Hearing Order OH-001-2014
Trans Mountain Pipeline ULC
Trans Mountain Expansion Project
NEB File OF-Fac-Oil-T260-2013-03 02
Filed July 3, 2014

Notice of Motion

Decision or Order Requested

The Intervenor, Andrew Weaver, requests an order from the Board that:

1. Trans Mountain be compelled to provide full and adequate responses to those portions of Information Request No. 1, as identified below in Table 1, by such date as the Board in its absolute discretion, deems appropriate.

2. The time required for Trans Mountain to provide the requested information be excluded in the calculation of the time limit for issuance of the Board's Report for the Trans Mountain Expansion Project pursuant to section 52 (4) and 52 (5) of the National Energy Board Act;

3. The Hearing Order be amended to provide new and reasonable deadlines for information requests and written intervenor evidence, oral testimony and final hearings, once Trans Mountain has provided the required information;

4. Such other relief as the Board deems fit.

Statement of Facts

1. Trans Mountain has failed to provide full and adequate responses to a number of questions prepared by the Intervenor Andrew Weaver.

2. In several instances Trans Mountain has made significant error in determining that the requested information is not relevant to the List of Issues or is outside the scope of the review. Trans Mountain has failed to provide compelling explanations for these determinations.

3. The Intervenor, Andrew Weaver, has prepared in table format, as directed by the Board's Procedural Direction #3, a list of the partial or inadequate responses with explanations as to why the answers are inadequate or erroneous as the case may be, and where they should be corrected and fully addressed.

4. The Intervenor, Andrew Weaver, is concerned that Trans Mountain has failed in its obligation to provide full and adequate responses.

5. The Board is respectfully requested to order Trans Mountain to answer all questions as presented.

All of which is respectfully submitted on July 3, 2014.

Andrew Weaver, MLA
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Room 027, Parliament Buildings
Victoria, BC V8V 1X4
250-387-8347

Procedural Direction No. 3 – Process for hearing motions to compel full and adequate responses to information requests (IRs)

Organizational chart for comments on inadequacy of IR responses (Round 1 Intervenor IRs to Trans Mountain)

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
1.01	**Reference** i) A3S5Q3, Application Volume 8A, Marine Transportation PDF pages 4-11 of 29 ii) A3S4X1, Ecological Risk Assessment of Westridge Marine Terminal Spills iii) Federal Government Technical Report – Properties, Composition, and Marine Spill Behaviour, Fate and Transport of Two Diluted Bitumen Products from the Canadian Oil Sands (30 November 2013) – Environment Canada website: http://www.ec.gc.ca/Publications/ iv) Western Canada Marine Response Corporation news post – WCMRC website: http://wcmrc.com/news/federal-government-releases-dilbit-study/ v) A3S5F6, Application Volume 8C Pt.2, General Risk Analysis vi) A3S4T1, Application Volume 8C Pt. 1, Casualty Data Survey PDF page 9 of 38 vii) A3S5I9, Review of Trans Mountain Expansion Project: Future Oil Spill Response Approach Plan, Recommendations on Bases and Equipment, Full Report.	b.1) – b.5): Reference iii) corroborates Trans Mountain's own conclusions (please refer to the responses to NEB IR No. 1.61a and 1.61b). As such, there is no need to conduct a further analysis as requested by this information request. b.6) A total loss scenario is not a viable scenario as it is not considered credible. Therefore, this information request is not relevant to one or more of the issues identified in the National Energy Board's List of Issues for the Trans Mountain Expansion Project. c) As written in Volume 8A — Marine Transportation — Section 5.4.4.5, beginning on page 8A-565, all scenarios were assessed with no mitigation. c.1) Please refer to the response to Weaver A IR No.1.01c.	b.1-b.5) It can reasonably be argued that the Gainford study, used in Trans Mountain's application, made a number of assumptions and was conducted under very favorable conditions. Some of these assumptions included the use of warm water temperatures; temperature extremes as large as 18 degrees Celsius on test results; higher range salinities; combination of winter blend test oils and summer water temperatures; the effect of shallow water depths and limited spreading to overall weathering; and cutting off experiments after 10 days. Conditions like these are rarely, if ever, present along the Trans Mountain tanker route and in the event of a spill diluted bitumen would very likely remain in the water for much longer than 10 days. Concerns surrounding the Gainford study have been presented by numerous intervenors on a number of occasions. Therefore, the request that Trans Mountain incorporate the scientifically sound Federal Government study on the behaviour of diluted bitumen in water into their application is in fact a valid one. Could the National Energy Board please request that Trans Mountain acknowledge the limitations of the Gainford Study and provide an adequate answer to the original request.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	Preamble: Reference i) outlines the potential socio-economic impacts of an oil spill Reference ii) outlines the risk assessment of an oil spill at Westridge Marine Terminal. Reference iii) is a report by the Canadian Government on research that federal government departments have conducted regarding the potential fate and behavior of diluted bitumen spilled in water Reference iv) is a post by the Western Canada Marine Response Corporation which recognizes the results of the Canadian Government's report on diluted bitumen in water. Reference v) discusses total loss scenarios and factors or incidents that can contribute to a total loss. Reference vi) provides information on the number of world-wide total loss incidents that have occurred between the period of 2002-2011 Reference vii) provides an account of the current and recommended enhancements for oil spill response capacity in light of the Trans Mountain Expansion Project (TMEP). **Request:** b) Given the results and conclusions of reference iii), please provide:		b.6) According to Termpol 3.15, "a 90th percentile event causing uncontrolled outflow from a tanker's cargo oil tanks has…been recommended as the Project's definition of a credible worse case". This means that there remains a 1/10 (10%) chance that an oil spill will be greater than Trans Mountain's definition of a credible worse case. While a spill larger than 16,500m3 may not be considered a "credible" occurrence under Trans Mountain's definition, it is not an impossible one. Trans Mountain states that not including a total loss of containment scenario in the credible worst case scenario is "based upon the fact that there has not been any total loss of containment scenarios involving a double hull tanker, ever, to date…" However, policies requiring all new tankers to be constructed with double hulls are relatively new. It is only within the last 20 years that it has been mandatory for all newly built tankers to be double hulled. Likewise, the final phase-out of single-hull tankers is set for 2015 (https://www.tc.gc.ca/eng/marinesafety/oep-environment-tankers-background-539.htm). In other words, while there has been no occurrence of a total loss scenario involving a double-hull tanker to date, these ships have not been in use long enough for such a justification to be credible. At one time, a total-loss scenario involving a single-hull tanker may have also been considered not credible based upon the fact that there had not been any incidences to

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	b.1) A detailed analysis of the potential socio-economic outcomes of an 8,250 m3 diluted bitumen oil spill and a credible worst-case 16,500 m3 diluted bitumen oil spill at hypothetical oil spill scenario location D, the Strait of Georgia. b.2) A detailed analysis of the potential socio-economic outcomes of an 8,250 m3 diluted bitumen oil spill and a credible worst-case 16,500 m3 diluted bitumen oil spill at hypothetical oil spill scenario location E, Arachne Reef. b.3) A detailed analysis of the potential socio-economic outcomes of an 8,250 m3 diluted bitumen oil spill and a credible worst-case 16,500 m3 diluted bitumen oil spill at hypothetical oil spill scenario location G, Race Rocks. b.4) A detailed analysis of the potential socio-economic outcomes of an 8,250 m3 diluted bitumen oil spill and a credible worst-case 16,500 m3 diluted bitumen oil spill at hypothetical oil spill scenario location H, Buoy J. b.5) A detailed analysis of the potential socio-economic outcomes of an 8,250 m3 diluted bitumen oil spill and a credible worst-case 16,500 m3 diluted bitumen oil spill at		date; but as of today's date, there have been multiple occurrences of such an event. c) In response to Weaver A IR No.1.01c, Trans Mountain states that "all scenarios were assessed with no mitigation. This response is subject to interpretation, can Trans Mountain please clarify exactly what is meant by "no mitigation". Does this mean that no response regime is assumed? Does it mean that the more conservative current oil spill response regime is assumed? Or does it mean something else entirely? c.1) If it is determined that an oil spill response regime is assumed in the scenarios, it is requested that Trans Mountain provide an appropriate response to question 1.01c.1.

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	the Westridge Marine Terminal. b.6) Recognizing that a total loss scenario is not within the 90th percentile of risk, but given the statistics that show that it is still a viable scenario, please provide a detailed analysis of the potential socio-economic outcomes of a total loss scenario with a complete cargo discharge of all oils at each of the four hypothetical oil spill scenario locations (D, E, G and H). Please assumed only the current oil spill response capacity is applied to this scenario, as outlined in reference vii) c) Please clarify whether an enhanced oil spill response regime or the current oil spill response regime, as outlined in reference vii), is assumed in the discussion of the socio-economic impacts of an 8,250 m3 oil spill and a 16,500 m3 oil spill at each of the four hypothetical oil spill scenario locations (D, E, G and H) presented in reference i), as well as at the Westridge Marine Terminal. c.1) Regardless of which regime is used, please confirm whether the oil spill response inputs for the model have been collaborated with historical data.		
1.02	**References:** i) A3S5Q3, Application Volume 8A, Marine Transportation,	g) Please refer to the response to Weaver A IR No. 1.04.1d.	g) According to Termpol 3.15, "a 90th percentile event causing uncontrolled outflow from a tanker's cargo oil tanks has…been recommended as the Project's definition of a

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	PDF pages 8-9 of 29 ii) Stats Canada Report – Age and Sex Structure: Subprovincial, 2010, Table 1 (July 1, 2010) – Statistics Canada Website: http://www.statcan.gc.ca/pub/91-209-x/2011001/article/11512-eng.htm iii) A3S4Y5, Application Volume 8A, Marine Transportation, PDF pages 37 to 43 of 43 iv) A3S4Y6, Application Volume 8A, Marine Transportation, PDF pages 1 to 22 of 34 v) A3S5F6, Application Volume 8C Pt.2, General Risk Analysis vi) A3S4T1, Application Volume 8C Pt. 1, Casualty Data Survey PDF page 9 of 38 vii) A3S5I9, Review of Trans Mountain Expansion Project: Future Oil Spill Response Approach Plan, Recommendations on Bases and Equipment, Full Report. **Preamable:** Reference i) discusses the human health impacts of an oil spill and the effects of age on sensitivity to chemical exposures. Reference ii) is a report from Statistics Canada's website outlining the population age demographics for metropolitan cities across Canada. References iii) and iv), provide a detailed description of four locations along the tanker transit route that were	h) No mitigation was assumed in any of the discussions of the potential human health effects associated with credible worst case and smaller oil spill scenarios for marine transportation	credible worse case". This means that there remains a 1/10 (10%) chance that an oil spill will be greater than Trans Mountain's definition of a credible worse case. While a spill larger than 16,500m3 may not be considered a "credible" occurrence under Trans Mountain's definition, it is not an impossible one. Trans Mountain's states that not including a total loss of containment scenario in the credible worst case scenario is "based upon the fact that there has not been any total loss of containment scenarios involving a double hull tanker, ever, to date…" However, policies requiring all new tankers to be constructed with double hulls are relatively new. It is only within the last 20 years that it has been mandatory for all newly built tankers to be double hulled. Likewise, the final phase-out of single-hull tankers is set for 2015 (https://www.tc.gc.ca/eng/marinesafety/oep-environment-tankers-background-539.htm). In other words, while there has been no occurrence of a total loss scenario involving a double-hull tanker to date, these ships have not been in use long enough for such a justification to be credible. At one time, a total-loss scenario involving a single-hull tanker may have also been considered not credible based upon the fact that there had not been any incidences to date; but as of today's date, there have been multiple occurrences of such an event.

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	selected for modelling the expected behavior and impacts of spilled oil. Reference v) discusses total loss scenarios and factors or incidents that can contribute to a total loss. Reference vi) provides information on the number of world-wide total loss incidents that have occurred between the period of 2002-2011 Reference vii) provides an account of the current and recommended enhancements for oil spill response capacity in light of the Trans Mountain Expansion Project (TMEP). **Requests:** c) Please Provide: A detailed discussion of the potential human health impacts of a smaller, 8,250 m3 diluted bitumen oil spill at location E, on Victoria, British Columbia's population, given their local age demographics. g) Recognizing that a total loss scenario is not within the 90th percentile of risk, but given the statistics that show that it is still a viable scenario, please provide a detailed analysis of the potential human health impacts of a total loss scenario with a complete cargo discharge of all oils at location G on Victoria, British Columbia's population, given their local age demographics.		h) In response to Weaver A IR No.1.01c, Trans Mountain states that "all scenarios were assessed with no mitigation. This response is subject to interpretation, can Trans Mountain please clarify exactly what is meant by "no mitigation". Does this mean that no response regime is assumed? Does it mean that the more conservative current oil spill response regime is assumed? Or does it mean something else entirely?

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	h) Please clarify whether an enhanced oil spill response regime or the current oil spill response regime, as outlined in reference vii) is assumed in the discussions of oil spill impacts on human health, for all hypothetical oil spill sizes and locations requested above		
1.04.2	**Reference:** i) A3S5Q3, Application Volume 8A, Marine Transportation PDF page 24 of 29 **Preamble:** Reference i) discusses the death of marine birds following the Exxon Valdez Oil Spill and marine bird species listed as "recovering", stating that "only nine carcasses of adult black oystercatchers were recovered…and although the actual number of mortalities may have been several times higher, this represents a small fraction of the population of 1,500 to 2,000… about 1,000 Harlequin duck (about 7 per cent of the wintering population) were killed by oil exposure at the time of the spill." **Request:** a) Can Trans Mountain please confirm what percentage of a Marine Species population constitutes a large fraction and what percentage must die from an oil spill for it to be considered worrisome for population numbers and recovery potential. a.1) Can Trans Mountain please provide a detailed discussion about how the percentages in request a) were	a) The statistics provided in the reference quoted above were based on the documented findings of the Exxon Valdez Oil Spill Trustee Council (EVOSTC 2010) as cited in Technical Report 8B-7 of Volume 8B, Ecological Risk Assessment of Marine Transportation Spills Technical Report (Stantec Consulting Ltd. December 2013). Stochastic oil spill fate and transport modeling used in Technical Report 8B-7 was completed following an approach based on that of the Aleutian Islands Risk Assessment Project (AIRA 2010 in Environment Canada 2011) as recommended by Environment Canada during the Northern Gateway Hearings (Environment Canada 2011). The analysis superimposes the probability contours for oiling of the water surface and shorelines onto biological resource layers including Important Bird Areas (IBAs) and noteworthy colony locations for birds. However, the AIRA did not attempt to overlay oil spill probability contours onto quantitative estimates of the abundance and distribution of individual birds, and neither did the Marine Ecological Risk Assessment (ERA).	Trans Mountain's response does not address the specific question about the percentage of a population that constitutes a large fraction. Can the National Energy Board please request that Trans Mountain answer the question that was asked?

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	reached.	Representatives of the ERA team met with regulators on April 16, 2013 to discuss the selection of ecological indicators to be considered in the ESA, and on May 25, 2013 to discuss specific ecological receptors and modelling methods to be considered in the marine ERA. In addition, Trans Mountain and its consultants conducted a number of engagement activities to inform Aboriginal communities, stakeholders, the public and regulatory authorities about the approach to assessing potential environmental and socio-economic effects of the Project, and to seek input throughout the Project planning process.	
1.05	**Reference**: i) Trans Mountain Report – Meteorological and Oceanographic Data Relevant to the Proposed Westridge Terminal Shipping Expansion (November 2013) ii) A3S5Q3, A3S4Y7, A3S4Y8, and A3S4Y9 Application Volume 8A, Marine Transportation. iii) A3S5Q3, Application Volume 8A, Marine Transportation PDF pages 11-12 of 29 iv) A3S5F6, Application Volume 8C Pt.2, General Risk Analysis v) A3S4T1, Application Volume 8C Pt. 1, Casualty Data Survey PDF page 9 of 38 vi) A3S5I9, Review of Trans Mountain Expansion Project: Future Oil Spill Response Approach Plan,	d) A total loss scenario is not a viable scenario and it is not considered credible. Volume 8A of the Facilities Application focused on credible worst-case and smaller spills consistent with the National Energy Board's "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project" dated September 10, 2013. Evaluation of a total loss scenario is not contemplated. f) Please refer to the response to Weaver A IR No. 1.05d. g) Please refer to the response to Weaver A IR No. 1.05f	d) According to Termpol 3.15, "a 90th percentile event causing uncontrolled outflow from a tanker's cargo oil tanks has…been recommended as the Project's definition of a credible worse case". This means that there remains a 1/10 (10%) chance that an oil spill will be greater than Trans Mountain's definition of a credible worse case. While a spill larger than 16,500m3 may not be considered a "credible" occurrence under Trans Mountain's definition, it is not an impossible one. Trans Mountain's states that not including a total loss of containment scenario in the credible worst case scenario is "based upon the fact that there has not been any total loss of containment scenarios involving a double hull tanker, ever, to date…" However, policies requiring all new tankers

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	Recommendations on Bases and Equipment, Full Report. **Preamble:** Reference i) discusses the effects of storms and wind energy on the water properties of the Pacific Ocean. It states that "during a storm, the energy from the wind leads to mixing of waters, typically to a depth of tens or even hundreds of metres…This process of wind mixing is illustrated by the progressive deepening of the upper layer during a storm event…" Reference ii) states multiple times that certain marine species will likely not be impacted, or will be minimally impacted, by an oil spill due to the depths at which they live in the ocean and the tendency for crude oils to remain near the surface of the ocean. Reference iii) discusses the problem formulation and spatial boundaries used for the ecological risk assessment Reference iv) discusses total loss scenarios and factors or incidents that can contribute to a total loss. Reference v) provides information on the number of world-wide total loss incidents that have occurred between the periods of 2002-2011 Reference vi) provides an account of the current and recommended enhancements for oil spill response capacity in light of the Trans Mountain Expansion Project (TMEP). **Request:**		to be constructed with double hulls are relatively new. It is only within the last 20 years that it has been mandatory for all newly built tankers to be double hulled. Likewise, the final phase-out of single-hull tankers is set for 2015 (https://www.tc.gc.ca/eng/marinesafety/oep-environment-tankers-background-539.htm). In other words, while there has been no occurrence of a total loss scenario involving a double-hull tanker to date, these ships have not been in use long enough for such a justification to be credible. At one time, a total-loss scenario involving a single-hull tanker may have also been considered not credible based upon the fact that there had not been any incidences to date; but as of today's date, there have been multiple occurrences of such an event. f) According to Termpol 3.15, "a 90th percentile event causing uncontrolled outflow from a tanker's cargo oil tanks has…been recommended as the Project's definition of a credible worse case". This means that there remains a 1/10 (10%) chance that an oil spill will be greater than Trans Mountain's definition of a credible worse case. While a spill larger than 16,500m3 may not be considered a "credible" occurrence under Trans Mountain's definition, it is not an impossible one. Trans Mountain's states that not including a total loss of containment scenario in the credible worst case scenario is

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	d) Recognizing that a total loss scenario is not within the 90th percentile of risk, but given the statistics that show that it is still a viable scenario, please provide a detailed analyses of how high storm winds mixing water to deeper depths could have an effect on the ecological impacts under a total loss scenario with a complete cargo discharge of all oils. f) Recognizing that a total loss scenario is not within the 90th percentile of risk, but given the statistics that show that it is still a viable scenario, please provide a detailed analyses of how strong storm winds mixing spilled oil in the ocean to depths of hundreds of meters, could affect the response time and clean up capacity of responders for a total loss scenario with a complete cargo discharge of all oils. g) Please clarify whether an enhanced oil spill response regime or the current oil spill response regime, as outlined in reference vi), is assumed for each of the responses provided to requests a) - f) presented above.		"based upon the fact that there has not been any total loss of containment scenarios involving a double hull tanker, ever, to date…" However, policies requiring all new tankers to be constructed with double hulls are relatively new. It is only within the last 20 years that it has been mandatory for all newly built tankers to be double hulled. Likewise, the final phase-out of single-hull tankers is set for 2015 (https://www.tc.gc.ca/eng/marinesafety/oep-environment-tankers-background-539.htm). In other words, while there has been no occurrence of a total loss scenario involving a double-hull tanker to date, these ships have not been in use long enough for such a justification to be credible. At one time, a total-loss scenario involving a single-hull tanker may have also been considered not credible based upon the fact that there had not been any incidences to date; but as of today's date, there have been multiple occurrences of such an event. g) In response to Weaver A IR No.1.01c, Trans Mountain states that "all scenarios were assessed with no mitigation. This response is subject to interpretation, can Trans Mountain please clarify exactly what is meant by "no mitigation". Does this mean that no response regime is assumed? Does it mean that the more conservative current oil spill response regime is assumed? Or does it mean something else entirely?

