 U.S. gallons	1.161 Displacement tons	1 Metric tonne

Reference: Created using Wolfram Alpha (http://www.wolframalpha.com/)