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Order of Appearances

Northern Gateway Panel 2

Marine Emergency Preparedness & Response

Mr. John Carruthers	Mr. Randy Belore	Mr. Jeffrey Green
Dr. Alan Maki	Mr. Owen McHugh	Mr. Greg Milne
Mr. Jon Moore	Dr. Edward Owens	Dr. Walter Pearson
Dr. Jack Ruitenbeek	Dr. Malcolm Stephenson	Mr. John Thompson
Mr. Chris Wooley		

Examination by Mr. Chris Jones for the Province of BC (continued) 4483

Examination by Ms. Terry-Lynn Williams-Davidson for Haida Nation 5011

Examination by Ms. Karen Campbell for the Coalition 5699

Examination by Mr. Chris Jones for the Province of BC (continued)

4483

Mass balance scenarios

Environment Canada (EC) reviewed Northern Gateway Pipelines (NGP) evidence relating to marine spill modelling and environmental consequences [[Exhibit E9-39-2](#)]. Mr. Jones put up NGP's response to this evidence [[Exhibit B164-13](#)], and turned to Adobe 33 to begin a set of questions about mass balance scenarios. EC had said that "risk matrix" scenarios are widely used. NGP had agreed, saying that the approach "can be part of the detailed contingency planning process post Project approval." Mr. Jones asked, "Why would that [risk matrix modelling] have not been done now as opposed to in the detailed planning phase?" 4483

Mr. Jeffrey Green replied, "There's a number of different ways that we could have employed modelling for assessment of environmental effects and for looking at spill response scenarios." NGP chose to look at increased risk areas as identified through the DNV (Det Norske Veritas) modelling, and developed detailed, locally-specific trajectory models. Mr Green described some of that process. 4490

Mr. Owen McHugh said NGP "want to use a scenario-based approach to developing detailed oil spill response plans. ... We don't control where the oil goes. That's the weather. So you can only pick the selected sites and then it's really up to the environment on a specific day, if this ever occurred, of which way the oil would move and how it would react. ... The important piece that Environment Canada was getting at here [[Adobe 34](#)] is the use of stochastic modelling to make effects types predictions." 4500

Mr. Green: "We don't believe that either approach would end up with a different environmental consequence. Given the right weather conditions, the right proximity of environmental resources, the effects, we believe, most certainly will be adverse. And depending on just how the oil interacts with different resources, there's a high likelihood that effects on certain VECs would be significant." 4512

Discussion continued about the implications of stochastic modelling, the state of the art technologies and approaches to modelling, and six weather stations NGP installed in the confined channel assessment area (CCAA). 4520

Mr. Jones quoted, “*Technology and approaches are continuously evolving. Northern Gateway will apply state-of-the-art technologies and approaches to modelling, post Project Certificate, for the purposes of marine emergency preparedness and response planning.*” [Exhibit B164-13, Adobe 7] He asked, “Does that suggest that Northern Gateway has not chosen state-of-the-art technologies and approaches to modeling at this point?” Mr. McHugh rejected the suggestion and spoke about the evolution of modelling technologies, and that “models are fit to purpose. You design them for what you want to use them for.” He also noted that in 2005-2006, NGP had “installed six weather stations or met stations throughout the confined channel” to improve their modelling. 4531

Geographic Response Plans candidate sites work group

Mr. Jones turned to “GRP Site Selection” [Adobe 16] and asked, “What is the GRP Candidate Sites workgroup?” Mr. McHugh said, “It would ... be on an area-specific basis; so it would include the relevant communities and stakeholders within a certain area [to identify local sensitivities] ... It could also be a larger working group with other industry partners, the B.C. government, the federal government, Western Canada, to actually decide what is the best format.” 4550

Mr. Jones asked “Is it Northern Gateway’s intention at the end of the day that it would make a decision ... about what areas would ... be the subject matter of a geographic response plan?” Mr. McHugh and Mr. Green contributed to the reply, the essence of which is that NGP has made a commitment to gather many types of data, in detail in the confined channel assessment area. Mr. Green listed a number of specific studies. Mr. McHugh said that much of what they just said is “one page up.” [Adobe 15] 4556

When Mr. Jones concluded that “ultimately it’s Northern Gateway’s call about which areas it chooses to do geographic response plans in,” Mr. McHugh replied, “I don’t think that’s the case at all. ... You may identify a whole bunch of candidate sites and then working through those groups you’ll have a system in place to actually determine what the most appropriate sites are.” Mr. Jones: “Would you describe that as a consensual approach?” Mr. McHugh: “That’s a fundamental principle behind geographic response planning.” 4582

Limited benefits of further modelling

Mr. Jones said that “Northern Gateway indicates that further modelling at this time is not necessary to conclude that the effects of a marine spill would be significant and adverse.” [Adobe 23] which Mr. Green said earlier. He asked whether, even if “further modelling wouldn’t change a conclusion that an oil spill would be adverse, ... wouldn’t additional modelling indicate how adverse or how significant?” Mr. Green said, “That would be an extraordinarily hard task to undertake. ... We don’t have the quality of data. The EA would not come out with any different conclusion.” 4590

Mr. McHugh added that there is no useful purpose in doing more stochastic modelling in the confined channel assessment area because the models would conclude there is “high probability of shoreline oiling. And we know that. We don’t need to do stochastic modeling to determine that fact.” 4601

Mr. Green also added that the quality of available data limits the quality of continued modelling. As an example, he said, “If you really wanted to predict percentage of effects on birds ... you would have to know where the birds are at 6 hours, at 12 hours, at 24 hours, at 48 and so on and we simply do not have that kind of information. One would have to start building in all sorts of assumptions about bird distribution and behaviour.” Mr. Jon Moore said, “When you ... do have a spill you find ... that often the results of those sorts of analysis have not ... helped you.” 4606

