First Affidavit of Dr. Timothy Keen Takaro
Sworn the __ day of November, 2020
Court Registry No. S183541
Registry: Vancouver

IN THE SUPREME COURT OF BRITISH COLUMBIA

BETWEEN:

TRANS MOUNTAIN PIPELINE LLC

Plaintiff

AND:

DAVID MIVASAIR, BINA SALIMATH, MIA NISSEN, COREY SKINNER (AKA CORY SKINNER), UNI URCHIN (AKA JEAN ESCUETA), ARTHUR BROCINER (AKA ARTUR BROCINER), KARL PERRIN, YVON RAQUL, EARLE PEACH, SANDRA ANG, REUBEN GARBANZO (AKA ROBERT ARBESS), GORDON CORNWALL, THOMAS CHAN, LAUREL DYKSTRA, RUDI LEIBIK (AKA RUTH LEIBIK), JOHN DOE, JANE DOE, AND PERSONS UNKNOWN

Defendants

THE ATTORNEY GENERAL OF BRITISH COLUMBIA

Intervenor /Respondent

FIRST AFFIDAVIT OF DR. TIMOTHY KEEN TAKARO

I, DR. TIMOTHY KEEN TAKARO, BSc.,MD., MPH., MS., of New Westminster, British Columbia MAKE OATH AND SAY AS FOLLOWS:

1. I am a medical doctor and professor of environmental and occupational health sciences. I hold degrees in biology, medicine, epidemiology and toxicology. I am a professor at the Faculty of Health Sciences, Simon Fraser University. I am a clinical professor in the Department of Environmental & Occupational Health Sciences in the School of Public Health at the University of Washington in Seattle, Washington. I am also a visiting associate professor in the Department of Medicine at the University of British Columbia.

2. I am a spouse and a parent of two children: Nina Anne Takaro, age 24 and Benjamin Neal Takaro age 21.

3. As the Applicant herein, I have personal knowledge as to the matters deposed to, except where the facts stated to be based on information and belief, and as to those matters, I believe them to be true.

4. The Plaintiff is in the course of destroying trees at the Brunette River and Holmes Creek in New Westminster and Burnaby, British Columbia in order to build an interprovincial pipeline, (the "Project") that is currently authorized by Parliament. No part of that approval process (or at least no part of the approval process made known to the public) ie.:
   a. The National Energy Board Inquiry;
   b. The "Upstream Emissions Assessment; and
   c. The Ministerial Panel;

   Considered whether increased emissions resulting from the expansion of the oil sands production facilitated by Trans Mountain Pipeline LLC would be or could be consistent with:
   i. Reconciling growth in emissions resulting from the Project with cutting Canada's total (domestic) emissions sufficient to meet Canada's commitment to the 2015 Paris Climate Accord of 511 Mt (megaton) goal by 2030, (upstream emissions) and
   ii. Canada's commitments to keep the increase in global average surface temperature within 1.5 or at least 2 degrees warming limits? (downstream emissions).

5. I have been engaged in peaceful, lawful and safe protest of the Trans Mountain Pipeline Expansion ("TMX") at the Brunette River in New Westminster and Holmes Creek in Burnaby, British Columbia[1]. On December 9, 2020 when I arrived at Holmes Creek I found that our camping and other equipment had been demolished. CN and CP police then arrived

[1] Pursuant to paragraph 14 of the Order.

together with contractors working for TMX. The contractors, who refused to identify themselves, advised that the area of our protest was now a work zone. I was read the injunction order and advised that pursuant to the Order, I had to leave. I was given a copy of the Order. I complied with the direction that I was given. The contractors then commenced to cut down the trees in which our protest had been manifest. Accordingly, Holmes Creek is now an "operation site" pursuant to the Order.[2] The Order has been posted at Holmes Creek.[3] As I have received notice of the Order, I am enjoined from continuing my peaceful, lawful and safe protest at Holmes Creek.[4] As a result, I am a person affected by the Order, and pursuant to its terms, bring this application to set it aside.[5]

6. Governments around the world have declared a climate emergency. In 2019, Canada's Parliament committed "to meeting its national emissions target under the Paris Agreement and to making deeper reductions in line with the Agreement's objective of holding global warming below two degrees Celsius and pursuing efforts to keep global warming below 1.5 degrees Celsius." Despite the emergency call, the Trudeau government, continues to prepare to build a $12-15 billion pipeline to extend the climate damage and risk the beautiful Burrard Inlet, Burnaby Mountain, Simon Fraser University, numerous drinking water sources and several indigenous communities, some against their consent. This threat has compelled me to put my body on the line to prevent construction of this climate killing project.