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1.07.1	**References:** A3S5Q3, Application Volume 8A, Marine Transportation: i) PDF pages 11-12 of 29 ii) PDF pages 13-26 of 29 iii) PDF pages 26-29 of 29 iv) A3S4Y7, A3S4Y8, and A3S4Y9 Application Volume 8A, Marine Transportation. v) Federal Government Technical Report – Properties, Composition, and Marine Spill Behaviour, Fate and Transport of Two Diluted Bitumen Products from the Canadian Oil Sands (30 November 2013) – Environment Canada website: http://www.ec.gc.ca/Publications/ vi) Western Canada Marine Response Corporation news post – WCMRC website: http://wcmrc.com/news/federal-government-releases-dilbit-study/ vii) A3S4Y5, Application Volume 8A, Marine Transportation, PDF pages 37 to 43 of 43 viii) A3S4Y6, Application Volume 8A, Marine Transportation, PDF pages 1 to 22 of 34 ix) A3S5F6, Application Volume 8C Pt.2, General Risk Analysis x) A3S4T1, Application Volume 8C Pt. 1, Casualty Data Survey PDF page 9 of 38 xi) A3S5I9, Review of Trans Mountain Expansion Project: Future Oil Spill Response Approach Plan,	a) The oil spill fate and transport modeling which was completed in support of the Technical Report 8B-7 of Volume 8B, Ecological Risk Assessment of Marine Transportation Spills Technical report (Stantec Consulting Ltd. December 2013) was undertaken prior to the release of reference (v) by the Government of Canada. Thus, this study was not factored Page 25 of 148 Trans Mountain Response to Weaver A IR No. 1 in the analysis. However, although the two studies differed in the approach used for weathering (the Government of Canada report is based on artificially weathering AWB and CLB dilbits instead of a more natural evaporation) and simulated conditions of receiving waters, the Government of Canada results are generally supportive of the Gainford experiments. It is Trans Mountain's view that the findings presented by reference (v) do not necessitate changes to the problem formulation(s) applied to oil spill fate and transport modeling, or consequence analysis as part of the Application. Please also refer to the response to NEB IR No.1.61a and 1.61b. **b)** Please refer to the response to Weaver A IR No.	a) – c) It can easily be argued that the Gainford study, used in Trans Mountain's application, made a number of assumptions and was conducted under very favorable conditions. Some of these assumptions included the use of warm water temperatures; temperature extremes as large as 18 degrees Celsius on test results; higher range salinities; combination of winter blend test oils and summer water temperatures; the effect of shallow water depths and limited spreading to overall weathering; and cutting off experiments after 10 days. Conditions like these are rarely, if ever, present along the Trans Mountain tanker route and in the event of a spill diluted bitumen would very likely remain in the water for much longer than 10 days. Concerns surrounding the Gainford study have been presented by numerous intervenors on a number of occasions. Therefore, the request that Trans Mountain incorporate the scientifically sound Federal Government study on the behaviour of diluted bitumen in water into their application is in fact a valid one. Could the National Energy Board please request that Trans Mountain acknowledge the limitations of the Gainford Study and provide an adequate answer to the original request. d) In response to Weaver A IR No.1.01c, Trans Mountain states that "all scenarios were assessed with no mitigation. This response is subject to interpretation, can Trans Mountain please clarify exactly what is meant by "no mitigation". Does this mean that no response regime is

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	Recommendations on Bases and Equipment, Full Report. Preamble: Reference i) discusses the problem formulation and spatial boundaries used for the ecological risk assessment Reference ii) discusses the biological sensitivity ranking factors for each of the four ERA ecological receptor groups. References iii) and iv) provide BSF ratings for shoreline habitats, marine fish communities, marine birds, and marine mammals for hypothetical spill scenarios at each of the four locations Reference v) is a report by the Canadian Government on research that federal government departments have conducted regarding the potential fate and behavior of diluted bitumen spilled in water. Reference vi) is a post by the Western Canada Marine Response Corporation which recognizes the results of the Canadian Government's report on diluted bitumen in water. References vii) and viii) provide a detailed description of four locations along the tanker transit route that were selected for modelling the expected behavior and impacts of spilled oil. Reference ix) discusses total loss scenarios and factors or incidents that can contribute to a total loss.	1.07.1a. **c)** Please refer to the response to Weaver A IR No. 1.07.1a. **d)** Please refer to the response to Weaver A IR No. 1.04.3c **e)** Please refer to the response to Weaver A IR No. 1.04.3c	assumed? Does it mean that the more conservative current oil spill response regime is assumed? Or does it mean something else entirely? e) In response to Weaver A IR No.1.01c, Trans Mountain states that "all scenarios were assessed with no mitigation. This response is subject to interpretation, can Trans Mountain please clarify exactly what is meant by "no mitigation". Does this mean that no response regime is assumed? Does it mean that the more conservative current oil spill response regime is assumed? Or does it mean something else entirely?

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	Reference x) provides information on the number of world-wide total loss incidents that have occurred between the periods of 2002-2011 Reference xi) provides an account of the current and recommended enhancements for oil spill response capacity in light of the Trans Mountain Expansion Project (TMEP). Requests: a) Please confirm that the results of reference v) were not factored into the conclusions presented in references i), ii), vii), and viii). b) Please provide an updated problem formulation and spatial boundaries assessment that factors in the results and conclusions of the government of Canada's report (reference v)) on the expected behavior of submerged diluted bitumen in water. c) Factoring in the results of request a) and the Government of Canada's report (reference v)), please provide new biological sensitivity ranking factors (BSF) for each of the four ERA ecological receptor groups listed in reference ii) at each of the hypothetical oil spill scenario locations discussed in references vii) and viii). c.1) Please provide a detailed analyses comparing and		

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	contrasting the original BSF rankings for each ERA receptor group as provided in references ii), iii), and iv) and the new BSF rankings resulting from request b). c.2) Given the BSF rankings established under request b), please provide a detailed analyses of the ecological impacts of an 8,250 m3 diluted bitumen oil spill and a 16,500 m3 diluted bitumen oil spill at each of the hypothetical oil spill scenario locations D, E, G, and H (reference vii) and viii)) c.3) Given the BSF rankings established under request b), please provide a detailed analyses of the ecological impacts of a total loss scenario hypothetical diluted bitumen oil spill scenario for locations D, E, G, and H (reference vii) and viii)). d) Please clarify whether an enhanced oil spill response regime or the current oil spill response regime, as outlined in reference xi), is assumed in determining the problem formulation and spatial boundaries assessments of an oil spill, for all hypothetical oil spill locations discussed in references vii) and viii). e) Please clarify whether an enhanced oil spill response		

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	regime or the current oil spill response regime, as outlined in reference xi), is assumed in determining the BSF rankings for each of the four ERA ecological receptor groups listed in reference ii) at each of the hypothetical oil spill locations discussed in references vii) and viii).		
1.07.2	**Reference:** i) A3S5Q3, A3S4Y7, A3S4Y8, and A3S4Y9 Application Volume 8A, Marine Transportation ii) A3S4Y5, Application Volume 8A, Marine Transportation, PDF pages 37 to 43 of 43 iii) A3S4Y6, Application Volume 8A, Marine Transportation, PDF pages 1 to 22 of 34 iv) Federal Government Technical Report – Properties, Composition, and Marine Spill Behaviour, Fate and Transport of Two Diluted Bitumen Products from the Canadian Oil Sands (30 November 2013) – Environment Canada website: http://www.ec.gc.ca/Publications/ v) Western Canada Marine Response Corporation news post – WCMRC website: http://wcmrc.com/news/federal-government-releases-dilbit-study/ vi) A3S5F6, Application Volume 8C Pt.2, General Risk Analysis vii) A3S4T1, Application Volume 8C Pt. 1, Casualty Data Survey PDF page 9 of 38 viii) A3S5I9, Review of Trans Mountain Expansion Project: Future Oil Spill Response Approach Plan,	a) Similarly to Weaver A IR No. 1.07.1a, the oil spill numerical modelling factored the results from the Gainford physical experiments described in the Application. The Government of Canada published their study late 2013. This study was not factored in the analysis. However, although the two studies differed in the approach used for weathering (the Government of Canada report is based on artificially weathering AWB and CLB dilbits instead of a more natural evaporation) and simulated conditions of receiving waters, the Government of Canada results are generally supportive of the Gainford experiments, especially with respect to the evolution of oil density due to weathering, and the fact that in all cases the dilbit remained buoyant (floating) on saltwater (20 to 35 ppt). b.1) Please refer to the response to Weaver A IR No. 1.07.1a. b.2) Please refer to the response to Weaver A IR No. 1.07.1a.	a) It can easily be argued that the Gainford study, used in Trans Mountain's application, made a number of assumptions and was conducted under very favorable conditions. Some of these assumptions included the use of warm water temperatures; temperature extremes as large as 18 degrees Celsius on test results; higher range salinities; combination of winter blend test oils and summer water temperatures; the effect of shallow water depths and limited spreading to overall weathering; and cutting off experiments after 10 days. Conditions like these are rarely, if ever, present along the Trans Mountain tanker route and in the event of a spill diluted bitumen would very likely remain in the water for much longer than 10 days. Concerns surrounding the Gainford study have been presented by numerous intervenors on a number of occasions. Therefore, the request that Trans Mountain incorporate the scientifically sound Federal Government study on the behaviour of diluted bitumen in water into their application is in fact a valid one. Could the National Energy Board please request that Trans Mountain acknowledge the limitations of the Gainford Study and provide an adequate

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	Recommendations on Bases and Equipment, Full Report. **Preamble:** Reference i) provides a discussion of the potential environmental effects of an oil spill on various marine life and habitats. References ii) and iii), provide a detailed description of four locations along the tanker transit route that were selected for modelling the expected behavior and impacts of spilled oil. Reference iv) is a report by the Canadian Government on research that federal government departments have conducted regarding the potential fate and behavior of diluted bitumen spilled in water. Reference v) is a post by the Western Canada Marine Response Corporation which recognizes the results of the Canadian Government's report on diluted bitumen in water. Reference vi) discusses total loss scenarios and factors or incidents that can contribute to a total loss. Reference vii) provides information on the number of world-wide total loss incidents that have occurred between the period of 2002-2011	b.3) A total loss scenario is not a viable scenario as it is not considered credible. Volume 8A of the Facilities Application focused on credible worst-case and smaller spills consistent with the National Energy Board's "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project" dated September 10, 2013. A total loss scenario will not be evaluated. b.4) Please refer to the response to Weaver A IR No. 1.07.1a. b.5) Please refer to the response to Weaver A IR No. 1.07.1a. b.6) A total loss scenario is not a viable scenario as it is not considered credible. Volume 8A of the Facilities Application focused on credible worst-case and smaller spills consistent with the National Energy Board's "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project" dated September 10, 2013. A total loss scenario will not be evaluated.	answer to the original request. b.1) / b.2)/b.4)/b.5)/b.7)/b.8)/b.10)/b.11) It can easily be argued that the Gainford study, used in Trans Mountain's application, made a number of assumptions and was conducted under very favorable conditions. Some of these assumptions included the use of warm water temperatures; temperature extremes as large as 18 degrees Celsius on test results; higher range salinities; combination of winter blend test oils and summer water temperatures; the effect of shallow water depths and limited spreading to overall weathering; and cutting off experiments after 10 days. Conditions like these are rarely, if ever, present along the Trans Mountain tanker route and in the event of a spill diluted bitumen would very likely remain in the water for much longer than 10 days. Concerns surrounding the Gainford study have been presented by numerous intervenors on a number of occasions. Therefore, the request that Trans Mountain incorporate the scientifically sound Federal Government study on the behaviour of diluted bitumen in water into their application is in fact a valid one. Could the National Energy Board please request that Trans Mountain acknowledge the limitations of the Gainford Study and provide an adequate answer to the original request. b.3)/b.6)/b.9)/b.12)/b.15) According to Termpol 3.15, "a 90th percentile event causing uncontrolled outflow from a

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	Reference viii) provides an account of the current and recommended enhancements for oil spill response capacity in light of the Trans Mountain Expansion Project (TMEP). Requests: a) Please confirm that the results of reference iv) were not factored into the conclusions presented in reference i). b) Based on the results and conclusions of reference iv), please provide: b.1) A detailed analysis of the impacts of an 8,250 m3 spill scenario of diluted bitumen on shoreline habitats for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H) b.2) A detailed analysis of the impacts of a credible worst-case 16,500 m3 diluted bitumen oil spill on shoreline habitats for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H) b.3) A detailed analysis of the impacts of a total loss scenario with a complete cargo discharge of all oils, including diluted bitumen, on shoreline habitats for each of the four hypothetical oil spill scenario locations (locations	b.7) Please refer to the response to Weaver A IR No. 1.07.1a. b.8) Please refer to the response to Weaver A IR No. 1.07.1a. b.9) A total loss scenario is not a viable scenario as it is not considered credible. Volume 8A of the Facilities Application focused on credible worst-case and smaller spills consistent with the National Energy Board's "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project" dated September 10, 2013. A total loss scenario will not be evaluated. b.10) Please refer to the response to Weaver A IR No. 1.07.1a. b.11) Please refer to the response to Weaver A IR No. 1.07.1a. b.12) A total loss scenario is not a viable scenario as it is not considered credible. Volume 8A of the Facilities Application focused on credible worst-case and smaller spills consistent with the National Energy Board's "Filing Requirements	tanker's cargo oil tanks has…been recommended as the Project's definition of a credible worse case". This means that there remains a 1/10 (10%) chance that an oil spill will be greater than Trans Mountain's definition of a credible worse case. While a spill larger than 16,500m3 may not be considered a "credible" occurrence under Trans Mountain's definition, it is not an impossible one. Trans Mountain's states that not including a total loss of containment scenario in the credible worst case scenario is "based upon the fact that there has not been any total loss of containment scenarios involving a double hull tanker, ever, to date…" However, policies requiring all new tankers to be constructed with double hulls are relatively new. It is only within the last 20 years that it has been mandatory for all newly built tankers to be double hulled. Likewise, the final phase-out of single-hull tankers is set for 2015 (https://www.tc.gc.ca/eng/marinesafety/oep-environment-tankers-background-539.htm). In other words, while there has been no occurrence of a total loss scenario involving a double-hull tanker to date, these ships have not been in use long enough for such a justification to be credible. At one time, a total-loss scenario involving a single-hull tanker may have also been considered not credible based upon the fact that there had not been any incidences to date; but as of today's date, there have been multiple occurrences of such an event.

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	D, E, G, & H). b.4) A detailed analysis of the impacts of an 8,250 m3 spill scenario of diluted bitumen on the Marine Fish Community for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H). b.5) A detailed analysis of the impacts of a credible worst-case 16,500 m3 diluted bitumen oil spill on the Marine Fish Community for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H). b.6) A detailed analysis of the impacts of a total loss scenario with a complete cargo discharge of all oils, including diluted bitumen, on the Marine Fish Community for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H) b.7) A detailed analysis of the impacts of an 8,250 m3 spill scenario of diluted bitumen on Marine Birds for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H) b.8) A detailed analysis of the impacts of a credible worst-case 16,500 m3 diluted bitumen oil spill on Marine Birds	Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project" dated September 10, 2013. A total loss scenario will not be evaluated. b.13) Reference iv) corroborates Trans Mountain's own conclusions (Please refer to the response to NEB IR No. 1.61a and 1.61b). As such, there is no need to conduct a further analysis as requested by this information request b.14) Reference iv) corroborates Trans Mountain's own conclusions (Please refer to the response to NEB IR No. 1.61a and 1.61b). As such, there is no need to conduct a further analysis as requested by this information request b.15) A total loss scenario is not a viable scenario as it is not considered credible. Volume 8A of the Facilities Application focused on credible worst-case and smaller spills consistent with the National Energy Board's "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increased Marine Shipping Activities, Trans Mountain Expansion Project" dated September 10, 2013. A total loss scenario will not be evaluated. c) Please refer to the response to Weaver A IR No. 1.04.3c	b.13) & b.14) It can easily be argued that the Gainford study, used in Trans Mountain's application, made a number of assumptions and was conducted under very favorable conditions. Some of these assumptions included the use of warm water temperatures; temperature extremes as large as 18 degrees Celsius on test results; higher range salinities; combination of winter blend test oils and summer water temperatures; the effect of shallow water depths and limited spreading to overall weathering; and cutting off experiments after 10 days. Conditions like these are rarely, if ever, present along the Trans Mountain tanker route and in the event of a spill diluted bitumen would very likely remain in the water for much longer than 10 days. Concerns surrounding the Gainford study have been presented by numerous intervenors on a number of occasions. Therefore, the request that Trans Mountain incorporate the scientifically sound Federal Government study on the behaviour of diluted bitumen in water into their application is in fact a valid one. Could the National Energy Board please request that Trans Mountain acknowledge the limitations of the Gainford Study and provide an adequate answer to the original request. c) In response to Weaver A IR No.1.01c, Trans Mountain states that "all scenarios were assessed with no mitigation. This response is subject to interpretation, can Trans

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	for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H). b.9) A detailed analysis of the impacts of a total loss scenario with a complete cargo discharge of all oils, including diluted bitumen, on Marine Birds for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H). b.10) Based on the results and conclusions of reference iv), please provide: A detailed analysis of the impacts of an 8,250 m3 spill scenario of diluted bitumen on Marine Mammals for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H). b.11) Based on the results and conclusions of reference iv), please provide: A detailed analysis of the impacts of a credible worst-case 16,500 m3 diluted bitumen oil spill on Marine Mammals for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H). b.12) Based on the results and conclusions of reference iv), please provide: A detailed analysis of the impacts of a total loss scenario with a complete cargo discharge of all oils, including diluted bitumen, on Marine Mammals for each of	d) Please refer to the response to Weaver A IR No. 1.04.3c	Mountain please clarify exactly what is meant by "no mitigation". Does this mean that no response regime is assumed? Does it mean that the more conservative current oil spill response regime is assumed? Or does it mean something else entirely? d) In response to Weaver A IR No.1.01c, Trans Mountain states that "all scenarios were assessed with no mitigation. This response is subject to interpretation, can Trans Mountain please clarify exactly what is meant by "no mitigation". Does this mean that no response regime is assumed? Does it mean that the more conservative current oil spill response regime is assumed? Or does it mean something else entirely?

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	the four hypothetical oil spill scenario locations (locations D, E, G, & H). b.13) Based on the results and conclusions of reference iv), please provide: A detailed analysis of the impacts of an 8,250 m3 spill scenario of diluted bitumen on human health for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H). b.14) Based on the results and conclusions of reference iv), please provide: A detailed analysis of the impacts of a credible worst-case 16,500 m3 diluted bitumen oil spill on human health for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H). b.15) Based on the results and conclusions of reference iv), please provide: A detailed analysis of the impacts of a total loss scenario with a complete cargo discharge of all oils, including diluted bitumen, on human health for each of the four hypothetical oil spill scenario locations (locations D, E, G, & H) c) Please clarify whether an enhanced oil spill response model or the current oil spill response model, as outlined in reference viii), is assumed in the discussion of the		

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	potential environmental effects of an oil spill on various marine life and habitats, provided in reference i). d) Please clarify whether an enhanced oil spill response model or the current oil spill response model, as outlined in reference viii), is assumed for each of the responses provided to requests b.1) - b.15) presented above.		
1.08.1 Request e)	Preamble: "Overall, engagement scope provides feedback on the following: determining the scope of the environmental and socio-economic assessment (ESA); identifying potential mitigation measures to reduce environmental and socio-economic effects; identifying potential benefits associated with the Project; and routing alternatives where it is not practical to follow the existing TMPL System right-of-way" Question e): Please comment on why the engagement scope implicitly assumes the project will be constructed, regardless of input received.	It does not. Section 1.3.5, Volume 3A of the Application describes Trans Mountain's phased approach to Stakeholder Engagement. Feedback from each phase has, and will continue to inform each subsequent phase. Section 1.3.1, Volume 3A of the Application describes future consultation plans of our phased approach to engagement; and includes providing communities with information on pipeline integrity, safety and emergency response, topics that we already knew to be of interest to stakeholders. Providing stakeholders with information not only about the proposed project, but also about our current operational practices, enables stakeholders to make an informed assessment of the proposed Project. Trans Mountain's engagement activities are ongoing and we continue to seek feedback that informs our planning and design activities of the Project. Additional engagement and communications phases will be developed; through project assessment, continued design, regulatory process and, if successful, the construction phases of the Project.	In responding to this question, Trans Mountain makes no reference to any of the 4 elements that guided their consultation as cited in the preamble. Instead, Trans Mountain's response details how the engagement works. Even the first paragraph of their response "Feedback from each phase has, and will continue to inform each subsequent phase", does not necessarily address the question that was asked, as the feedback must be viewed within the constraints that Trans Mountain placed on this consultation process via their scope. The 4 elements of Trans Mountain's scope all deal with the operation of the pipeline through: mitigating risk, identifying benefit of the project, identifying ideal routing, or the scope of environmental impacts to look at. Given the "engagement scope" frames the feedback that was sought by Kinder Morgan, it must be fair to ask them why their feedback does not specifically address the question "is this something that should be constructed?" Scope can be defined as the extent of the area or subject matter that something deals with or to which it is relevant. It is critical that questions about what falls inside or outside

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			of scope are adequately addressed, in order to properly evaluate how consultation was conducted. Given Trans Mountain's lack of reference to the 4 specific elements that made up their scope for consultation as cited in the preamble, and given the lack of argument about how the scope of the consultation does in fact include the possibility that the project will not be constructed, I therefore submit that this response is inadequate.
1.08.4 Request a)-q)	**Reference:** A3SOR3, Application Volume 3A, Public Consultation i) Table 1.5.2 Phase 2 – Open House and Online Engagement Notification Advertising Plan – Pg. 13 **Preamble:** Reference i) contains a list of all the publications that were used as part of the government's Phase 2 newspaper advertising as identified in section 1.5.22, and listed in table 1.5.2.	**Partial Response:** Reference i) above in the preamble is incorrect. The list of publications were used as part of Trans Mountain Expansion Project's Phase 2 newspaper advertising. Please refer to the response to Kerr K IR No.1.4.1.1 for a complete list of print publications for phase 2 engagement.	Every response in this section started with the same 3 sentences. The reason that Reference i) is incorrect is because Trans Mountain failed to provide a completed table in their application. Their response incorrectly implied an error on behalf of the intervenor. The second issue with this response is that in our view it is inappropriate, by way of a response, to direct an intervenor to a different intervenors responses, without providing a direct link to that document. Trans Moutain themselves acknowledged the overwhelming number of questions they received, and the NEB database can be very time consuming to navigate. It is inappropriate to send an intervenor on a goose chase to find an answer to a question they asked, particularly given the tight timeline for the hearing process.
1.08.5 Request b)	The parameters by which Kinder Morgan qualifies an individual as a "subject matter expert".	As is described in Section 1.5.3.1 of Volume 3A, the goal of the ESA Workshops conducted in March and May 2013 was to seek input from knowledgeable stakeholders on the scope and methodology of the ESA studies. Three terrestrial ESA workshops were held in each of our three pipeline regions: Alberta, Interior BC and the Lower Mainland/Fraser	Trans Mountain's response has nothing to do with the question about "subject matter expert's", and in fact appears to have been copied and pasted from the response to question a). Given that Trans Mountain's response does not directly or

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		Valley. An additional session on agricultural interests specific to the Lower Mainland Fraser Valley region was held in Abbotsford. Two marine focused ESA workshops were held in each of our two coastal regions: a Mainland Coastal session in North Vancouver, BC and an Island Coastal session in Langford, BC. In recognition of the fact that the ESA studies were scoped at a regional level it was decided to hold one workshop per region to allow for appropriate cross-pollination between subject matter experts and the Project's environment team disciplines. In order to ensure that travel was not a barrier to participation, Trans Mountain reimbursed all travel related expenses for participants in these workshops and offered an honorarium in recognition of the time commitment required by participation. The selection of individual venues for each workshop was driven by venue capacity and availability.	indirectly address anything to do with "subject matter experts", I submit this response is inadequate.
1.08.5 Request d)	The parameters by which Kinder Morgan qualifies people as "stakeholders and environmental subject matter experts from pipeline communities;"	Please refer to the response to Weaver A IR No. 1.08.5b. (See response above)	Trans Mountain's response refers me to a response that does not address the question about identifying people as "stakeholders and environmental subject matter experts from pipeline communities". Given that Trans Mountain's response does not directly or indirectly address how they identified people as "stakeholders and environmental subject matter experts from pipeline communities", I submit this response is inadequate.
1.08.5 Request	Confirm that the Regional Marine ESA workshops held in North Vancouver on May 22nd 2013 and Langford on May	Trans Mountain Pipeline ULC (Trans Mountain) is not of the opinion that only those who are members of academia have	Trans Mountain's response fails to confirm or deny the question that was asked of them.