Dr. Malcolm Stephenson said, “Your question was really asking: Wouldn’t more modeling be helpful to show how adverse a spill could be?” He referred to [Exhibit B23-15](#), Adobe 58 which indicates that a large 36,000 cubic metre spill has a very low frequency of occurring, whereas “the more likely spills are much smaller spills. ... By doing spills that range ... from 250 cubic metres up to 36,000 cubic metres, we have explored that range of possible adversity. So your question: “How adverse?” We’ve given you the end point on that. In fact, much more credible scenarios would be much less adverse.” Mr. McHugh said, “Instead of trying to say how about we use modelling to determine exactly where an incident occurs, ... we made an assumption ... [that] all marine areas are sensitive areas. ... The entire area ... is considered a high consequence area.” 4626

Wind and wave selection criteria – the most likely outcomes

Mr. Jones asked if the mass balance scenarios used “average wave and wind conditions for the June and December periods.” Mr. McHugh said they used non-averaged datasets from Environment Canada wind stations for specific periods. Mr. Jones: “Was a particular wind and wave circumstance chosen then? Like a particular day or the worst day of a month?” Mr. McHugh said that “a month of stochastic data for the same period” was selected for the scenarios. 4637

Mr. McHugh put up a technical data report and Figure 4-12 as an example [[Exhibit B25-2](#), Adobe 77]. He said, “What we are showing is what would be the most likely type of trajectory based on the stochastic modelling.” Mr. Jones replied, “Having chosen the most likely case, the scenarios that are depicted don’t choose what would be the worst case wind and wave circumstance.” Mr. Randy Belore described some preliminary models were run after which a human operator selected from them. “The attempt ... was to find the most credible movement of oil in that month.” Dr. Alan Maki added, “Extreme outcomes ... the disaster consequence. Taken to its extreme, you can use stochastic modelling to define the probability that a meteor will drop into Kitimat outlet and change the entire ecology. ... It’s most useful for our purpose ... to define the family of options that are the most likely outcomes.” 4689

Mr. McHugh said, “If you want to talk about worse case, ... the original DNV risk assessment [reports] in terms of what is worse case discharge ... and the most likely locations for those in terms of increase risk area.” 4718

Mr. Jones put up IR 14.4 [[Exhibit B164-13](#), Adobe 29] in which NGP said it had a crew conduct an overflight during the Queen of the North spill. He asked what was the purpose of that flight. Mr. McHugh said it was “To get a general movement, but ... within that one hour, you’re not seeing the movement. But the general spill path [compared] against what was predicted in the stochastic for the Wright Sound example were in quite good alignment.” 4720

Validating spill models

Mr. Jones asked about validation of spill models, following from NGP’s statement [Adobe 29] that “*good spill model validation does not necessarily require modeling actual incidents in the locale of interest. Well documented spills in any location with a similar environment are suitable for validating a spill model.*” Mr. Belore said that “there have not been large spills on the B.C. coast to be able to validate the model.” Mr. McHugh said that Mr. Jones was interpreting the statement in a way it was not intended, but that NGP “wishes to determine the suitable approaches for validation and/or calibration of spill models.” 4736

Mr. Jones quoted from number 4 [Adobe 31] that Environment Canada said, “*The consequence analysis should be conducted for each of the selected spill sites.*” NGP said, “*This work can be undertaken using the stochastic approach within the risk matrix framework, as part of the detailed contingency planning....*” He asked what NGP means by “can be undertaken.” Using Figure 2-1: the Proposed Scientific Advisory Committee Management and Facilitation Structure [Adobe 13], Mr. McHugh said, “We want this scope to remain fairly flexible and the ability ... to examine the most important elements first. Then this can feed back into the detailed contingency planning. There are pieces that we know we’ll have to do first ... and there are pieces that I would consider extras.” 4767

Mr. Jones asked more questions about statements in [Exhibit B164-13](#), particularly with respect to points where NGP “*agrees with Environment Canada’s response and is supportive of undertaking this work.*” Mr. McHugh said, “We do have a lot of agreement with Environment Canada on almost everything, [and] the modelling that we’ve completed to date we feel is sufficient for the environmental effects assessment.” Details of these questions and answers should be read in the transcript. 4778

Mr. Jones quoted, “Refinement of the dispersion modelling process would not alter the conclusions of the spill impact assessments or the spill response planning.” [Adobe 53]. He asked, “Why would refinement of the dispersion modelling not alter spill response planning?” Mr. McHugh and Mr. Belore replied that essentially they understand the dispersion and behaviour of the products they will be transporting. “We’ve covered the range from a light product with a higher dispersion rate through to something that remains on the surface. And so your actual spill response planning elements would be covered by those products.” 4799

Mr. Belore said “The three different products cover a wide range of behaviours with the diluted bitumen products remaining primarily on the surface, the condensate primarily dispersing or evaporating very rapidly and the synthetic crude, somewhere in the middle but probably closer to the condensate.” Dr. Stephenson commented on spill impact assessment and potential oiling of birds, shorelines, and organisms in the water column. He said these impacts could happen “and the absolute amount didn’t really matter.” “The approach that we took was relatively insensitive to [different dispersion possibilities] and this dispersion question wouldn’t have changed our conclusions regarding the environmental effect side.” 4807

Environmental effects that are both likely and adverse

Mr. Jones asked if NGP is of the view that the Joint Review Panel could not, as part of its mandate under the CEA Act, take into account potential effects of the project that have a likelihood of less than 50 percent, irrespective of the gravity of the effects? He was referring to this quote, “*Only environmental effects that are both likely and adverse can be considered in determinations of significance. If environmental effects are not both likely to occur and adverse, then they cannot be taken into consideration in a determination of significance under the Act*” [Exhibit B164-13, Adobe 59] Mr. Green replied: “What the Panel decides, that’s up to the Panel. ... Adverse effects [are] the emphasis of the Act, and then likelihood is an important part of the consideration.” As to Mr. Jones’ “50%,” Mr. Green said, “In environmental assessment, [we talk] about effects being likely or unlikely and it’s not typically associated with a probability.” 4823