7. I didn't expect to find myself protesting TMX at Holmes Creek and the Brunette River at 63 years of age. I am a public health physician who has been studying and working on policy regarding the health impacts of climate change for nearly 30 years. I've been very active in the review

[2] Pursuant to sections 1(a)(iii) & 2(c) of the Order.
[3] pursuant to section 9 & 10 of the Order.
[4] Pursuant to sections 2, 9 & 10 of the Oder.
[5] Pursuant to section 17 of the Order.

process of TMX focussing on the health impacts. After two extensive reports and multiple meetings with public health colleagues, community members and government officials, construction has begun. In choosing civil disobedience to block construction of TMX I am choosing a far lesser crime than that perpetrated by the proponents of this project. This action is required by my professional code of conduct as a public health physician when I promised to protect the health of Canadians and do no harm. In addition to the direct health risks of the project, I am considering the future of my children, their children and future generations around the world. No short-term economic benefit can out-weigh this risk. This is the right fight, in the right place, at the right time to firmly turn Canadian energy policy towards the planet's sustainable future.

8. Over 20 tankers a month are slated to carry diluted bitumen (a heavy tar-like substance that when diluted with gasoline-like condensate is known as dilbit) through First and Second Narrows in Vancouver if the project is completed. This is seven times more than what currently passes through these dangerous Narrows. The review process used for the project was so flawed and inadequate at assessing the health risks of the project that it is now discarded and replaced by Parliament (by Bill C-69). With a myriad of unanswered questions, the project is being pushed through despite opposition from the Province of BC, local governments, First Nations and hundreds of thousands of Canadians.

9. As a public health professional who has participated at every stage of the process, I have seen firsthand National Energy Board (NEB) review. At the outset, the NEB specifically said it would not accept health assessments that discussed global warming impacts from the project. Even after the Harper-to-Trudeau government transition, when a review panel was convened to evaluate the climate impacts, the panel was not allowed to consider the largest source of emissions, those from burning the transported product. Several other health impacts of spilled dilbit

raised in our two health impacts reports have also been left unaddressed, including the carcinogenic risks to infants and young children, mental health impacts, disruptions from large scale evacuations in Vancouver and cumulative air quality impacts during heat waves and wildfire smoke events. These were either inadequately assessed by the NEB or not considered at all. Many important aspects of the risk assessment were performed by contractors hired by Kinder Morgan, who decline to share their methods, saying their risk assessment processes are “proprietary”.

10. Considering the health risks from TMX and lack of response to a BC Health Officers’ Council call for an independent review of the health impacts of the project in April of 2019, I have weighed the clear and imminent peril caused by the project compared with the peril to the national interest by blocking construction and determined that it is indeed my responsibility as a public health professional to take action to block this project. We must rise to the opportunity to leave future generations a healthier planet with a sustainable energy supply.

11. TMX is a 40-year infrastructure project that will enable the expansion of the Alberta oil sands and at the very least should not move ahead until all the cumulative risks are thoroughly assessed. At the current rate carbon emissions are increasing around the world, the earth’s average surface temperature will likely increase by more than 2^{o} C by 2060, a biological threshold that most scientists agree would be catastrophic. Building this new pipeline is the opposite of essential. In fact, it is essential for future generations that TMX not be built.

ASSESSMENT OF UPSTREAM AND DOWNSTREAM EMISSIONS

12. None of the three processes conducted by the Government of Canada that reviewed aspects of the Trans Mountain expansion project (TMX) before it

was authorized by an Order-in-Council dated November 29, 2016, considered the implications of the project's contribution to rising global emissions. Canada' oil sands output is exported to the U.S. and to a lesser degree to other foreign markets. The expansion of pipeline capacity facilitates the growth of oil sands production and exports. "Downstream emissions" are those that result from the consumption of Canada's increased oil sands production when the product is burned as fuel in foreign countries (in vehicles) and also emissions from refining the product outside Canada. In contrast, emissions released by the oil sands production process in Canada are referred to as "upstream emissions"[6]. Only the upstream emissions are reported in Canada's various annual reports.[7]

The National Energy Board inquiry

13. The primary review process was the National Energy Board inquiry commenced in 2013. It released its report on May 19, 2016, recommending to the Government of Canada that the project be approved. In the course of the inquiry, the NEB did not consider downstream or upstream greenhouse gas emissions. Attached hereto as **Exhibit "A"** to this my affidavit is a true copy of Chapter 1 of the National Energy Board Report and the preceding Summary of Recommendations. The full report can be found at: https://docs2.cer-rec.gc.ca/ll-ng/llisapi.dll/fetch/2000/90464/90552/548311/956726/2392873/2969696/2969867/A77045-1_NEB_-_Report_-_Trans_Mountain_-__Expansion_Project_-_OH-001-2014.pdf?nodeid=2969681&vernum=-2.