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e)	23rd 2013 did not have any members who qualified as local subject matter experts (universities/colleges, etc.), and why this was the case. If not confirmed provide a list of those who were in attendance.	exclusivity to being persons of local knowledge or expertise. Nonetheless, as part of our stakeholder engagement efforts, Trans Mountain has had several discussions and interactions with various people who hold positions with universities and colleges. For a list of those organizations that attended Regional Marine ESA Workshop held in North Vancouver and Langford, please see Tables 1.5.13 and 1.5.14, Volume 3A of the Application.	Furthermore, they take issue with the terminology used in the question, even though it was pulled directly from their application. In Volume 3A – Public Consultation Page 3A-75, participation for ESA workshops is broken down by undefined groups, one of which was "local subject matter experts (universities/colleges, etc.)". This was the exact terminology used in the question. Given that Trans Mountain fails to either confirm or deny the presence of the requested category of participants (that they identified as a distinct group), I submit that this response is inadequate.
1.09 Request f)	Confirmation that the use of only these 4 main ecological receptor group/habitat combinations is consistent to industry best practice, citing examples of their use in comparable projects. If not confirmed, explain the decision to either omit additional receptors, or restrict the ecological receptors to these four combinations.	Please refer to the response to Weaver A IR No. 1.07.1a. **Response in Weaver A IR No. 1.07.1a.:** The oil spill fate and transport modeling which was completed in support of the Technical Report 8B-7 of Volume 8B, Ecological Risk Assessment of Marine Transportation Spills Technical report (Stantec Consulting Ltd. December 2013) was undertaken prior to the release of reference (v) by the Government of Canada. Thus, this study was not factored in the analysis. However, although the two studies differed in the approach used for weathering (the Government of Canada report is based on artificially weathering AWB and CLB dilbits instead of a more natural evaporation) and simulated conditions of receiving waters, the Government of Canada results are generally supportive of the Gainford experiments. It is Trans Mountain's view that the findings presented by reference	Trans Mountain's response refers me to a response that does not directly or indirectly address the question that was asked. The question was about the exclusive use of 4 main ecological receptor group/habitat combinations, and whether this was best practice. The response given appears to refer me to a different response about how different studies on oil spill fate were dealt with. Given the lack of relevance in the response, I submit that this response is inadequate.

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		(v) do not necessitate changes to the problem formulation(s) applied to oil spill fate and transport modeling, or consequence analysis as part of the Application.	
1.09 Request g)	Confirmation that Kinder Morgan received no advice from Subject Matter experts as to the need to include additional ecological receptor group/habitat combinations.	Please refer to the response to Weaver A IR No. 1.07.1a. **Response in Weaver A IR No. 1.07.1a.:** The oil spill fate and transport modeling which was completed in support of the Technical Report 8B-7 of Volume 8B, Ecological Risk Assessment of Marine Transportation Spills Technical report (Stantec Consulting Ltd. December 2013) was undertaken prior to the release of reference (v) by the Government of Canada. Thus, this study was not factored Page 25 of 148 Trans Mountain Response to Weaver A IR No. 1in the analysis. However, although the two studies differed in the approach used for weathering (the Government of Canada report is based on artificially weathering AWB and CLB dilbits instead of a more natural evaporation) and simulated conditions of receiving waters, the Government of Canada results are generally supportive of the Gainford experiments. It is Trans Mountain's view that the findings presented by reference (v) do not necessitate changes to the problem formulation(s) applied to oil spill fate and transport modeling, or consequence analysis as part of the Application.	Trans Mountain's response refers me to a response that does not directly or indirectly address the question that was asked. The question was about whether Trans Mountain received any advice about the exclusive use of 4 main ecological receptor group/habitat combinations. The response given appears to refer me to a different response about how different studies on oil spill fate were dealt with. Given the lack of relevance in the response, I submit that this response is inadequate.
1.09 Request h)	**Reference iv:** Reference iv) states: Spatial boundaries for evaluating the environmental effects of spills originating from marine transportation accidents include the	Please refer to the response to NEB IR No. 1.67. **Response to NEB IR No. 1.67.:** Section 4.2.1 of the Ecological Risk Assessment (ERA) of Marine Transportation	By way of response, Trans Mountain refers us to their response to NEB IR No. 1.67. While this response does deal with relevant subject matter (oil spill modelling and

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	geographic domain where potential environmental effects of spilled crude oil are expected to be measurable i.e., the modelling domain for the stochastic oil spill model. The areas considered in the PQERA are identified as follows…" **Request:** Confirmation that the Spatial Boundaries laid out in Reference iv), include the potential of submerged bitumen, and take that into account when establishing the oil spill footprint and regional study area.	Spills (Technical Report 8B-7 of Volume 8B) utilized the Regional Study Area (RSA) as defined for the effects assessment for marine resources and marine birds. The Marine RSA was established by the Environmental and Socio-economic Assessment (ESA) team to be the area of ecological relevance where environmental effects could result from the Project, and extends from the Westridge Marine Terminal through Burrard Inlet, out to the 12 nautical mile limit of Canada's territorial sea in accordance with direction from the NEB. Based on the established RSA limits, information related to biological resources was collected and used for the assessment of effects to marine resources and marine birds, as well as for the evaluation of effects from spills in the ERA. Seasonal stochastic oil spill modelling (Technical Report 8C-12 of Volume 8C, General Risk Analysis and Intended Methods of Reducing Risk [EBA December 2013]) was subsequently completed at a number of release locations (including Buoy J) with the results summarized in the Application (see Sections and 5.4.4.8 of Volume 8A). The ERA (Technical Report 8B-7) subsequently focused on potential environmental effects arising from hypothetical oil spills at several locations moving outward along the shipping route towards international waters. The ERA carried out assessments at most of the locations where oil spill fate and transport modeling had been completed by EBA (Technical Report 8C-12). At most locations, little of the spilled oil considered in the modelling was expected to be transported beyond the boundaries of the RSA. If an incident were to occur close to the boundary of the RSA (e.g., Buoy J), a substantial fraction of the spilled oil could extend beyond that boundary. However, because the	footprint), it fails to address the key issue in my request, namely whether the "Spatial Boundaries laid out in Reference iv), include the potential of submerged bitumen". This information cannot be found in their response in NEB IR No. 1.67., and is a matter of critical importance when determining whether adequate spill modeling has taken place. Given that Trans Mountain's answer to my request directs me to a different response that fails to address the original question, I submit that this response is inadequate.

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		probability of an oil spill occurring due to a vessel collision is extremely low at Buoy J (Volume 8C, TERMOL Risk Analysis), the ERA studies appropriately focus on hypothetical credible worst case spill locations where the probability of an incident is somewhat greater (although still low).	
1.10.1.a	**1.10.1 Global Oil Tanker Incident Frequency** **Reference:** i) A3S4Y3, Application Volume 8A, Marine Transportation, PDF page 289. ii)A3S4T1, TERMPOL 3.8, Casualty Data Survey, PDF pages 5-18. iii)A3S4Z2, Application Volume 8A, Marine Transportation, Appendix B **Preamble:** Reference i) states that: "based on the available data, DNV shows that the worldwide incident frequency involving oil tankers is among the lowest of all marine vessels for the period 2002 to 2011…" Reference ii) gives the corresponding analysis that reference i) is based on. Reference iii) provides a list of Marine vessel types that are present along the British Columbia coast. **Request:**	**Response to 1.10.1.a.1:** a.1) The following vessel types are categorised in the IHS Fairplay database: • Dry Cargo and passenger Container Dry Cargo (general cargo) Ro-Ro Cargo Passenger • Bulk Carriers Dry bulk Dry/oil bulk • Fishing • Non-Merchant – Yachts • Barges • Offshore vessels Supply vessels Other offshore vessels • Tankers Oil tankers Gas carriers	The quote in reference i) states that "based on the available data, DNV shows that the worldwide incident frequency involving oil tankers is among the lowest of *all marine vessels* for the period 2002 to 2011…" (emphasis added). This quote is very clear—it compares oil tankers to all marine vessels. The response to information request 1.10.1.a.2 clearly notes that only 4 types of vessels were considered for the analysis that supports this conclusion: oil tankers, bulk carriers, chemical tankers and LNG-LPG tankers. The response to information request 1.10.1.a.1 clearly shows that data is available on significantly more vessel types than is included in the analysis supporting the quote in reference i). Trans Mountain, in its response to IR 1.10.1.a.3, justifies only considering these 4 types of vessels based on the fact that they are the "relevant types of vessels according to the project development". Request for Ruling:

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	a) Please confirm that the conclusion made in reference i) is based on the data provided in reference ii). In case other data provided in the Application is used to support this conclusion, please identify and source this data. a.1) Please provide a comprehensive list of marine vessel types for which global incident frequency data is available including those identified in reference iii) a.2) Please confirm if, when developing the conclusion in reference i), DNV analyzed global incident frequency data for any marine vessel types other than the four listed in Figure 4-1 of reference ii), namely "LNG-LPG Tanker", "Chemical Tanker", "Oil Tanker", "Bulk Carrier". If so, please list all types of vessels for which this analysis was done and provide the corresponding analysis. a.3) Please provide a justification for any instance where incident frequency data was available for a marine vessel type but was not incorporated into DNV's analysis in reference ii).	Chemical tankers Other liquid tankers • Miscellaneous Tugs Dredging vessels Research Other **Response to 1.10.1.a.2:** the analysis was done for the vessel categories listed in Figure 4-1 of reference ii). Those vessel categories are the most relevant for comparison with oil tankers and set the basis for understanding the safety level of the vessel type. **Response to 1.10.1.a.3:** The Casualty Data Survey (Termpol 3.8) is conducted to give an understanding of the likelihood of incidents with relevant types of vessels according to the project development. Transport Canada's TERMPOL Review Guideline (TP743E) refers to casualty data involving release of cargo in bulk as the casualties of relevance.	1. Trans Mountain has not adequately explained why incident frequencies from cargo ships of a comparable size to an oil tanker would not be equally informative, for the purpose of the Casualty Data Survey. There are relevant two parts to consider when looking at incident frequencies: Firstly, the overall incident rate (regardless of cargo discharge) and secondly, the incident rate of cargo discharge. A comparison of oil tankers to cargo ships, for instance, would be equally informative as the data provided when calculating the overall incident rate comparisons (regardless of cargo discharge). I therefore request that the Board please rule that Trans Mountain's response to IR 1.10.1.a.3, as it currently stands, is inadequate. 2. Based on Trans Mountain's responses to IRs 1.10.1.a through 1.10.1.a.3, the quote offered in reference i) is unsubstantiated. Trans Mountain clearly did not do the reasonable analysis to make a claim that "worldwide incident frequency involving oil tankers is among the lowest of all marine vessels." I therefore request that the Board please rule that a full analysis containing all vessels identified in response to Weaver A IR 1.10.1.a.1 be provided by Trans Mountain, or that the quote, "worldwide incident frequency involving oil tankers is among the lowest of all marine vessels", be removed from consideration by the panel.
1.10.1.f	Please identify how many shipyears would be equivalent to one year of operations of the fully-completed Kinder Morgan Expansion Project with the expected 408 tankers	Based on an average of 5 days time spent within the marine study area, 408 tanker calls equates to approximately 5.6	On page 12 of TERMPOL 3.8 it is clearly stated that the "exposure data for global oil tankers includes all the sailing of the tankers, also in high seas while the likelihood for an

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	departing Westridge Marine Terminal annually.	shipyears annually.	incident at high seas is much lower than in coastal waters." In other words, the incident frequency rates that are provided in TERMPOL 3.8 are based on shipyears that incorporate the entire sailing route of a tanker, not just the time spent in coastal waters. Trans Mountain's answer to IR 1.10.1.f only accounts for the time a tanker would spend in the "marine study area" (i.e. the B.C. coast). It does not include the time that tanker would spend in the open ocean, carrying product from Westridge Marine Terminal. Trans Mountain's answer to IR 1.10.1.f is therefore inconsistent with TERMPOL 3.8 in its definition and application of "shipyears". This is important because as the quote on Page 12 of TERMPOL 3.8 notes, incident rates at high seas are "much lower than in coastal waters." I therefore respectfully request that the Board please ask Trans Mountain to provide an updated answer to IR 1.10.1.f that is consistent with the definition and application of "shipyears" in TERMPOL 3.8
1.10.1.h	**Reference:** i) A3S4Y3, Application Volume 8A, Marine Transportation,	h) Det Norske Veritas's observation that incident frequency involving oil tankers is among the lowest of all marine vessels is accurate and reflected in information provided in:	Trans Mountain's response to this information request has failed to support the conclusion that is quoted in reference i). Trans Mountain's response to Weaver A IR No. 1.10.1.a

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	PDF page 289. ii) A3S4T1, TERMPOL 3.8, Casualty Data Survey, PDF pages 5-18. **Preamble:** Reference i) states that: "based on the available data, DNV shows that the worldwide incident frequency involving oil tankers is among the lowest of all marine vessels for the period 2002 to 2011…" **Request:** h) In light of the answers to the questions above, please provide a detailed justification for how the conclusion given in reference i) is supported by the data provided in reference ii). In case additional data was used to support the conclusion give in reference i), please provide it.	• Technical Report 8C-6 in Volume 8C, TERMPOL 3.8, "Casualty Data Survey" (Det Norske Veritas, September 2013) • Technical Report 8C-12 in Volume 8C, TERMPOL 3.15, "General Risk Analysis and Intended Methods of Reducing Risks—Trans Mountain Expansion Project" (Det Norske Veritas, November 2013) Information in the Casualty Data report is based on historical records and shows that oil tanker incidents have trended downwards, on a clear decline over a number of years. Comparing total loss statistics does not reflect the actual loss of a vessel because it contains information on both actual and constructive total loss. Furthermore, as noted by the Joint Review Panel for the Enbridge Northern Gateway Project: "(Risk) assessments based solely on historical incident records provide poor insight into future performance since incident records do not account for new technology and learnings that occur from the incident investigations." (NEB 2013) It should be noted that the historical tanker records include information on all tanker vessels, not only for modern double-hull tankers — the type that currently call at Westridge and will in future, which are of a high operating standard. Taking all this into consideration, a sufficient amount of credible and relevant information has been provided for the purpose of the risk assessment and risk informed decision-making.	made it clear that Trans Mountain has not considered "*all* marine vessels" (emphasis added) in its analysis. Trans Mountain has only considered 4 types of vessels: LNG-LPG Tankers, Chemical Tankers, Oil Tankers and Bulk Carriers. According to Figure 4-1 of TERMPOL 3.8, of those 4 types of vessels, oil tankers have the second highest "total loss" incident rate and the third highest "serious" incident rate for the period 2002-2011. The incident frequency rates of oil tankers are therefore in the middle range of the 4 types of vessels that were analyzed and not "among the lowest" as suggested in the quote. When these statistics are further broken down by each individual year, in Figure 4-2, there is no clear decline in the "serious" or "total loss" incident rate over time. The only clear decline visible for oil tankers in Figure 4-2 is a decline in the number of "not serious" incidents. As DNV notes on the following page (page 10) immediately under Figure 4-3, serious incidents are underreported in the database. Hence, the data provided cannot conclusively point to a decline in the incident rate of oil tankers over time. However, even if Trans Mountain can point to data showing a decline in the incident frequency rate, this would still not be sufficient to support the conclusion stated in reference i). I therefore submit that Trans Mountain has failed to adequately respond to the information request.
1.10.2	**1.10.2 West Coast Oil Tanker Incident Frequency** **Reference:**	**Response to 1.10.2.a:** The comparison of marine casualties was made between tankers and bulk carriers and not the entire marine fleet.	To conclude that the low number of incidents involving tankers may suggest that the current scheme to manage navigation and marine traffic on the West Coast is effective,

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	i) A3S4Y3, Application Volume 8A, Marine Transportation, PDF page 291. ii)A3S4T1, TERMPOL 3.8, Casualty Data Survey, PDF page 24. iii)A3S4T1, TERMPOL 3.8, Casualty Data Survey, PDF page 19-28. **Preamble:** Reference i) concludes that: "The low number of incidents involving oil tankers on the West Coast may suggest the current scheme to manage navigation and marine traffic on the West Coast is effective." Reference ii) states that: "There is no traffic density data correlated to the TSB data so it is not possible to derive incident frequencies based in terms of number of ship years or sailed nautical miles." Reference iii) gives the corresponding analysis that reference i) is based on. **Request:** a) Please confirm that the conclusion made in reference i) is based on the data provided in reference iii). In case other data provided in the Application is used to support this conclusion, please identify and source this data. b) In light of reference ii) and the information provided in	Comparatively, these are the most relevant vessel types — yielding the most relevant information regarding bulk and tanker transport. **Response to 1.10.2.b:** Trans Mountain's conclusion that, "The low number of incidents involving oil tankers on the West Coast may suggest the current scheme to manage navigation and marine traffic on the West Coast is effective", is valid based on total recorded incidents. Please refer to the response to Weaver A IR No. 1.10.2a. **Response to 1.10.2.b.1:** Please refer to the response to Weaver A IR No. 1.10.2a. **Response to 1.10.2.b.2:** Please refer to the response to Weaver A IR No. 1.10.2b.	one must correlate the number of incidents with traffic density data to obtain an incident frequency rate. Without an incident frequency rate, one cannot assess whether the number of tanker incidents on the B.C. coast is in fact a relatively high or low value. For instance, the low number of incidents could also be the result of an even lower number of tankers that actually have a relatively high incident rate. I therefore submit that Trans Mountain's responses to IR 1.10.2.b, IR 1.10.2.b.1, and IR 1.10.2.b.2 are all inadequate.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	Table 5-1 of reference iii), please confirm if the conclusion made in reference i) is supported by data on oil tanker incident frequencies that compares the number of tanker incidents to the number of annual transits. If yes, please provide the oil tanker incident frequency data that supports the conclusion made in reference i). b.1) If no, please confirm that without incident frequency data relating the number of tanker incidents to the number of annual transits, DNV cannot assess whether the number of tanker incidents on British Columbia's coast is in fact a relatively high or low value. b.2) If the position is that DNV can make this assessment without incident frequency data, please explain how.		
1.10.3.c	**1.10.3 Tanker Incident and Oil Spill Accident Frequencies** **Reference:** i)A3S4T1, TERMPOL 3.8, Casualty Data Survey, Full Report **Preamble:** Reference i) provides the casualty data survey performed as a part of the TERMPOL review process. Most of the data is provided for the period 2002 to 2011, with some variations. Section 8 of the report concludes that: "The casualty data survey shows that there has been a decline in	**Response to IR 1.10.3.c:** Incident data for the period 1993–2001 are available at the following sources: • Worldwide casualty data from the IHS Fairplay database (IHS) • Oil spills recorded by the International Tanker Owners Pollution Federation Limited (ITOPF) (Ref. http://www.itopf.com/information-services/data-and-statistics/ statistics/). Accessed: June 2014. • Incidents in Canadian waters summarized in Marine Statistics, published by the Transportation Safety Board of Canada (TSB) (Ref. http://www.tsb.gc.ca/eng/stats/	The request included: "Please graph this data in bar charts and include a trend line, including significance intervals, for each chart that represents the number of frequency of a given incident over time." Trans Mountain has not met this request.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	the number of incidents both internationally and in Canadian waters for 2002 – 2011." (PDF page 36) **Request:** c) Wherever possible, please provide corresponding data for all figures and tables in TERMPOL 3.8, dating from 1993 to 2013. Please graph this data in bar charts and include a trend line, including significance intervals, for each chart that represents the number or frequency of a given incident over time.	marine/index.asp). Accessed: June 2014. • Incidents in US waters summarized in Marine Statistics (Marine Casualty and Pollution Data) from the US Coast Guards published by Homeport - US Department of Homeland Security All the databases, except the IHS Fairplay database, are open available databases. Access to the IHS Fairplay database can be purchased from IHS (http://www.ihs.com/products/maritime-information/index.aspx).	
1.10.3.f	**1.10.3 Tanker Incident and Oil Spill Accident Frequencies** **Reference:** i)A3S4T1, TERMPOL 3.8, Casualty Data Survey, Full Report **Preamble:** Reference i) provides the casualty data survey performed as a part of the TERMPOL review process. Most of the data is provided for the period 2002 to 2011, with some variations. Section 8 of the report concludes that: "The casualty data survey shows that there has been a decline in the number of incidents both internationally and in Canadian waters for 2002 – 2011." (PDF page 36) **Request:** f) Please plot the data provided in Figure 4-2 on "total loss"	The request is not relevant to the analysis. Det Norske Veritas (DNV) has not applied regression analysis or trend lines in the analysis, or as basis for any conclusions. The data in figure 4-2 are clearly readable and, thus, there should not be any need for separate graphs.	Reference i) argues that there has been a decline in the number of tankers incidents worldwide. Table 4-2 provides part of the supporting analysis for this claim. However, the table includes 'not serious', 'serious' and 'total loss' scenarios all amassed together, without any trend line. The purpose of IR 1.10.3.f and IR 1.10.3.g is to isolate 'total loss' and 'serious' incident rates and to track over time whether the worldwide incident rates have, in fact, decreased over time as claimed in the report. It would appear from the table that most of the decline in incident rates is accounted for by a decline in 'not serious' incidents, which, for the purpose of assessing the project risk, are less relevant. Indeed, it would appear that the frequency of worldwide 'serious' and 'total loss' tanker incidents may be increasing, or at least staying constant, over time. I therefore submit that the answer given by Trans Mountain is inadequate and request that Trans Mountain provide the