Environment Canada had said that NGP’s “ecological study was not conducted according to methodology described by the CCME.” NGP had replied that “*It has been concluded that the environmental effects of oil spills in the marine environment, ranging in size from 250 m³ to 36,000 m³, could be adverse in the context of the Canadian Environmental Assessment Act. This conclusion is sufficient for the present management purpose (the environmental assessment process under the Act), and no evaluation at a higher tier under the ERA process is likely to alter this fundamental conclusion.*” [Adobe 60] 4835

Mr. Jones asked that this be explained. Dr. Stephenson said, “Environment Canada was critical of the methodology that was applied in the ecological risk assessment study and was arguing that more detailed methodology ought to have been applied. Ecological risk assessment in Canada is conducted under guidance that was prepared by the Canadian Council of Ministers and the Environment and they’re very clear that ecological risk assessments should be done in a tiered and step-wise fashion. You start at a simple level and if you get an answer that is adequate for the management purposes that you’re applying the analysis to then you can stop.” 4838

Mr. Jones asked about the statement that “*The selection of additional scenarios will be based on the need of the project, post Project approval.*” [Adobe 66] Mr. McHugh said that this is part of the geographic response planning process, “so if there are examples that will help ...the communities understand what the potential could look like, then that’s what we’re intending there.” 4855

Spill scenarios from the application

Mr. Jones turned to the scenarios at the end of Volume 8C [[Exhibit B3-42](#), Adobe 7] and put up Table10-1, “Mass Balance Estimates for a 10,000 m³ Synthetic Oil Spill off Emilia Island during Winter” and asked why only 5% of the oil is indicated as having washed ashore after 12 hours. Mr. McHugh said, “What you’re seeing here is primarily based on the currents and the winds within this region. You’re actually getting movement along the channel for the first period of time before it’s contacting shore.” 4876

Mr. Jones asked about a statement regarding the use of escort tugs for lightering (removing cargo) a grounded tanker. [Adobe 8], specifically “Emergency lightering pumps on escort tugs are used to begin the offload of cargo from damaged tanks to internal tanks on tugs or barges.” He asked if instead of lightering, the tugs shouldn’t be engaged first in stabilization of the vessel. Mr. McHugh agreed that “their primary function is to the tanker itself ... controlling the tanker and its movements.” 4887

Mr. Jones quoted, “In the event of fire, the shipmaster activates the Marine Fire Response Teams and notify the Kitimat Fire Department.” [Adobe 9]. Mr. McHugh said that the escort tugs themselves will be “fire capable” and “primarily, the marine fire response teams would be the escort tugs.” Mr. Jones asked about the Kitimat Fire Department. Mr. Greg Milne said that it is “standard practice to notify stakeholders and potential responders.” 4901

Noting the quote that “During successive winter storms, high seas and swells, combined with strong crosswinds and currents, create difficult navigational conditions in Caamaño Sound” [Adobe 26], Mr. Jones asked if these conditions would make a spill response not possible. Mr. McHugh replied, “There’s always a response, environmental conditions present challenges to certain forms of response but you evaluate the options and you respond in different ways.” 4912

To a statement that NGP would take action to remunerate affected individuals in the case of an oil spill, [Adobe 71] Mr. Jones asked if that would only be the case where NGP is the responsible party. Mr. McHugh agreed that is the case but mentioned “the harvesting studies which are a good example of a way in which Northern Gateway’s gone and above and beyond to ensure that communities and their traditional harvests are compensable under the existing fund regime that’s in place.” 4925

Funding the costs to ensure rapid response participation

Mr. Jones quoted “Agencies, authorities or private companies that participate in the response may have to bear the initial cost of their involvement or make arrangements with the RP or its insurer to cover those costs,” from TERMPOL 3.18 [[Exhibit B23-16](#), Adobe 13] He asked, “Would Northern Gateway [provide] a fund to cover these costs prior to an incident occurring as part of its contingency planning which could then enable everyone to focus on the response when the incident occurs?” Mr. John Carruthers noted that “there is a very well-established regime to compensate in an event of a marine spill,” and “The response ... will have ... significantly more equipment there than is regulated. ... The big costs are there and they’re being borne by the Project already. We start with prevention though because we don’t want to pay those costs either.” 4932

Mr. Jones said, “For groups that might have a challenge in bearing the initial costs such as First Nations groups ... would you see their role as then coming a bit later if they were delayed by the need to find a way to deal with those upfront costs?” Mr. Carruthers said, “Those would be covered through agreements with the response organization.” 4948

From the Ship Source Oil Pollution Fund website, Mr. Jones quoted, “*The measures taken and the costs and expenses incurred must be reasonable under prevailing circumstances.*” He asked, “Is NGP willing to work with the Province and First Nations and others to try to agree on measures that they would consider reasonable to eliminate this issue in the event of a spill?” Mr. Carruthers began his reply: “Very much so.” 4955

Transport Canada designates shipping routes

Mr. Jones put up a map, Figure 6-4, “Important Ecological and Biological Areas in the Open Water Area” [Exhibit B3-28, Adobe 7]. He asked, “Would NGP ... commit to require tankers to use defined tankers routes through the Open Water Area to maintain maximum distances from shorelines and to avoid or minimize transits through these areas?” Mr. McHugh said, “These are safe navigation routes. They have been assessed and reviewed by the TERMPOL committee and they came out with the recommendation that they did feel these are safe navigation routes. ... Designating specific shipping routes ... is an issue for Transport Canada.” 4965

