Hearing Order OH-001-2014

Board File: OF-Fac-Oil-T260-2013-0302

**NATIONAL ENERGY BOARD**

**IN THE MATTER OF** the *National Energy Board Act*, RSC 1985 c N-7, as amended, and the Regulations made thereunder;

**AND IN THE MATTER OF** the *Canadian Environmental Assessment Act*, 2012, SC c 19, s. 52, as amended, and the Regulations made thereunder;

**AND IN THE MATTER OF** an application by Trans Mountain Pipeline ULC as General Partner of Trans Mountain L.P. for a Certificate of Public Convenience and Necessity and other related approvals pursuant to Part III of the *National Energy Board Act*.

---

# FINAL ARGUMENT OF THE CITY OF NORTH VANCOUVER

---

## Table of Contents

# Part A: Introduction

## I. Summary

1. Upon careful review and consideration of Trans Mountain Pipeline ULC's ("Trans Mountain") application (the "Application") for the Trans Mountain Expansion Project ("the Project") as well as the evidence submitted by the various intervenors, the City of North Vancouver (the "City") has determined that the risk of a marine oil spill occurring, although not thoroughly and adequately assessed in the Application, is considerable and unacceptable. In addition, the City finds that such a spill, whether small or large, will have significant adverse impacts on its residents, environment, culture and economy. As demonstrated by the *M/V Marathassa* oil spill in English Bay on April 8, 2015, local governments are on the front line of spill response and bear the economic, ecological and social burden of an oil spill. Considering these factors, the City has determined that the risks of the expansion project outweigh the benefits, and that the effects of the project are not justified in the circumstances. As a result, the National Energy Board (the "Board") should recommend against approval of the Project.

## II. General Background

2. As presented in the City's Written Evidence, the City of North Vancouver is a small urban community that supports a diverse population of over 52,000 people in a land area of approximately 12 square kilometres. By 2041 the City's population is expected to be 68,000.[1] The City of North Vancouver is located on the north side of Burrard Inlet, and is bounded by the District of North Vancouver to the north, east and west. It is a part of a family of oceanfront communities which line the shores of the Burrard Inlet. The City is designated as a Regional Centre within Metro Vancouver and has high residential density, high employment and convenient transit accessibility and is in close proximity to Vancouver's central business district via transit passenger ferry (Seabus).

## III. The City of North Vancouver and the Local Environment

3. Nearly six kilometers of the City of North Vancouver's waterfront is located on the north shore of Burrard Inlet. The entirety of the City's shoreline is adjacent to the shipping route from Westridge Marine Terminal through Burrard Inlet. At its closest point, the City's shoreline is just over six kilometers west of Westridge Marine Terminal.

4. The Salish Sea, including Burrard Inlet and its shorelines, has particular ecological importance:

> "The Salish Sea, and especially Burrard Inlet and the Fraser River estuary, has been identified as one of the most ecologically important coastal marine habitats along the entire Pacific coast of North America. It is seasonally inhabited by over

[1] City of North Vancouver, Written Evidence – CNV City Profile (A4L6L6) at p. 2

> a million sea- and shorebirds, including more than 30% of the global population of snow geese. It is one of just 6 sites along the west coast of North America of international and hemispheric importance."[2]

5. The City's waterfront is also a significant asset to the community. Its uses range from industry and marine activity to residential, retail and public spaces. The City established a Waterfront Project in 2005 to increase the public's access to and enjoyment of the waterfront and has made significant investment in furtherance of this goal. Through the Waterfront Project, greenways, activities and destinations along Burrard Inlet have been created and enhanced, including the creation of the North Shore Spirit Trail, a unique, waterfront-oriented, multi-use and fully accessible greenway. The City's vision for this area includes a balance of social, economic and environmental needs of the local community and taking steps to preserve, protect and enhance its waterfront. To that end, several areas on the waterfront have been designated as environmentally sensitive areas.[3]

6. As a leader in environmental protection and stewardship, the City of North Vancouver is committed to building a sustainable community that integrates and balances the social, economic and environmental needs of its diverse residents. The City enjoys one of the most breathtaking natural landscapes in Metro Vancouver. To ensure that its parks and green spaces remain an enduring source of community pride, the City has developed park programs that aim to protect and enhance the City's green spaces.[4]

7. The City's Parks Master Plan is attached to the City Profile as Appendix C.[5] It includes a variety of goals which focus on protecting the natural environment and providing green space, including emphasizing the City's uniqueness as part of the North Shore through the variety of parks and open spaces provided; ensuring parks are well distributed throughout the community, particularly in higher density areas; and protecting and enhancing natural resources and ecosystems.[6]

## IV. Interest in the Trans Mountain Application

8. As outlined above, the City has significant concerns regarding the Project, including the heightened risk of an oil spill in Burrard Inlet, the inadequacies in Trans Mountain's risk assessment, the absence of an appropriate emergency response plan, and the significant and enduring impacts that a marine spill from the Project would have on the City.

9. The City has identified the following six issues from the list of those being considered by the Board as being of primary importance:

---

[2] City of Vancouver, Written Evidence, Appendix 3 – "*Fate and Effect of Oil Spills from the Trans Mountain Expansion Project in Burrard Inlet and the Fraser River Estuary*", Jeffrey W. Short (A4L7W1) ("JWS Report") at p. 17
[3] City of North Vancouver, City Profile at pp. 2-4
[4] City of North Vancouver, City Profile at p. 6
[5] City of North Vancouver, City Profile, Appendix C: Parks Master Plan 1 (A4L6L9) and Parks Master Plan 2 (A4L6Q0)
[6] City of North Vancouver, City Profile, Appendix C: Parks Master Plan 1 at pp. ii-iii

4. The potential environmental and socio-economic effects of the proposed project, including cumulative environmental effects that are likely to result from the project, including those required to be considered by the NEB's filing Manual.

5. The potential environmental and socio-economic effects of marine shipping activities that would result from the proposed Project, including the potential effects of accidents and malfunctions that may occur.

8. The terms and conditions to be included in the approval the Board may issue.

10. Potential impacts of the project on landowners and land use.

11. Contingency planning for spills, accidents or malfunctions, during construction and operation of the project.

12. Safety and security during construction of the proposed project and operation of the project, including emergency response planning and third party damage prevention.

10. The City will present its submissions under two main headings. Firstly, it will demonstrate that, based on the evidence, the risk of a marine spill in Burrard Inlet is significant and has not been properly accounted for in the Application. Secondly, the City will highlight the significant adverse effects that it will face should such a spill occur.

## Part B: Spill Risk in Burrard Inlet

11. The Project significantly increases the risk of an oil spill in Burrard Inlet and English Bay. Numerous studies have considered the probability of such a spill. Based on a review of this evidence, the City has determined the risk to be significant and unacceptable.

12. Firstly, Trans Mountain's own analysis shows the combined likelihood of an oil spill for the Project is high, at 99%.[7] For terminal and tanker spills specifically, Trans Mountain finds that the spill probability is 77% and between 16-67% respectively.[8] However, the evidence of Drs. Thomas Gunton and Sean Broadbent, submitted on behalf of Tsleil-Waututh First Nation, Upper Nicola Band and Tsawout First Nation ("*An Assessment of Spill Risk for the Trans Mountain Project*" (the "Gunton Report")), is that given the methodological weaknesses in Trans Mountain's analysis, explored further below, Trans Mountain's probabilities understate the likelihood of spills associated with the Project.[9]

13. Conducting their own analysis using a range of widely accepted methods, including the method used by Trans Mountain, Drs. Gunton and Broadbent found that the likelihood of a tanker spill is high, between 58% and 98%.[10] The authors also found that the low end estimate of 16% provided by Trans Mountain is an outlier significantly below the estimates based on other methods, and conclude that given the methodological deficiencies in Trans Mountain's oil spill risk assessment and the fact that its low end estimates are significantly below the estimates generated by other methodologies, the low end spill risk estimates in the Application should not be relied on as accurate estimates of tanker spill risk.[11]

14. In their Report, Drs. Gunton and Broadbent also looked specifically at the potential spill likelihood in the Vancouver Harbour area. Comparing the spill risk assessment provided in Trans Mountain's Application and estimates generated with the OSRA model, the authors found that spill probabilities over 30- and 50-year periods were relatively similar; while the Application estimates an 83.0% likelihood of a spill in the Harbour over a 50-year period, the OSRA model estimates a spill probability of 87.4%.[12] It is the City's submission that, regardless of the difference in probability estimates generated by these two models, the risk of a spill in the Vancouver Harbour area is unacceptable.

15. Further studies have made similar findings regarding the risk of a spill in the Vancouver region. A leading professional services firm, WSP Canada Inc., prepared a Canada-wide assessment for Transport Canada to determine risks associated with ship-source spills. The WSP risk assessment, which considered both likelihood and consequence of a spill, resulted in a ranking of "very high" for the entire Georgia Strait, including the Vancouver

[7] Tsleil-Waututh Nation, Record of Written Evidence, Volume 5 – "*Assessment of Spill Risk for the Trans Mountain Expansion Project*", Drs. Thomas Gunton and Sean Broadbent (A4L6A6 ) (the "Gunton Report") at p. 131
[8] Gunton Report at p. 131
[9] Gunton Report at p. viii
[10] Gunton Report at p. iv
[11] Gunton Report at pp. viii-ix
[12] Gunton Report at p. 93

region, on the Environmental Risk Index for crude oil spills within a range of volumes from 10 $m^3$ to 10,000 $m^3$. The assessment also considered the potential for future increase in tanker traffic as a result of the proposed Project. The WSP Risk Assessment states that "doubling the volume of oil passing through the Pacific sub-sector would likely increase the spill risks to "very high" for all zones (nearshore, intermediate and deep-sea) for 10 000 $m^3$ spill volume and greater."[13]

16. A review of the historic operations of the Trans Mountain pipeline also confirms a significant risk of oil spill. In conducting his assessment of the operations of the Trans Mountain Pipeline, Professor Sean Kheraj - whose evidence was submitted on behalf of the City of Vancouver - found that between the years 1961 and 2013, Trans Mountain reported 81 liquid hydro-carbon spill incidents to the NEB, an average annual rate of 1.53 spills/year.[14]

17. Based on this and other evidence, the City has determined that the risk of a spill in the Burrard Inlet is high. The City's concerns are exacerbated by the inadequacies in Trans Mountain's risk analysis and emergency response plan. These inadequacies, which are discussed in detail below, lead the City to conclude that the mitigation measures proposed by Trans Mountain cannot be relied upon to address the impacts of a spill.

## I. Risk Analysis

18. In addition to the high likelihood of a spill occurring in Burrard Inlet as a result of the Project, the City has concluded and now submits that the analysis completed by Trans Mountain has failed to properly assess the risk of a marine based oil spill, thus underrepresenting the overall risk of the project.

19. As discussed further below, several experts commissioned to assess Trans Mountain's risk assessment models, including Drs. Gunton, Broadbent and Short, conclude separately that various aspects of Trans Mountain's risk assessment have should not be relied upon to assess the risk of tanker spills or the environmental risk of the Project. In addition, Dr. Galt (on behalf of Genwest Systems Inc.) identifies serious shortcomings in Trans Mountain's oil spill modelling, which assesses the extent and duration of potential spills and their impacts. As a result of these deficiencies, the City has determined that the overall costs of the Project, particularly to communities bordering Burrard Inlet, are not accurately represented.