Section 1.2.4 of the report states:

> *Some participants said that the Board should consider upstream and downstream effects of the Project. However, in the circumstances of the hearing of this project, as explained in detail in Ruling No. 25, the Board did not consider*

[6] See below exhibit "E".
[7] See below exhibit "D".

> *upstream and downstream effects, including those of greenhouse gas emissions. In Ruling No. 25, the Board found that no particular upstream development is dependent on the Project. The Board also found that it did not consider there was a necessary connection between the Project and upstream production or downstream uses.*
>
> — NEB report, May 19, 2016, p.6 (emphasis added)

14. Two years earlier, in April 2014 when it issued the Hearing Order for the project that included the List of Issues, the NEB excluded from the List of Issues the environmental effects associated with the upstream emissions and downstream emissions that would result from the expansion of oil sands production facilitated by the Project. The City of Vancouver, which was an intervenor at the inquiry, applied for an order expanding the List to include those issues. Other intervenors made submissions supporting the City of Vancouver's motion. The NEB panel in a ruling on July 23, 2014 (NEB Ruling No. 25) rejected the City's application, which would have allowed participants to call expert evidence about greenhouse gas emissions and climate change. Attached hereto as **Exhibit "B"** to this my affidavit is a true copy of National Energy Board, Ruling No. 25. The substance of the ruling is that environmental impacts of that kind are not "directly related" to the Project:

> *The project does not include upstream production and is not dependent on any particular upstream development and, therefore, any link to environmental changes caused by such upstream production is indirect and not necessarily incidental to Project approval.*
>
> — NEB Ruling No. 25, July 23, 2014, p. 3 (emphasis added)

15. On October 16, 2014, the Federal Court of Appeal dismissed an application by the City of Vancouver for leave to appeal the NEB Panel's Ruling No. 25. Attached hereto as **Exhibit "C"** to my affidavit is a true copy of the Federal Court of Appeal's Order, October 16, 2014, dismissing the City's application without reasons.

16. Public appeals in Canada by individual citizens and by climate scientists in the summer of 2014 and through 2015 directed attention to the need to conduct an inquiry that would examine whether the planned expansion of Canada's oil sands production enabled by the Trans Mountain project (and by other proposed pipelines) could be consistent with the science-based evidence that had established the urgent need to begin to reduce emissions from burning fossil fuels. On June 10, 2014, 110 senior scientists and researchers from across North America signed a public statement calling for a moratorium on proceeding with any new infrastructure projects, including pipelines, explaining that the continued expansion of oil sands production would be inconsistent with Canada's commitments to reduce CO_2 and other greenhouse gas emissions. Seven of the signatories, including leading energy economists and climate scientists knowledgeable about the pace and impact of rising global GHG emissions, published an article on June 14, 2014, in the journal *Nature*, warning that the existing approval process had failed to look at the cumulative effects of energy resources development projects. Attached as **Exhibit "D"** to my affidavit is a true copy of the article "Energy: Consider the global impacts of oil pipelines" published June 25, 2014, in the journal *Nature*, signed by Wendy J. Palen of the Department of Biological Sciences at Simon Fraser University, energy economist Mark Jaccard, Thomas Sisk, and five others.