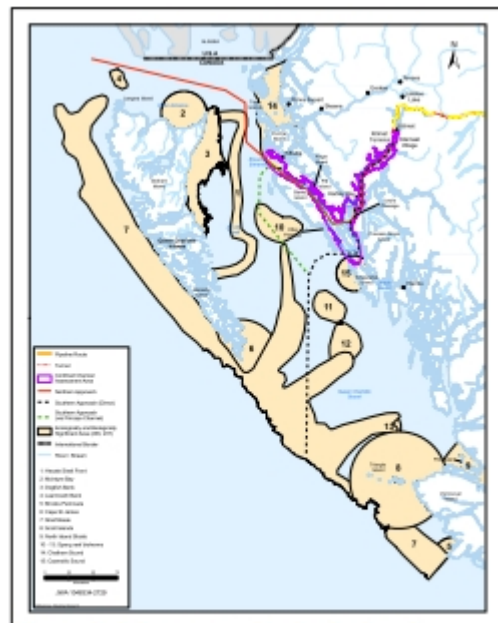


Figure 6-4, Important Ecological and Biological Areas in the Open Water Area, B3-28

Mr. Jones quoted again from Volume 8C [Exhibit B3-41, Adobe 3] in 9.2.3 concerning heritage resources: “The British Columbia Archaeology Branch would immediately release a series of mitigation measures.” He asked what this meant. Mr. Green explained that “under the laws of British Columbia, you cannot disturb or damage archaeological resources and they would have to be consulting as to what is the best approach for dealing with sites that may be at risk or have already been oiled. ... The archaeology branch has the ultimate authority. And operating without their approval would be in violation of the Acts protecting archaeological resources.” 4976

Examination by Ms. Terry-Lynn Williams-Davidson for Haida Nation 5011

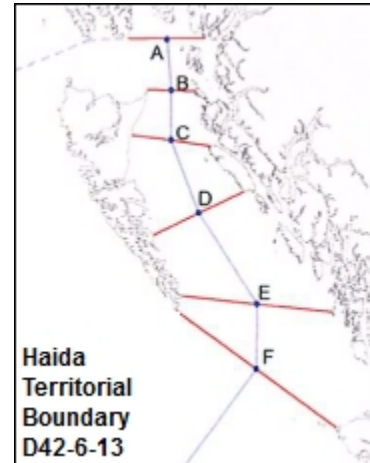
Effects of hydrocarbons on Haida lands and waters

“I am gid7ahl-gudsllaay lalaxaaygans, Terri-Lynn Williams-Davidson.” Ms. Williams-Davidson introduced her co-counsel, Sophia Nishimoto of White Raven Law Corporation, other Haida members present, and the people of Haida Gwaii who are

listening to the proceedings. She said she would refer to species using Haida names, as well as English names. “Our questions will be directed at the effects of hydrocarbons on the lands and waters of Haida territory, specifically Haida territory. Our focus will be on the ecological values with cultural importance to the Haida Nation. 5011

Haida Gwaii has most of the significant ocean areas in the Open Water Area

Ms. Williams-Davidson’s first exhibit was a map of Haida territory [Exhibit D42-6-13, Adobe 1]. Mr. Carruthers confirmed that the Haida lands are completely surrounded by water, and that the NGP marine routes go through or are immediately adjacent to the marine portion of the Haida territory. Ms. Williams-Davidson then put up Figure 6-1, “Ecosections within the Open Water Area” from Volume 8C [Exhibit No. B3-38, Adobe 3] She noted that two-thirds, or “eight of the twelve oceanographic areas of significance surround Haida Gwaii.” 5021



The Northern Route

Ms. Williams-Davidson focussed on the Northern Route, said that 45 of the 50 VLCCs will be traversing Dixon Entrance, based on Table 4-2, “Assumed distribution of ship traffic to and from the Kitimat Marine Terminal” [Exhibit B23-15, Adobe 44]. Based on the Ecosections map, she said that four oceanographic areas of significance in the Haida Territory are impacted by the Northern Route. 5055

Focused on three species: black seaweed, Dungeness clam, razor clam

Ms. Williams-Davidson said she wanted to focus on three species that are important culturally and economically to the Haida. The detailed discussion is definitely worth reading in the transcript. 5088

The first of these is *sGyuu*, black seaweed (*Porphyra*). She established that NGP had filed no information about this species, though it was mapped in the Haida Marine Traditional Knowledge (HMTK) [Exhibit D42-7-47, Figure 3] and its significance had been made explicit in the oral submissions. Mr. Moore and Dr. Maki discussed the habitat and characteristics of the marine algae. Dr. Maki said “They don’t seem to be very susceptible to hydrocarbons at all, from a toxic standpoint. The main concern would be in a heavy oiling scenario where you may have physical smothering.” Mr. Moore said, “It recovers extremely rapidly and you can’t really tell the difference very soon after a spill ... from beforehand.” 5091-5161

Spill response, shoreline assessment and clean up process was discussed. Mr. Moore added, “The likelihood of oil remaining on the sorts of habitat where the black seaweed grows is quite limited.” Ms. Williams-Davidson asked when is the most sensitive time for black seaweed. Dr. Maki replied that it was springtime, when it is warmer, the days are longer, and the spores are in the water. Dr. Edward Owens said that it “characteristic of oil spills world-wide, is that oil strands in typically the upper half or the upper one-third of the intertidal zone. ... In most cases no oil gets stranded in that lower half of the

intertidal zone.” Ms. Williams-Davidson said this black seaweed grows in the upper intertidal area. Discussion of black seaweed begins at 5162-5259.