### *Spill Risk Estimate*

20. Firstly, as discussed briefly above, there is significant evidence indicating that the spill risk estimates in Trans Mountain's Application are low and cannot be relied upon as an accurate estimate of tanker spill risk. As set out above, Drs. Gunton and Broadbent

[13] City of Vancouver, Written Evidence, Appendix 55 – "*WSP Canada (2014) Risk Assessment for Marine Spills in Canadian Water: Phase 1, Oil Spills South of the 60th Parallel*" Report from WSP Canada Inc. to Transport Canada (A4L7L4) at p. 53
[14] City of Vancouver, Written Evidence, Appendix 18 - Written Evidence of Sean Kheraj (A4L7X6) at p. 21

conducted an evaluation of Trans Mountain's oil spill risk assessments. In total, the Gunton Report identifies 27 major weaknesses in Trans Mountain's risk analysis for tanker, terminal and pipeline spills. The authors also found that none of the seven best practices for risk assessment were met by Trans Mountain. These best practices include transparency, reasonableness, reliability and validity.[15]

21. In the report titled "*Guidance to Metro Vancouver and Fraser Valley Municipalities to Assist in Reviewing the Trans Mountain Pipeline Expansion Project from a Public Health Perspective*" (the "Public Health Guidance Document"), Vancouver Coastal Health and Fraser Health (the "Health Authorities") also identify several issues with Trans Mountain's risk assessment. Specifically, the Health Authorities noted a number of concerns regarding the use of probabilistic risk assessment methodology. Trans Mountain relies upon a probabilistic risk assessment to conclude that the risk of marine oil spills from additional tanker traffic is extremely low and will not be significantly higher than the risk at the current level of tanker traffic once proposed mitigation measures are implemented.[16]

22. In particular, the Health Authorities warn that Trans Mountain's risk probabilities should be reviewed with caution for the following reasons:

- Only the point estimates for the risks are provided. Risk probabilities are usually given as a range. No sensitivity analyses are provided.
- Probabilistic risk assessment can underestimate risks. A rare but potentially catastrophic accident such as a large oil spill is usually the end result of a number of events in a chain. The common approach in probabilistic risk assessment is to assume that these events in the chain are independent of each other and therefore the total risk is the multiplicative product of the probabilities of each event in the chain. Some of these events may not in fact be independent but are related, for example the occurrence of one event may increase the likelihood of another event in the chain to occur.
- Probabilistic risk assessments cannot in general adequately account for human errors in judgement and decision.
- It unknown how increased marine transportation of hazardous materials from other projects such as the proposed LNG plants in the Squamish area is taken into account in the analysis.
- Most of the inputs for the modelling consist of historical data. It is unknown how environmental changes (e.g. increased frequency of extreme weather events from climate change, or major seismic event) are taken into account.[17]

---

[15] Gunton Report at p. 64

[16] City of Vancouver, Written Evidence, Appendix 50 - "*Guidance to Metro Vancouver and Fraser Valley Municipalities to Assist in Reviewing the Trans Mountain Pipeline Expansion Project from a Public Health Perspective*", Vancouver Coastal Health and Fraser Health (A4L7K9) ("Public Health Guidance Document") at p. 10

[17] Public Health Guidance Document at p. 10

23. Considering this evidence, coupled with the alternative spill risk probabilities in the Gunton Report, the City is concerned that Trans Mountain's assessment of the likelihood of an oil spill is inadequate and inaccurate.

### *Extent of Spills*

24. The City also has several concerns regarding Trans Mountain's modelling of oil spill trajectory. Sharing this concern, the City of Vancouver, City of Burnaby and the Tsleil-Waututh Nation commissioned Genwest Systems Inc. to prepare an expert report on oil spill trajectory modelling in Burrard Inlet for the Project. The report, titled "*Oil Spill Trajectory Modelling Report in Burrard Inlet for the Trans Mountain Expansion Project*" (the "Genwest Report")[18], includes a peer review of the marine oil spill modelling completed by Trans Mountain and models four oil spill scenarios in Burrard Inlet.

25. The Genwest Report identifies two serious shortcomings in the oil spill model used by Trans Mountain in the Application. Firstly, the Report notes that the beaching algorithm in the Trans Mountain model does not allow for refloating of oil that is beached. Instead, the Trans Mountain model removes all beached oil from further movement and spreading once it comes into contact with the shoreline. The Report finds that this treatment of beached oil is strongly contradicted by experience with thousands of real spills. In fact, the authors note that heavily oiled shoreline tends to be rewashed, and often stranded oil is retained for a number of tidal cycles. The Report finds that the failure to include refloating could lead to significant underestimates of both the extent and duration of concern associated with a spill, particularly in the Burrard Inlet and the Fraser Delta.[19]

26. The City experienced the effect of refloating first-hand following the *M/V Marathassa* oil spill in English Bay on April 8, 2015. Following the spill, the City became aware of re-oiling at several points along the North Shore, including popular parks such as Kings Mill Walk (City of North Vancouver) and John Lawson Park (District of West Vancouver).

27. The second shortcoming, identified by Genwest as "very serious", is Trans Mountain's unreasonable and inappropriate assumption that the containment boom at the Westridge Marine Terminal will always be in place and will be 100% effective. Given effects of wind, tidal eddies and terminal boating activities, this assumption is unrealistic and results in Trans Mountain's spill trajectory model processing a much smaller spill.[20]

28. As noted above, the Genwest Report also modelled four oil spill scenarios in the Burrard Inlet. Based on its modelling, Genwest concluded:

---

[18] City of Vancouver, Written Evidence, Appendix 56 - "*Oil Spill Trajectory Modelling Report in Burrard Inlet for the Trans Mountain Expansion Project*", Genwest Systems Inc. (A4L7L5) ("Genwest Report")
[19] Genwest Report at p. 1
[20] Genwest Report at pp. 1-2

i. Oil spreads quickly in the confined setting of Burrard Inlet and may spread widely throughout the Inlet.[21]
ii. Winds and tides are major drivers of oil movement in the Burrard Inlet. Strong winds tend to strand oil on the leeward shore, while weak winds allow tidal currents to distribute the oil more widely.[22]
iii. The models developed in the Report "provide a realistic representation of the behavior of oil spills in Burrard Inlet. They can therefore be used to realistically evaluate the possible extent of oil spread resulting from a spill at the Terminal, Second Narrows, First Narrows, and the Outer Harbour locations."[23]

29. Overall, the modelling done by Genwest Systems Inc. found that a spill in Burrard Inlet would quickly impact nearly all communities surrounding the Inlet. As the City of Vancouver summarizes in its Written Evidence:

> "In all modelling scenarios, between 50 percent and 90 percent of the oil would reach the shorelines within days, and in many scenarios within hours, causing significant impacts to human health, the environment and the economy. Beaching of oil can cause it to adhere to sediment and increase the speed at which it will submerge or sink when it refloats."[24]

30. The Genwest Report clearly demonstrates that the spill model presented in the Application is inadequate and that the effects of a spill in the Burrard Inlet are likely to be much more significant than anticipated by Trans Mountain. The effect on the City of North Vancouver is likely to be particularly significant in light of its extensive shoreline, the entirety of which is adjacent to the shipping route from Westridge Marine Terminal through Burrard Inlet.

### *Failure to Model Large Spill in Burrard Inlet*

31. A further issue with Trans Mountain's risk assessment model, identified by the City and other intervenors, is the failure to model a large spill in the Burrard Inlet. Based on its determination that the Vancouver Harbour Area and English Bay are not feasible spill locations due to the relatively low probability of an accidental oil spill[25], Trans Mountain's Application does not include oil spill scenarios for these segments or risk assessments regarding the impacts of an oil spill in Burrard Inlet.[26]

---

[21] Genwest Report at p. 3
[22] Genwest Report at p. 7
[23] Genwest Report at p. 8
[24] City of Vancouver, Written Evidence (A4L9F0) at p. 56
[25] See Trans Mountain Pipeline ULC, Trans Mountain Expansion Project, Volume 8C, Part 2 - TERMPOL 3.15: General Risk Analysis and Intended Methods of Reducing Risks (A3S5F6) Ch. 10.1, Table 31 where study Segments 3 and 4 were "[n]ot considered as viable spill location due to relatively low frequency for an accidental oil cargo spill."
[26] City of Vancouver, Written Evidence, Appendix 22 – Written Evidence of David Etkin, Appendix A: "*Low Probability High Consequence Events and the Risk of Oil Spills: An Evaluation of the Trans Mountain-Det Norske Veritas Risk Analysis*" (A4L7Y0 ) ("Etkin Report") at p. 4

32. Professor David Etkin, an expert commissioned by the City of Vancouver to review and evaluate the risk assessment methodology used by Det Norske Veritas ("DNV") and submitted by Trans Mountain in the Application, identifies this as a shortfall. As noted in Professor Etkin's Report, risk can only be evaluated using both hazard (probability and severity) and consequence (exposure and vulnerability), and must not be based on probability alone.[27] By incorrectly using hazard probability in lieu of risk, Professor Etkin concludes that the Trans Mountain risk assessment improperly excluded a large range of low probability, high consequence ("LPHC") events from the risk assessment.[28] He finds that the potential consequences of a LPHC spill on the City of Vancouver and other communities should be calculated and should form an explicit component of the risk analysis.[29]

33. Professor Etkin also finds that the risk assessment conducted by Trans Mountain fails to meet TERMPOL standards[30] due to a failure to consider the local population's view of what is an acceptable level of risk. He notes that there are both quantitative and qualitative aspects to risk, and that it is culturally framed. Viewing risk not only as a function of objective and measureable quantities, but also with reference to values, is important for determining the true costs and benefits of the Project and an acceptable level of risk.[31] As noted above, the City of North Vancouver is committed to building a sustainable community and has strong cultural values regarding environmental protection. Although these values are thwarted by the proposed Project, they have not been considered by Trans Mountain in its risk assessment.

34. The City of Vancouver notes that the approach to risk assessment discussed in Professor Etkin's evidence is consistent with the approach promoted by Trans Mountain's consultant, DNV. In an online publication titled "Time to Rethink Risk", DNV states:

> "*Good and traditional risk management includes ranking risks according to consequence and probability of occurrence, and giving most attention to management of those that score high on both. ...*
>
> *However, our traditional risk management methods have a weak spot. Following this approach strictly may result in little attention given to those few risks with a very high loss potential and very low probability of happening. The most dramatic consequences are typically a result of a combination of many factors, each with their own risk picture. This can be said about such shocking events as the earthquake and tsunami that violently struck Japan, the global financial meltdown and the Macondo well blowout disaster in the Gulf of Mexico. The occurrence and consequences of these events were not impossible to foresee, they were just highly improbable – and managing the risks effectively up front would come at a cost.*

[27] Etkin Report at p. 2
[28] Etkin Report at p. 2
[29] Etkin Report at p. 18
[30] Etkin Report at p. 3
[31] Etkin Report at p. 3

> *[. . .]*
>
> *it is time for us to focus of [sic] our attention, technical skill and research and development on the low probability, high consequence, events.*"[32]

35. The Health Authorities echoed Professor Etkin's concerns regarding Trans Mountain's failure to model a large oil spill event in the Burrard Inlet, noting that a large spill would have significant public health consequences:

> "Because the proponent does not believe it is a credible risk, the proponent has not modeled the consequences of a large oil spill in the Burrard Inlet. We believe this is a critical omission. Even if such an event is as extremely unlikely as the proponent believes, and we cannot verify this conclusion, the public health consequences of such an event could be very significant, given the large and densely populated communities surrounding the Burrard Inlet."[33]

### *Other Methodological Issues*

36. In his assessment of Trans Mountain/DNV's risk assessment methodology, Professor Etkin noted several other methodological issues. Firstly, by relying solely on historical data, Professor Etkin notes that the Trans Mountain/DNV risk analysis excludes events that have not happened yet, which can "easily lead to a deeply flawed risk estimation".[34] He calls this the "Titanic Mentality", referring to a long history of catastrophes that were considered to be so implausible that they were not properly planned for.[35] He finds that a robust risk assessment must go beyond historical data and must include scenarios of possibilities.[36]

37. Professor Etkin also notes that the Trans Mountain risk assessment only addresses the individual impact of spills, and does not include cumulative impacts of smaller incidences. According to Professor Etkin, a risk assessment of a hazard such as tanker oil spills requires an evaluation of both specific impacts from low frequency/high consequence disastrous events and also the cumulative impact from high probability/low consequence events.[37] He notes that Trans Mountain's failure to consider cumulative effects is a serious omission which is not in accordance with best practice in risk assessment.[38]

---

[32] City of Vancouver, Written Evidence at p. 26
[33] Public Health Guidance Document at p. 51
[34] Etkin Report at p. 17
[35] Etkin Report at p. 17
[36] Etkin Report at p. 17
[37] Etkin Report at p. 18
[38] Etkin Report at p. 3

38. In the City's view, these additional methodological errors further compromise the validity and reliability of Trans Mountain's risk assessment and suggest that the Application should not be relied upon to assess the true risk of the Project.