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	incidents in a separate bar chart and include a trend line with significance intervals.		bar charts, as requested in IR 1.10.3.f.
1.10.3.g	**1.10.3 Tanker Incident and Oil Spill Accident Frequencies** **Reference:** i)A3S4T1, TERMPOL 3.8, Casualty Data Survey, Full Report **Preamble:** Reference i) provides the casualty data survey performed as a part of the TERMPOL review process. Most of the data is provided for the period 2002 to 2011, with some variations. Section 8 of the report concludes that: "The casualty data survey shows that there has been a decline in the number of incidents both internationally and in Canadian waters for 2002 – 2011." (PDF page 36) **Request:** g) Please plot the data provided in Figure 4-2 on "serious" incidents in a separate bar chart and include a trend line with significance intervals.	The request is not relevant to the analysis. Det Norske Veritas (DNV) has not applied regression analysis or trend lines in the analysis or as basis for any conclusions. The data in figure 4-2 are clearly readable and, thus, there should not be any need for separate graphs.	Reference i) argues that there has been a decline in the number of tanker incidents worldwide. Table 4-2 provides part of the supporting analysis for this claim. However, the table includes 'not serious', 'serious' and 'total loss' scenarios all amassed together, without any trend line. The purpose of IR 1.10.3.f and IR 1.10.3.g is to isolate 'total loss' and 'serious' incident rates and to track over time whether the worldwide incident rates have, in fact, decreased over time as claimed in the report. It would appear from the table that most of the decline in incident rates is accounted for by a decline in 'not serious' incidents, which, for the purpose of assessing the project risk, are less relevant. Indeed, it would appear that the frequency of worldwide 'serious' and 'total loss' tanker incidents may be increasing, or at least staying constant, over time. I therefore submit that the answer given by Trans Mountain is inadequate and request that Trans Mountain provide the data table, as requested in IR 1.10.3.g.
1.10.3.h	**1.10.3 Tanker Incident and Oil Spill Accident Frequencies** **Reference:** i)A3S4T1, TERMPOL 3.8, Casualty Data Survey, Full Report	Both the variation in "serious incident" frequencies and "not serious incident" frequencies affect the incident frequency from year to year. The "total loss" frequency also affects the variation from year to year, but not as much as the two other categories. Total loss in the IHS database includes both actual and constructive total loss.	Trans Mountain's response does not answer the information request. The IR specifically asked for confirmation that *the most significant drop in incident frequency* for each type of marine vessel in Figure 4-2 is accounted for in the decline of "not serious" incidents. Trans Mountain has not confirmed nor denied this

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	Preamble: Reference i) provides the casualty data survey performed as a part of the TERMPOL review process. Most of the data is provided for the period 2002 to 2011, with some variations. Section 8 of the report concludes that: "The casualty data survey shows that there has been a decline in the number of incidents both internationally and in Canadian waters for 2002 – 2011." (PDF page 36) **Request:** h) Please confirm that the most significant drop in incident frequency for each type of marine vessel in Figure 4-2 is accounted for in the decline of "not serious" incidents.		statement and hence has not adequately responded to the IR.
1.10.3.j	**1.10.3 Tanker Incident and Oil Spill Accident Frequencies** **Reference:** i)A3S4T1, TERMPOL 3.8, Casualty Data Survey, Full Report **Preamble:** Reference i) provides the casualty data survey performed as a part of the TERMPOL review process. Most of the data is provided for the period 2002 to 2011, with some variations. Section 8 of the report concludes that: "The casualty data survey shows that there has been a decline in the number of incidents both internationally and in Canadian waters for 2002 – 2011." (PDF page 36)	**Response to 1.10.3.h:** Both the variation in "serious incident" frequencies and "not serious incident" frequencies affect the incident frequency from year to year. The "total loss" frequency also affects the variation from year to year, but not as much as the two other categories. Total loss in the IHS database includes both actual and constructive total loss. **Response to 1.10.3.i:** Confirmed. **Response to 1.10.3.j:** There is a decline in the number of tanker incidents leading to oil spill accidents; both the number of incidents and	Trans Mountain has not confirmed nor denied the statement made in the information request and hence has not responded directly to the information request. It was clearly stated that "not serious incidents" are underreported. It is also clear from Figure 4-2 that the decline in "not serious incidents" accounts for a significant amount of the possible overall decline in worldwide tanker incidents. The request was for Trans Mountain to confirm or deny whether it is possible that the decline in worldwide tanker incidents could simply be accounted for by a lower reporting rate of "not serious incidents" and hence, not a reflection of an actual decline in incident rate. If Trans Mountain were to deny this statement, then the IR requested that they explain why it could not be so.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	Request: h) Please confirm that the most significant drop in incident frequency for each type of marine vessel in Figure 4-2 is accounted for in the decline of "not serious" incidents. i) Please confirm that DNV believes 'not serious' incidents are underreported, as stated in the following quote on PDF page 14: "DNV believes that the reason for that the number of 'not serious incidents' is lower than the number of 'serious incidents' is that the 'not serious incidents' are underreported in the database." j) Given the responses to requests h) and i) of this section, please confirm that if there is in fact a decline in the number of tanker incidents internationally, that this decline could simply be the result of a lower reporting rate for "not serious" incidents and not a reflection of an actual decline in the incident rate. If not, why not?	volume of oil spilled have declined.	Given the lack of response to the IR, I request that the Board please rule Trans Mountain's answer to be inadequate.
1.10.3.l	**1.10.3 Tanker Incident and Oil Spill Accident Frequencies** **Reference:** i)A3S4T1, TERMPOL 3.8, Casualty Data Survey, Full Report **Preamble:** Reference i) provides the casualty data survey performed as a part of the TERMPOL review process. Most of the	The request is not relevant to the analysis. Det Norske Veritas (DNV) has not applied regression analysis or trend lines in the analysis or as basis for any conclusions.	The purpose of this question is to assess whether the rate of spills, overall, is increasing or decreasing with time. This is relevant, given that the project would see a dramatic increase in the number of shipping incidents that could lead to an oil spill. Given the lack of response to the IR, and the importance of the information requested, I submit that Trans Mountain's answer is inadequate.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	data is provided for the period 2002 to 2011, with some variations. Section 8 of the report concludes that: "The casualty data survey shows that there has been a decline in the number of incidents both internationally and in Canadian waters for 2002 – 2011." (PDF page 36) **Request:** l) Please provide a trend line, including significance intervals, for the data given in Figures 5-7 for the period 2001-2009.		
1.10.3.m	**1.10.3 Tanker Incident and Oil Spill Accident Frequencies** **Reference:** i)A3S4T1, TERMPOL 3.8, Casualty Data Survey, Full Report **Preamble:** Reference i) provides the casualty data survey performed as a part of the TERMPOL review process. Most of the data is provided for the period 2002 to 2011, with some variations. Section 8 of the report concludes that: "The casualty data survey shows that there has been a decline in the number of incidents both internationally and in Canadian waters for 2002 – 2011." (PDF page 36) **Request:** m) Please provide a trend line, including significance intervals, for the data given in Figures 5-7 for the period 2001-2008.	The request is not relevant to the analysis. Det Norske Veritas (DNV) has not applied regression analysis or trend lines in the analysis or as basis for any conclusions.	The purpose of this question is to assess whether the rate of spills, overall, is increasing or decreasing with time. The significant decline in 2009 appears to be an outlier and could therefore skew the result. Hence, I have requested a trendline for the period 2001-2008. This is relevant, given that the project would see a dramatic increase in the number of shipping incidents that could lead to an oil spill. Given the lack of response to the IR, and the importance of the information requested, I submit that Trans Mountain's answer is inadequate.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
1.10.4.c	**Reference:** ii)A3S4S8, TERMPOL 3.6, Special Underkeel Clearance Survey, PDF page 6. **Preamble:** Reference ii) notes that: "The actual draught can vary from the nominal draught due to such effects as vessel squat or wave action. Similarly, the seabed elevation in a channel dredged to a specific nominal depth can vary somewhat due to dredging tolerances and survey accuracy." **Request:** c) In light of reference ii), please confirm if it is possible that the actual draught in a 13.5m nominal draught scenario could be significantly more, thereby decreasing the total underkeel clearance of a laden tanker transiting First Narrows to less than 1.7m. c.1) If yes, please provide the maximum range of the variability between actual and nominal draught that could occur in this scenario and the accompanying analysis. c.2) If no, please explain why not.	Please see Technical Report 8C-4 in Volume 8C, TERMPOL 3.6, "Special Underkeel Clearance Survey—Trans Mountain Expansion Project" (Moffatt & Nichol, November 2013) for this information.	Trans Mountain's response does not answer the request. It simply refers back to the reference source on which the request is based. Given Trans Mountain's response to the IR does not provide the information that was requested, and given the importance of the information requested, I submit that Trans Mountain's answer is inadequate.
1.10.4.h	**Reference:** iii)A3S4S8, TERMPOL 3.6, Special Underkeel Clearance Survey, PDF page 16.	Please refer to the response to Weaver A IR No. 1.10.4g. This information request is not deemed relevant to the risk assessment. Please see Technical Report 8C-10 in Volume	Segment 5 of the route has been identified as one of the most difficult parts of the route to navigate. The scope of a tanker's maneuverability to accommodate unexpected

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	iv)A3S4S8, TERMPOL 3.6, Special Underkeel Clearance Survey, PDF page 15. v)A3S4T7, TERMPOL 3.5 & 3.12, Route Analysis & Anchorage Elements, Full Report **Preamble:** Reference iii) notes that: "As vessels enter into shallower water with less underkeel clearance, they become more difficult to manoeuvre due to the effects of increased current drag forces, vessel squat, etc." Reference iv) notes that: "Apart from intermittent notations on the hydrographic charts indicating the nature of the seabed (eg, rock, mud, etc.) in specific locations, we are not aware of any comprehensive public sources of data that provide for a systematic description of the seabed along the entire vessel route." Reference v) provides an analysis of the tanker route from Westridge Marine Terminal to Bouy J. The report states that: "One of the main issues in transiting and clearing the First Narrows is interference caused by small pleasure craft fishing at the mouth of the Capilano River. A large ocean going vessel has limited manoeuvring room and has few options once committed to the transit, other than slowing down, the vessel is required to maintain course." (PDF page 13).	8C, TERMPOL 3.5 & 3.12, "Route Analysis & Anchorage Elements" (Moffatt & Nichol, November 2013) for the route study including Segment 5.	obstacles is essential to ensuring the safety of the route. Given the serious consequences associated with a potential oil spill, requesting an analysis of the scope of maneuverability of an aframax tanker is not an unreasonable request. I therefore submit that Trans Mountain's response is inadequate.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	Request: h) In light of references iii), iv) and v) please provide an exhaustive analysis of an Aframax tanker's scope maneuverability, including turning and stopping, to accommodate unexpected obstacles, including other vessels, when passing through segment 5 of the proposed vessel route, as shown in Figure 2-6 of reference v).		
1.10.4.i	**Reference:** v)A3S4T7, TERMPOL 3.5 & 3.12, Route Analysis & Anchorage Elements, Full Report **Request:** i) Please elaborate on section 3 of reference v) (PDF page 23) to provide a detailed and comprehensive description of any and all key geographic and geological factors along the tanker route that could contribute to a tanker incident or spill. Please also identify any gaps in existing public sources of data pertaining to geographic and geological factors along the tanker route.	The existing route is used by all ocean going ships calling the port of Vancouver. Please refer to Volume 8C, Termpol 3.5/3.12 for information on the route. For additional information, please refer to the appropriate navigation chart issued by the Canadian Hydrographic Service (CHS).	Trans Mountain's response does not address the purpose of the information request. The IR requested that trans mountain provide a more detailed description of geographic and geological factors along the tanker route than is currently provided by TERMPOL 3.5/3.12. Trans Mountain's response was to refer to TERMPOL 3.5/3.12. For clarify purposes, here is Section 3 of TERMPOL 3.5/3.12 in its entirety: "3. GEOGRAPHIC AND GEOLOGICAL FACTORS The southern coast of British Columbia has a wide range of geographic and geological formations. The proposed waterways have a variety of sandy to rocky shore lines and scattered with islands, coves, and inlets. The proposed route is deep and wide enough and currently providing safe transit for vessels similar to the project vessels to and from Vancouver harbour." The purpose of the IR was to obtain a more detailed and

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
			comprehensive description of the "wide range of geographic and geological formations" that could contribute to a tanker incident or spill. Given the lack of detail provided in Section 3 of the TERMPOL 3.5/3.12 as to the specific geographic and geological factors, and given that Tran's Mountain's response to Weaver A IR 1.10.4.i, I submit that Trans Mountain has not adequately responded to this request.
1.10.4.j	**Reference:** vi) A3S5F6, TERMPOL 3.15, General Risk Analysis and Intended Methods of Reducing Risks, Full Report. **Request:** j) Please provide an annotated breakdown of all environmental data used in the MARCS model to account for geographical features along the Trans Mountain tanker sailing route, as described on PDF page 77 in reference vi). Please include a sensitivity analysis of the MARCS model with respect to the uncertainty of this data.	j) The information request is an enquiry about Appendix 1, Description of the MARCS Model, Section 3.4. The environmental data refers to information available in the main report, found in Section 3.5 of Technical Report 8C-12 in Volume 8C, TERMPOL 3.15, "General Risk Analysis and Intended Methods of Reducing Risks—Trans Mountain Expansion Project" (Det Norske Veritas, November 2013). The uncertainty of this data is low because it is obtained from government sources, such as Environment Canada and Canadian Hydrographic Service (CHS). Thus, a further sensitivity analysis is not necessary or contemplated.	The fact that the data is obtained from government sources, such as Environment Canada and Canadian Hydrographic Service in itself says nothing about the certainty in the data. For instance, DNV provides the wind rose data used by the MARCS model in Table 3 of Technical Report 8C-12 in Volume 8C, TERMPOL 3.15, "General Risk Analysis and Intended Methods of Reducing Risks—Trans Mountain Expansion Project" (Det Norske Veritas, November 2013). No information is provided regarding the time period over which this wind data was collected (e.g. does it represent the aggregate of multiple years of data or just one year?) or the time of year during which the data was collected (is it from winter months or summer months, or is it year-round data?). The answers to these questions will have an impact on the certainty of the data. Trans Mountain has not provided this information for the environmental data nor has it provided a sensitivity analysis with respect to the uncertainty of the data. They have therefore made an assertion (that the data has a low degree of uncertainty) without supporting that assertion with evidence (such as that requested in the sensitivity analysis).
1.10.5.d	**Reference:**	d) Information on other vessel types can be found in	Weaver A No. IR 1.10.5.d.1. requested a description of how

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	ii) A3S5F6, TERMPOL 3.15, General Risk Analysis and Intended Methods of Reducing Risks, Full Report. **Request:** d) According to PDF page 3 of reference ii), the MARCS analysis assumes all tankers are Aframax size. Please identify any and all other classes of oil tanker that could service Westridge Marine Terminal. d.1) Please provide a description of how inputting the given parameters of each of the tankers listed in response to request d) would likely impact the outcome of the risk analysis, including whether, how and why it would increase or decrease the likelihood of a spill.	Technical Report 8C-7 in Volume 8C, TERMPOL 3.9, "Ship Specifications—Trans Mountain Expansion Project" (Moffatt & Nichol, November 2013). d.1) Please see Technical Report 8C-5 in Volume 8C, TERMPOL 3.7, "Transit Time & Delay Survey—Trans Mountain Expansion Project" (Moffatt & Nichol, November 2013) regarding possible ship size distribution. Please refer to the response to City Burnaby IR No. 1.22.02c. Trans Mountain believes the majority of tankers will be of Aframax size	inputting the given parameters of each type of tanker noted in response to Weaver A No. IR 1.10.5.d, would impact the outcome of the risk analysis, including whether, how and why it would increase or decrease the likelihood of a spill. Trans Mountain's answers make it clear that Panamax tankers may service Westridge Marine Terminal, and that as a result there may be more than 34 tankers serviced at the terminal each month. It also notes that 100 barges will service the terminal each year. However, no description was offered as to how these other vessel types would impact the outcome of the risk analysis, as requested by the IR. For the reasons identified above, I submit that Trans Mountain has not adequately responded to this request.
1.10.5.e.1	**Reference:** ii) A3S5F6, TERMPOL 3.15, General Risk Analysis and Intended Methods of Reducing Risks, Full Report. **Request:** e) On PDF page 11 of reference ii) the report states that: "DNV is unaware of a grounding incident which has occurred with a tethered tug in attendance, so a reduction factor of 100 times reduction is applied to the mechanical failure rate of tethered tankers." Please provide any and all analysis and model validation that was done when determining a reduction factor of 100 times for the	e) A tethered tug with sufficient power to hold a laden disabled Aframax tanker and thus prevent it from drifting is modelled as a redundant system to prevent drifting because it is attached to a vessel with full propulsion abilities. In risk analysis the probability of failure in case of a redundant system can be calculated as the squared original probability of failure (Px2). The probability of loss of power is 0.0001, so the probability of loss of power for the tanker and the tug is (0.0001)2 = 0.00000001, a factor of 1,000 lower. However, taking uncertainty into account, Det Norske Veritas (DNV) used a factor of 100 in the drift grounding reduction. It is important to note that the risk reduction of 100 times was only applied for the probability of drift grounding events, not for powered grounding.	Weaver A No. IR 1.10.5.e.1 asked for confirmation as to whether or not the risk reduction factor has been validated for the Trans Mountain sailing route. Trans Mountain's refers to "part e)", in which Trans Mountain offers the rational for offering a 100 times reduction factor. However, no validation of this rational is provided for the Trans Mountain sailing route. Similarly, the fact that tethered tugs are an existing procedure and that no incidents have occurred is not a proper validation of the 100 times risk reduction factor.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	mechanical failure rate for tethered tankers. e.1) Please confirm if the 100-time risk reduction factor has been validated for the Trans Mountain tanker sailing route. If yes, please provide this validation. If no, please explain why not.	e.1) Please refer to part e). The procedure with tethered tugs in the Narrows and Haro Strait is an existing procedure for laden tankers in the sailing route. There have been no incidents with grounding of tankers in these areas.	Trans Mountain therefore has not provided any confirmation that the 100-time risk reduction factor has in fact been validated for the Trans Mountain sailing route. The second part of Weaver A No. IR 1.10.5.e.1 was that if the reduction factor has been validated, to please provide the validation. If it has not, please explain why not. I submit that neither Weaver A No. IR 1.10.5.e nor Weaver A No. IR 1.10.5.e.1 have been adequately answered.
1.10.5.f	**Reference:** ii) A3S5F6, TERMPOL 3.15, General Risk Analysis and Intended Methods of Reducing Risks, Full Report. **Request:** f) On PDF page 11 of reference ii) the report states that: "A tethered escort tug may also respond to prevent a powered grounding incident. In previous work, DNV has assessed the benefit of this as a reduction by a factor of 2." Please provide any and all analysis and model validation that was done when determining a reduction factor of 2 times for the powered grounding incident rate for tethered tankers. f.1) Please confirm if the 2-time risk reduction factor has been validated for the Trans Mountain tanker sailing route. If yes, please provide this validation. If no, please explain	f) The tug effectiveness parameters were originally developed for the Prince William Sound Risk Assessment project in the mid-1990s. They consist of engineering calculations of performance and expert judgment. These parameters were reviewed and revised during work performed in the Bosphorus in the mid-2000s and again in 2013. These later projects were performed under commercial confidentiality agreements. The exact parameters are proprietary to DNV and cannot be disclosed. f.1) The procedure with tethered tugs in the Narrows and Haro Strait is an existing procedure for laden tankers in the sailing route. Please refer to the response to Weaver A IR No. 1.03f.	Trans Mountain's response to Weaver A No. IR 1.10.5.f states clearly that the analysis and therefore justification for applying a risk reduction factor of 2 to tethered escort tugs in preventing a powered grounding incident is "proprietary to DNV and cannot be disclosed." Therefore I ask that the Board please note that the risk reduction factor provided cannot be verified for accuracy. As a point of clarification, in Trans Mountain's response to Weaver A No. IR 1.10.5.f.1, Trans Mountain refers to Weaver A IR No. 1.03f. The answer to Weaver A No. IR 1.03.f is irrelevant to Weaver A No. IR 1.10.5.f.1 It is therefore presumed that Trans Mountain intended to reference Weaver A No. IR 1.10.5.f Furthermore, Trans Mountain's response to Weaver A No. IR 1.10.5.f.1 does not provide any validation for a risk reduction factor of 2 for the Trans Mountain sailing route. The existence of this procedure in the Narrows and Haro