Dungeness Crab

Ms. Williams-Davidson put up Figure 8-1, “Summary of Biological Important Areas for Marine Benthos in the Open Water Area” [[Exhibit B3-39](#), Adobe 13]. “We want to begin with two species that are located at or near Naikun, Rose Spit, ... the northeastern tip of Haida Gwaii. [This] is a very special area to the Haida people since according to oral histories, the Haida people emerged from that area out of the beaches of Rose Spit, Naikun.” Focussing on *K’ust’aan*, Dungeness Crab (*Metacarcinus magister*), she stated that the largest landings in BC come from that area, and asked what the effect of an oil spill in that area would be on crab. 5271

Dr. Maki cited a study done in Prince William Sound (PWS) two and three years after the Exxon Valdez oil spill (EVOS). The crabs in PWS are related, but are not Dungeness, and the researchers “were unable to find any significant effects on any parameters of the growth or survival or reproductive performance of those benthic crabs in the Prince William Sound area.” Dr. Maki generalized that “those species which are in the deeper waters are not at major risk of oil spill effects.” Mr. Green pointed to a discussion about “the specific effects of an oil spill ... on Dungeness crab” at Adobe 19. Ms. Williams-Davidson confirmed that it is not about the Dungeness crabs of Haida Gwaii, however, and that no baseline data has been compiled. 5279

Ms. Williams-Davidson asked about the crab in the sub-tidal area. Dr. Walter Pearson said there are two stages that need to be examined. The “first instar” when the juvenile crab is “about the size of your thumbnail,” and in May when female crabs moult, and mate. The toxicity effect in the sub-tidal area would be at 1 to 10 parts per million. He said that the oil in water levels in PWS were about 0.2 parts per billion or 1000 times less than the mortality level, and that oil needs to mix with sediments before it will sink. Ms. Williams-Davidson noted that the Rose Spit area is “almost 20 kilometres of sand.” Dr. Stephenson suggested that the sand at Rose Spit may be inter-tidal, not sub-tidal. 5317

Razor clam

K’amahl, razor clams (*Siliqua patula*) were Ms. Williams-Davidson’s next species. She said that they are in the same area as Dungeness crab and “this is the only commercial inter-tidal digging fishery for razor clams in British Columbia,” with licences held by Haida individuals and 100% of the catch processed in Masset. Dr. Maki spoke about testing in PWS: “the results of all of these tests, both chemically and toxicologically, ... and then they tested the sediments with a benthic species. ... There’s not a lot of concern for toxicity of any oil down in those sediments.” 5357

Dr. Moore spoke of razor clam behaviour in Scotland, where a percentage of clams are known to eject themselves from the sub-tidal sediments when high concentrations of oil are present. This is also a response to a common fishing method for this clam: squirt a hyper-saline solution “down the burrow of the clam and it ejects itself like a Polaris missile from the sediment and then can be caught.” He said, “They then lie on the sediment and when its concentrations of oil dissipate, disperse, then they will become

active and burrow themselves back down into sediment again.” Where there were “high densities of these razor clams and where there was very high concentrations of dispersed oil ... after the spill, there were certainly large populations still present.” In reply to Ms. Williams-Davidson’s questions, Dr. Moore said the oil was not entrained in the sediments and that these were relatively light oils. 5385

Mr. Wooley discussed food safety issues from his experience in Alaska with the Exxon Valdez and Selendang Ayu spills. With the EVOS, a health task force recommended that “if there was a food source that looked like it was oiled, then ... it should not be consumed. But they had tested ... foods .. that were not ... visibly oiled. Those foods were shown to be safe to eat.” He added, “within six months of the spill.” 5412

Ms. Williams-Davidson asked about clean-up activities that would be possible in Haida Gwaii. Dr. Owens said that much has been learned about how to clean sand beaches from the Gulf of Mexico, and spoke about mechanical and manual techniques – “just shovels and rakes.” The former can be very fast, but though the latter is slower, it removes less material, and leaves more of the sediments intact. He also said, that “the oiling on a sand beach is discontinuous. It’s not a continuous swath of oil that forms a wide band.” 5426

13% of spilled oil deposited in sub-tidal zones

Ms. Williams-Davidson referred to a statement at the EVOS Trustee Council [website](#) that “up to 13 percent of the oil settled in subtidal habitats.” Mr. Dennis Langen for NGP emphasized that this information is not on the record, and that “there’s no agreement necessarily unless the witnesses agree that that is the percentage.” Ms. Williams-Davidson asked the witnesses if they would agree that it would be a comparable percentage in Haida Gwaii. Dr. Maki said it may be valid in “some net depositional areas and backwaters.” Ms. Williams-Davidson asked how that might compare with a spill of condensate or dilbit. Mr. Belore said that condensate is unlikely to get to shore because it will evaporate and disperse. Dilbit, or diluted bitumen, is a heavy product, and “some of that oil could make it to shore.” 5440

The Southern Route

Ms. Williams-Davidson pointed out that the Southern Route adjoins the Gwaii Haanas National Park Reserve and Haida Heritage Site. A map is in [Exhibit B3-36](#). She said, “It is a very important area to the Haida people. You would have heard the oral histories about why it is important.” She said that *gahlyan* or abalone are in Gwaii Haanas, but “there are not any maps in the application showing the abalone in Haida Gwaii.” Mr. Green said, “But abalone is discussed. It’s a species at risk.” Ms. Williams-Davidson said that abalone distribution is shown in the HMTK [[Exhibit D42-7-45](#), Adobe 15] “Specific locations are not provided because ... it is endangered and there are poachers. ... The Haida fisheries have been involved in stewardship activities for about 22 years to research and rebuild this stock.” 5486

Abalone is an endangered species

Ms. Williams-Davidson asked, “How long would it take to recover the abalone given the state that it’s in right now, given that it’s endangered, given that there are so few left? Would it recover?” Mr. Moore said that abalone are a shallow sub-tidal species, and they

graze in algae off the rocks. “The possible exposure route is of disbursed oil ... but they’re not filter-feeders, then they’re not likely to take up the oil to any greater extent. ... The mechanism for affecting them ... is very limited.” He mentioned a couple of spills but could provide no information. Mr. Green said that the abalone is 50 to 60 km from the southern tanker approach, so there is “an element of time to respond” and “dispersants might be an appropriate response.” 5508