### *Human Error*

39. The Trans Mountain risk assessment may also fail to adequately account for human error. A large body of evidence suggests that human error is a major cause of significant accidents, including those involving oil spills. Trans Mountain's risk consultant DNV states that the human factor is the main cause of approximately 80% of accidents.[39]

40. At pages 30-31 of its Written Evidence, the City of Vancouver summarizes two studies assessing the role of human error in oil spills and notes several specific accidents where human factors were major contributors:

> "A 2006 report by Nuka Research & Planning Group, LLC for the Prince William Sound Regional Citizens Advisory Council also identified "human factors"—either individual errors or organizational failures—as the cause for up to 80% of oil spills and marine accidents. The US Coast Guard in its report "Human Error and Marine Safety" identified human error as contributing to 84 – 88% of tanker accidents, 79% of towing vessel groundings, 89 – 96% of collisions, 75% of collisions, and 75% of fires and explosions. Human error can also cause response mistakes and failures that can exponentially increase the negative effects of such accidents.
>
> Specific accidents in which human factors were identified as major contributors include:
>
> a. the 2007 Cosco Busan oil spill in San Francisco, which the National Transportation Safety Board concluded was caused by human errors of the pilot and master of the vessel
> b. the July 24, 2007 rupture of the Trans Mountain pipeline and resulting release of crude oil in Burnaby BC and Burrard Inlet;
> c. March 22, 2014 collision between the bulk carrier Summer Wind and the Miss Susan Tow in the Houston Ship Channel, Texas, during which the pilot of the Summer Wind was using a portable pilot unit laptop, and both vessels had working radars and automatic identification system, yet never contacted each other by radio until 3 minutes before the accident, causing a double hull cargo tank rupture;
> d. The Enbridge hazardous liquid pipeline rupture and release in Marshall, Michigan, July 25, 2010, which remained undetected for 17 hours due to inadequate training of personnel."[40]

[39] City of Vancouver, Written Evidence at p. 30 citing City of Vancouver, Written Evidence, Appendix 28 - "*Human Factors and Safety Culture*", Det Norske Veritas (A4L9C2)
[40] City of Vancouver, Written Evidence at pp. 30-31

41. The role that human error may play in an oil spill in Burrard Inlet is particularly important to consider given Trans Mountain's use of probabilistic risk assessment. As noted by the Health Authorities, and set out above, such assessments cannot in general adequately account for human errors in judgment and decision.[41] As a result, the risk of a spill in Burrard Inlet may be significantly higher than predicted in the Application.

### *Ecological Risk Assessment*

42. In addition to a failure to accurately assess the likelihood of a spill in Burrard Inlet, evidence suggests that Trans Mountain has also presented an unreliable assessment of the ecological risks associated with the Project.

43. In a study commissioned by the City of Vancouver, the Tsleil-Waututh Nation and Living Oceans Society titled "*Fate and Effects of Oil Spills from the Trans Mountain Expansion Project in Burrard Inlet and the Fraser River Estuary*" (the "JWS Report"), Jeffrey W. Short, PhD identified several issues with the Trans Mountain's ecological risk assessment ("ERA"), concluding that it cannot be relied upon to assess the environmental risk of the Project.

44. The JWS Report echoes concerns similar to those noted by Professor Etkin in his assessment of Trans Mountain's spill risk assessment methodology. As noted above, Professor Etkin outlined serious concerns regarding Trans Mountain's reliance on hazard probability in lieu of risk. Similarly, the JWS Report found that Trans Mountain confounded assessments of exposure probability and sensitivity of species and habitat, thereby excluding the most serious consequences of an oil spill:

> "Oil spills are classic "low-probability/high-consequence" events.... By confounding assessments of exposure probability and sensitivity of species and habitats, the Trans Mountain ERA largely excludes the most serious consequences that could occur from consideration...."[42]

45. The JWS Report notes that in failing to select locations informed by the potential consequences of oil spills, and instead selecting locations only based on their assessment of the probability of a spill, Trans Mountain failed to comply with instructions from the National Energy Board, which include that the Application "must include an assessment of potential accidents and malfunctions at the Terminal and at representative locations along the marine shipping routes. Selection of locations should be risk informed considering both probability and consequence."[43]

46. Overall, the JWS Report states that there are at least four fundamental deficiencies in Trans Mountain's ERA:

[41] Public Health Guidance Document at p. 10
[42] JWS Report at p. 2
[43] JWS Report at pp. 2-3

a) It fails to integrate oil exposure risk based on multiple locations within ecologically distinct sub-regions along the marine shipping routes, including at or near ecologically-sensitive areas.
b) It fails to assess hazard independently of exposure. Trans Mountain concludes that hazard is minimal based on its conclusion that there is a low probability of oiling. However, Trans Mountain should have assessed hazard based on species sensitivity to oiling independently of oiling probability.
c) It fails to assess the possibility of organisms being exposed to submerged oil.
d) It fails to consider all the ways that oil can harm organisms.[44]

47. The JWS Report provides detailed summaries regarding the nature of each of these four fundamental deficiencies. Firstly, the JWS Report finds that Trans Mountain's failure to integrate exposure based on multiple locations results in a narrow view of potential effects:

> "By assuming that a single point of spill origin is typical for the Strait of Georgia, the Trans Mountain ERA implicitly assumes that the only accidents that could ever occur would involve collisions between ferry and oil tanker vessels. In reality, oil spill accidents usually involve combinations of events that appear highly unlikely in retrospect. This is why these accidents are both rare and difficult to anticipate. Arbitrarily dismissing all other possibilities for accidents, including any that may occur within Burrard Inlet (apart from the Westridge Marine Terminal) or elsewhere along the tanker route amounts to unreasonably eliminating much or even most of the risk of a spill occurring. More importantly, spills that originate at different locations along the tanker route can have very different trajectories, and hence impact habitats differently. The potential effects of these differences are lost by only considering a single location for spill origin."[45]

48. Regarding Trans Mountain's failure to assess hazard independently of exposure, the JWS Report notes:

> "Oil slick trajectory scenarios based on models driven by historical wind and current data led to identification of habitats and shoreline types most likely to be oiled. Because results from a single location were incorrectly taken as typical of Georgia Strait, habitats and the species that had low estimated likelihood of oiling were then presumed to have low sensitivity to oiling. This approach effectively confounds exposure risk and hazard assessment, whereas the conceptual foundation of the ERA expressly separates assessments of exposure and hazard, precisely to avoid such confounding. This confounding alone invalidates the Trans Mountain ERA.
>
> The method used by Trans Mountain to evaluate the sensitivity of species to oiling is also flawed. ... [The] scheme is not based on fundamental differences in

[44] JWS Report at pp. 3-4
[45] JWS Report at p. 4

> sensitivity, but on taxonomic similarities that are largely blind to the inherent sensitivities of the organisms evaluated." [46]

49. The JWS Report also finds that Trans Mountain's ERA fails to assess the possibility of organisms being exposed to submerged oil. Submergence may occur quickly in fresh or brackish waters, such as those in Burrard Inlet[47], and can result in exposure to a much wider diversity of organisms and lead to multiple damage pathways that are not normally significant following typical crude oil spills.[48] By failing to consider submergence, the Application inappropriately excludes these major oil exposure pathways which have the potential to affect a host of species, many of which are important for commercial and subsistence harvests.[49]

50. The combined effects of the flawed methods incorporated into the Trans Mountain ERA are, according to the JWS Report, most prominently illustrated by the failure of the ERA to consider the numbers of resident and migratory birds at risk of oil exposure, and the comprehensive absence of quantitative estimates of adverse effects for any of the species considered.[50] Ultimately, the Report concludes that Trans Mountain's ERA is fundamentally flawed and should not therefore be used to assess the ecological risks of the Project.[51]

51. In addition to the concerns set out in the JWS Report, the Gunton Report, described above, also expressed significant concerns regarding Trans Mountain's assessment of environmental effects. At page i of the Report, Drs. Gunton and Broadbent conclude that Trans Mountain did not provide the necessary information in the Application to enable an accurate assessment of the likelihood of adverse environmental effects resulting from oil spills from the Project for decision makers and as required by *Canadian Environmental Assessment Act, 2012*, S.C. 2012, c. 19, s. 52.[52]

52. Given the biodiversity supported by the local environment, as well as its importance to the community, the City considers the shortcomings in Trans Mountain's ERA to be highly problematic. The ecological risks of the Project have not been adequately considered by Trans Mountain and cannot be fully appreciated until a proper risk assessment is conducted.

### *Assessment of Human Health Risk*

53. In addition to the inadequacies in Trans Mountain's ecological risk assessment, the City adopts the evidence of both the City of Vancouver and the Health Authorities concerning inadequacies in Trans Mountain's assessment of human health risk.

---

[46] JWS Report at pp. 4-5
[47] JWS Report at p. 9
[48] JWS Report at p. 9
[49] JWS Report at p. 6
[50] JWS Report at p. 7
[51] JWS Report at p. 8
[52] Gunton Report at p. i

54. As Jennifer Mayberry, Manager of Environmental Planning for the City of Vancouver notes:

i. The human health risk assessments included in the Application do not conform with the requirements of the BC Ministry of Environment set out in the "Technical Guidance on Contaminated Sites: Supplemental Guidance for Risk Assessments"; and
ii. The Application does not refer to guidance documents released by Health Canada regarding human health deterministic risk assessment, as recommended by the BC Ministry of Environment.[53]

55. Upon review of the human health risk assessments filed by Trans Mountain, the Health Authorities concluded that Trans Mountain may be underestimating the potential health effects of the Project:

- The assumptions in the air dispersion models may be incorrect.
- Trans Mountain omits identified key air pollutants, such as diesel particulate matter, 1,3-butadiene and carbon tetrachloride in its air dispersion models.
- The Application excludes from spill scenarios products other than Cold Lake Winter Blend diluted bitumen that would also be carried by the pipeline, particularly those that contain a greater proportion of lighter and more volatile/flammable hydrocarbon fractions. A revised human health risk assessment should be conducted under a credible worst-case scenario includes those types of refined products.
- The human health risk assessments should identify how Trans Mountain intends to assess potential post-spill health risks and other plausible exposures to the public and to individuals involved in spill clean-up.
- The Application excludes spill scenarios exposure pathways other than air inhalation, such as food ingestion, dust inhalation and direct dermal contact. This omission should be explicitly acknowledged by Trans Mountain.[54]

### *Conclusions Regarding Trans Mountain's Risk Assessment*

56. Based on a review of the evidence, it is the City's position that the risk assessment for the project is inadequate and not comprehensive. The City agrees with the City of Vancouver, where it states that "[t]he application presents incremental risk on a piecemeal basis, an approach which tends to underestimate risk."[55] Very significantly to the City of North Vancouver, Trans Mountain's risk assessment fails to properly estimate the risk of an oil spill in Burrard Inlet, excluding it as a potential spill location due to the relatively low probability of an accidental oil spill while failing to consider the significant consequences such a spill would present as well as the local population's view of what is an acceptable level of risk to be borne locally.

[53] City of Vancouver, Written Evidence at p. 48
[54] Public Health Guidance Document at pp. 4-5; City of Vancouver, Written Evidence at pp. 49-50
[55] City of Vancouver, Written Evidence at p. 31

57. Given the various methodological errors in the risk assessment that the expert witnesses for several intervenors have demonstrated, the weight of the expert evidence before the Board is that Trans Mountain's risk assessment should not be relied upon to assess the risk or extent of tanker spills or the environmental or human health risks associated with the Project.

## II. Emergency Management Plan

58. Drawing on its experience with the recent *M/V Marathassa* oil spill in English Bay on April 8, 2015, the City has concluded that the Emergency Management Plan ("EMP") developed by Trans Mountain for the Project does not adequately address the needs of local communities in the event of a marine based spill, accident or malfunction. It finds that the EMP is vague and not comprehensive, thus confounding the risk borne by local communities.

### *Lack of Clearly Defined End Points*

59. It is the City's view that the EMP presented by Trans Mountain lacks clear and comprehensive information regarding clean-up end points and when they will be reached. This is a major shortcoming which results in a failure to accurately capture and address the potential risks of the Project that will be borne by local communities.