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	why not.		Strait does not constitute sufficient validation. Trans Mountain has therefore not responded sufficiently to this IR.
1.10.5.h	**Reference:** v)A3S5F8, TERMPOL 3.15, General Risk Analysis and Intended Methods of Reducing Risks, Full Report. **Request:** h) In section 3 of Appendix 4 in reference v), the report states that: "As discussed in Section 2.3 above, the basic parameters in MARCS represent North Sea average shipping operations in the mid to late 1990s." Please provide an exhaustive account of how the MARCS model has been updated to represent current and local shipping operations in British Columbia since 2010, including the process of validating the model for these conditions.	h) The MARCS model does not require specific tuning to British Columbia (BC). For the analysis area, Det Norske Veritas (DNV) has chosen to apply a lower risk reduction factor (more conservative) than could have been applied based on global data.	Weaver A No. IR 1.10.5.h requested information about how the MARCS model has been updated for both current and local conditions, as well as how the model has been validated for these conditions. Trans Mountain's response states that the model does not require specific tuning for BC (i.e. local conditions). Trans Mountain does not address how the model was updated for current conditions (i.e. 2014 instead of 1990s), nor does it address how the model was validated for either current or local conditions. Trans Mountain has therefore not fully answered the request.
1.10.5.i.2 **1.10.5.j.1** **1.10.5.j.2** **1.10.5.k.1**	Not applicable	Not applicable	The responses to the information requests listed in the far left column all refer to a response provided to Weaver A IR No. 1.03f. This response has nothing to do with the information requested. These information requests all pertain to the Risk Analysis done in TERMPOL 3.15, General Risk Analysis and Intended Methods of Reducing Risk. The response to Weaver A IR No. 1.03f pertains to Trans Mountain's decision not to evaluate a "total loss" oil spill scenario. It is therefore assumed that this reference is a mistake and hence it is requested that Trans Mountain please update its answers to correct this mistake. In case no mistake was made, it is requested that Trans Mountain please explain the connection between the response provided to Weaver A IR No. 1.03f and the four information

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
			requests listed in the far right column.
1.10.5.k.1	**Reference:** v) A3S5F8, TERMPOL 3.15, General Risk Analysis and Intended Methods of Reducing Risks, Full Report. **Request:** k) In section 3.2.3 of Appendix 4 in reference v) the report states that: "When the discussion in Sections 3.1 and 3.2 were first compared it was noticed that the analysis predicted that VTS is a more effective risk reduction option than the presence of a pilot on the bridge. This observation is inconsistent with the parameters in MARCS derived from SAFECO. It is also inconsistent with the expert judgement of 2 ex-navigating officers employed by DNV. Taking into account all available evidence, DNV has made the decision to favour the MARCS parameters, and these have been further amended to represent all important influences as described above." Please provide the following: k.1) An exhaustive description of any and all amendments that were made to the MARCS model or the PSFs of the risk reduction options referred to in request k) of this section in response to the inconsistency mentioned in request k) of this section. k.2) All analyses that were done as a result of noting the inconsistency identified in request k) of this section, to ensure that the MARCS model itself was not inaccurate. k.3) An account of how the MARCS model has been validated for the Trans Mountain tanker sailing route after addressing the inconsistency described in request k) of this	k) k.1) Please refer to the response to Weaver A IR No. 1.03f. The PSFs that are applied for VTS and pilotage are shown in Table 3-1 of Appendix 4 of the Volume 8C TR 8C-12 TERMPOL 3.15 report. The text that is referred to in question k) above does not represent an inconsistency as suggested in the question but is instead a description of the process and professional judgment that was used in determining the PSF applied in the study. Please note that the quotation provided in the question is incorrect as the passage actually ends, "…as described below." Details of the reference studies for PSFs are described and quantified "above" in Section 3.1 (VTS) and 3.2 (Pilotage) and a summary showing the values applied is provided "below" in Table 3.1. The quoted passage describes how a PSF for VTS more conservative than the global studies might otherwise support was applied for use in the model. No inaccuracies are noted. k.2) Please refer to part k.1) above. k.3) Please refer to the responses to Weaver A IR No. 1.10.5i.1, 1.10.5i.2 and 1.10.5k.1 above. No specific study has been carried out for the analysis area, thus DNV has chosen to apply a risk reduction factor that	The term "inconsistent" is a direct quote from DNV. Trans Mountain has not adequately explained *why* there is no inconsistency when DNV clearly states that there was. Without explaining why there is no inconsistency, the information request still stands, and Trans Mountain`s answers remain inadequate. Trans Mountain has also not provided any analyses that were done to ensure that the MARCS model itself was not inaccurate, as requested in Weaver A. IR No. 1.13.5.k.2. Trans Mountain has also not addressed the need to validate the changes that were made in order to address the inconsistency.

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	section.	are in the lower bound of the global data. No inconsistencies are seen.	
1.10.5.r	r) In section 3.4 of Appendix 4 of reference v) the report attempts to quantify the effect of ship routing measures for the MARCS model. Please provide: r.1) A sensitivity analysis of the MARCS model with respect to the uncertainty of the PSF applied for ship routing measures. r.2) An account of how the PSF applied in the MARCS model for ship routing measures has been validated for the Trans Mountain tanker sailing route.	r) r.1) The discussions in section 3.4 of Appendix 4 serves as a description of various ship routing measures and their potential effect on navigation safety. The actual effect from the traffic separation schemes and movement restriction areas in the marine RSA sailing route is estimated in the MARCS model by modelling only one-way traffic in the TSS area. However, the directional sailing lanes are modelled with some overlap to account for potential stray vessels (see Volume 8C – Termpol 3.15, Appendix Section 3.1). The AIS data applied in the analysis gives local information about the actual distance seperating directional sailing lanes. Other movement restrictions, such as the Movement Restriction Area (MRA) in Vancouver harbour and the restriction of passing and overtaking vessels around Turn Point in the Haro Strait, are also included in the MARCS modelling. r.2) Please refer to the response to Weaver IR No. 1.10.5r.1.	The answer provided offers a description of the approach taken to model the effect of ship routing measures but does not provide a sensitivity analysis with respect to the uncertainty of the approach taken. This is particularly important since, as the response notes, MARCS only models one-way traffic and then accounts for overlap in order to model the directional sailing routes present in the study area. No sensitivity analysis is provided with respect to the uncertainty inherent in this approach. I therefore submit that Trans Mountain has not adequately responded to the information request.
1.10.5.w	w) Regarding reference iii), please provide a detailed and comprehensive account of how each input (ship structure, rocky vs. soft shoreline, wave and wind affects, and collision momentum), was factored into the model, including any calculations or weighting that was used for each input. Please also provide a detailed account of how each input was validated for the Trans Mountain tanker sailing route.	w) Please refer to Section 3 of Technical Report 8C-12 in Volume 8C, TERMPOL 3.15, "General Risk Analysis and Intended Methods of Reducing Risks—Trans Mountain Expansion Project" (Det Norske Veritas, November 2013) for a description of the factors requested above. w.1) Please refer to Appendix 1 of the TERMPOL 3.15 report for description of the MARCS methodology and applied factors.	Trans Mountain has not provided information regarding how specifically "collision momentum" was factored into the MARCS model. Similarly, as noted above in the Intervenor's Explanation for claiming Weaver A. IR No. 1.10.4.j response to be inadequate, the wind rose data provided in TERMPOL 3.15 is insufficient to determine its validity and accuracy as a predictive input in the model. I therefore submit that the information requested has not been adequately provided.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
1.10.5.aa	aa) Please provide the PSF and risk reduction factor applied to the MARCS model for the additional escort tug in Case 1a in reference ii). Please also provide: aa.1) A detailed account of any analysis and research used to determine the appropriate PSF and risk reduction factor applied to the MARCS model for the additional escort tug in Case 1a.	aa) There is not one single risk reduction factor for the use of extended escort tug. The effect of escort tug is modelled in MARCS and varies with wind and wave conditions and the sailing routes distance from shore. aa.1) Case 1a does not specify an additional escort tug. It specifies three segments of the route (3, 4 and 7) where a new escort tug would be provided. These segments are, between English Bay and Saturna Island, and from Race Rocks to the J Buoy as indicated by a comparison of Figures 21 and 27 of Volume 8C TR 8C-12 Termpol 3.15. The tug save model contains many parameters as described in Section 4.3.2 of Appendix 1.	While acknowledging that there is not one PSF or risk reduction factor for the use of an extended escort tug, the purpose of the question was to obtain the input value(s) applied for this risk reduction measure. Trans Mountain has not provided these inputs and therefore has not answered the question. Moreover, Trans Mountain has not provided any analysis or research that went into informing the risk reduction inputs that were applied to the MARCS model for the extended escort tug. Therefore Trans Mountain has not adequately answered the information request.
1.10.5.cc.i	cc.3) Please provide all PSFs and risk reduction factors applied to the MARCS model for the moving exclusion zone in Case 1b in reference ii). Please also provide: cc.3.i) A detailed account of any analysis and research used to determine the appropriate PSFs and risk reduction factors applied to the MARCS model for the moving exclusion zone in Case 1b.	cc.3.i) The key performance issue for a moving exclusion zone is the degree of compliance achieved. In a well-managed waterway such as the study area, where professional sea-farers understand that compliance failures have consequences, as such Det Norske Veritas (DNV) expects a moving exclusion zone would be highly effective. DNV believes the estimated PSF is very conservative compared to expected performance.	Trans Mountain has not provide any analysis or research to support DNV`s expectations of the efficacy of a moving exclusion zone, as was requested. Therefore, I submit that Trans Mountain has not adequately responded to this information request.
1.10.5.dd	dd) In section 7.5.2 of reference ii), the report compares incident frequencies to conclude that under Case 1b, the incident frequency of Trans Mountain tankers will be below the global average for the past 10 years. Given that the parameters of Case 1b are not a certainty for the project, please provide an analysis of the annual projected oil cargo spill accident frequency for Trans Mountain tankers under Case 0, Case 1, Case 1a and Case 2.	dd) The information requested is provided in Section 7 of Technical Report 8C-12 in Volume 8C, TERMPOL 3.15, "General Risk Analysis and Intended Methods of Reducing Risks—Trans Mountain Expansion Project" (Det Norske Veritas, November 2013).	The oil cargo spill frequency for Trans Mountain tankers under Case 0, Case 1, Case 1a and Case 2 could not be found in Section 7 Technical Report 8C-12 in Volume 8C, TERMPOL 3.15 "General Risk Analysis and Intended Methods of Reducing Risks—Trans Mountain Expansion Project" (Det Norske Veritas, November 2013). I therefore request that Trans Mountain please provide this information as requested, or that the Board rule that Trans Mountain has not adequately responded to the information

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
			request.
1.10.5.ee	ee) In section 7.5.3 of the reference ii), the report compares the Danish Strait to the Salish Sea, concluding that "the sailing route is relatively similar to the Trans Mountain tanker sailing route" and therefore that the "likelihood of a marine transit incident and the likelihood for an oil cargo spill accident are therefore considered relatively low [along the Trans Mountain tanker sailing route] compared with other well established sailing routes." Please provide: ee.1) An exhaustive comparison of the oceanographic observations in the Danish Strait and along the entire Trans Mountain tanker sailing route, in support of this conclusion. ee.2) An exhaustive comparison of the meteorological observations in the Danish Strait and along the entire Trans Mountain tanker sailing route, in support of this conclusion. ee.3) An exhaustive comparison of the topographic observations in the Danish Strait and along the entire Trans Mountain tanker sailing route, in support of this conclusion. ee.4) An exhaustive comparison of the risk controls in place in the Danish Strait and along the entire Trans Mountain tanker sailing route, in support of this conclusion. ee.5) An exhaustive comparison of the navigational hazards in the Danish Strait and along the Trans Mountain sailing route, in support of this conclusion.	ee.1) In response to all requests related to the Danish Strait: The comparison with the Danish Strait is relevant for comparing risk level and providing a sense of what is considered acceptable in a well-managed waterway outside North America in a country whose citizens highly uphold their environmental values. The comparison is not made as a validation of the results of TERMPOL 3.15. Trans Mountain believes that its Application contains appropriate and credible information to allow informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013 and their List of Issues published on 29th July 2013. Therefore the information requested will not be provided. Therefore, the descriptions and assessments requested below will not be provided. ee.2) Please refer to the response to Weaver A IR No. 1.10.5.ee.1. ee.3) Please refer to the response to Weaver A IR No. 1.10.5.ee.1. ee.4) Please refer to the response to Weaver A IR No. 1.10.5.ee.1. ee.5) Please refer to the response to Weaver A IR No. 1.10.5.ee.1.	According to DNV, their model is based on data developed from/for the Danish Strait. The comparison between the Danish Strait and the Salish Sea is therefore significantly more than a simple comparison of risk level to provide a sense of what's acceptable elsewhere. The comparison is fundamental to the risk analysis. DNV has not validated its model for B.C., raising questions about the model's accuracy in the project area. Trans Mountain has declined to provide the information requested and hence I submit that this is an inadequate response.

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1.10.5.f.2	ff) On PDF page 73 of reference ii), the report states that: "MARCS calculates the accident risk in stages. It first calculates the location dependent frequency of critical situations (the number of situations which could result in an accident –"potential accidents"—at a location per year; a location is defined as a small part of the study area, typically about 1 nautical mile square, but dependent on the chosen calculation resolution)". Please provide the following: ff.2) A complete list of the location dependent frequencies of critical situations throughout the entire study area for each separate risk analysis (including Case 0, Case 1, Case 1a, Case 1b and Case 2) conducted in TERMPOL 3.15. (references i), ii) and v))	ff.2) The MARCS analysis correlated closely with the marine network focal points shown in Figure 3-1 in Technical Report 8C-2 in Volume 8C, TERMPOL 3.2, "Origin, Destination & Marine Traffic Volume Survey—Trans Mountain Expansion Project" (Moffatt & Nichol, November 2013). The analysis confirmed these as locations for higher collision probability due to increased marine traffic. Trans Mountain believes that its Application contains appropriate and credible information to allow informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013 and their List of Issues published on 29th July 2013. Therefore the additional information requested will not be provided.	Trans Mountain has not provided a list of the location dependent frequencies of critical situations throughout the study area. Without this information, one cannot assess the accuracy of the risk analysis provided. I therefore submit that Trans Mountain has not adequately responded to Weaver A. IR No. 1.10.5.f.2.
1.10.5.gg	gg) PDF page 76 of reference ii) describes the internal operational data used by MARCS to analyze the risk of an incident. Please provide a complete annotated list of all types of "internal data" used by MARCS. Please also note which data was sourced from British Columbia's west coast.	Please refer to Appendix 1 of Technical Report 81C-12 in Volume 8C, TERMPOL 3.15, "General Risk Analysis and Intended Methods of Reducing Risks—Trans Mountain Expansion Project" (Det Norske Veritas, November 2013) and Technical Report 8C-6 in Volume 8C, TERMPOL 3.8, "Casualty Data Survey" (Det Norske Veritas, September 2013) for the data and descriptions of methodology used by MARCS.	Neither of the two documents referenced in Trans Mountain's response provide a complete list of internal data used by MARCS, nor an annotated list. Given that MARCS does not appear to have been validated for B.C. waters, it is important to get this data so that one can better assess the accuracy of the model for study area. I therefore submit that Trans Mountain has not adequately responded to the information request.
1.10.5.hh	hh) Section 11 of reference ii) (PDF pages 52-53) offers a discussion of the sensitivity of the methods and the MARCS model validation. Based on these discussions, please explain in detail: hh.1) If MARCS algorithms are not calibrated with historical	hh.1) The MARCS model is developed based on historical data and as described in Section 11 of Volume 8C TR 8C-12 Termpol 3.15 it has been shown to provide good agreement with good quality historical accident data. hh.2) By using the MARCS model, local tuning is avoided. It	Section 11 of TERMPOL 3.15 provides a general discussion that notes that the MARCS model has generally agreed with historical data. However, DNV provides no sensitivity analysis nor does it provide the historical data against which the model has been validated. As such, there is no way to verify this validation. Moreover, while it is important to