Herring and herring spawn on kelp

Ms. Williams-Davidson’s next species was *k’aaw*, herring spawn on kelp, with Figure 8-2. “the map showing fish, basically” [Exhibit B3-39, Adobe 23]. She emphasized its cultural importance and significance as a fishery to the Haida. *Inang*, herring, spawn from the winter through spring, in a range of intertidal and subtidal areas. Mr. Green said that this information is documented in section 8.7 [Adobe 20]. Ms. Williams-Davidson said that HMTK [Exhibit D42-7-45] contains more information, and a better map [Adobe 3]. She said that “the herring populations on Haida Gwaii have been depressed and haven’t supported commercial fisheries for several years,” then noted that the EVOS report found that herring are not recovering in PWS.” 5547

Dr. Pearson spoke about “the history of what went on there. In the ... spill year, there were localized effects found on herring eggs and the development of the embryos that are contained in the eggs. The next year, [no effects were found] on the eggs. Following that, there was no effect at the population level. There were high population levels in PWS and a record high harvest. Then, in 1993, there was abrupt decline. Some people call it a collapse of the herring fishery and the biomass that supported it. ... That launched about 20 years’ worth of research to determine, in large part, whether that collapse was an artefact or consequence of the oil spill or whether it was a consequence of other causes.” In short, he said “Colleagues on both sides of the question earlier are coming to the conclusion that the collapse in 1993 is not relating to the spill. It’s related to several natural factors and maybe one man-made factor in the environment; that being the changes in the amount of prey available to the herring. This is true all over the Gulf of Alaska.” “What this is showing is a profound shift in the Gulf of Alaska’s ecosystem and the amount of food that’s available to herring in the Gulf of Alaska.” 5574

Herring compete with and are preyed upon by other species

In PWS, the herring question is compounded by the fact that over 600 million salmon fry a year are being released into the sound. This creates both competition with the herring and predation by the juvenile salmon. In addition, an increasing population of overwintering humpback whales in PWS also competes with herring for krill, and preys on herring directly. Ms. Williams-Davidson asked if the oil spill had any impact on PWS herring. Dr. Pearson said, “At the population level, no. Were there localized effects in the first year to eggs and potentially larvae? Yes.” 5585

Ms. Williams-Davidson asked if there was an “assessment of Haida Gwaii herring that accounts for its depressed state.” Mr. Green said, “Not in our assessment. ... Herring populations along the coastline of BC are exhibiting similar depression.” 5608

Returning to the map, Figure 8-2, Ms. Williams-Davidson asked what species were including in the shading which indicates overlapping important habitat. Were salmon and halibut included? Mr. Green said most of the information on these maps come from PNCIMA (Pacific North Coast Integrated Management Initiative). The list of species included in the orange colour is provided in [Exhibit B3-42](#), Adobe 168, and it does include salmon and halibut. 5612

Ancient murrelet

Ms. Williams-Davidson put up the Haida evidence, the Living Marine Legacy [[Exhibit D42-4-4](#)] and the corresponding NGP evidence [[Exhibit B3-39](#)] which is concerned with *sGidaana*, the ancient murrelet, which again are of high cultural significance to the Haida, but since Haida Gwaii is home to 50% of the world's population of ancient murrelet, is also of global significance. Mr. Green said that NGP did not do an environmental assessment of the ancient murrelet. 5626

Genetically unique stock of herring on Haida Gwaii.

Ms. Williams-Davidson said, "I want to confirm that you've not done an environmental assessment for the herring spawn on kelp in Haida Gwaii." Mr. Green said "That's not correct. ... We look specifically at herring. ... In Haida Gwaii we don't expect [effects of an oil spill on herring] to be any different than the types of effects we've outlined in the general section of our impact assessment." Ms. Williams-Davidson: "That assessment would not have factored in then the unique importance to the Haida people or the very depressed states of a unique stock." Mr. Green questioned what she meant by "the unique stocks of Haida Gwaii." Ms. Williams-Davidson replied, "The stock of herring that's found in Skidegate Inlet is not found anywhere else. It's genetically distinct from other stocks of herring found in B.C. or Alaska." Mr. Langen challenged this premise and asked for a reference. Dr. Pearson said that there are localized stocks in BC as well as stocks that use "a good part of the waters of BC. The stock for the Haida is one of those that appears to be localized and it has some genetic differences from the other stocks, but those differences don't rise to the point where we would call them a unique or different species." 5636

Ms. Williams-Davidson asked if the Haida Gwaii stock of herring could be wiped out by an oil spill. Mr. Green said that would be very unlikely. Dr. Pearson said that a spill would have to affect all the herring sites on Haida Gwaii, coming in from all directions, and the likelihood of that is "vanishing small." "One of the natural factors involved in recovery is whether or not there exists some portions of the population in adjacent areas that can then recolonize or migrate into the area that was affected. ... You have a diversity of sites ... in your territory that would allow for that recovery." 5658

Environmental assessments of selected species

Ms. Williams-Davidson asked about an environmental assessment for razor clam in Haida Gwaii. Mr. McHugh said, "You're talking about a multiple layer probability on top of probability on top of probability to come out with these types of effects. Yes, we did assess this. We assessed it from a probabilistic standpoint. Ms. Williams-Davidson repeated her question. Mr. Green said the effects assessment that was done for benthic invertebrates would stand in for the razor clam. 5669

Ms. Williams-Davidson asked about an environmental assessment for Dungeness crab. Mr. Green said his answer was the same as the previous two species. 5678

Ms. Williams-Davidson said “The assessments for Haida Gwaii ... were limited and consisted of a list and description of some species.” Mr. Green said “I’ve explained to you several times now how we did our assessment. It’s not geo-specific to Haida Gwaii or to any other part of the Open Water Area. We’ve looked at representative species.” “The analysis we did do would apply to the species on Haida Gwaii.” 5680

Examination by Ms. Karen Campbell for the Coalition 5699

(ForestEthics, Living Oceans Society and Raincoast Conservation Foundation)

Exxon Valdez oil spill and EVOS Trustee Council

Ms. Campbell noted that in its evidence, NGP had referenced the Exxon Valdez oil spill (EVOS), had relied on a number of EVOS studies, and had referenced the work of the EVOS Trustee Council website. Mr. Green said, “The Exxon Valdez, because of its proximity to this area and similar types of habitat, is a very good surrogate area to our study area and so it’s been relied on for many of the valued environmental components as a good source of information. It’s also likely the best studied oil spill in the world.”