60. The lack of clear end points was a significant concern during the *M/V Marathassa* spill.

61. North Shore Emergency Management ("NSEM") is an emergency management agency funded by and serving the City of North Vancouver, the District of North Vancouver and the District of West Vancouver. It coordinates effective and efficient preparedness, planning, response and recovery activities by combining resources from the three municipalities, response agencies, public safety lifeline volunteers and other organizations on the north shore of the Burrard Inlet (the "North Shore").[56]

62. NSEM describes its experience as follows:

> "…John Lawson Beach [in the District of West Vancouver] would not have been adequately cleaned up to the appropriate level of beach end point criteria if not for the insistence of the District of West Vancouver that an independent analysis of the beach be done. Unified Command was prepared to leave this beach cleaned to the level of the normal standard for beach clean-up end points which allows for globules of oil to be present. However, the District of West Vancouver insisted that this standard be modified to take into account the high public use of this beach and the potential exposure to the public.
>
> …

[56] City of North Vancouver, Affidavit of Dorit Mason (A4L6L4) ("NSEM Affidavit") at paras. 2.1-2.2

> There did not appear to be any objective criteria for reaching end-points such as when the clean-up of John Lawson Beach would be considered complete."[57]

63. It is the City's opinion that end points must be developed in advance of a spill, in consultation with local communities, and should form a part of Trans Mountain's EMP. In addition to being clearly defined, end points must consider all the relevant factors. For example, when developing end points for beaches, all aspects of the beach should be considered, including environmental sensitivity, human use and cultural importance.[58]

64. By failing to clearly define end points and ensure that the selected end points acknowledge local needs, the EMP fails to accurately capture the risk and potential harm posed by the Project and fails to evidence an intention to work collaboratively with local authorities to address the impacts of spill events.

### *No Provision for Training or Resources*

65. The City also has concerns regarding the lack of adequate training and other resources provided to local authorities by Trans Mountain.

66. As outlined in NSEM's evidence, no tabletop exercises have been done by Trans Mountain or its spill response agency, Western Canada Marine Response Corporation ("WCMRC"), specifically with the North Shore municipalities.[59] Such tabletop exercises are essential in planning for any potential oil spill.[60] Although WCMRC has initiated the development of Geographic Response Plans in a few areas of the North Shore, significantly more work needs to be done; such plans are critical in determining how to respond to an oil spill and must involve significant input from the neighbouring communities.[61]

67. The City of Vancouver has raised similar concerns regarding its participation in spill response training exercises. It notes:

> "Despite the potential for major impacts to the City of Vancouver in the event of a spill, the Office of Emergency Management has never been invited by Trans Mountain to participate in the Unified Command structure in an exercise simulating a spill or incident from a Trans Mountain tanker in the Burrard Inlet or at the Westridge Terminal. OEM has also never been invited by WCMRC or the CCG to participate beyond the role of observer in table-top or functional exercises that simulate spills in the Burrard Inlet or Lower Fraser River."[62]

---

[57] NSEM Affidavit at paras. 6.8 (a) and (e)
[58] NSEM Affidavit at para 6.8
[59] It should be noted that on October 29, 2015, Kinder Morgan invited local governments to participate in an emergency exercise for an incident at Westridge Marine Terminal. This exercise was completed for current operations and was not related to the Application. The City of North Vancouver, the District of North Vancouver, the District of West Vancouver and the City of Vancouver participated in this exercise.
[60] NSEM Affidavit at para. 4.1
[61] NSEM Affidavit at para 4.2
[62] City of Vancouver, Written Evidence at p. 54

Further, the City of Vancouver has been unable to obtain an oil spill response plan from the CCG or WCMRC that clearly explains how spills in the Burrard Inlet will be managed, or how the risks to the public of a spill in this densely populated area will be addressed.[63]

68. In addition to a lack of training, there is no provision made in the Application for necessary resources to local governments and nothing to ensure they will have the tools they need to respond to a spill.

69. Coordinated response to a spill in the Burrard Inlet is crucial to reducing the negative impacts of such an incident. By failing to provide local authorities with an opportunity to participate in training exercises[64] and access adequate spill response resources, Trans Mountain leaves local authorities without the tools and experience to address the risks that the Project creates.

### *Public Health Considerations*

70. The Health Authorities have also expressed significant concerns regarding spill response and emergency management from a public health perspective. In their May 25, 2015 letter, they note that much of the spill preparedness related to the Project is focused on minimizing environmental damage, while little information is available regarding the ability of Trans Mountain and WCMRC (referred to as West Coast Marine Spill Response Corporation or WCMSRC by the Health Authorities, as quoted below) to respond to an oil spill from the human health and safety perspective. In particular, echoing the concerns of NSEM and the City of Vancouver regarding access to resources, the Health Authorities note that the proper resources and equipment may not be available to protect and monitor the public health effects of a spill:

> "It is unknown whether equipment such as air quality monitors, personal protective equipment for responders (other than for WCMSRC and IMP staff), and volunteers are part of the prepositioned supply and ready for deployment. It is also unknown whether the proponent and its designated oil spill response agency WCMSRC have oil spill related environmental health, toxicology, and laboratory expertise on standby that can be deployed in a timely way following a spill. The health authorities do not have such equipment, nor the specific expertise on oil spills."[65]

71. The Health Authorities also identify as a major issue the capacity to monitor specific chemical substances released following a large oil spill and to track their dispersion in real time:

---

[63] NSEM Affidavit at para. 6.9
[64] Apart from the Westridge Marine Terminal emergency response exercised conducted on October 29, 2015, as noted above.
[65] Public Health Guidance Document at p. 13

> "The capacity to quickly identify and track the chemical substances being released is important for evidence based and timely public health decisions to ensure the health and well being of the public. The health authorities do not have the capacity for monitoring chemicals released following a large oil spill. It is not known whether or not the designated lead response agency, West Coast Marine Spill Response Corporation (WCMSRC), or the pipeline operator has such capacity locally. The Metro Vancouver commissioned air dispersion modelling suggests that the concentrations of the released petroleum chemicals will be highest in the first hour or two following the spill. It is not certain whether such air monitoring equipment, even if available, can be deployed quickly enough to be useful for assisting the initial public health and safety decisions."[66]

72. Trans Mountain's EMP also fails to provide for human activities and habitat baseline data which is necessary to facilitate remediation decisions. Without this data, remediation and end point determinations following a large spill will be very difficult.[67]

### *Compensation Eligibility Process*

73. Not only does the Application not provide for adequate training or resources, it also fails to include a clear and comprehensive compensation process. This compounds the risk borne by local communities and further compromises their ability to effectively deal with the impacts of a spill.

74. Canadian law makes the tanker owner responsible for pollution damages from oil spills under the "polluter-pay principle". However, the payment of compensation is dependent to a large extent on the applicable legal regime as well as the category of loss.[68]

75. The authors of the Gunton Report, discussed above, conclude that total potential pipeline spill costs range from $5 million to $1.5 billion for a single spill, estimates which are approximately 1.7 to 4.7 times higher than those presented in the Application. While the Application does not provide any estimates of potential tanker spill damage costs, the authors conclude that those costs are likely to range from $2.2 to $4.4 billion for a single spill. Including passive use damages in the spill cost estimates, the cost of a potential tanker spill could be closer to $25.5 billion.[69]

76. Considering the current compensation regime, the authors of the Gunton Report find that total spill costs could exceed available compensation by over $2.9 billion for a single spill. Despite these significant costs, which are explored further in Part III of the City's argument below, the authors find that Trans Mountain has not provided a comprehensive

---

[66] City of Vancouver, Written Evidence, Appendix 51 – Letter from Fraser Health and Vancouver Coastal Health dated May 25, 2015 (A4L7L0) ("Health Authorities Letter") at p. 2
[67] Health Authorities Letter at p. 3
[68] City of Vancouver, Written Evidence at p. 94, citing Transport Canada "*Tanker Safety and Spill Prevention*" (http://www.tc.gc.ca/eng/marinesafety/menu-4100.htm)
[69] Gunton Report at p. v

mitigation and compensation plan to assure the public that it will be fully responsible for all spill clean-up and damage costs.[70]

77. The City of Vancouver analyzed various categories of losses and the International Oil Pollution Compensation ("IOPC") Fund's treatment of those losses as compensable or not.[71] It found that compensation is unavailable or uncertain for a variety of losses that may be incurred by local governments, including non-economical marine environmental damage; loss of recreation and public areas, such as beaches and seawalls, during the recovery period; technical and other programs to assist those impacted by the spill; and volunteer management costs.[72] The table can be found at pages 104-106 of the City of Vancouver's Written Evidence.

78. One example of the City's vulnerability to the costs associated with an oil spill arose following the *M/V Marathassa* incident. In the wake of that spill, the City was informed that compensation paid to local governments for staff wages related to spill-response activities was limited to overtime hours only. This does not account for the fact that countless staff hours were and continue to be spent dealing with the spill and its effects during regular work time, during which staff are not carrying out their regular duties.[73] The Application also makes no provision for avoiding this harm to the City.

79. The City has determined that the current compensation regime may result in no or uncertain levels of compensation, leaving the City vulnerable to extensive spill response costs.

## III. Conclusions Regarding Spill Risk in the Burrard Inlet

80. As discussed above, the analysis of Drs. Gunton and Broadbent indicates that the likelihood of an oil spill occurring in the Burrard Inlet as a result of the Project is very high; the probability of a spill in the Vancouver Harbour area over 50 years is between 83% and 87.4%. Despite this risk, Trans Mountain has failed to model a large spill in Burrard Inlet, and the methodological shortcomings present in the risk assessments it has conducted make them unreliable.

81. Trans Mountain's Application also evidences deficiencies in emergency response planning. Of that which is has been publicized, Trans Mountain's EMP is based on inaccurate conclusions regarding the risks posed by the Project and fails to provide for the needs of local communities who will bear the burden of a spill. These shortcomings in response planning serve to compound the risks faced by local communities, including the City.

[70] Gunton Report at p. vii
[71] City of Vancouver, Written Evidence at p. 104
[72] City of Vancouver, Written Evidence at pp. 104-106
[73] NSEM Affidavit at para. 6.13(a)

82. Given the deficiencies and inaccuracies in Trans Mountain's Application, the mitigation measures proposed cannot be relied upon to properly address the adverse effects that may arise from a spill, including those that will be borne by the City and other communities surrounding Burrard Inlet.

## Part C: Impacts of Marine Spill on the City of North Vancouver

83. In light of the significant likelihood of a spill occurring in Burrard Inlet over the lifespan of the Project, the City has carefully considered the potential impacts of such a spill on the City. As demonstrated by the April 8, 2015 *M/V Marathassa* oil spill in English Bay, local governments are on the front line of spill response and bear economic, ecological and social burdens.

84. Based on its review of the evidence, and as set out further below, the City has concluded that a spill in Burrard Inlet or English Bay is likely to have a variety of impacts on the City:

- Spill modelling presented in the Genwest Report indicates that a marine spill in Burrard Inlet, particularly at First or Second Narrows, may result in oiling along North Shore beaches.
- Impacts are likely to be exacerbated by the unique properties of diluted bitumen and its behaviour in the fresh and brackish waters of the Burrard Inlet, as well as shortcomings in spill response capacity.
- As discussed below, even spills considerably smaller than the credible worst case scenario can have significant adverse impacts on the local environment.[74]
- Finally, in responding to a spill in the Inlet, the City may incur significant costs and may experience adverse economic, social, health, and environmental effects.

### I. Probability of Effects

#### *Spill Trajectory*

85. As discussed above, the Genwest Study modelled four oil spill scenarios in Burrard Inlet:

(a) an oil spill of 8,000 $m^3$ at Westridge Marine Terminal;
(b) an oil spill of 16,000 $m^3$ at Second Narrows;
(c) an oil spill of 16,000 $m^3$ at First Narrows; and
(d) an oil spill of 16,000 $m^3$ in the Outer Harbour at Anchorage #8.

86. In determining the reasonable worst-case scenario oil spills for the four sites mentioned above, Genwest relied on the evidence of Nuka Research and Planning, LLC ("Nuka"),

[74] JWS Report at p. 12

presented in its report titled "*Technical Analysis of Oil Spill Response Capabilities and Limitations for Trans Mountain Expansion Project*" (the "Nuka Report") and submitted by Tsleil-Waututh Nation, the City of Vancouver and Tsawout First Nation.