17. Attached as **Exhibit "E"** to my affidavit is a true copy of the public statement released on June 6, 2015 by over 100 prominent scientists in the U.S., Canada, Australia, and Britain, which explained ten reasons for a moratorium on continued expansion of oil sands in Canada, on the ground that it is incompatible with limiting climate warming to a level that society can handle. The statement cited recent sources in support of their warning, including the *IPCC 2013, The Physical Science Basis* and *IPCC 2014, Climate Change 2014*. The Summary for Policymakers (SPMs) that accompanied those two reports are appended to my affidavit as **Exhibits**

"F" and "G" respectively. At the time when the public statement marked as **Exhibit "E"** was published in the summer of 2015, the two IPCC reports were the most recent and authoritative studies documenting the exigency of the need to curb the continued growth in the annual level of global emissions. The statement is found at http://www.oilsandsmoratorium.org/wp-content/uploads/2015/06/Oil-Sands-Moratorium-Message.pdf

18. In 2015, Canada agreed to reduce its national emissions (that is, *all* emissions caused by activities within Canada's borders) 30% by 2030, below the 2005 level. That pledge was formally made by the Conservative Government on May 15, 2015, and was re-affirmed by the Liberal Government at the climate conference in Paris in December 2015. The 2005 level was 730 Mt. The target is 511 Mt.

19. All parties to the United Nations Framework Convention on Climate Change (UNFCCC) were obligated to submit their reductions targets in advance of the Paris Conference scheduled for December 2015. The May 2015 target submitted by the Conservative Government subsequently became Canada's "Nationally Determined Contribution" under the terms of the Paris Agreement, which meant it became Canada's formal commitment to make the required reductions by 2030. Under the Paris Agreement, in December 2015 Canada also committed to "*holding the increase in global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C*".

20. On January 27, 2016, the Government of Canada released an announcement entitled "Interim Measures for Pipeline reviews". Attached hereto as **Exhibit "H"** to my affidavit is a true copy of the document. The substance of the announcements was that there would be no change in the scope of the NEB's ongoing inquires with respect to existing proposed new pipelines or pipeline expansions. The ongoing NEB inquiry for the Trans Mountain Project would not be altered or revised to address downstream or

upstream greenhouse gas emissions. However, the document stated that a new, separate process would be created that would "assess the upstream greenhouse gas emissions associated with this [the Trans Mountain] project and make this information public".

Review of Related Greenhouse Gas Emissions Estimates for the TMX Project

21. On March 19, 2016 the government published details of the proposed new emissions assessment procedure in the *Canada Gazette*. Attached hereto as Exhibit 19 to my affidavit is a true copy of the four-page document. It begins with an overview of the approach:

> *The assessment of upstream GHGs will consist of two parts: (A) a quantitative estimation of the GHG emissions released as a result of upstream production associated with the project, and (B) a discussion of the project's potential impact on Canadian and global emissions.*
>
> — "Estimating upstream GHG emissions", Canada Gazette, March 19, 2016. (http://www.gazette.gc.ca/rp-pr/p1/2016/2016-03-19/html/notice-avis-eng.php#nl4

22. The draft report, informally described as the "upstream emissions assessment" and officially entitled the *Review of Related Greenhouse Gas Emissions Estimates for the Trans Mountain Expansion Project* was released on May 19, 2016. The final version of the report was publicly released on November 25, 2016, four days before the Government of Canada authorized the project by Order-in-Council dated November 29, 2016. Attached hereto as **Exhibit "I"** to my affidavit is a true copy of the *Review of Related Greenhouse Gas Emissions Estimates for the Trans Mountain Expansion Project* November 25, 2016, final report (also referred to hereinafter as the "upstream emissions assessment report").

23. The document entitled "Estimating upstream GHG emissions" released on March 19, 2016 , **Exhibit "J",** specified what it described as the

"methodology" that would govern the assessment of the impact of the project on Canadian and global emissions. Part B of the assessment promised to provide Canadians with "a discussion of the project's potential impact on Canadian and global emissions". However, the "methodology" that governed Part B was formulated in a particular way, which significantly limited the scope of the inquiry:

> *The second part of the analysis discusses the conditions under which the Canadian upstream emissions estimated in Part A could be expected to occur even if the project were not built.*
>
> — Canada Gazette, March 19, 2016

24. The document provided guidance on what steps the assessment must follow to answer that question:

> *The second step involves evaluating the technical and economic potential for alternate modes of transportation to be used in the absence of the proposed project.*

25. The assessment was directed to evaluate whether rail transport would be an economically viable method to transport the increased bitumen production to market, and to do that it was required to look at the "economic and technical potential" of the alternate mode of transport. The report subsequently determined that rail transport is more expensive than pipelines (about US$10 more per barrel, according to the assessment). The determinative question, addressed in the report, was whether future long-term oil prices would be high enough to cover the extra cost of rail "in the absence of the proposed project." The Trans Mountain report found that oil prices at about $80 per barrel or higher would make rail transport viable.