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	data, then how can one know if they are grounded in reality? hh.2) How does MARCS ensure that a in, a particular case, one is not getting the "right answer" for the "wrong reason" (i.e. Tuning)?	considers local environmental data, local shipping lane geography and local traffic, then conducts the risk analysis in a standardised and repeatable method — thus avoiding tuning.	validate the model against historical data, this validation, on its own, is not sufficient for evaluating the predictive nature of the model. Insufficient documentation has been provided to adequately verify that the model is not affected by tuning. Trans Mountain has therefore failed to provide documentation or evidence to support its assertions that the MARCS model has been calibrated for accuracy and to prevent tuning.
1.11.a.2	**Reference:** i) A3S5G2, A3S5G4 A Study of Fate and Behaviour of Diluted Bitumen Oils on Marine Waters **Request:** a.2) As a result of the fact that "limited empirical observations have been recorded about how these [dilbit] products reacted when spilled into the environment" and so "the literature review was forced to rely largely on available information on other heavy crude oils" (page 1), and in light of the publication of reference [x], do Trans Mountain plan to undertake: a.2.i) any more tank experiments with water containing suspended sediments typical of the Strait of Georgia, Haro Strait and Juan de Fuca Strait? If not, why not? a.2.ii) any field experiments in the Strait of Georgia, Haro Strait or Juan de Fuca Strait? If not, why not?	a.2) Please refer to the response to NEB IR No. 1.63a regarding future research.	NEB IR No. 1.63a does not answer the question that I posed. It says "specific research plans have not yet been defined" and talks about hypothetical collaborative research which may or may not occur in the future. The response does not address my question with respect to either: 1) tank experiments with water containing suspended sediments typical of the Strait of Georgia, Haro Strait and Juan de Fuca Strait? or 2) any field experiments in the Strait of Georgia, Haro Strait or Juan de Fuca Strait? I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
1.11.a.3	**Reference:** i) A3S5G2, A3S5G4 A Study of Fate and Behaviour of Diluted Bitumen Oils on Marine Waters **Request:** a.3) The literature review resulted in only six studies which focused on dilbits (page 5, lines 12-13). a.3.i) Please list these six studies with URLs so that I can access them. a.3.ii) Do any of these studies appear in the peer-reviewed scientific literature?	a.3) Please refer to the response to Province BC IR No. 1.1.73c.	This was a very simple request for information and the answer is indicative of the dismissive response that most questions received. It is unacceptable that simple request for a list of studies relied on is not responded to. It is unacceptable that an intervenor is directed to the response to another intervenor. The response to the questions posted in Province BC IR No. 1.1.73c do not answer the questions I posed. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided to include the six studies that are referred to on page 5, lines 12-13? Furthermore are these peer-reviewed (scientific technical reports are not considered peer-reviewed)?
1.11.a.4	**Reference:** i) A3S5G2, A3S5G4 A Study of Fate and Behaviour of Diluted Bitumen Oils on Marine Waters **Request:** a.4) The tank experiments were all conducted with conditions claimed to be typical of Burrard Inlet. Have any tank experiments been conducted: a.4.i) with more saline conditions typical of the Strait of Juan de Fuca? If not, why not? a.4.ii) with colder conditions typical of winter? If not, why	a.4) Additional studies were conducted by the Government of Canada (2013), under more saline conditions and different temperatures. Please refer to the response to NEB IR No 1.63a regarding future research.	This response is unacceptable. I am aware of the government on Canada studies. As noted in 1.11.a.2 above, NEB IR No 1.63a does not provide any details of any research that may or may not get done. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	not? a.4.iii) in the presence of strong horizontal and/or vertical sheer? If not, why not? a.4.iv) in the presence of whirlpools? If not, why not? a.4.v) in the presence of downwelling conditions with downwelling velocities reaching greater than 40-50 cm/s as observed in references [vi] and [ix]. If not, why not?		
1.11.a.5	**Reference:** i) A3S5G2, A3S5G4 A Study of Fate and Behaviour of Diluted Bitumen Oils on Marine Waters **Request:** a.5) To what extent does Trans Mountain believe that the Oil Distribution In the Water Column measurements of section 4.4 have any relevance to conditions present in the highly turbulent, sediment laden, dynamic, tidally-mixed Strait of Georgia, Haro Strait and Juan de Fuca Strait?	a.5) Conditions used to assess oil distribution into the water column provide a basis for modeling and extrapolation to other conditions. Trans Mountain has provided credible and relevant information on marine risk to enable risk assessment and risk based decision making.	Trans Mountain has simply made an assertion without providing any evidence. The reason why I am asking these questions to determine whether or not Trans Mountain has indeed "provided credible and relevant information on marine risk to enable risk assessment and risk based decision making". The "trust us" response is unacceptable. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.a.7	**Reference:** i) A3S5G2, A3S5G4 A Study of Fate and Behaviour of Diluted Bitumen Oils on Marine Waters **Request:** a.7) How much of the recommended future research in	a.7) Some aspects have been partially addressed through Government of Canada initiatives. Please see the response to NEB IR No. 1.63a regarding future research.	NEB IR No. 1.63a does not address my question. I can only conclude that none of the recommended future research will be done. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	section 7 has been done or will be done?		
1.11.a.8	**Reference:** i) A3S5G2, A3S5G4 A Study of Fate and Behaviour of Diluted Bitumen Oils on Marine Waters **Request:** a.8) Table 8.1 on page 63 contains a list of Frequently Asked Questions. a.8.i) Why does the first question not address the relevant question "Does dilbit sink in highly turbulent marine conditions near the outlow of a sediment laden major river"? a.8.ii) The third question suggests that chemical dispersants could be effective on dilbit spills. How does one reconcile the given answer with the result found in reference [x] and given above, namely "Under conditions simulating breaking waves, where chemical dispersants have proven effective with conventional crude oils, a commercial chemical dispersant (Corexit 9500) had quite limited effectiveness in dispersing dilbit"?	a.8) The question posed in FAQs is with respect to a broader condition, not a specific setting as posed in the IR. The behavior and fate of spilled dilbit (bitumen blended with condensate or synthetic crude oil) was canvassed extensively in the Joint Review Panel hearings relating to Northern Gateway, and the Panel in assessing the issue accepted that the maximum initial density of the dilbit would be 940 kilograms per cubic metre or less, in conformance with the pipeline tariff specification. And : • "When initially spilled, the density would be less than that of fresh water or salt water, making dilbit a floating oil. • Experts agreed that dilbit is not a simple two-phase mixture of bitumen and condensate, but is instead a new, cohesive, blended product. When spilled into water, lighter hydrocarbon fractions of the entire blend would begin to evaporate. As lighter fractions evaporate, the viscosity of the weathered dilbit would increase, and evaporation of remaining lighter fractions would be progressively inhibited. • Past examples of spills do not indicate that products similar to dilbit are likely to sink within the timeframe for response options, or in the absence of sediment or other suspended particulate matter interactions. • Dilbit may sink when it interacts with sediment or other suspended particulate matter, or after prolonged	Trans Mountain assert that: "Past examples of spills do not indicate that products similar to dilbit are likely to sink within the timeframe for response options, or in the absence of sediment or other suspended particulate matter interactions" This assertion should be backed up with evidence. The Kalamazoo example is clearly at odds with this statement. The evidence that Trans Mountain is relying on to make this statement is critical in determining whether or not it is supportable. Since the evidence has not been provided, this answer does not fully address the question I asked. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
		weathering." Both the Gainford (2013) tests and the Government of Canada (2013) tests showed that application of Corexit 9500 did disperse relatively unweathered dilbit. Studies of the effectiveness and window of opportunity are areas recommended for additional research. **Reference:** Government of Canada, 2013. Properties, Composition, and Marine Spill Behaviour, Fate and Transport of Two Diluted Bitumen Products from the Canadian Oil Sands.	
1.11.b.1	**Reference:** ii) A3S5G7 A Comparison of the Properties of Diluted Bitumen Crudes with Other Oils **Request:** b.1) In the abstract on page 1 the following conclusion is given: "Laboratory and mesoscale weathering experiments show dilbits have physical properties very much aligned with a range of intermediate fuel oils and other heavy crude oils and generally, depending the initial blend and the state of weathering, and are not characterized as nonfloating oils [sic]." In light of the new findings in reference [x], how should this conclusion be revised?	b.1) Please refer to the response to NEB IR 1.61a. With respect to Reference x), on page 43 (Adobe page 45) of Reference x), it is stated: "The intent of the study was not to examine mechanisms of formation, but the possible end states of the processes, i.e., their fates. Each of the factors would be tested at the limits of what would be possible in the natural environment: high mixing energy conditions, high sediment loads, long evaporative and photo-oxidizing conditions." Furthermore, the Executive Summary concludes, on page 5, (Adobe page 7) that: "Like conventional crude oil, both diluted bitumen products floated on saltwater (free of sediment), even after	I am surprised that Trans Mountain would be so dismissive of the findings of Reference x with respect to its implications on the Trans Mountain submission. Trans Mountain argue that the government use 10 g/L (10,000 mg/L) in their analysis. But on page 45 of reference x it states: "The sediment loading chosen was 10 mg sediment /L brine" What is the corrected Government of Canada report 2014 that is not provided? In addition, if it is indeed true that 10,000 mg / L was used, what plans do Trans Mountain have to examine 10-100mg/L sediment situations? There is a glaring research gap here.

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		evaporation and exposure to light and mixing with water." With respect to oil-sediment interactions, the sediment concentration used was 10,000 mg/L, about 100 or more times the concentration found along the marine route. Hence, the results presented in reference x) provide no information that would lead Trans Mountain to revise the information presented in the Application. Trans Mountain believes that appropriate and credible information on oil fate and behaviour has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No changes are contemplated.	Without answering the above questions, the original IR has not been fully responded to. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.b.2	**Reference:** ii) A3S5G7 A Comparison of the Properties of Diluted Bitumen Crudes with Other Oils **Request:** b.2) On page 5, the report states: "Only after extensive weathering, or mixing with suspended particulate material, may some portion of weathered dilbit become submerged or sink." b.2.i) What evidence is used to substantiate this assertion?	b.2) b.2.i) Please see densities measured and reported in the referenced report. Also, Reference x), Figure 4-1 clearly showed that the extensive evaporative weathering used in that study does not increase the density of the dilbit to the point that it would sink. b.2.ii) With respect to observations of whirlpools, downwelling zones, convective instabilities or fronts in the Strait of Georgia, Haro Strait or Juan de Fuca Strait, please refer to Farmer D IR No. 1.2b and Farmer D IR No. 1.2c3.	Once more, rather than responding to the question, I am diverted to another response where, in fact, my questions are not answered. No evidence has been provided to substantiate the assertion that "Only after extensive weathering, or mixing with suspended particulate material, may some portion of weathered dilbit become submerged or sink." I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	b.2.ii) Are there any observations of whirlpools, downwelling zones, convective instabilities or fronts in the Strait of Georgia, Haro Strait or Juan de Fuca Strait? b.2.iii) How are the observations in references [vi], [viii], [ix] and [xi] consistent or inconsistent with this statement?	b.2.iii) Please refer to Farmer D IR No. 1.2b and Farmer D IR No. 1.2c3.	
1.11.b.3	**Reference:** ii) A3S5G7 A Comparison of the Properties of Diluted Bitumen Crudes with Other Oils **Request:** b.3) On page 8, the report states: "The resin and asphaltene content determine the likelihood of tar-ball formation". How likely is this to occur in the Strait of Georgia, Haro Strait or Juan de Fuca Strait in light of reference [x]?	b.3) The studied oils, like other medium and heavy crude or fuel oils can be expected to weather to tarballs provided the oils remain in the water column for sufficient time. In the case of a release, prompt response plus shoreline stranding can be expected to minimize the volume of oil left to long-term weathering and tarball formation.	The response states "provided the oils remain in the water column for sufficient time." This is a meaningless statement. What is "sufficient time" and how do we know if the oils do or do not remain in the water column? Also, what is "prompt" in terms of a unit of time? Without answering the above questions, the original IR has not been fully responded to. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.b.4	**Reference:** ii) A3S5G7 A Comparison of the Properties of Diluted Bitumen Crudes with Other Oils **Request:** b.4) How would the results of the cited evaporation studies (on page 10 immediately below Table 6), which showed that "the first hours of exposure to air result in rapid loss of portions of the diluent with resulting increases in	b.4) The amount of oil that may be subject to sediment interaction during the first hours of natural weathering is likely minor compared to that portion undergoing evaporative loss. Therefore the results are not expected to be materially different in practice. Significant sediment interaction and consequent sinking only occurs if sufficient sediment and sufficient energy are present, conditions which only occur near energetic shorelines.	Please justify this statement "conditions which only occur near energetic shorelines." in light of the fact that it is well known that the waters to be travelled are subject to intense tidal mixing? Without answering the above questions, the original IR has not been fully responded to. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be

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	density and viscosity" change if suspended sediments or other particulates were located throughout the water column.		provided.
1.11.b.5	**Reference:** ii) A3S5G7 A Comparison of the Properties of Diluted Bitumen Crudes with Other Oils **Request:** b.5) On page 11, Tsaprailis et al 2013 is the only study cited with respect to penetration of various types of oil into sand. b.5.i) Is this study peer reviewed? b.5.ii) Is this study published in a scientific journal? b.5.iii) Are there any peer reviewed scientific journal studies that have examined dilbit penetration into sands? If so, please list them. b.5.iv) Have any vertical sand penetration studies been done as part of the Trans Mountain submission?	b.5) b.5.i) Trans Mountain is unaware of the review process used for the Tsaprailis et al 2013 report but assumes that it was peer reviewed by the client (AIEES). b.5.ii) Trans Mountain does not have this information. b.5.iii) Trans Mountain is unaware of any scientific publication on dilbit penetration into sediment other than Brown et al. (1992). b.5.iv) No vertical sand penetration tests have been conducted as part of the Project application although analogous behavior can be interpolated from tests done with medium to heavy oils.	Trans Mountain have relied upon the work of Tsaprailis et al 2013 yet they are unaware where it was published and it if was peer-reviewed. This is unacceptable and such information should be provided. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.b.6	**Reference:** ii) A3S5G7 A Comparison of the Properties of Diluted Bitumen Crudes with Other Oils **Request:**	b.6) b.6.i) Please refer to results of AWB and CLB weathering densities in the referenced reports (i) and (x). b.6.ii) Please refer to referenced report (x).	In response to b.6.iv) Trans Mountain assert "The observations reported in (vii) have no effect, since sediment concentrations and energy dissipation levels are too small to result in oil-sediment interactions." What evidence is used to support this assertion in light of the fact that no research has been done to justify it. It is not acceptable to

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	b.6) On page 13 and on page 21 the report provides its "most significant" observation that "the behavior of dilbits tested or spilled are consistent with Group 3 and 4 crude oils: they float on water until oil densities change through weathering and/or sediment uptake." b.6.i) What evidence is used to substantiate this assertion? b.6.ii) Are there any peer-reviewed scientific journal publications that substantiate this statement? b.6.iii) How would the observations in references [vi], [viii], [ix] and [xi] affect this statement? b.6.iv) How would the observations in reference [vii] affect this statement? b.6.v) What conclusions can be drawn about the properties of dilbit versus other Group 3 or 4 oils in light of reference [x]? b.6.vi) What conclusions can be drawn about the properties of dilbit versus other Group 3 or 4 oils spilled in the Strait of Georgia, Haro Strait or Juan de Fuca Strait in light of references [vi], [vii], [viii], [ix], [x] and [xi]?	b.6.iii) Please refer to Farmer D IR No. 1.2b and Farmer D IR No. 1.2c3. b.6.iv) The observations reported in (vii) have no effect, since sediment concentrations and energy dissipation levels are too small to result in oil-sediment interactions. Significant sediment interaction and consequent sinking only occurs if sufficient sediment and sufficient energy are present, conditions which only occur near energetic shorelines. b.6.v) Reference (x) does not change the conclusions presented in reference (i), and in fact reinforces them. b.6.vi) As discussed earlier in this IR response, the interesting oceanographic features found in Haro Strait do not inform any conclusions about the properties of dilbit versus Group 3 and 4 oils. In summary, Trans Mountain believes that appropriate and credible information on oil fate and behaviour has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No changes to submitted conclusions are contemplated.	assert a response without justifying it with evidence. Without answering the above questions, the original IR has not been fully responded to. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.

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		Reference: Brown, H.M., Goodman, R.H., and Nicholson, P., 1992. The evaporation of heavy oil stranded on shorelines. Proc. 15th Arctic Marine Oil Spill Program Technical Seminar, p. 47-53.	
1.11.c.3	**References:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** c.3) Why was a catastrophic worst case not considered?	c.3) The goal in selecting scenarios for simulation was to provide credible worst case scenarios, so that credible assessments of ecological damage and relevant plans for mitigation could be developed.	Trans Mountain claim that a catastrophic worst case is not credible. The Prestige tanker disaster off Spain and Portugal released most of its load. The Exxon Valdez spill was 'catastrophic. The Sea Empress spill was catastrophic. The Deepwater Horizon spill was catastrophic. The Queen of the North sinking was thought to be impossible. I recognize promise that double hulled tankers will be used but a prudent risk assessment would assess low likelihood high risk events along with higher likelihood lower risk events. Please define how you justify using the word "credible". Without answering the above questions, the original IR has not been fully responded to. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.c.4	**References:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices)	c.4) Trans Mountain believes that appropriate and credible information on oil spill modeling has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of	The question is not whether or not Trans Mountain believe that they have included appropriate and credible information on oil spill modeling but rather whether as intervenors we can assess whether that is true or not. As noted above, Trans Mountain assert that a catastrophic

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	Request: c.4) Please provide modelling results for a catastrophic worst case spill where the entire volume of marine-transported dilbit in a tanker is released in each of the locations listed in Table 2.1.1 on page 2.	Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No additional modeling or assessment is contemplated.	release is not possible. A prudent risk assessment would assess low likelihood high risk events along with higher likelihood lower risk events. My request is perfectly reasonable in this context and it is unacceptable for it to be ignored. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.c.5	**References:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** c.5) On Page 3, the H3D model is described as "proprietary" (line 1). c.5.i) Is the model code used (including all parametrizations) available to the public? c.5.ii) If the answer to c.5.i is no, how can Trans Mountain feel confident in the implementation and appropriateness of subgrid scale processes if it can not be independently examined?	c.5.i) No. c.5.ii) The H3D model has been used in other assessments and been subjected to scrutiny by commercial and non-commercial reviewers. Trans Mountain believes that the oil spill model results are appropriate and credible to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No additional modeling or assessment is contemplated.	According to the responses to c.5.i the model code is not available to the public which implies that it is simply not possible to determine its effectiveness/appropriateness for use as a tool to determine the fate and behavior of marine oil spills in the Salish Sea. Trans Mountain respond that "The H3D model has been used in other assessments and been subjected to scrutiny by commercial and non-commercial reviewers." Who are these unnamed commercial and non-commercial reviewers? There is reason to believe that the tool is not appropriate for use in the Without answering the above questions, the original IR has not been fully responded to. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.c.6	**References:**	c.6) These are described in Stronach et al. (1993).	Stronach et al. (1993) (available at Google Books) details the

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	iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** c.6) Please provide information on the order, dispersion, stability and numerical dissipative properties of the semi implicit timestepping scheme that is used.		GF8 model. Reference A3S5G9 states that "[H3D] is derived from GF8. The question was not answered as one needs to now how it differs from GF8 in light of the fact that it is proprietary. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.c.7	**References:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** c.7) As noted on page 6, the representation of vertical and horizontal mixing within the model (section 3.1.6) is critical in terms of "determining the correct distribution of velocity and scalars such as temperature and salinity". Could an analysis of the sensitivity of the model results to its representation of internal mixing please be conducted?	c.7) The level of validation provided in reference i) provides sufficient credibility to the model. H3D consistently demonstrated good reproduction of temperature and salinity distributions in the Salish Sea, so additional sensitivity tests are not contemplated.	This answer is unacceptable. What oceanographic hydrographic observations are used to validate the representation of the temperature and salinity distributions in the Salish Sea? All I have access to is a study in Okanagan Lake that is not relevant to the Salish Sea. A risk analysis must take into account uncertainty in the model that would imply understanding the uncertainty in the representation of subgrid scale processes. It is not appropriate to assert "The level of validation provided in reference i) provides sufficient credibility to the model." My expert view is that this is not the case. This is why I am requesting the additional information. Without answering the above questions, the original IR has not been fully responded to. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.

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1.11.c.8	**References:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** c.8) In section 3.1.7, the initial conditions for the model are discussed. c.8.i) Were annual mean temperature and salinity used in the initial condition? If not, what was used? c.8.ii) What evidence is there to support 9 months as being the appropriate spin-up time for the model? c.8.iii) What evidence is there to suggest that the initial conditions are consistent with the 2011 -2012 forcing conditions?	c.8.i) Salinity and temperate date corresponding to the end of March/ beginning of April were used to initialize the model. c.8.ii) Given the annual cycle of the major forcings in the system, it was determined by experts that this was sufficient time for a spin-up. c.8.iii) The observed annual cycle of the distribution of temperature and salinity, and the observed annual cycle of circulation in the system indicate that climatological data is an adequate source of initial conditions.	Re: c.8.i), this answer is not very specific. I assume that only surface temperature data were used. Where did surface salinity come from for March/beginning of April? Where did subsurface data come from? I am unaware of any three-dimensional T/S fields for the domain of interest — certainly there is no data available at the model grid level scale. Please clarify. c.8.ii) Who are the 'experts' that are being referred to. The answer is not complete. I find it extremely odd that the spin up timeframe does not even include a complete annual cycle. c.8.iii) This statement "The observed annual cycle of the distribution of temperature and salinity, and the observed annual cycle of circulation in the system indicate that climatological data is an adequate source of initial conditions" doesn't make any sense. The modelling is an initial value problem. There will be an adjustment period if the initial conditions are incompatible with the initial forcing. Please provide the evidence to suggest that the adjustment period is much shorter than the 9 month spin up time. This has not been done. Without answering the above questions, the original IR has not been fully responded to. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be

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			provided.
1.11.c.9	**References:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** c.9) The model is run from September 2011 to October 2012. (page 4) c.9.i) What was the underlying North Pacific seasonal climate during this period? c.9.ii) Was this during an El Niño, La Niña, or not? c.9.iii) What was the magnitude of the Fraser river outflow during this period relative to the previous decade? c.9.iv) What evidence is there to suggest that the ambient conditions during September 2011 to October 2012 are representative of prior or future years? c.9.v) Have Trans Mountain considered any potential changes in Fraser River outflow, seasonal climate or extreme weather events as a consequence of future climate change in their modelling studies?	c.9.i) Please refer to the response to Tsawout FN IR No. 1.03a on the representativeness of the modelled year. c.9.ii) Please refer to the response to Tsawout FN IR No. 1.03a on the representativeness of the modelled year. c.9.iii) Information on the magnitude of the Fraser can be found on Environment Canada website. Please refer to the response to Tsawout FN IR No. 1.03a on the representativeness of the modelled year. c.9.iv) Please refer to the response to Tsawout FN IR No. 1.03a on the representativeness of the modelled year. c.9.v) Such changes and events were not considered in the modelling present in i). Climate change is not identified amongst the issues identified by the NEB in their List of Issues published on 29th Jul 2013.	c.9.i) Tsawout FN IR No. 1.03a does not answer this question. Please provide the answer. c.9.ii) Tsawout FN IR No. 1.03a does not answer this question. Please provide the answer. Myquestion was simple. Was there an El Nino or a La Nina happening? c.9.iii) I have asked a very specific question with respect to the Fraser river outflow during this period relative to the previous decade? I am not even shown the courtesy of being give the URL where I can find the data. The response is unacceptable. c.9.iv) Tsawout FN IR No. 1.03a does not answer this question. Please provide the answer. c.9.v) The answer is unacceptable. It is simply not true to try and dismiss the question by saying "Climate change is not identified amongst the issues identified by the NEB in their List of Issues published on 29th Jul 2013." The NEB list of issues talks about not including: "The Board does not intend to consider the environmental and socio-economic effects associated with upstream activities, the development of oil sands, or the downstream use of the oil transported by the pipeline." My question is specific and has to do with undertaking a proper risk analysis. It is unacceptable to not consider any

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			potential projected changes in extreme weather or Fraser River outflow. These extreme events are projected to occur (and frankly are already happening) so Trans Mountain should have done a risk analysis to them in their risk assessment and modelling. I am not asking Trans Mountain to consider the upstream effects of the combusted oil on climate. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.c.10	**References:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** c.10) On page 7, section 3.2.1 starts with the statement "The primary validation of an oceanographic model concerns the reproduction of observed tidal heights". c.10.i) Please provide evidence to support this statement. c.10.ii) How are the validation of 3-D ocean temperature, salinity and velocity fields evaluated using tidal heights? c.10.iii) Is there any evidence to suggest H3D would simulate better tidal heights than commonly used	c.10.i) Since tides provide the largest amount of energy to the system, their reproduction is essential to modelling other aspects, such as baroclinic effects and mixing. c.10.ii) Tidal heights do not validate the simulation of temperature, salinity and velocity. c.10.iii) No. However, H3D also simulated baroclinic phenomena, which is a necessary condition for simulating the estuarine processes in the Salish Sea. c.10.iv) The nonlinear terms are very important in general, because of their role in generating eddies and shears. These small-scale features are then important in the horizontal dispersion of the oil slicks. c.10.v) Trans Mountain believes that appropriate and	Thank you for the answers to the first four questions. Unfortunately, the answers to questions (v) through (vii) are unacceptable. Trans Mountain has provided no evidence to support the notion that their model is accurately simulating the three dimensional fields of temperature and salinity which, as they note in the answer to .10.iii are "a necessary condition for simulating the estuarine processes in the Salish Sea." It is inappropriate to for an intervenor to have to rely on a "trust us" approach to their spill response. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	barotropic or 2-layer tidal models? c.10.iv) How important are the nonlinear terms in the Navier Stokes equations and the tracer advection equations that are solved in H3D? c.10.v) Please provide a comparison of simulated and observed temperature and salinity fields or transects (where available) at snapshots throughout the period September 2011 to October 2012. c.10.vi) Please provide a comparison of simulated and observed mixed layer depths throughout the study region at snapshots throughout the period September 2011 to October 2012. c.10.vii) Please provide observational evidence to support the evaluation of the validity of the sub grid scale mixing schemes used.	credible information has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No additional modeling or assessment is contemplated. c.10.vi) Trans Mountain believes that appropriate and credible information has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No additional modeling or assessment is contemplated. c.10.vii) Trans Mountain believes that appropriate and credible information has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No additional modeling or assessment is	