87. Nuka is firm of international experts in marine environmental consulting, and in particular oil spill contingency planning and response. The authors have worked on oil spill prevention and response oversight for provincial and national governments in Canada and have significant experience with oil spill analysis in British Columbia and Washington State. The report prepared by Nuka presents primary analysis developed by the authors along with expert interpretation of results and findings.[75]. In light of this expertise, and given the various methodological issues that have been identified in the risk assessment conducted by DNV, the City relies on the evidence of Nuka to establish reasonable worst-case scenario oil spills for the Project.

88. As Nuka explains, the 16,000 $m^3$ spill volume is consistent with the 16,500 $m^3$ "credible worst case" oil spill volume derived from the marine transportation risk assessment for in the Application.[76] The 8,000 $m^3$ spill in the Central Harbour is significantly higher than the 160 $m^3$ spill presented in the Project Application but, as Nuka explains, is supported by the Application and is consistent with the methods used by the proponent to select worst case volumes for other locations.[77]

89. Based on its modelling of the worst-case scenarios identified by Nuka, Genwest concluded that oil spreads quickly in the confined geophysical setting in Burrard Inlet. The combined results of all the modelled scenarios demonstrate that oil has the potential to spread throughout the Inlet.[78]

90. While the effect of a spill on the City will depend on tidal currents, wind and other factors, the spill models frequently indicated that significant oiling of North Shore beaches would result from a spill in Burrard Inlet. For example, Figure 11 in that Report shows the results of an oil spill at Second Narrows, which results in very heavy oiling along the northern shore of the Inner Harbour.[79] Spills at First Narrows produce equally concerning results, as shown in Figures 12, 13, 14 and 15.[80] As summarized in the JWS Report, the Genwest models demonstrate that "an oil spill anywhere in Burrard Inlet would almost certainly result in considerable shoreline oiling".[81]

91. Shorelines form an important habitat for organisms. If shoreline oiling occurs, it may have both short-term and long-term impacts for habitats and wildlife. The JWS Report

[75] City of Vancouver, Written Evidence, Appendix 68 – "*Technical Analysis of Oil Spill Response Capabilities and Limitations for Trans Mountain Expansion Project*" Nuka Research and Planning, LLC (revised December 1, 2015) (A74443) ("Nuka Report") at pp. 3-4
[76] Nuka Report at p. 39
[77] Nuka Report at p. 39
[78] Genwest Report at p. 3
[79] Genwest Report at p. 42
[80] Genwest Report at pp. 44, 46, 48 and 50
[81] JWS Report at p. 11

noted that once diluted bitumen is incorporated beneath the surface of the shoreline, it may persist for significant periods of time in the absence of physical disturbance.

92. Based on this evidence, the City finds that there is a significant risk that oiling of its beaches and shoreline will result from a spill in Burrard Inlet.

### *Diluted Bitumen Effects*

93. Studies have identified two unique risks associated with a spill of diluted bitumen:

i. Diluted bitumen is prone to submergence when spilled:

- The JWS Report concludes that diluted bitumen may submerge quickly, within about 24 hours under near worst-case ambient conditions, in fresh and brackish waters such as those in Burrard Inlet.[82]
- If diluted bitumen submerges, it becomes more difficult to track and can disperse more widely.[83]
- Submergence also results in multiple exposure pathways, potentially impacting a large variety of species.[84]
- The Application, which has not considered the possibility of submergence, also reveals a lack of plans and equipment to protect shorelines and recover submerged diluted bitumen.[85]

ii. Diluted bitumen poses an increased risk to air quality and human health due to the toxic plume created by evaporating diluents:

- The chemical composition of the diluents and the toxicity of the plume they create when evaporating will pose health risks to first responders and the local population and may create an explosion hazard, risks which may delay response.[86]

94. Overall, the unique properties of diluted bitumen may lead to more widespread adverse effects, and may have implications for the speed and effectiveness of any oil spill response and recovery measures, as discussed further below.[87] This creates additional uncertainty for local communities and further compounds the risks that they face.

### *Spill Response Capacity*

[82] JWS Report at p. 6
[83] JWS Report at p. 7
[84] JWS Report at pp. 6, 26
[85] City of Vancouver, Written Evidence at p. 78
[86] City of Vancouver, Written Evidence at pp. 77-78
[87] City of Vancouver, Written Evidence at p. 45

95. Mentioned briefly above, the City has concerns with the ability of Trans Mountain and other relevant agencies to efficiently and effectively respond to a spill in Burrard Inlet, and believes that the ability to recover spilled oil may be overestimated in the Application. Any delay or gaps in incident response have the potential to exacerbate the adverse effects of an oil spill that are experienced by the City and surrounding communities. The City's concerns were highlighted during the *M/V Marathassa* oil spill, where the City witnessed serious problems with the process and timeliness of notification, the role of the participants, the implementation of the emergency response plan and the overall capacity to respond adequately.

96. In the Nuka Report, Nuka examines key factors that could impact the mitigation of potential oil spills along the Trans Mountain pipeline and marine vessel routes in British Columbia. To assess marine spill response, Nuka conducted both a marine oil spill response gap analysis, which models the impact of environmental conditions on marine oil spill response, and a marine oil spill response capacity analysis, which estimates the total capacity for mechanical recovery of major marine oil spills, both using various locations in coastal Southern BC.[88]

97. The Nuka Report identified several key findings from both of these analyses. Nuka summarized the results of its oil spill response gap analysis as follows:

    1. There is no location along the Trans Mountain tanker route where on-water oil spill response will always be possible.
    2. There may be times when on-water vessel operations are possible but poor visibility - including darkness - precludes aerial reconnaissance, making it very difficult to track and target oil for recovery.
    3. **During the winter, response is not possible between 56% and 78% of the time at sites along the Trans Mountain tanker route.**
    4. If a spill occurs during a time when response gap conditions exist, the unmitigated oil slick will remain in the environment until conditions improve. If the response gap conditions extend for several days, there may not be any opportunity for on-water recovery.
    5. Lack of a response gap does not ensure that a response will occur, nor does it guarantee that the response will be effective.[89]

98. For the Central Harbour area specifically, Nuka found that on water oil spill response operations with aerial reconnaissance would be impeded or completely shut down due to weather or environmental conditions, and in particular limitations on visibility, for 34% of the time during the summer months and for 57% of the time during the winter months.[90] Nuka also noted that while Trans Mountain submitted a partial response gap analysis as part of the Application, it did not apply a standard methodology and did not

[88] Nuka Report at p. i
[89] Nuka Report at p. vi
[90] Nuka Report at p. iv

account for several important factors, such as visibility limits, interaction among factors, and seasonal variability.[91]

99. To assess response capacity, Nuka modelled a series of hypothetical oil spills at five locations along the Trans Mountain tanker route to estimate the total potential oil recovery during the first 72 hours of the spill. Following its response capacity analysis, Nuka concluded:

1. On-water oil spill recovery capacity is reduced during winter months by as much as 50% compared to summer.
2. If spill response were delayed for any reason - lags in detection, poor weather, equipment malfunction - the total volume of oil recovered would decrease significantly. A 48-hour delay in the modeled response to a 16,000 m3 Outer Harbour spill would result in over 1,000 m3 of oil left in the environment.
3. The modeled response capacity estimates do not consider the potential for shoreline stranding [when oil remains on shorelines, limiting its ability to be recovered through on-water response methods]. This may overestimate total recovery at all sites, and most significantly in Burrard Inlet where models show up to 90% of an oil spill stranding on the beaches.
4. The spill response forces currently available in Southern B.C. have the capacity to recover only 10-20% of a worst case oil spill under favourable conditions.
5. Current response forces are clustered in the Vancouver Port area, which reduces response capacity for other sites along the Trans Mountain tanker route.
6. Night operations require double the personnel and create significant safety risks that may not be justified by the modest improvement to oil recovery from 24-hour operations.
7. Changes to diluted bitumen density and viscosity within the first few days of the release may render oil spill response systems ineffective.[92]

100. The Nuka Report emphasizes the importance of time, which was shown to be critical in its analyses.[93] Due to the progression of physical and chemical changes that occur when oil escapes into a water body, oil spill response is a “race against the clock”.[94] The response capacity analysis demonstrates that recovery rates diminish over the first 72 hours due to the spreading and weathering of the spilled oil; a delay of just 48 hours reduced modeled recovery by up to 80% in some scenarios.[95] If an oil spill occurred at the onset of a period of prolonged adverse conditions, it is possible that the entire spill volume would remain unmitigated.[96]

101. The Washington State Department of Ecology also noted concerns with spill response capacity for the Project. The Department found that Trans Mountain “provides too few

[91] Nuka Report at p. iv
[92]Nuka Report at p. ix
[93] Nuka Report at p. 106
[94] Nuka Report at p. 106
[95] Nuka Report at p. 106
[96] Nuka Report at p. 106

details about the response capability and access to the best achievable technologies strategically pre-staged to respond immediately to vessel spills in Canadian waters that could affect Washington waters."[97]

102. The City's concerns with response capacity are well summarized in the following quote from Nuka:

> "On-water spill response is a logistically complex and often inefficient process. Even when everything goes well, the total amount of oil removed from the sea surface may be only a small percentage of the total volume spilled. There may be times when weather or environmental conditions prevent any response at all. Oil spills that occur during these gap periods would be left unmitigated for hours to days, depending on conditions."[98]

103. Overall, based on the Application and the evidence before the Board, the City has serious concerns with the ability of Trans Mountain and other agencies to effectively respond to an oil spill. This concern arises in particular from the factors set out in the Nuka Report and based on the inefficiencies demonstrated during the response to the *M/V Marathassa spill*, discussed further below. The City recognizes that any delays or limitations in spill cleanup response will decrease the total volume of oil recovered significantly and will increase the adverse impacts faced by the City. It is clear from the Nuka Report that there will be times and places where effective spill response will be difficult or impossible.[99] The Application provides no evidence to reliably counter these conclusions.

### *M/V Marathassa Spill*

104. The City's concerns regarding the adequacy of Trans Mountain's emergency management plan and the spill response capacity for the Project were reinforced during the *M/V Marathassa* oil spill in English Bay. The Canadian Coast Guard ("CCG") and WCMRC, Trans Mountain's spill response agency, were largely responsible for spill response. The response by those agencies, both of which will be involved in a marine spill from the Project, raises concerns that they have insufficient capacity to respond to the risk posed by the Project.