26. The March 18, 2016 notice set out how the analysis should be conducted:

> *As an example, when considering whether Canadian GHG emissions would increase as a result of a crude oil pipeline project, the primary factor will be the potential increase in Canadian upstream oil production that would be expected to occur if the pipeline were not built.*

27. The upstream emissions assessment report **Exhibit "J"** followed that method of analysis. With respect to the central question of whether and to what extent the Trans Mountain expansion would have an impact on Canada's emissions, the report at sections B.4.4.1.1 to B.4.4.1.3 (at pages 37 – 40) concluded that if long-term oil prices are greater than US$ 80 per barrel "a large amount of oil sands growth would be expected to occur regardless of whether the oil was moved by pipeline or rail" (page 38). In Table 8 ("Potential Incremental Oil Sands Production in Canada", at page 89) the report affirms that if long-term oil prices exceed US$80 per barrel the Incremental GHG Emissions as a result of building the pipeline will be "minimal".

28. According to the report, at that relatively high price level the projected oil sands expansion (and the accompanying increase in emissions) would occur even "if the pipeline were not built". Therefore, based on the methodology that governed this emissions assessment, the amount of "incremental GHG emissions" that would be caused "as a result of" proceeding with the construction of the pipeline would be "minimal" (Table 8, p. 39).

29. The report, **Exhibit "J",** also concluded that if long-term oil prices are less than US$60 per barrel, there would be limited or no growth in oil sands production (section B.4.4.1.1 at p. 37 and Table 8). It acknowledged (section B.4.4.1.2 at p. 38) that if long-term prices are in the mid-range of US$60-80 the completion of the pipeline would facilitate "limited growth in oil sands production," explaining that at those lower prices the development of new production may not be economically viable if producers are obliged to rely on higher-cost rail transport.

30. The report **Exhibit "J"** concluded that the volume of additional production shipped by the Trans Mountain expansion would add 13 to 15 Mt of new emissions to Canada's annual total (adding 20%-25% more to Canada's

annual oil sands emissions): *Report*, November 25, 2016, section A.5, "Estimated Upstream GHG Emissions", p. 14.

31. The upstream emissions assessment report also states that oil sands emissions will continue to increase to 2030, and they will be the main driver of growth in Canada's total emissions:

> *The growth in emissions to 2030 is driven largely by growth in the upstream oil and gas sector and, in particular, from the oil sands. ECCC projections indicate that GHG emissions from the oil sands are expected to increase from 62 Mt in 2013, to 90 Mt in 2020, and up to 116 Mt in 2030.*
>
> — Report, November 25, 2016, section B.2.2, Canada's GHG Projections, p.22 (emphasis added)

32. Notwithstanding the acknowledged substantial increase in oil sands emissions that will occur as a result of the projected growth of production to 2030, the report concluded that provided long-term oil prices exceed US$80 per barrel, the incremental GHG emissions caused as a result of the pipeline expansion will be "minimal." That conclusion was based on the rationale that as long as oil prices over the long-term reach US$80 or higher, the same amount of increased production will occur "even if the pipeline were not built".

33. A second pipeline expansion project, called Line 3, was also given final approval on November 29, 2016, the same day as the Trans Mountain approval. Line 3 adds 370,000 bpd of new capacity. The emissions assessment report for Line 3 found that the additional emissions associated with the increased volume of production carried by Line 3 would be approximately 10 Mt to 13 Mt of CO_2eq per year. The Trans Mountain and the Line 3 projects will together add 960.000 bpd of new shipping capacity. The volume of new production represented by the combined capacity of those two projects will generate between 23 Mt and 30 Mt of GHG emissions per year.

34. The *Review of Related Greenhouse Gas Emissions Estimates for the Trans Mountain Expansion Project,* **Exhibit "J"** did not include an analysis of whether the projected growth in oil sands emissions to 2030 could be offset by sufficient emissions reductions in Canada's other economic sectors to meet the commitment under the December 2015 Paris Agreement to reduce the county's domestic emissions to 511 Mt by 2030.

35. The report acknowledges that the most recent emissions projections available at that time, the Government of Canada's *Second Biennial Report* published in February 2016, showed that total emissions for all economic sectors were expected rise to 815 Mt by 2030, based on current policies.