Ms. Campbell put up the EVOS Trustee’s 2009 report. [Living Oceans Society [Exhibit D122-7-15](#)] and confirmed with the witnesses that the EVOS Trustee Council is “an independent body, it allocates settlement funds for restoration activities, for long-term monitoring, and for research related to EVOS.” “It consists of a representative group of stakeholders who have an interest in documenting, tracking, and researching the effects of the spill.” Dr. Maki said, “The Trustee Council consists of three state agency and ... three federal agency representatives; total of six.” 5708

Ms. Campbell turned to the chart on Adobe 18 and said, “According to the Trustee Council, only 10 of the 27 environmental resources that were injured by the EVOS have recovered. Three have likely recovered.” Mr. Green said, “That’s what it says. ... To have a discussion about these results it’s important not to look at a summary like this, but to focus on specific species.” Dr. Maki said, “We have an extensive record of why this is not an accurate representation. ... In quick summary, there are thousands of species in Prince William Sound that aren’t studied, that are fine, have been recovered or were never affected in the first place. They’re not reflected in this table. To unduly focus on the 26-odd species that are listed here brings an inappropriate focus to the entire ecosystem recovery scenario.” 5728

Lingering effects of EVOS, and NGP’s spill models

Ms. Campbell asked if “there remain lingering effects of EVOS that are significant or otherwise? Are there minor effects that are still being felt in the environment to this day as a result of EVOS?” Dr. Maki replied, “There are minor effects on some of those species that are still measurable today.” 5734

Ms. Campbell said, “You’ve done five studies ... five models. ... The 36,000 cubic metre spill in Wright Sound as well as the 10,000 m³ spills. ... In doing the mass balance model for Wright Sound, ... you conducted an ecological risk assessment and a human health risk assessment.” Mr. Green added that they modelled two other spills in the marine environment at the terminal, and did human and ecological risk assessments for those two scenarios.” 5737

Ms. Campbell: “[You relied] on studies of EVOS impacts to assess the impacts of hydrocarbons in the marine environment from [the Wright Sound spill]?” Dr. Stephenson agreed: “We used them as a surrogate.” The witnesses agreed with Ms. Campbell that they had used studies from various sources, including from the EVOS Trustee Council, “and drew what we thought was a balanced conclusion based on a comparison.”

Impacts felt longer than 20 years

Ms. Campbell asked, “If there was a spill in Wright Sound, as you modelled, is it possible that its impacts would be felt longer than 20 years?” Dr. Stephenson said “That’s unlikely. We put our opinion as to the length of time that it would take for recovery to occur as part of the ecological and human health risk assessment.” Mr. Green added that much has changed since 1989. “One of the big differences between Exxon Valdez and now is what we’re talking about here is a very different type of spill response, a very different type of prevention approach.” 5743

Orcas were not selected as a receptor in spill risk assessment

Ms. Campbell put up Section 2.2.5, Identification of Receptors [[Exhibit B16-33](#), Adobe 30] and noted the four criteria for selection of receptors in the risk assessment for the hypothetical spill examples at the Kitimat terminal and in Wright Sound. The four factors are: 1. indigenous to the area; 2. likely to be exposed to chemicals of potential concern; 3. representative of trophic levels in feeding guilds; 4. of cultural, economic or social importance. 5755

Ms. Campbell noted that the four marine mammals that were selected are: harbour porpoise, mink, sea otter and the Steller Sea Lion. [Adobe 31] “These mammals are primarily fish and invertebrate eaters.” She said that killer whales, particularly transient pods which eat other marine mammals, “represent another trophic level that cannot be represented by the fish eaters “ Dr. Stephenson replied that “The primary contaminants of concern we’re dealing with are hydrocarbons. They do not biomagnify or transfer up the food chain in appreciable quantities.” Ms. Campbell repeated, “There is a trophic level that is not represented.” 5760

This is the beginning of a detailed and interesting discussion about killer whales, EVOS, which should be read in the transcript beginning at paragraph 5755.

NGP’s evidence: no conclusive linkage of killer whale populations and EVOS

Ms. Campbell said that “the EVOS Trustee Council identifies that transient killer whales are not recovering as a result of the EVOS and that their extinction is anticipated. [Given that experience] would it not have been ... precautionary ... to include killer whales in the ERA?” Dr. Maki said that “The data underlying that are ambiguous at best. They

cannot make a linkage to an original effect of the oil spill. ... This group has the highest levels of the polychlorinated organics, PCBs, pesticides and many other biopersistent, bioaccumulative compounds that we've measured in marine mammals. The levels are high enough in those organisms, in those particular members of AT1 pod to be of concern for reproductive impairment. That group of killer whales has not reproduced a calf since 1984, five years before the spill." 5778

Ms. Campbell noted that killer whales are listed as threatened under both the Species at Risk Act and COSEWIC, that they are small and isolated populations, and are slow-reproducing. 5790