105. As noted in NSEM's evidence, there were significant delays in the notification of affected parties during the *M/V Marathassa* spill, such that response could not even begin until several hours after the incident. NSEM was contacted by WCMRC approximately 14 hours after the initial report of the spill, and it was not until approximately 2:30 p.m. on April 9, 2015 that the extent of the spill was communicated to NSEM.[100] At that point, oil was approximately 500 m from the shoreline in West Vancouver.[101]

---

[97] Washington State Department of Ecology, Written Evidence (A4Q1X6) at p. 10
[98] City of Vancouver, Written Evidence, Appendix 80 – "*English Bay Oil Spill Debrief and Tanker Scenario Planning Workshop*" Nuka Research and Planning Group, LLC (A4L8E8) ("Nuka Spill Debrief") at p. vi
[99] Nuka Report at p. 108
[100] NSEM Affidavit at paras. 5.1-5.2
[101] NSEM Affidavit at para 5.2

106. The City of Vancouver experienced a similar delay in notification. In its Written Evidence, it notes that it was not until three hours after the initial spill report that the Canadian Coast Guard directed WCMRC to respond to the spill. Approximately 90 minutes later, WCMRC crews arrived on scene. It look eleven hours from the time the spill was reported for WCMRC to determine that the *M/V Marathassa* was the most likely source of the spill, although the responsible party did not formally acknowledge this until the evening of April 9. The City of Vancouver was not formally notified until 5:06 a.m., twelve hours after the initial report of the spill.[102]

107. Both NSEM and the City of Vancouver also described concerns with response once notification had occurred. In particular, the parties had concerns regarding:

i. the structure of the response model (Unified Command);
ii. the role and proficiency of the participants, including the Canadian Coast Guard, Environment Canada, WCMRC, First Nations, local governments, and the Responsible Party;
iii. the implementation of the emergency response plan;
iv. the ability to ensure effective communication between participants;
v. the ability to boom and protect beaches;
vi. the ability to appropriately communicate response activities and safety information to the public in a coordinated fashion;
vii. a lack of planning regarding volunteer management; and
viii. the overall capacity to respond adequately.[103]

108. 18 hours after the spill was reported, the source of the leak had still not been established.[104] Cleaning of vessel hulls was delayed at various points during the response due to weather and safety concerns despite fairly average weather conditions.[105]

109. Overall, the City of Vancouver commented that the response to the spill "served as an important illustration of the challenges in coordinating between various government agencies to respond efficiently and effectively to prevent and mitigate environmental consequences."[106]

110. Following the English Bay spill, the City of Vancouver held a debriefing and scenario planning workshop. The goal of the workshop was to describe the City's role in the incident, identify lessons learned during the response and consider how the City might be impacted by a large scale oil spill. A report titled "*English Bay Oil Spill Debrief and Tanker Scenario Planning Workshop"* ("Nuka Spill Debrief") was prepared by Nuka to summarize the workshop. Although its findings are specific to the City of Vancouver, many of the same considerations, outcomes and lessons apply to surrounding

[102] City of Vancouver, Written Evidence at p. 36
[103] NSEM Affidavit at para. 6.1; City of Vancouver, Written Evidence at pp. 72-73
[104] City of Vancouver, Written Evidence at p. 38
[105] City of Vancouver, Written Evidence at p. 37
[106] City of Vancouver, Written Evidence at p. 42

municipalities, including the City of North Vancouver. The Nuka Spill Debrief identified the following gaps in policies, plans and resources during the English Bay spill response, many of which echo the concerns of the NSEM and the City of Vancouver:

- Delays in official notification to the City limited opportunities to take protective actions to minimize adverse impacts.
- Delays in the Responsible Party's acceptance of responsibility contributed to delays in ramping up the response and resulted in losses of knowledge and efficiency during the transfer of spill management authority from the federal government to the ship owner once they accepted responsibility for the spill.
- An uneven level of Incident Command System (ICS) proficiency among federal agencies and other partners in the ICP led to delays in producing Incident Action Plans, lack of consistency in incident documentation, outdated or incorrect information posted in ICP situation displays, incomplete staffing of all ICS functions, and a chaotic meeting environment.
- There were substantial gaps in the scope and quality of spill science that adversely impacted the rigor of environmental assessments and cleanup conducted during the response, resulting in problems with shoreline assessment mapping and documentation, minimal environmental sampling and monitoring, and lack of protective booming.
- The spill response created a significant draw on City resources, including operational staff (particularly within Parks, because of the need for additional attention on beaches and parks), which would have been difficult to sustain. [107]

111. The City's experience during the incident is particularly concerning, given the relatively small size of the spill. A credible worst case spill scenario in the Central Harbour of 8,000 $m^3$ would be 2,500 times larger than the reported volume spilled by the *M/V Marathassa* while a credible worst case scenario spill of 16,000 $m^3$ in the Outer Harbour would be over 5,000 times larger.[108]

112. The City's experience during the *M/V Marathassa* spill highlighted the need for a thorough and reliable emergency management plan and, to use the words of Nuka, "reinforce[d] the reality that collecting and removing oil from the sea surface is a challenging, time-sensitive, and often ineffective process, even under the most favourable conditions."[109] Any delays or gaps in response have the potential to exacerbate the adverse effects of a spill, particularly for the City and other local communities.

113. The agencies and systems involved in the *Marathassa* spill will be involved in responding to a spill from the Project. Trans Mountain has failed to acknowledge and address the issues that arose during the *Marathassa* incident, simply stating that the relevant organizations, including WCMRC and the Canadian Coast Guard, will take coordinated action to mitigate public and environmental impacts resulting from a spill

[107] Nuka Spill Debrief at pp. 11-12
[108] Nuka Spill Debrief at p. 13
[109] Nuka Report at p. 109

from the Project.[110] The risks caused by the remaining deficiencies and uncertainties will be borne by the City and other local communities.

## II. Impacts on the City of North Vancouver

114. Upon a review of the evidence, it is clear to the City that an oil spill in Burrard Inlet, small or large, will have adverse impacts on the City's economy, environment, and the health and safety of its residents and visitors. The City has several unique characteristics which make it particularly susceptible to the impacts of an oil spill in Burrard Inlet, including:

- high residential density near the waterfront;
- an extensive shoreline, the entirety of which is adjacent to the shipping route through Burrard Inlet to the Westridge Marine Terminal;
- a developed waterfront that includes numerous parks and open spaces, such as Shipbuilders' Square and the Shipyards, Lonsdale Quay, Waterfront Park, Kings Mill Walk Park and Spirit Trail, all of which are highly valued by the community and used by residents and visitors from the very young to the very old;
- several economically sensitive areas, which are the subject of restoration and habitat enhancement projects and are likely to be affected by a marine oil spill; and
- complex regional transportation infrastructure which includes many bridges as well as important public transportation routes such as the sea bus, which may be impacted by a hazard event in the harbour or at the Port Metro Vancouver.[111]

115. In coming to this conclusion, the City also draws on its experience from the *M/V Marathassa* spill, during which the City experienced a range of impacts despite the relatively small size of the spill.[112] Although only small amounts of oil were found on the City's waterfront along Kings Mill Walk, the City dedicated staff time and resources to the response, including through participation in Unified Command.

116. Building from its experience during the *M/V Marathassa* spill, the City realizes that the impacts of a major diluted bitumen spill in Burrard Inlet would likely be catastrophic, even if there were no complications or delays in spill response. This was echoed in the Nuka Spill Debrief, which found that the incident "...exposed a fundamental reality that a worst case tanker spill in Burrard Inlet could not be fully mitigated, and that there would be significant adverse impacts to local environment, public health, culture, and economy."[113]

[110] Trans Mountain Pipeline ULC, Revised Final Argument (A4W6L8) at p. 176
[111] City of Vancouver, Written Evidence at p. 32
[112] Nuka Spill Debrief at p. viii
[113] Nuka Spill Debrief at p. 27

### *Economic Impacts*

117. The City of Vancouver commissioned a report from Recovery and Relief Services, Inc. regarding the potential costs faced by local governments in responding to and recovering from an oil spill. The report, titled "*Local Government Impact of Oil Spills: A study of potential costs for the City of Vancouver*" (the "Costs Report") finds that local governments are at the front lines of oil spills and "that a catastrophic spill could present significant costs to local governments."[114]

118. Although local governments do not have the primary responsibility to plan for and respond to on-water spills, they do have a responsibility to protect the local population.[115] As the Costs Report notes, a common principle in disaster management is the notion that all disasters are local; the greatest exposure from oil spills is borne by the local community and the costs that are not compensated by national or international regimes will devolve to local governments, business and individuals.[116]

119. The Costs Report identified the following categories of costs that are incurred by local governments following oil spills:

#### i. Opportunity Costs

The Report finds that the opportunity costs associated with focusing on spill response and recovery is the greatest gap in the understanding of spill impacts. Opportunity costs to local governments include the inability of staff to spend their time on their regular duties, a halt on or delay in routine operations and maintenance, and the postponement or elimination of future development activities.[117] The City experienced significant opportunity costs following the *M/V Marathassa* spill, as staff members were diverted from their regular duties to support the response.

#### ii. Staging

Staging refers to the resources and activities dedicated to the coordination of response activities.[118] This may include the costs of establishing and operating an incident command or emergency operations centre. In responding to the Cosco Busan oil spill, the City and County of San Francisco (CCSF) incurred $1,633,951 in staging costs, not including legal and volunteer expenses.

#### iii. Space Requirements

---

[114] City of Vancouver, Written Evidence, Appendix 81 – Evidence of Jeremy Stone, "*Local Government Impact of Oil Spills*: *A Study of Potential Costs for the City of Vancouver"* Recovery and Relief Services, Inc. ("Costs Report") at p. 8
[115] City of Vancouver, Written Evidence at p. 35
[116] Costs Report at p. 3
[117] Costs Report at pp. 30-31
[118] Costs Report at p. 11

Space requirements include the area required for both implementing response operations and housing incoming response workers. Although the Costs Report was unable to find specific local government cost data, it noted that response operations often occupy municipal buildings and result in a strain on local services.[119]

### iv. Evacuation

Due to the presence of toxic fumes, which may pass onshore, evacuation may sometimes be required, especially if the spill happens near a populated area. Although again no local government data was available regarding the costs of such evacuations, particularly in the context of marine spills, the Report referred to several examples, including the need to evacuate 250 local residents following the Trans Mountain pipeline spill in Burnaby.

### v. Fire, police and emergency services

The Report noted that first responders are necessary for a variety of functions in the wake of an oil spill. Following the relatively small Cosco Busan spill (188 $m^3$), the cost of emergency services alone was $203,419. In addition, the costs to the City of New Orleans following the Deepwater Horizon spill, which never reached the City's shores, was $305,000. [120]

### vi. Public Health Costs

Generally speaking, personal health care costs are not oil-spill related expenses. However, local governments may incur costs in implementing public health precautionary measures, such as beach closures, public notification, air and water monitory and worker safety. An example of such costs are those incurred by the Calhoun County Public Health Department in responding to the Kalamazoo spill. According to the Report, a total of $610,696 has been spent on air and water monitoring, evacuations and worker safety. [121]

As noted by the Health Authorities, it is not clear from the Application what Trans Mountain is planning to fund in the event of a spill that has human health consequences. The Health Authorities currently have no legal means to recover the costs incurred by them in preparing for or responding to a spill.[122] As a result, in addition to the public health costs incurred by local governments, other local authorities may also incur costs associated with a spill.

### vii. Waste collection, transportation and disposal

[119] Costs Report at p. 13
[120] Costs Report at p. 14
[121] Costs Report at p. 15
[122] Public Health Guidance Document at p. 17

This topic includes waste management activities with both short and long term costs. Although no local government data was available, recent spill recovery modeling for a spill of up to 60,000 $m^3$ calculated disposal costs of approximately $107,000,000.[123]

### viii. Communication costs

The report notes that effective communication is one of the critical roles of disaster response. This can include various IT costs including a communications center and staff for researching and relating information to the public. During the Cosco Busan oil spill, the CCSF incurred costs totalling $297,982 for communications equipment and services.[124]

### ix. Volunteer Management

The Report notes that large groups of volunteers often converge at a scene following an oil spill in coastal areas.

Despite the fact that volunteers work for free, the need to organize and make them effective creates costs for local governments, including costs of reception and registration, training (both safety and work training), personal protective equipment (PPE - overalls, boots, gloves, masks etc), equipment and materials (spades, buckets, sorbents), accommodation, transport, and food/water and medical costs. During the Cosco Busan oil spill, the CCSF enlisted 1,500 volunteers and incurred costs of $408,377, or $273 per volunteer. The Report notes that in addition to direct costs of managing volunteers, there are additional hidden costs which are difficult to calculate.[125]

### x. Permitting and Regulatory Oversight

As noted in the Report, following a disaster issues like temporary structure permit requests, building code enforcement, land use permits, land leases, water demand, and other types of requirements may put enormous pressure on local governments, as was the case in the Exxon *Valdez* disaster. Unfortunately, little data on these costs are available, likely because they are embedded within the operating budgets of the relevant departments.[126]

### xi. Lost Use of Parks and Other Municipal Spaces

The Report notes that marine and waterfront properties owned or used by municipalities may be damaged by direct oil contamination or while being used as staging or temporary disposal sites during the response. Although marine property losses have been recorded for various spills, there is little indication of what portion of these properties were owned by local governments. Further, although local government offices and facilities have been

[123] Costs Report at pp. 15-17
[124] Costs Report at pp. 17-18
[125] Costs Report at pp. 18-19
[126] Costs Report at p. 27

used for response activities in some cases, it is not clear how much this use cost or what alternate uses could not continue as a result.[127]

This potential cost is particularly important for the City given its extensive shoreline and numerous waterfront parks, trails and public spaces. The City has significant concerns regarding the contamination of its waterfront property, the cost of site clean-up and impacts on the public, particularly if the response and clean-up takes a substantial amount of time.