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
		contemplated.	
1.11.c.11	**References:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** c.11) On page 8 the Bob Lord Drift is used as a tool for the evaluation of the ocean model. Bob Lord fell in the water on July 25, 1993. The model is run over the period September 2011 to October 2012. c.11.i) How can event that occurred in 1993 be used to evaluate the model for future use? c.11.ii) How can the results of the GF9 model be used to evaluate the H3D model? c.11.iii) Please provide the reference unpublished Seaconsultant report to the Canadian coast guard on which the Bob Lord Drift analysis is based? c.11.iv) Why is the surface drift evaluation relying on an unpublished report? c.11.v) What is the uncertainty in Bob Lord's initial position?	c.11.i) The Bob Lord hindcast was run using data from July 1993. c.11.ii) Outside of the immediate vicinity of the Fraser River Plume, the model physics are essentially identical. c.11.iii) This report will be provided as part of this response in the document "Verification_ Trial_CANSARP…..pdf". (Weaver A IR No. 1.11c–Attachment 1). c.11.iv) Because the unpublished report is associated with a striking event, which was strongly influenced by both summer stratification and the relaxation after a strong wind event. c.11.v) Not known, but he recognized the navigation lights and shore features at his starting position, so probably less than 1 km. c.11.vi) Not known. c.11.vii)He was travelling as part of a general flow to the south, so a change in initial position would influence the manner (location, drift velocity) in which he entered Boundary Pass.	Regarding c.11.viii), the requested information is not irrelevant. If I plan to drop three to five "bob lord" dummies in the same location (within errors), my hypothesis is that they will take very different trajectories because of the highly turbulent nature of the circulation in this region. I cannot conduct this experiment without the appropriate information. In fact, recent experiments (with 4 by 6 inch cardboard) like this were conducted by the NGO Georgia Strait Alliance. Regarding, c.11.xi) please provide whose expert opinion it was. Without answering the above questions, the original IR has not been fully responded to. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	c.11.vi) What is the uncertainty in Bob Lord's drift trajectory? c.11.vii) If Bob Lord's initial position was off by 200 m in any direction how would his drift trajectory change? c.11.viii) What was Bob Lord's weight, height, density, drag coefficient and surface tension? c.11.ix) How do the answers in c.11.viii compare to various oil products? c.11.x) Were any surface drifter observations used to validate the model? If not, why not? c.11.xi) Were any subsurface drifter observations used to validate the ocean model? If not, why not? c.11.xii) On page 9 it states: "It is clear from these results that the calculations with the full three-dimensional model were able to reliably hindcast Mr. Lord's drift..". Please provide evidence to justify this statement. Please also provide evidence to suggest that Mr. Lord's initial position and trajectory were known sufficiently well to justify this statement.	c.11.viii)These are irrelevant, he was assumed to travel with the flow in the top 3 m. c.11.ix) This appears to be irrelevant: except for a small region around the initial release point, the oil is assumed to travel under the influence of surface currents, and with a small wind leeway. c.11.x) Surface drifter observations were not used to validate the model. It was felt that the reproduction by the hydrodynamic model of the Fraser River plume satellite image provided sufficient validation of surface currents produced by the model. This validation unfortunately was not provided in the report, but is provided as part of this response in the document "Fraser_River_Plume_Validation.pdf." (Weaver A IR No. 1.11c–Attachment 2) c.11.xi) No. It is expert opinion that the model provided realistic flow fields for oil spill simulation. c.11.xii) The main evidence to justify this statement is that a barotropic tidal model was not able to hindcast the drift. Mr. Lord, an experienced boater, was able to identify various landmarks along his route, so the experts in EBA are confident that his initial position and the position of his recovery are accurately hindcast.	

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
1.11.c.17	c.17) Why was 07:00 on August 23, 2013 assumed to be the date that a spill occurred at Arachne Reef (section 9.1)?	c.17) The rationale for the selection of a single deterministic scenario at the Arachne Reef location for use in the ecological and human health risk assessments is provided in Section 5.7.1.3 of Application Volume 8A.	There is no justification given in Section 5.7.1.3 of Application Volume 8A. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.c.20	c.20) In the Executive Summary it states: "H3D, a three dimensional circulation model calibrated and validated in the area of study, to generate surface currents" c.20.i) In light of the discussion above (and in d below), please justify the claim that the model has been "calibrated and validated in the area". c.20.ii) Please explain the justification for use of the word "credible" in the first paragraph of page iii.	c.20) c.20.i) The claim is based on many years' use of H3D in EBA's consulting business, and the validation studies that were done for these projects. c.20.ii) In this context, credible refers primarily to the amount of oil that is spilled, which was determined by DNV, please see Termpol 3.15, Section 9. References: Stronach, J.A., J.O. Backhaus, and T.S. Murty. 1993. An update on the numerical simulation of oceanographic processes in the waters between Vancouver Island and the mainland: the GF8 model, Oceanography and Marine Biology Annual Review, 31:1-86. Hodgins, D.O. and J.A. Stronach. Verification Trial with CANSARP for the Bob Lord Drift Incident. Memorandum Prepared for the Canadian Coast Guard Search and Rescue Division by Seaconsult Marine Research Ltd. . October, 1993.	c.20.i) None of this information is publicly available for an independent assessment. How are we to obtain independent verification of the validation? Here again we are asked to "trust us". I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.d.1	**Reference:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion	d.1) The turbulence scheme used has been shown to reproduce the interplay of turbulence and stability in determining vertical transports of momentum and scalars. Since it does not involve the advection of turbulence	Please document where the turbulence scheme has been "shown to reproduce the interplay of turbulence and stability in determining vertical transports of momentum and scalars" in the case of the Salish Sea. No information is

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	Project (including figures and appendices) **Request:** d.1) Please explain the ramifications of using "a simpler turbulence scheme in the vertical" (page 1 of Appendix A)	scalars, it allows a faster execution speed.	provided in the answer. Without answering the above questions, the original IR has not been fully responded to. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.d.5	**Reference:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** d.5) On page 5 of Appendix A, the report states: "if data is available for calibration, these ratios can be adjusted based on comparisons between modeled and observed data". d.5.i) Were data available for calibration? If not, why not? d.5.ii) Were values of the ratio of vertical eddy diffusivity to viscosity and horizontal eddy diffusivity to velocity of 0.75 and 1.0, respectively, used? If so, what is the justification for this? d.5.iii) Are there any observations in the Strait of Georgia, Haro Strait and Juan de Fuca Strait that support the chosen	d.5.i) Data were available for calibration. d.5.ii) Both ratios were set to 1.0 for the simulations generated for this project as they have been shown to provide more realistic simulation for the Salish Sea. d.5.iii) The validations against currents at Westridge, reported in Reference i), as well as a validations against the sediment distribution in the Fraser River plume, support these choices. Other projects done by EBA also support these choices. d.5.iv) Uncertainties wouldn't have an effect on model results per se, but if inappropriate choices for mixing parameters were made, the resulting errors would affect, in particular, the spatial distribution of surface currents.	d.5.i) What data and where were these data from? To state "Data were available for calibration" is not a complete answer. d.5.ii) Where were these shown to provide realistic simulations? Again, we are asked to simply take it as a matter of faith. d.5.iii) No observations have been offered to validate these choices. Where are the observations published? There have been a number of microstructure experiments over the years in the study region. Without answering the above questions, the original IR has not been fully responded to. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	use of mixing coefficients? d.5.iv) What effect would uncertainty in mixing parameters have on the model results?		
1.11.d.6	**Reference:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** d.6) Please provide a quantification of the magnitude and spatial variability in the three dimensional fields of artificial numerical diffusion associated with the use of the flux-corrected transport algorithm (Zalesak, 1979) [mentioned on page 5 of Appendix A].	Trans Mountain believes that appropriate and credible information on oil spill modeling has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No additional modeling or assessment is contemplated.	This is an unacceptable answer. The Flux corrected transport algorithm is a dissipative scheme (adds in just the right amount of artificial numerical diffusion to ensure grid Reynolds number criteria are not broken). When one is looking at a diffusive process (such as what happens in an oil spill), its important to have a handle on the explicit and implicit numerical diffusion in the scheme. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.d.8	**Reference:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** d.8) Please provide a detailed comparison between the oceanographic conditions in the Strait of Georgia, Haro Strait and Juan de Fuca Strait and the water conditions in Okanagan Lake.	d.8) Trans Mountain believes that appropriate and credible information on oil spill modeling has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No additional modeling or assessment is contemplated.	This question was ignored. The model has been validated for Okanagan Lake then applied in the Salish Sea. One needs to get an understanding of the different oceanic conditions in these two locations if one is to have confident that the use of the model in both is appropriate. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
1.11.d.9	**Reference:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** d.9) Please provide a detailed comparison between the internal wave fields in the Strait of Georgia, Haro Strait and Juan de Fuca Strait and Okanagan Lake.	d.9) Trans Mountain believes that appropriate and credible information on oil spill modeling has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No additional modeling or assessment is contemplated.	This question was ignored. The model has been validated for Okanagan Lake then applied in the Salish Sea. One needs to get an understanding of the different internal wave field in the two locations as that ultimately will determine whether the appropriate vertical mixing representation is used in each. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.d.10	**Reference:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices) **Request:** d.10) Please provide a detailed comparison between the tides and frontal dynamics in the Strait of Georgia, Haro Strait and Juan de Fuca Strait and Okanagan Lake.	d.10) Trans Mountain believes that appropriate and credible information on oil spill modeling has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No additional modeling or assessment is contemplated.	This question was ignored. The model has been validated for Okanagan Lake then applied in the Salish Sea. One needs to get an understanding of the different tides and frontal dynamics in each to see if it is appropriate to evaluate the physics in Okanagan Lake and then apply it to the Salish Sea. I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.d.11	**Reference:** iii)A3S5G9, A3S5H1, A3S5H3, A3S5H4, A3S5H7, A3S5H8, A3S5H9, A3S5I0, A3S5I1 Modelling the Fate and Behaviour of Marine Oil Spills for the Trans Mountain Expansion Project (including figures and appendices)	d.11) Trans Mountain believes that appropriate and credible information on oil spill modeling has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of	This question was ignored. The model has been validated for Okanagan Lake then applied in the Salish Sea. One needs to get an understanding of the ratio of the internal deformation radius to relevant length scales in the two geographic locations as certain physical processes require basin widths etc greater than the internal deformation radius.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	Request: d.11) Please provide a detailed comparison between the topography in the Strait of Georgia, Haro Strait and Juan de Fuca Strait and Okanagan Lake.	Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No additional modeling or assessment is contemplated.	I submit that Trans Mountain has not adequately answered the question(s), and request that an appropriate answer be provided.
1.11.e.1.v	**Reference:** A3S4Y5 Section 5.4: Fate and Behaviour of an Oil Spill in a Marine Environment **Request:** e.1.v) How was the H3D model 'calibrated' for use in the Strait of Georgia, Haro Strait and Juan de Fuca Strait?	e.1.v) Please refer to the response to Weaver A IR No.1.11d.	e.1.v) Please refer to my response to Weaver A IR No.1.11d.
1.13.1.a	**Reference:** i)A3S4Y6, Application Volume 8A, Section 5.5 **Requests:** a) In section 5.5.1.2 of reference i) the report states that "With respect to personnel, WCMRC maintains a team of full-time and part-time employees, and has more than 20 contractor and 30 advisory agreements in place at any time." (PDF page 29). Please provide: a.1) A full detailed list of all full-time positions held by WCMRC employees, broken down by location and including the number of full time staff in each position and the training and responsibilities associated with each	a) Trans Mountain does not keep information regarding WCMRC's internal structure, nor their contracts and agreements. Accordingly, Trans Mountain encourages Mr. Weaver to contact WCMRC directly to obtain that information.	Trans Mountain is the proponent responsible for the Trans Mountain Expansion Project. The project would lead to an increase in oil tankers servicing Westridge Marine Terminal and passing along the B.C. coast. Those tankers would lead to an increase in the risk of an oil spill. It is therefore Trans Mountain's responsibility to provide any and all information necessary to assess whether an adequate oil response regime exists. Trans Mountain has based its application on the assumption of an enhanced spill response regime, and yet in its response to NEB. IR 1.64 it is clear Trans Mountain does not have direct control over whether or not this regime is applied. It therefore must be assumed, until proven otherwise, that the current response regime will be used for the TMEP. Weaver, A. IR 1.13.1.a is requesting some of the information necessary to evaluate whether the current response capabilities are sufficient, given the elevated risk posed by the project. It is therefore highly

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	position. a.2) A full detailed list of all part-time positions held by WCMRC employees, broken down by location, and including the number of full time staff in each position, and the training and responsibilities associated with each position. a.3) The detailed contractual stipulations for both full-time and part-time employees with regards to overtime and availability requirements for responding to oil spill accidents. Where contract stipulations vary between positions, please provide the stipulations for each variance, including the number of employees operating under each variance. a.4) A detailed account of each of the 20 contracts, including, but not limited to, the name of the contracted entity, the purpose the contract intends to fulfill, a list of the contracted services to be provided including the scope of services contracted, the length of time services will be offered under the contract and whether or not plans already exist to renew each contract once it expires. Please also list and describe all contractual stipulations for each contract with regards to responding to oil spill accidents. a.5) A detailed account of each of the 30 advisory agreements, including, but not limited to, the name of the entity providing advisory services, the purpose the		relevant to the hearing process. It is not adequate for Trans Mountain to redirect an intervenor to an organization that is functioning outside of the hearing process and that is not itself a proponent of the project. Given that Trans Mountain has not provided the requested information, I submit that Trans Mountain's response is inadequate.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	agreement intends to fulfill, a list of the advisory services to be provided including the scope of services agreed to and the length of time each service will be offered under the agreement as well as whether or not plans already exist to renew each agreement once it expires. Please also list and describe all stipulations for each agreement that pertain to responding to oil spill accidents.		
1.13.1.d	**Reference:** iii) A3S5I9, Review of Trans Mountain Expansion Project: Future Oil Spill Response Approach Plan, Recommendations on Bases and Equipment, Full Report. **Request:** d) Section 2 of reference iii) outlines current oil spill response capacities. Please provide a single table that includes all oil spill response equipment currently owned by WCMRC. Please include the following information in the table: • The storage locations of each piece of equipment • The quantity of each piece of equipment at each location • The quantity of each piece of equipment that, under current standards, could be reallocated to a different part of the province to respond to an oil spill without undermining the minimum capacity requirements at	Trans Mountain does not keep information regarding WCMRC's current oil spill response plan. Accordingly, Trans Mountain encourages Mr. Weaver to contact WCMRC directly to obtain that information.	Trans Mountain is the proponent responsible for the Trans Mountain Expansion Project. The project would lead to an increase in oil tankers servicing Westridge Marine Terminal and passing along the B.C. coast. Those tankers would lead to an increase in the risk of an oil spill. It is therefore Trans Mountain's responsibility to provide any and all information necessary to assess whether an adequate oil response regime exists. Trans Mountain has based its application on the assumption of an enhanced spill response regime, and yet in its response to NEB. IR 1.64 it is clear Trans Mountain does not have direct control over whether or not this regime is applied. It therefore must be assumed, until proven otherwise, that the current response regime will be used for the TMEP. IR 1.13.1.d is requesting some of the information necessary to evaluate whether the current response capabilities are sufficient, given the elevated risk posed by the project. It is therefore highly relevant to the hearing process. It is not adequate for Trans Mountain to redirect an intervenor to an organization that is functioning outside of the hearing process and that is not itself a proponent of the project.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	any point along the coast. • The range of meteorological and oceanographic conditions within which each piece of response equipment can be deployed, including the point at which the equipment begins to be less effective in each condition. Please reference and site all known studies that support any claim about the effectiveness of equipment in a given condition. • The effectiveness of each piece of equipment at recovering submerged diluted bitumen. Please reference and site all known studies that support any claim about the effectiveness of a given piece of equipment at recovering submerged dilulted bitumen.		In addition, Trans Mountain has not explained in its application whether any of the equipment used by WCMRC is capable of recovering submerged diluted bitumen, nor has Trans Mountain full identified the range of meteorological and oceanographic conditions within which each piece of equipment used by WCMRC will function. These two pieces of information are essential for the TMEP, given that federal government studies have shown that under certain circumstances diluted bitumen can sink and that conditions on the west coast commonly render response equipment ineffective. Given that Trans Mountain has not provided the requested information, I submit that Trans Mountain's response is inadequate.
1.13.1.f	**References:** i)A3S4Y6, Application Volume 8A, Section 5.5 v)Federal Government Technical Report: Properties, composition and marine spill behavior, fate and transport of two diluted bitumen products from the Canadian oil sands. November 30, 2013, ISBN 978-1-100-23004-7, 85pp. **Request:** f) On PDF page 32 of reference i) the report states that: "With respect to in-situ burning, the study concluded that, given the appropriate safety, environmental and operating conditions, in-situ burning might be effective but likely only for a short time, during the first 12 to 24 hours of a spill…". Please revise this statement in light of reference v),	f) Dilbit will not sink simply in the presence of suspended sediment. Even given the very high sediment loads, high energy mixing, and artificially weathered oil used in reference (v), not all weathered phases of dilbit sank sediment interaction. A controlled burn of spilled dilbit is a viable response alternative. During a response, any plan to burn would have to be approved by the Unified Command and appropriate regulatory agencies.	Trans Mountain's response does not address the actual information request. The federal government study cited in reference v) found that under certain circumstances dilbit can sink. The Kalamazoo River spill offers a clear example of this. Trans Mountain in its answer to the information request notes that "*not all* weathered phases of dilbit sank" (emphasis added), implying that *some* did sink. Yet Trans Mountain has not addressed whether in-situ burning would still be effective if dilbit were to sink. Hence, Trans Mountain has failed to revise the statement from reference i) inlight of the findings in reference v). I therefore submit that Trans Mountain's response is inadequate.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	which demonstrates that dilbit will sink in the presence of suspended particulate matter.		
1.13.1.g.2	**Reference:** iii) A3S5I9, Review of Trans Mountain Expansion Project: Future Oil Spill Response Approach Plan, Recommendations on Bases and Equipment, Full Report. **Requests:** g) Section 3.2 of reference iii) recommends a voluntary "Tier 5" response level that would exceed the Canadian Coast Guard guidelines. Please outline what guarantees would be in place to ensure that this voluntary standard is consistently and constantly implemented and maintained, should the Trans Mountain Expansion Project be approve and should the Tier 5 response level remain a voluntary level. g.2) Please provide a financial analysis, including a list of all additional financial costs, associated with implementing and maintaining a voluntary "Tier 5" capacity, compared to a baseline "Tier 4" capacity.	g.2) This is not deemed relevant to a risk assessment of the Project. Please also refer to the response to NEB IR No. 1.64.	Trans Mountain has included in its application the expectation of an enhanced spill response regime, and yet in its response to NEB IR No. 1.64 it is clear Trans Mountain does not have direct control over whether or not this regime is applied. Trans Mountain has made it clear in its response to NEB IR No. 1.64 that achieving an enhanced Tier 5 response regime "requires that an appropriate funding mechanism be in place to protect other WCMRC members from costs associated with investments by WCMRC in enhanced marine spill response procedures, equipment, and resources…" In proposing the Tier 5 response regime, Trans Mountain, in conjunction with WCMRC, presumably has conducted a financial analysis of the additional financial costs necessary to implement and maintain the regime. IR 1.13.1.g.2 is therefore directly relevant to the TMEP application. Given that Trans Mountain has not provided the requested information, I submit that Trans Mountain's response is inadequate.
1.13.1.g.4	**Reference:** iii) A3S5I9, Review of Trans Mountain Expansion Project: Future Oil Spill Response Approach Plan, Recommendations on Bases and Equipment, Full Report.	g.4) This information is not relevant to a risk assessment of the project.	In response to City Burnaby IR No. 1.25.01d, Trans Mountain estimates that an additional 100 staff will be needed to meet the enhancements described in their report and that the majority of those positions will be full time. This would constitute a significant cost for maintaining the