Dr. Maki described killer whale biology and evolving research efforts. He noted that each killer whale in the entire north Pacific is identified and catalogued through photos of their dorsal fins and their colouration, and is assigned an alpha-numeric identifier. The catalogue is maintained at the DFO Nanaimo lab. PWS has two types of pods: the resident pods which eat fish and the transient pods which are primarily marine mammal consumers. "They are very different in their feeding ecology and their behaviours." In PWS in 1989, there were six pods of killer whales, about 117 individuals. Only two pods – the AB and AT1 – exhibited significant losses. "It leaves the question open: what about the other ones?" 5793

Other studies: there is linkage of impacts to killer whale populations and EVOS

Ms. Campbell read excerpts from Volume 8C of the Application, Section 8.9.1.2, entitled "Killer Whales" [[Exhibit B3-40](#), Adobe 7], then put up an aid to questioning [[AQ62-A](#)], a report entitled "Ongoing population-level impacts on killer whales following the Exxon Valdez oil spill" by Craig Matkin *et al.* Mr. Green said that the same paper is discussed in [[Exhibit B3-40](#), Adobe 15]. Ms. Campbell quoted from the conclusions [Adobe 11] in the Matkin paper: "The results of this study underscore 3 key aspects of killer whale behavior and ecology that leave them highly vulnerable to natural or anthropogenic disasters such as oil spills. 1. free ranging killer whales do not or cannot detect or avoid crude oil sheens at the water's surface and are susceptible to inhalation of vapors and/or oil, skin contact, and, especially in the case of mammal-eating transients, to ingestion. 2.... resident killer whale pods ... may take decades to recover from the impacts of an oil spill ... particularly if reproductive females and/or juvenile females are lost. 3. in a small, isolated and threatened population like AT1, a major environmental perturbation can greatly hasten the decline toward extinction" Ms. Campbell concluded: "It's the opinion of this scientist that killer whales are vulnerable to crude oil spills." 5846

Mr. Green said that the issues are quite different with resident and transient killer whales, it is important to recognize that killer whales are a special status species. "In the case of an oil spill, the best solution for a killer whale is prevention. There's not a great range of mitigation techniques for killer whales and so prevention is an important one." 5869

Ms. Campbell quoted from NGP's reply evidence on the recovery of biophysical and human environments from oil spills [[Exhibit B83-17](#), Adobe 75]: "*The Exxon Valdez oil spill is to date the best study of major tanker accident and the findings of studies related to killer whales suggested there had been adverse effects.*" Then she said that in "the

subsequent six pages, you actually challenge this conclusion in a number of ways and you describe other studies that would diminish the idea that there have been direct effects on the whales from the Exxon Valdez.” 5879

Longline fishermen shooting whales who raid their catch

One of these studies is Ms. Campbell’s second AQ, entitled, “Killer Whale Deaths in Prince William Sound, Alaska, 1985-1990” by Mark Fraker [[AQ62-B](#)] Ms. Campbell said, “One of the ideas posited by Fraker is that there was a depredation of killer whales by fishermen in the years preceding the spill and that bullet wounds could have been a factor in the death of the whales after EVOS.” Dr. Maki replied, “It’s not only the position of Fraker. He cites published literature and reports that were presented before the International Whaling Commission that confirms that. And additionally, there were quite a number of whales that were discovered in the late 1980s that had clearly died from bullet wounds.” He explained that shooting whales became the response of longline fishermen to having the catch on their longlines raided by killer whales. Apparently, the noise of the hydraulic pulleys became “essentially the dinner bell ringing” and fishermen were pulling in “nothing more than the head of the halibut or the head of the black cod. The rest of it had been very neatly clipped off by the killer whales as it was being retrieved through the water.” 5891

Dr. Maki listed other researchers who had reached the conclusion that the evidence does not support the Exxon Valdez spill as a clear cause of the killer whale mortalities, or who had found evidence of other causes, including Matkin, Spees, Geraci and St. Aubin. He said, “The final conclusion after we analyze all this work, and this is our position -- whether the EVOS somehow contributed to the killer whale deaths is simply unknowable. We can’t tell one way or the other. The data are just not clear. 5896

Oil spill as the catastrophic last straw

Ms. Campbell said, “Given that there are already existing threats to the population ... isn’t it possible ... that exposure to the oil spill could be catastrophic because these killer whales are already compromised and might well be unable to contend with additional disturbance?” Mr. Green said, “That is not outside the realm of possibility. [Considering] the probability of, first of all, a spill occurring, that killer whales have to be in the exact location of that spill within a very short time period of that spill occurring and they have to be inhaling - those things all have to add up together. The multiple probabilities means this is a highly unlikely event. It’s not to say it couldn’t happen.” 5925

Prince William Sound contaminants found in whales are not from oil

Dr. Stephenson drew on Matkin *et al*, Ms. Campbell’s AQ62-A [Adobe 11] to quote a sentence about the inhalation, contact, and ingestion pathways of contaminants in killer whales, and a later sentence about lack of recruitment in the AT1 pod from high contaminant levels. The source for this statement is “Influence of life-history parameters on organochlorine concentrations in free-ranging killer whales from Prince William Sound,” Ylitalo *et al*, 2001. Dr. Stephenson said, “I return on this point back to my contention earlier that the concern about mammal eating killer whales is specifically in the context of organochlorines and not PAHs, which do not magnify. Organochlorines

are those classes of contaminants that would include PCBs and DDT, for example, which are simply not relevant to this Application.” 5941

At Ms. Campbell’s question, the witnesses confirm that the Fraker study is a review article and is not based on original research. She then asked if they were aware that it was funded by Exxon Mobil. Dr. Maki said, “I’m aware of that, but I’m not sure that that implies anything as far as the credibility. Fraker was an independent researcher who was funded to do and write his own conclusions.” He added that Dr. Fraker had done “observational work. ... I’ve had him out on research cruises with me in Prince William Sound.” 5949