### xii. Costs of damage assessment

To assess the damages sustained by a local government, which is necessary to prepare for response activities, litigation and claims recovery as well as to performing ongoing monitoring and planning, local governments may be required to obtain damage assessments. These include natural resource assessments, economic analyses, and other damage assessments. Following the Exxon *Valdez* spill, $550,000,000 was expended on assessment costs.[128]

### xiii. Recovery Planning

In addition to assessment, local governments may incur costs for recovery planning and programming. Recovery planning involves community consultation and the allocation of resources to meet community needs, while recovery programming is the resulting series of activities that are used to implement the plan. Unfortunately, local government data on recovery planning and programming costs were not available.[129]

### xiv. Technical Assistance Programs

Local governments may establish technical assistance programs to assist oil spill victims with application processes. Following the Deepwater Horizon spill, one non-profit representing only 0.01% of the total claimants in the State of Louisiana spent a total of $191,000 on application technical assistance.[130]

### xv. Interim Financial Relief

In addition to assisting spill victims with formal claims to the responsible parties, governments or other entities may provide short-term assistance in the form of grants, loans, or suspension of tax payments. No local government data was available for this cost category.

### xvi. Mitigation and Preparedness Activities

[127] Costs Report at p. 28
[128] Costs Report at p. 20
[129] Costs Report at pp. 20-21
[130] Costs Report at pp. 21-22

The Report found that the quality of the contingency planning and the management of response operations have been defined as a potentially crucial variable in determining the costs of the oil spill, and noted an example from Washington State:[131]

> "In the wake of the 1988 Nestucca fuel barge spill in Washington and the catastrophic 1989 Exxon Valdez tanker spill in Alaska, the Washington legislature created two dedicated accounts to fund the Department of Ecology's oil spill prevention, preparedness, and response activities. Today its core services include vessel and facilities inspections, plan review and approvals, contingency plan drills, natural resource damages assessment on spills to water, environmental restoration, and response to oil and hazardous materials spills delivered 24/7 from field offices.
>
> According to the 2013-15 operating budget for the program, nearly $27.0 Million is assigned to the program. Out of this budget 17% ($4.68 million) is allocated for prevention...."[132]

**xvii. Lost Tax Revenues**

As the Report notes, "When economies, incomes, and real estate lose value, tax bases suffer. ...This is especially problematic after an oil spill because at the very time there is a greater need for public services to assist with the disaster, the volume of resources available to meet these needs decreases."[133] Following the Deepwater Horizon spill, the State of Alabama claimed tax losses calculated at a total of $164 million.[134]

**xviii. Legal Costs**

Significant costs may be incurred for legal services following an oil spill. For example, approximately $59 million was spent by the Spanish government following the *Prestige* spill.[135]

120. Despite its findings regarding the various cost categories, the Costs Report noted that more data is needed with regard to the impacts of oil spills on local governments, and found that costs for oil spills, especially future spills, are likely to be greater than those described.[136] As a result, while this data provides some information regarding the costs that are likely to be incurred by the City in responding to a spill, significant uncertainty remains.

121. Overall, the City finds that, notwithstanding the limitations in available data, a spill will have significant economic effects for the City. As discussed above, it also doubts whether

[131] Costs Report at pp. 24-25
[132] Costs Report at pp. 24-25
[133] Costs Report at p. 26
[134] Costs Report at p. 26
[135] Costs Report at pp. 26-27
[136] Costs Report at pp. 8-9

the current compensation regime will adequately provide for its financial needs and the needs of its community.

### *Public Health Impacts*

122. In addition to the economic impacts of a spill, the City is also concerned about the public health effects.

123. A report commissioned by Metro Vancouver and prepared by Levelton Consultants Ltd. (the "Levelton Report")[137] simulates air dispersion following an oil spill in 48 different scenarios. Results from the air quality modelling assessment were compared to acute inhalation exposure limits and the Protective Action Criteria (PAC), which is used to predict the potential health effects to the general public. The Report notes that PAC has three tiers of exposure limits for each chemical, each of which is associated with increasingly severe health effects:

- PAC-1: Mild, transient health effects.
- PAC-2: Irreversible or other serious health effects that could impair the ability to take protective action.
- PAC-3: Life-threatening health effects.[138]

124. The Levelton Report makes the following conclusions:

- There are predicted exceedances for the majority of pseudo-components, modelled as surrogate chemicals, of acute inhalation, PAC-1, or PAC-2 exposure thresholds.
- There are predicted exceedances for i-butane, n-pentane and n-hexane, modelled as surrogate chemicals, of PAC-3 exposure thresholds over water
- The Texas Commission on Environmental Quality (TCEQ) acute inhalation exposure benzene limit was exceeded in large areas of the study domain affecting a range of 133,100 to 1,077,700 people within the model domain for the different spill locations and scenarios considered. Note that the acute inhalation exposure limit contour extends beyond the model domain for all spill locations and therefore these are likely underestimates of the potential population affected.
- The maximum predicted one-hour concentrations for benzene and i-butane from an oil spill is during the first hour following an oil spill. Therefore, the greatest human health risk from benzene and i-butane is likely to occur during the first hour following an oil spill based on the simulated scenarios considered.[139]

125. The Report also finds that the study area was not large enough to capture the full extent of the potential impacts and only a few spill locations and meteorological conditions were considered. It notes that "if the study area was larger and a greater number of

[137] Metro Vancouver, Written Evidence, Exhibit 3 – "*Air Quality Impacts from Simulated Oil Spills in Burrard Inlet & English Bay*" Levelton Consultants Ltd. (A4L7Y8 ) ("Levelton Report")
[138] Levelton Report at p. iii
[139] Levelton Report at pp. iii-iv

possible spill locations and meteorological conditions were considered, the results would indicate a greater population affected and likely indicate higher concentrations than reported herein."[140]

126. Vancouver Coastal Health reviewed the available literature on the health impacts of oil spills, finding that the literature:

1. Contained evidence of short term and reversible physical health effects for people living close to spills
2. Contained evidence of potential long term physical effects for people involved in spill-clean-up; and
3. Under recognized the mental health impacts from spills on affected populations.[141]

127. Nuka also discussed the potential health effects of an oil spill in Burrard Inlet. It noted that following the 2010 Kalamazoo River spill, close to 150 hospital visits for neurological, cardiovascular, dermal, ocular, rental and respiratory problems were reported.[142]

128. Given the City's high population density, much of which is in close proximity to the waterfront, the City is concerned that the impacts of a spill on the health and safety of its residents and visitors would be significant.

### *Environmental and Cultural Impacts*

129. Based on its review of the evidence surrounding environmental effects of oil spills, the City has determined that a spill in Burrard Inlet would have significant impacts on shoreline habitat, wildlife and the present and future health of its environment.

130. As noted in the Nuka Spill Debrief, diminished response capacity can lead to the inability to mitigate significant portions of a spill. If a spill occurs during a multi-day response gap, it may remain unmitigated for several days until conditions improve, at which point the window of opportunity for effective on-water recovery may diminish or completely close.[143] Such a large response gap would result in significant amounts of oil remaining in the environment.

131. The JWS Report made several findings regarding the impacts of an oil spill in the Burrard Inlet on wildlife. The Report notes that a major spill from the Project could result in one of the top ten bird mortality events ever caused by oil spill. Mortalities on this scale could have effects on the food web of Burrard Inlet and the Fraser River estuary, and could have result in cascading impacts throughout the marine-dependent ecosystem.[144] Along with shorebirds, marine mammals are also very vulnerable and

[140] Levelton Report at p. iii
[141] Public Health Guidance Document at p. 11
[142] Nuka Spill Debrief at p. iv
[143] Nuka Spill Debrief at p. vi
[144] JWS Report at pp. 9-10

sensitive to oil contamination. In particular, a spill could jeopardize the viability of the endangered southern resident killer whale population, which would permanently alter the marine food web of the Salish Sea.[145] Many important species who reside on shorelines would also be impacted by a spill and the resulting shoreline oiling.[146] The JWS Report finds that "even spills considerably smaller than the credible worst case scenario of 16,000 m3 can have substantial adverse effects on sea- and shorebirds as well as marine mammals and other organisms inhabiting the sea surface, shorelines and the water column if the oil submerges."[147]

132. The effects of an oil spill may last far into the future. The JWS Report finds that once incorporated beneath the surface of these beaches, diluted bitumen may persist for several decades or more in low-oxygen environments, posing long-term threats to various organisms. In addition, once oil is ingested, predator species may be indirectly exposed.[148]

133. Given the importance of the natural environment to the community, the City is also concerned that an oil spill will result in significant cultural and social impacts. As discussed in the City's Written Evidence, many of its beaches, parks, trails and other waterfront areas serve as important gathering spaces, hosting concerts, plays, farmers markets and festivals, and providing areas for community engagement and togetherness. An oil spill may force the City to limit access to these areas and cancel important community events.

134. Finally, although not within the scope of the Board's assessment, the City is also concerned with the impact of the Project on climate change. The extraction, processing and burning of oil transported by the Project will contribute to GHG emissions which in turn contribute to climate change and its associated effects.

135. The City shares important characteristics in common with the City of Vancouver and other municipalities surrounding Burrard Inlet which make it particularly vulnerable to the effects of climate change, including its highly developed and densely-populated waterfront which is vulnerable to flooding resulting from rises in sea levels and its susceptibility to the increased frequency and severity of extreme weather and changing precipitation.[149]

## III. Conclusion Regarding Impacts

136. Based on its review of the evidence, the City agrees that "Local governments are on the front lines of oil spills....Municipalities bear the physical scars of spills on the landscape, experience the core losses to their economies, and confront the long-term effects through

[145] JWS Report at p. 10
[146] JWS Report at pp. 10-11
[147] JWS Report at p. 12
[148] JWS Report at pp. 11-12
[149] City of Vancouver, Written Evidence at pp. 12-13)

costly and long-lasting recoveries."[150] The short and long term impacts of a spill in Burrard Inlet would be significant for the City.

137. The City also notes its experience during the *M/V Marathassa* oil spill, which, although relatively small, resulted in a range of impacts for the City and surrounding communities. Through that experience, the City came to appreciate that there is significant uncertainty involved in anticipating the long-term consequences of a spill.

138. The weight of the evidence before the Board is that the City and other local communities will bear the burden of a spill resulting from the Project. These potential adverse effects, which may be compounded by an inadequate understanding of the true risk associated with the Project as well as insufficient emergency response planning, are not justified in the circumstances. As a result, the Board should recommend against approval of the Project.

[150] Costs Report at p. 6

## Part D: Proposed Conditions

In light of the risks posed by the Project, the City of North Vancouver does not support its approval. However, should the Project be approved, the City submits that the following conditions are necessary to mitigate some of its concerns.

### 1. Emergency Management and Response Plans

As outlined above, the experience of the City, NSEM, the City of Vancouver, and other local authorities during the *M/V Marathassa* spill highlighted the importance of a well-planned and well-coordinated emergency response. Drawing on this experience, the City recommends a number of ways in which emergency management and response plans for the Project can be improved.

In the Nuka Spill Debrief, Nuka identified the following three critical outcomes for the City of Vancouver in managing oil spill response:

- Ensure City role and participation in Unified Command.
- Be prepared to manage convergent volunteers.
- Be prepared to collect the necessary information (samples, monitoring, etc.) to assess potential human health impacts and communicate those clearly to the public.

The City identifies these as critical outcomes for its own response to future spills. It also notes that all of these outcomes depend on the City having input into spill response and emergency management as well as access to certain resources.