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	Requests: g) Section 3.2 of reference iii) recommends a voluntary "Tier 5" response level that would exceed the Canadian Coast Guard guidelines. Please outline what guarantees would be in place to ensure that this voluntary standard is consistently and constantly implemented and maintained, should the Trans Mountain Expansion Project be approve and should the Tier 5 response level remain a voluntary level. g.4) Please estimate the total annual cost of hiring the additional employees identified in request g.3) of this section?		Tier 5 enhanced response regime. Identifying these costs, and then identifying the funding sources are two essential steps for assessing the likelihood that this response regime will exist. Given that Trans Mountain has proposed this Tier 5 response regime for the TMEP, IR 1.13.1.g.4 is directly relevant to the hearing process. Given that Trans Mountain has not provided the requested information, I submit that Trans Mountain's response is inadequate.
1.13.1.h.2	h.2) Confirm the length of time, in years, that the expanded Trans Mountain pipeline would operate.	h.2) Shippers on the project have entered into 15 and 20 year contractual agreements with Trans Mountain.	The information request was not meant to ask how long current contracts will last. Rather, it was a question of how many years the expanded pipeline is expected to operate. Presumably the current contracts will either be renewed or replaced after they expire. Trans Mountain has therefore not answered this information request.
1.13.1.i	**Reference:** iii) A3S5I9, Review of Trans Mountain Expansion Project: Future Oil Spill Response Approach Plan, Recommendations on Bases and Equipment, Full Report. v)Federal Government Technical Report: Properties, composition and marine spill behavior, fate and transport of two diluted bitumen products from the Canadian oil	i) Please see Volume 8A (Marine Transportation), Table 5.5.3. It is applicable to all segments of the tanker route.	Table 5.5.3 was submitted with Trans Mountain's application. It has previously been confirmed that reference v) was not considered in Trans Mountain's application, since it was not available at the time the application was developed. The federal government study cited in reference v) concludes that dilbit can sink when in the presence of suspended particulate matter. The Kalamazoo River spill offers an example of this.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	sands. November 30, 2013, ISBN 978-1-100-23004-7, 85pp. **Request:** i) Section 3.3 of reference iii) (PDF page 14) notes that: "An analysis of crude oil properties" and "simulation of oil fate and behavior at points along the tanker route" were considered when determining the enhanced response times. Please provide an updated consideration of adequate enhanced response times in light of both the findings in reference v) and the answers provided to the information requests detailed in Section 11 of this information request.		The information request asked Trans Mountain to provide an updated consideration of adequate enhanced response times in light of the findings in reference v). Given that Trans Mountain's response to the information request references a table that was developed without incorporating the findings from reference v), Trans Mountain has not adequately addressed this information request.
1.13.1.j	**Reference:** iii) A3S5I9, Review of Trans Mountain Expansion Project: Future Oil Spill Response Approach Plan, Recommendations on Bases and Equipment, Full Report. v)Federal Government Technical Report: Properties, composition and marine spill behavior, fate and transport of two diluted bitumen products from the Canadian oil sands. November 30, 2013, ISBN 978-1-100-23004-7, 85pp. **Request:** j) In section 3.4 of reference iii) (PDF page 15), the report states that: "During the course of the ten days test the diluted bitumen floated on the water and could be retrieved effectively using conventional skimming equipment." Please revise this statement in light of both the findings in reference v) and the answers provided to the information requests detailed in Section 11 of this	j) Trans Mountain sees no reason to revise the quoted statement.	The reason for revising the quoted statement is that while Trans Mountain has concluded in its application that diluted bitumen (dilbit) will float when spilled in the water, and that conventional skimming equipment will be effective in cleaning up a dilbit spill, the federal government study cited in reference v) concludes that in the presence of suspended particulate matter, dilbit may sink. As skimmers are only effective in recovering surface-level oil, they presumably will not be effective in recovering submerged dilbit. The results of the federal government study are consistent with the Kalamazoo River spill in which dilbit sank. Trans Mountain has provided no justification in support of its response that it "sees no reason to revise the quoted statement". Trans Mountain has not responded to the seemingly inconsistent results that they cite in their application and that the federal government study found.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	information request.		Given this, I submit that Trans Mountain's answer is inadequate.
1.13.1.l	l) Please provide a comprehensive analysis of the meteorological or oceanographic conditions that would prevent or impede the use of WCMRC equipment. l.1) Please provide an analysis of the average number of days in a given year in which each condition described in response to request l) of this section occurs. Please provide this analysis for all locations used for oil spill accident modeling in reference vi).	l) Please refer to the responses to NEB IR No. 1.65a, 1.65b and 1.65c. l.1) Please refer to the response to Weaver A IR No. 1.13.1l. Note: As the responses to NEB IR No. 1.65a, 165b, and 165c are several pages in length, they have not been included here. However, they can be found at this link (PDF pages 367-374): https://docs.neb-one.gc.ca/ll-eng/llisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2451003/2454322/B32-2_-_Trans_Mountain_Response_to_NEB_IR_No._1_1_of_2_-_A3W9H8.pdf?nodeid=2456419&vernum=-2	Table 1.65A-1 in NEB IR No. 1.65A provides the wind speed frequency for Beaufort scales 5, 6+ and 7+. However, the table does not distinguish between Beaufort Scales 0-4. A distinction is important as WCMRC notes that the effectiveness of its equipment is reduced already at Beaufort scale 3 (Source: Filing ID A3S5I9, pages 29-30). I therefore request that Trans Mountain revise its answer to distinguish between the relative percentages for each Beaufort Scale stage. Table 1.65C-1 states that the optimal working parameters for booms and skimmers include wind speeds of 16 knots. Similarly, the table states that the optimal condition for skimmers also includes a wave height of 1.5m. However, WCMRC notes that "Booming and skimming operations are most effective up to Sea State 2 (maximum wave height of 1 m) and with wind speeds less than 10 knots…Although WCMRC equipment is capable of operating in sea states greater than 2, the effectiveness of those countermeasures is reduced." (Source: Filing ID A3S5I9, pages 29). I submit that Trans Mountain's answer is incomplete as it does not address this apparent inconsistency. Although table 1.65C-3, does not identify the beaufort scale levels used to indicate whether response would be "effective", "less effective" or "not effective", it can be

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			derived from the other tables that Table 1.65C-3 uses the following classification: Response is Effective: B0-B4 (Beaufort Scale 0 to 4) Response is Less Effective: B5-B6 Response is Not Effective: B7 This classification is inconsistent with WCRMC's report that states that, as noted above, response equipment already becomes less effective at Beaufort scale 4. Moreover, WCMRC goes on to state that "Conditions preventing mechanical recovery generally occur at sea states greater than 3 (greater than Beaufort Scale 4). At that intensity, with significant wave heights above 1.5m and wind velocities greater than 16 knots, skimming and booming operations would be suspended limiting the response to equipment and personnel mobilization." (Source: Filing ID A3S5I9, pages 29). Based on this, I ask that Trans Mountain please update the table 1.65C-3 according to the information provided by WCMRC in Filing ID A3S5I9, and use the following distinctions: Response is Effective: B0-B3 Response is Less Effective: B4 Response is Not Effective: B5-B7+
1.13.1.m	**Reference:** iii) A3S5I9, Review of Trans Mountain Expansion Project:	m) The information requested is not relevant to one or more of the issues identified in the National Energy Board's List of Issues for the Trans Mountain Expansion Project.	The Board has determined that it will consider Issue 5, namely: "The potential environmental and socio-economic effects

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	Future Oil Spill Response Approach Plan, Recommendations on Bases and Equipment, Full Report. **Preamble:** Reference iii) provides an account of the recommended enhancements for oil spill response capacity in light of the Trans Mountain Expansion Project (TMEP). These are recommendations only and their implementation is not guaranteed under the TMEP. **Request:** m) Table 5-2 of reference iii) provides information on the proposed additional response bases. Please provide an analysis of the costs of implementing and maintaining each response base, including, but not limited to, staffing and equipment costs. Please identify which costs are already being incurred and which ones would be additional.		of marine shipping activities that would result from the proposed Project, including the potential effects of accidents or malfunctions that may occur." Trans Mountain has included in its application the expectation of an enhanced spill response regime, and yet in its response to NEB IR No. 1.64 it is clear Trans Mountain does not have direct control over whether or not this regime is applied. Trans Mountain has made it clear in its response to NEB IR No. 1.64 that achieving an enhanced Tier 5 response regime "requires that an appropriate funding mechanism be in place to protect other WCMRC members from costs associated with investments by WCMRC in enhanced marine spill response procedures, equipment, and resources…" In proposing the enhanced spill response regime, Trans Mountain, in conjunction with WCMRC, presumably has conducted a financial analysis of the additional financial costs necessary to implement and maintain the regime. Identifying these costs is an essential step for assessing the likelihood that this response regime will exist. IR 1.13.1.m is therefore directly relevant to the TMEP application and the list of issues being considered and Trans Mountain's response is inadequate.
1.13.1.o	o) In table 7-1 of reference iii), it is stated that none of the crude oils transported within the Trans Mountain Expansion Project sink upon spilling. Therefore it is implied	o) Trans Mountain does not find any credible reason to revise the statement. No oil was observed to sink for the conditions used during the Gainford tests. As noted in the	It can reasonably be argued that the Gainford study, used in Trans Mountain's application, was conducted under very favorable conditions. Some of these conditions included the

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	that no capacity is required to deal with sunken oils. Please revise this statement and the spill response plan in light of both the findings in reference v) and the answers provided to the information requests detailed in Section 11 of this information request. o.1) If, after revising the statement in light of the abovementioned findings, it is concluded that the capacity to recover sunken oils is still not a necessary requirement, please justify this conclusion in light of the fact that Washington State has determined it is a necessary requirement for vessels operating in their jurisdiction, as described in table 7-1 of reference iii).	same report and echoed in the Government of Canada (2013) report, as with other heavy oils, factors can contribute to oil submergence and/or sinking. As such, oil spill response plans and Response Organizations include strategies, tactics and equipment to respond promptly, minimize the potential for oil submergence or sinking and address submerged or sunken oil. Please also refer to the response to Katzie FN IR No. 1.11b. o.1) Please refer to the response to Weaver A IR No. 1.13.1n.	use of warm water temperatures; temperature extremes as large as 18 degrees Celsius on test results; higher range salinities; combination of winter blend test oils and summer water temperatures; the effect of shallow water depths and limited spreading to overall weathering; and cutting off experiments after 10 days. Conditions like these are rarely, if ever, present along the Trans Mountain tanker route and in the event of a spill diluted bitumen would very likely remain in the water for much longer than 10 days. Concerns surrounding the Gainford study have been presented by numerous intervenors on a number of occasions. Therefore, the request that Trans Mountain incorporate the scientifically sound Federal Government study on the behaviour of diluted bitumen in water into their application is in fact a valid one. The federal government study provides a very credible reason to revise the statement, particularly given that there currently is no response capacity to recover submerged dilbit. Moreover, Trans Mountain has provided no evidence to support its justification for not revising the statement. I therefore submit that Trans Mountain's response is inadequate.
1.13.1.q	**Reference:** iii) A3S5I9, Review of Trans Mountain Expansion Project: Future Oil Spill Response Approach Plan, Recommendations on Bases and Equipment, Full Report.	q) Please refer to the responses to NEB IR No. 1.65a, NEB IR No. 1.65b and NEB IR No. 1.65c.	As described above in response to Weaver A. IR 1.13.1.l, Trans Mountain's responses to NEB IR No. 1.65a, NEB IR No. 1.65b and NEB IR No. 1.65c do not adequately distinguish between the beaufort or sea state scales in a way that answers this information request.

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	Preamble: Reference iii) provides an account of the recommended enhancements for oil spill response capacity in light of the Trans Mountain Expansion Project (TMEP). These are recommendations only and their implementation is not guaranteed under the TMEP. **Request:** q) Section 8.2 of reference iii) explains that in sea states greater than 2, the effectiveness of WCMRC equipment declines. Please provide: q.1) An analysis of how many days (complete or partial) out of the year the sea state is 2 or greater (equivalent to 3 or higher on the Beaufort Scale) at each of the locations used for oil spill accident modeling in reference vi). q.2) An analysis of how many days (complete or partial) out of the year the sea state is 3 or greater (equivalent to 4 or higher on the Beaufort Scale) at each of the locations used for oil spill accident modeling in reference vi).		In particular, Trans Mountain's answer does not address Weaver A. IR 1.13.1.q.1 or Weaver A. IR 1.13.1.q.2. For reasons outlined in response to Trans Mountain's answer to Weaver A. IR 1.13.1.l, the distinctions requested by these information requests are relevant to assess the effectiveness of spill response efforts. I therefore submit that Trans Mountain's response is inadequate.
1.13.2.a	**Reference:** ii) A3S4T7, TERMPOL 3.5 & 3.12 Route Analysis & Anchorage Elements, Full Report **Request:** a) Given that reference ii) describes significant differences	a) The Arachne Reef site was recognized as a location for a Credible Worst Case spill with the potential for high shoreline oiling within a short time. The aim was to exercise and test the proposed spill response given Trans Mountain's and WCMRC's intent to develop response methods that would be best suited to mitigate spills along the shipping route. A spill in Juan de Fuca Strait will potentially stay	Weaver A. IR 1.13.2.a is based on information provided in Trans Mountain's application that clearly states the differences in the nature and challenges of spill response in areas east and west of Race Rocks. For example, the environmental conditions, as provided by

IR #	IR Wording	Trans Mountain's response to IR	Intervenor's explanation for claiming IR response to be inadequate
	in the nature of the route east and west of Race Rocks, and given that reference iii) describes the need to prepare a spill response plan that accommodates the differences east and west of Race Rocks, please provide an oil spill scenario comparable to what is provided in reference i) for a spill that occurs west of Race Rocks.	longer on the water surface, leaving more time for spill recovery. Hence, Arachne Reef was selected as being a more critical case. Trans Mountain believes that its Application contains appropriate and credible information to allow informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013 and their List of Issues published on 29th July 2013.	Trans Mountain in response to NEB IR No. 1.65a, NEB IR No. 1.65b and NEB IR No. 1.65c, limit effective spill response in the area west of Race Rocks for a much greater portion of the year. The oil spill simulation at Arachne Reef does not adequately address the challenges that exist west of Race Rocks. A comprehensive and comparable simulation of a spill west of Race Rocks is therefore essential for assessing the effectiveness of the spill response regime to deal with risks associated with the Trans Mountain Expansion Project. I therefore submit that Trans Mountain has not adequately responded to the Information Request.
1.13.2.b	b) Given that reference iii) makes it clear that the enhanced oil spill response scenario is not a guaranteed scenario under the Trans Mountain Expansion Project, please provide a separate oil spill scenario for the two locations given in reference i), plus the third location west of Race Rocks as requested in request a) of this section, applying the condition that only current equipment response capacity is enlisted, with no new or enhanced capacity applied.	b) Please refer to the response to Weaver A IR No. 1.13.2a. (Note: This response is provided in the immediately above)	As the information request notes, Trans Mountain has based the Arachne Reef spill scenario on the assumption of an enhanced response regime. There is currently no guarantee that this enhanced regime will be implemented, nor does Trans Mountain have any direct control over whether or not the regime gets implemented. The Arachne Reef spill scenario therefore does not provide "credible information to allow informed decision making" in the event that only current response capacity is in place. It is insufficient to provide a simulation based on a scenario that may or may not exist, without providing a comparable simulation based on the actual existing scenario. For my reply to Trans Mountain on the necessity of

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			including a comparable simulation west of Race Rocks, please see my explanation for Weaver A. IR 1.13.2.a, immediately above. I therefore submit that Trans Mountain has not adequately responded to the information request.
1.13.2.c	**Reference:** i) A3S5J0, TMEP Oil Spill Response Simulation Study, Arachne Reef and Westridge Marine Terminal, Full Report. **Request:** c) PDF page 14 of reference i) lays out the assumption that "spill site atmosphere in each of the scenarios presented no toxic or explosive hazards to first responders." Please provide a justification for applying this assumption.	c) Prevailing environmental conditions shall contribute to determining the potential hazardous conditions that will be encountered by first responders at the site of any spill. The oil spill response simulation studies for Arachne Reef and Westridge Marine Terminal assumes that within a few hours of the event occurring the spill site atmosphere will not present potential hazards to first responders that cannot be overcome by first responders using suitable personal protective equipment and approaching the site with due regard to prevailing conditions as is in such cases.	Trans Mountain's response only reiterates the assumption. It does not justify the reasoning behind it. I therefore submit that Trans Mountain has not adequately responded to the information request.
1.13.2.d	**Reference:** i) A3S5J0, TMEP Oil Spill Response Simulation Study, Arachne Reef and Westridge Marine Terminal, Full Report. **Request:** d) PDF page 14 of reference i) lays out the assumption that: "Adverse weather conditions did not prevent or complicate a response." Please justify this assumption in light of the responses given to requests l), l.1), and q) from Section 13.1 of this information request.	Please refer to the response to NEB IR No. 1.65a to 1.65c.	As stated in reply to Trans Mountain's response to Weaver A. IR 1.13.1.l, Trans Mountain's answers to NEB IR No. 1.65a to 1.65c do not distinguish between Beaufort scales 3 and 4, which has a significant impact on the effectiveness of spill response capabilities. Moreover, the relative frequency of each Beaufort scale level was not applied in a frequency analysis such that we do not know what the average beaufort scale level is over time. The information provided in NEB IR No. 1.65a to 1.65c

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			therefore is not a justification in and of itself for making the assumption that "Adverse weather conditions did not prevent or complicate a response," if the purpose of that simulation is to be representative of a possible spill.
1.13.2.j	j) Please provide a separate oil spill scenario for the two locations given in reference i), plus the third location west of Race Rocks for a total loss scenario in which the entire cargo capacity of the aframax tanker is discharged. Although this is an unlikely scenario, it is possible and has happened, so it is a scenario that needs to be addressed.	j) Total loss of a project tanker is not a credible event, please see Volume 8C, Termpol 3.15. Trans Mountain believes that appropriate and credible information on oil spill modeling has been included with the application to enable the appropriate level of risk assessment to have been conducted and risk informed decision making in accordance with the National Energy Board's Letter, "Filing Requirements Related to the Potential Environmental and Socio-Economic Effects of Increase Marine Shipping Activities, Trans Mountain Expansion Project" dated 10 September, 2013. No additional modeling or assessment is contemplated.	According to Termpol 3.15, "a 90th percentile event causing uncontrolled outflow from a tanker's cargo oil tanks has…been recommended as the Project's definition of a credible worse case". This means that there remains a 1/10 (10%) chance that an oil spill will be greater than Trans Mountain's definition of a credible worse case. While a spill larger than 16,500m3 may not be considered a "credible" occurrence under Trans Mountain's definition, it is not an impossible one. Trans Mountain's states that not including a total loss of containment scenario in the credible worst case scenario is "based upon the fact that there has not been any total loss of containment scenarios involving a double hull tanker, ever, to date…" However, policies requiring all new tankers to be constructed with double hulls are relatively new. It is only within the last 20 years that it has been mandatory for all newly built tankers to be double hulled. Likewise, the final phase-out of single-hull tankers is set for 2015 (https://www.tc.gc.ca/eng/marinesafety/oep-environment-tankers-background-539.htm). In other words, while there has been no occurrence of a total loss scenario involving a double-hull tanker to date, these ships have not been in use

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			long enough for such a justification to be credible. At one time, a total-loss scenario involving a single-hull tanker may have also been considered not credible based upon the fact that there had not been any incidences to date; but as of today's date, there have been multiple occurrences of such an event. Given that Trans Mountain has declined to provide a total loss scenario for any of the three requested locations, I submit that Trans Mountain's response is inadequate.
1.13.2.k	**Reference:** i) A3S5J0, TMEP Oil Spill Response Simulation Study, Arachne Reef and Westridge Marine Terminal, Full Report. **Request:** k) Please provide a justification for inputting a rate of release that took 13 hours to discharge the total spill volume in the Arachne Reef scenario, as stated on PDF page 18 of reference i). What analysis or research was used to inform this rate of release?	k) The rationale and the analysis behind the rate of release are explained in Volume 8C TR8C-12 Termpol 3.15 Section 10.1.	Trans Mountain's answer explains the assumptions behind the rate of release, but does not provide any analysis or research in support of their assumptions. One therefore still has no way of assessing the validity of the assumptions. I therefore submit that Trans Mountain has not adequately addressed this information request.
1.13.2.l	l) In the Arachne Reef Scenario on PDF page 19 of reference i) the report states that: "The 4 days length period was selected based on the slick thickness on water, which then becomes too thin to be efficiently recoverable after the end of the fourth day." Please confirm if this 4-day timeline is based off of any existing studies of diluted bitumen in marine environments. If yes, please provide a list of references and explain why a standard 10-day	l) It became evident as the simulation progressed that by the end of day 4, the remaining oil on water was in the form of a very thin slick, for which skimmer operations, even with boom concentration, were not effective. Therefore the simulation was stopped at 4 days and the results were evaluated and reported on that basis. The results have helped validate the premise that a quicker response to an oil spill will result in a considerable benefit in terms of	Trans Mountain's response does not confirm if the 4-day timeline is based on any existing studies of dilbit in marine environments or not. This is important to know when considering the validity of the results. If it is based on scientific studies, then the request asked for a list of references and for an explanation of why a standard

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	response period is still being proposed instead of a four-day response period, given these studies. If no, please explain why this parameter was used in the model if it does not reflect a scientific understanding of diluted bitumen.	recovery. Simulations are planning tools that do not impinge on the established planning standards set by Transport Canada or imply that during an actual spill equipment would be withdrawn after 4-days	10-day response period is still being proposed instead of a four-day response period, given these studies. If it is not based on scientific studies, then the request asked why this parameter was used in the model if it does not reflect a scientific understanding of dilbit. In all cases, Trans Mountain did not adequately respond to the information request.
1.13.2.s.1	s) Table 4-2 of reference i) provides an estimate of the mitigation outcomes under the current level of response assets. Please confirm that according to this table, after 4 days only 2911 m^3 of oil (equivalent to 17.64% of total oil spilled) would have been recovered. If no, please explain. s.1) Is Trans Mountain concerned about this low recovery rate, given that oil tankers carrying diluted bitumen from the Trans Mountain pipeline are already transiting the Salish Sea?	s) s.1) The spill response equipment owned by WCMRC to respond to a spill at sea exceeds the current set of standards from Transport Canada and is relative to the current potential for oil spill probability. Trans Mountain has proposed enhanced oil spill response for the Project.	Trans Mountain has not said whether or not it is concerned about the low recovery rate cited in Table 4-2. I therefore submit that Trans Mountain has not addressed the information request.