36. With respect to the Government of Canada's own data cited in the document which show the continued growth of Canada's total emissions to 2030, the report states that "recently announced provincial government policies" which refers to measures promised since September 2015 will be able to improve the outcome by 2030: the report says that these new provincial government policies "will have an impact on Canadian GHG emissions" (page 15). The report says that the impact of these new provincial polices "were not reflected in *Canada's Second Biennial Report* as the details of these policies were not available at the time of publication" (*Report*, November 25, 2016, section A.6, GHG Forecast Approach, p 15-16). The report itself provides no analysis of what emissions reductions might be achieved by 2030 as a result of emissions reduction policies that will apply to Canada's other economic sectors.

37. The report provided no analysis of the impact of promised future measures which are described as "under development" and others that had been announced but had not been implemented prior to September 2015:

> *While this analysis focuses on policies implemented as of September 2015 and does not reflect the impact of additional federal, provincial, or territorial measures announced or under development, it is recognized that future improved practices will mitigate emissions. As measures to meet targets are implemented, they will*

be incorporated into future emissions projections and future upstream GHG reviews.

— Report, section A.6, p. 16

The report provided no assessment of whether future emissions reduction measures in Canada could offset the projected increase of oil sands emissions to enable the country to achieve the required deep reductions by 2030.

38. The *Review of Related Greenhouse Gas Emissions Estimates for the Trans Mountain Expansion Project,* **Exhibit "J",** did not answer whether the projected continued expansion of Canada's oil sands production to 2030 and thereafter could be reconciled with keeping the further increase in global average surface temperature from exceeding the 2°C warming limit or with Canada's commitment to *"pursue efforts to limit the temperature increase to 1.5°C*. By 2016, the available scientific evidence had concluded that global oil production must begin to decline by 2020, to have even a 50% probability of keeping within the 2°C limit.

39. The matter of global oil production and the 2°C warming limit is briefly considered in the **Exhibit "J"** report in section B.2.3 ("Global Crude Oil Outlook" at p. 23) and in section B.2.6 of the report ("Canadian Climate Change Commitments and Oil Sands Production" at pp. 28-29). The report cited the IEA's 450 Scenario:

> *In the IEA's 450 Scenario, in which the world has a 50% chance of limiting the long-term increase in average global temperature to no more than 2°C, global oil demand peaks by 2020 at 93.7 MMbbl/d and declines 18% from 2014 levels to 74.1 MMbbl/d in 2040.*
>
> — Trans Mountain Report, sec. B.2.3 "Global Crude Oil Outlook", p. 23 (emphasis added)

40. The report does not agree – or disagree – with the IEA's conclusion that global oil consumption must begin to decline by 2020 to meet the 2°C

commitment. About the future trend of global oil production, the report says only this:

> *"However, a common result of modelling efforts to analyze a 2°C world is that overall global crude oil consumption declines relative to the status quo."*
>
> — **Exhibit "J",** Report, sec. B.2.6, page 28

41. That single sentence is the only acknowledgment in the report that multiple studies by climate scientists (described only as "modeling efforts") had concluded that absolute reductions in fossil fuel consumption, including global oil consumption, would be essential to avoid an irreversible commitment to warming above the 2°C limit. The report offered no comment on the time frame for when global oil consumption must peak and begin to decline (the IEA's 50 Scenario cited in the report said by 2020) and did not discuss the magnitude of the cuts needed by 2040.

42. The report stated that, in some studies, scenarios show that "oil sands production is not fully consistent with a world in which global warming is limited to 2°C." It asserted, however, that "other projections" show that "oil sands production could <u>continue to expand from current levels</u> while still limiting warming to 2°C" (emphasis added). The report summarizes what appeared to be conflicting evidence:

> *A number of studies have considered scenarios where global warming is limited to 2°C. However, these scenarios utilize different modelling frameworks and can have vastly different assumptions around technology and economic progress. The role of technological innovation, policy design … and business behaviour … can have significant implications on Canadian oil sands production in these scenarios. As a result of the differing treatment of these variables, conclusions across scenarios are not uniform, and <u>the impact on Canadian oil sands production is not clear</u>. However, a common result of modeling efforts to analyze a 2°C world is that overall global crude oil consumption declines relative to the status quo.*
>
> — **Exhibit "J",** Report, sec. B.2.6, p. 28 (emphasis added)

43. The report concluded that it “is not clear” whether Canada’s plans to continue expanding its oil sands production to 2040 could be consistent with a world in which global warming is limited to 2°C.