In the Public Health Guidance Report, the Health Authorities outline the findings of a literature review regarding the health impact of an oil spill, which revealed a number of practical ways to improve response to future spills. Although the Health Authorities speak from a public health perspective, these outcomes are also helpful when considered generally. The Report recommends:

- Increased inclusion of human health considerations in response planning, including pre-positioning and sourcing of environmental and human exposure monitoring equipment, stockpile of personal protective equipment (PPE) for volunteers and paid responders, as well as pre determined health surveillance approaches to enable rapid initiation of physical and mental health monitoring
- Systematic assignment and deployment of clean-up work that are based on expertise, skills, as well as health status
- Orientation of clean-up workers, whether paid or voluntary, on personal health and safety while on clean-up duty, and sufficient supply of PPE
- Communication with the affected populations that is timely, transparent, credible, and bi-directional (for example inclusion of the community's input in planning clean-up and determining end points)
- Ensure and strengthen social support within the affected community

- Facilitate rapid and satisfactory compensation to the affected populations"[151]

The City agrees with the evidence presented by the City of Vancouver and the Health Authorities. It believes that a well-drafted emergency management plan must provide for local needs by including clearly defined roles for local authorities, including local governments, in spill prevention and response; requiring meaningful consultation and communication; ensuring the availability of appropriate training and resources; and providing for a clear and comprehensive compensation regime. The proposed conditions relating to these changes are discussed in detail below.

### *a. Input from Local Authorities in Development of Emergency Response Plans*

In order to mitigate some of the risks associated with the Project, it is critical that local governments and other local authorities have significant input into emergency management and response plans. One major area where local government input should be considered is in defining end points, which should be done prior to any incident occurring. It is the City's view that the emergency management plan presented by Trans Mountain lacks clear information regarding clean-up end points and when they will be reached. As noted by the Health Authorities, there is also a need for human activities and habitat baseline data to facilitate remediation decisions; without this data, remediation and end point determinations following a large spill will be very difficult.[152]

The lack of definition regarding end points was a significant concern during the *M/V Marathassa* spill, as there did not appear to be any objective criteria for reaching end-points, making it difficult for parties to agree when clean-up would be considered complete. NSEM describes its experience as follows:

> "John Lawson Beach [in the District of West Vancouver] would not have been adequately cleaned up to the appropriate level of beach end point criteria if not for the insistence of the District of West Vancouver that an independent analysis of the beach be done. Unified Command was prepared to leave this beach cleaned to the level of the normal standard for beach clean-up end points which allows for globules of oil to be present. However, the District of West Vancouver insisted that this standard be modified to take into account the high public use of this beach and the potential exposure to the public."[153]

In developing clean-up end points, it is the City's position that all relevant factors must be taken into account. For example, when developing end points for beaches, all aspects of the beach should be considered, including environmental sensitivity, human use and cultural importance.[154] In addition, end points should be agreed upon and made available in an emergency management plan prior to a spill occurring. During the *M/V Marathassa* spill response, local governments were required to be strong advocates both in the field and in the Incident Command Post to

[151] Public Health Guidance Document at pp. 11-12
[152] Health Authorities Letter at p. 3
[153] NSEM Affidavit at para. 6.8 (a)
[154] NSEM Affidavit at para. 6.8 (e)

ensure that their needs and concerns were considered, despite the fact that the shoreline clean-up process is intended to be a consultative decision-making process.[155] Uncertainty and conflict could be avoided to some degree if end points were agreed upon in advance of a spill.

Trans Mountain's EMP does not appear to achieve these goals related to end-points. In particular, there does not appear to be any objective standards for what end points are appropriate for very high public use beaches.[156]

Should the Project be approved, the City submits that a requirement for Trans Mountain to consult with local authorities regarding the development of emergency management and response plans, and in particular in defining clean-up end points, should be made a condition of approval.

### *b. Clear Role for Local Authorities in Emergency Response*

In addition to the need to consult with local authorities and define end points, it is critical that the emergency management and response plans for the Project include a clear role for local authorities. The importance of this factor was demonstrated most recently during the response to the *M/V Marathassa* spill.

As noted in the evidence of NSEM, during the process of responding to the oil spill in English Bay, the North Shore local governments and the City of Vancouver made it clear that they wished to participate in Unified Command.[157] Once local governments arrived at Unified Command, they were informed that the Canadian Coast Guard ("CCG") retains the ability to make the final decision on spill response and recovery activities.[158] Although local governments, including the City, did play a role in the spill response, the City agrees with NSEM that participation would have been improved had the role of local governments in the response activities and Unified Command been better defined.[159] For example, had a clear role been established, the City and NSEM would likely have been notified of the spill earlier.

Overall, the City shares NSEM's view that it is critical that all impacted local governments have a voice at the Unified Command table in order to ensure that local knowledge is incorporated into spill response and local needs are considered and addressed.[160] While local governments play a key role during spill response and recovery, they must also deal with the consequences of emergency management and response decisions made by other parties.

Vancouver Coastal Health and Fraser Health also emphasize the importance of a clear understanding of the role of local authorities in spill response and mitigation. In their May 25, 2015 letter, the Health Authorities recommended that a systems-wide vulnerability and risk

[155] NSEM Affidavit at para. 6.9 (c)
[156] NSEM Affidavit at para. 6.12 (f)
[157] NSEM Affidavit at para. 6.2 (a)
[158] NSEM Affidavit at para. 6.2 (b)
[159] NSEM Affidavit at para. 6.2 (a)
[160] NSEM Affidavit at paras. 6.1-6.2 and 7.3

analyses be conducted to ensure that the various spill response agencies are able to react in a competent and coordinated manner:

> "A multitude of agencies with overlapping jurisdictions responded to the recent MV Marathassa fuel spill. The incident highlighted the fact that spill prevention, response, and mitigation depends on the correct and competent performance of many players, their interactions, as well as the adequacy of the supporting legislative framework. In our guidance document we recommended that "a systems theory based oil spills risk analysis of this project be undertaken that encompasses all the elements underlying the project such as legislation, governmental oversight, local community capacity, as well as private organizations throughout the supply chain". We are not aware that such systems wide vulnerability and risk analyses have taken place for possible spills in the Burrard Inlet and as well in the Fraser River that may arise from the project."[161]

In the same letter, the Health Authorities also commented that "have not seen a comprehensive emergency response plan from the proponent, which includes how the proponent intends to work/communicate with health authorities and other agencies, and how it intends to assess and monitor exposure in the event of a spill and to share all the information necessary to make timely public health and safety decisions."[162] The City agrees that, in addition to local governments, health authorities must be included in and have input into incident notification protocols. Not unlike local governments, health authorities must participate as soon as possible in the risk assessment and risk mitigation decisions with respect to the general population as well as first responders that may be affected by the incident.[163]

Should the Project be approved, the City submits that, as a condition of approval, Trans Mountain must be required to consult with local authorities, including municipalities, and develop emergency management and response plans and protocols that provide a clear role for local authorities, including a requirement that all impacted local governments be permitted to participate in Unified Command in the event of a spill.

### *c. Local Government Access to Training and Resources*

The City also has concerns regarding the lack of adequate training and other resources provided to local authorities. As discussed above, no tabletop exercises have been done by Trans Mountain or its spill response agency WCMRC for the Project specifically with the North Shore municipalities. Such tabletop exercises are essential in planning for any potential oil spill.[164] Although WCMRC has initiated the development of Geographic Response Plans in a few areas of the North Shore, significantly more work needs to be done; such plans are critical in determining how to respond to an oil spill and must involve significant input for the communities.[165]

---

[161] Health Authorities Letter at p. 2
[162] Health Authorities Letter at p. 3
[163] Public Health Guidance Document at p. 14
[164] NSEM Affidavit at para. 4.1
[165] NSEM Affidavit at para. 4.2

The City of Vancouver has raised similar concerns regarding spill response training and preparation. The City of Vancouver notes that "[d]espite the potential for major impacts to the City of Vancouver in the event of a spill, the Office of Emergency Management has never been invited by Trans Mountain to participate in the Unified Command structure in an exercise simulating a spill or incident from a Trans Mountain tanker in the Burrard Inlet or at the Westridge Terminal. OEM has also never been invited by WCMRC or the CCG to participate beyond the role of observer in table-top or functional exercises that simulate spills in the Burrard Inlet or Lower Fraser River."[166] Further, the City of Vancouver has been unable to obtain an oil spill response plan from the CCG or WCMRC that clearly explains how spills in the Burrard Inlet will be managed, or how the risks to the public of a spill in this densely populated area will be addressed.[167] As highlighted above, coordinated response to a spill in the Burrard Inlet is crucial to reducing the negative impacts of such an incident.

In addition to a lack of training, the City is concerned that the EMP will fail to provide adequate resources to local governments to assist them in dealing with a spill. This concern was highlighted during the *M/V Marathassa* spill, where support available from Unified Command and the Responsible Party was very limited. The City and other North Shore municipalities were forced to prepare and set up signs and provide staff members and volunteers to warn the public to stay off of the beaches.[168] No support or resources were provided by Unified Command or the Responsible Party for dealing with volunteers from the public.[169] Furthermore, as mentioned earlier, the Responsible Party objected to higher clean-up standards for John Lawson Beach, indicating that they did not want to pay for additional experts to assess the shoreline.[170] As noted in its Written Evidence, the City of Vancouver experienced similar challenges and incurred similar costs in its response.[171]

NSEM notes that in order to properly and adequately respond to a spill in Burrard Inlet in the future, equipment caches should be located on the North Shore to protect the shoreline, and personnel should be made available to activate this equipment. If there is an expectation that municipal staff will activate the equipment, they should be provided with proper training.[172] The City also agrees with NSEM's view that an Incident Command Post be located on the North Shore whenever there is an impact to North Shore communities.[173]

The Health Authorities have expressed significant concerns regarding spill response and emergency management from a public health perspective. In their May 25, 2015 letter, they note that much of the spill preparedness related to the Project is focused on minimizing environmental damage, while little information is available regarding the ability of Trans Mountain and WCMRC to respond to an oil spill from the human health and safety perspective. In particular,

[166] City of Vancouver, Written Evidence at p. 54
[167] NSEM Affidavit at para. 6.9
[168] NSEM Affidavit at para. 6.9 (a)
[169] NSEM Affidavit at para. 6.9 (d)
[170] NSEM Affidavit at para. 6.10 (a)
[171] City of Vancouver, Written Evidence at pp. 43-44
[172] NSEM Affidavit at para. 7.1
[173] NSEM Affidavit at para. 7.2

the Health Authorities note that the proper resources and equipment may not be available to protect and monitor the public health effects of a spill:

> "It is unknown whether equipment such as air quality monitors, personal protective equipment for responders (other than for [WCMRC] and IMP staff), and volunteers are part of the prepositioned supply and ready for deployment. It is also unknown whether the proponent and its designated oil spill response agency [WCMRC] have oil spill related environmental health, toxicology, and laboratory expertise on standby that can be deployed in a timely way following a spill. The health authorities do not have such equipment, nor the specific expertise on oil spills."[174]

The Health Authorities also identify as a major issue the capacity to monitor specific chemical substances released following a large oil spill and to track their dispersion in real time:

> "The capacity to quickly identify and track the chemical substances being released is important for evidence based and timely public health decisions to ensure the health and well being of the public. The health authorities do not have the capacity for monitoring chemicals released following a large oil spill. It is not known whether or not the designated lead response agency, [West Coast Marine Response Corporation], or the pipeline operator has such capacity locally. Metro Vancouver commissioned air dispersion modelling suggests that the concentrations of the released petroleum chemicals will be highest in the first hour or two following the spill. It is not certain whether such air monitoring equipment, even if available, can be deployed quickly enough to be useful for assisting the initial public health and safety decisions."[175]

Should the Project be approved, the City submits that the Trans Mountain must be required to provide adequate training and resources to local authorities, including municipalities. Due to their involvement in spill response, local authorities should be included in emergency planning and training exercises, and the City encourages further opportunities to participate in exercises and planning. Trans Mountain should also be required to establish a program to ensure that local authorities are provided with sufficient resources to adequately respond to Project-related spills, including the resources identified by NSEM and the Health Authorities as discussed above.

### 2. Adequate Compensation Regime

As discussed above, it is the City's view that the current compensation regime for the Project may result in no or uncertain levels of compensation for local authorities. This compounds the risk borne by local communities and further compromises their ability to effectively deal with the impacts of a spill.

If the Project is approved, a requirement for Trans Mountain to establish an adequate cost recovery model should be made a condition of approval. The model should be acceptable to local governments and should compensate local governments and other local authorities for

[174] Public Health Guidance Document at p. 13
[175] Health Authorities Letter at p. 2

community impacts in the event of a spill, including costs associated with spill response and remediation and economic losses arising from loss of park and amenity use.

All of which is respectfully submitted.

Dated January 11, 2016 in the City of North Vancouver.