44. The assessment was not a public inquiry. It provided no opportunity for cross-examination or any public questioning. There was no public or media access. There is no record. The March 19, 2016 notice in the *Canada Gazette* explained what evidence could be relied on in the assessment procedure: it stated that *“*publicly available date provided by the proponent will be used*”* (emphasis added) in the assessment. The “proponent” was the pipeline company. No representatives of the public were present to demand the right to call evidence.

The Ministerial Panel on the Trans Mountain Pipeline

45. The Ministerial Panel on the Trans Mountain Pipeline, the third government process, was appointed in the summer of 2016, shortly before the government’s final decision approving this project was made. At a series of public meetings conducted by the Panel in Alberta and in B.C. during July and August 2016, members of the public were permitted to attend and express their concerns about what issues and evidence had been overlooked, or inadequately dealt with, during the first two processes – or to express their approval of the project. The three panel members had no powers to call evidence, or to make findings, or draw any conclusions about the emissions implications of the project. Its mandate was to listen to members of the public. It was not allowed to make any recommendations. The report of the Ministry Panel released on November 1, 2016 is attached as **Exhibit “K**” to this my affidavit.

46. As the report recounts, the panel members heard conflicting statements from presenters on a number of issues, including on whether the planned expansion of oils sands production in Alberta facilitated by the Trans

Mountain Project could be consistent with keeping the increase in global average surface temperature to within the 1.5°C or 2°C warming limits.

47. Notwithstanding its lack of any formal inquiry powers, the Ministerial Panel found a way to make a series of significant findings. The Panel said this at page 46 of their report:

> *Our role was not to propose solutions, but to identify important questions that, in the circumstances, remain unanswered.*

48. One of the most significant divergences of views that the Ministerial Panel identified in its report was a fundamental difference between two visions about the future trend of global oil demand. The panel summarized the views of presenters in Alberta (people who attended and made submissions to the panel were called "presenters"). Presenters did not testify under oath, and were not subject to cross-examination. The Ministerial Panel process was not a judicial hearing. The panel recounts submissions during the hearings in Alberta about the future of global oil demand:

> *There was no campaign of denial. At the same time, presenters pointed to domestic and international energy industry projections that show a rising need for hydrocarbon-based sources during a period of transition to renewable forms of energy. The question, they said, is … how quickly that conversion can occur. The presenters who appeared before us in Calgary suggested a transitional timeline in the order of 30 to 50 years. And if you accept that timeline as realistic, they said that Canada should be prepared in the meantime to compete … for international market share; Canada should not restrain its energy production at the expense of its energy potential …*
>
> — Ministerial Panel Report, p. 10 (emphasis added)

49. In direct contradiction to that view, the report quotes several leading climate researchers who, in their submissions to the panel, explained the consequences of allowing Canadian oil and gas production to grow as presently planned. They explained that our present energy resource expansion plans are incompatible with our overriding commitment to keep warming below 2°C. The panel quotes political scientist Kathryn Harrison,

who has researched and published widely on energy policy and the efficacy of Canada's emissions reduction efforts:

> *To embrace the economic viability of this project is to self-consciously make an economic bet on a world of catastrophic climate change that the Government of Canada itself explicitly committed to avoid.*
>
> — Ministerial Panel Report, p. 32

50. Harrison's point is that the future economic viability of the Trans Mountain project depends on the world experiencing continued growth of global oil demand over the next twenty-five years, to 2040. Canada's oil sands industry is a high-cost producer, compared to other major suppliers of conventional crude oil around the world. The NEB's forecast expansion of oil sands production from 2.3 million in 2014 to 4.3 million in 2040 – which is the economic rationale for the Trans Mountain project – is based on the assumption that we will see *two or three more decades of increasing global oil consumption*.

51. The first "high-level question" that "remains unanswered", according to the three panel members, was whether the growth of emissions that will result from building the Trans Mountain pipeline can be reconciled with Canada's climate change commitments, which include our 2030 reduction target. In its report released on November 1, 2016, the panel stated the unanswered question this way:

> *Can construction of the new Trans Mountain Pipeline be reconciled with Canada's climate change commitments?*
>
> — *Ministerial Panel Report*, November 1, 2016, p. 46.

The Ministerial Panel unanimously concluded that this important question "remained unanswered".

52. The Ministerial Panel's report was delivered to the government four weeks before the Government of Canada formally authorized the pipeline expansion project. The government offered no public comment on the

unanswered question. For thousands of citizens in British Columbia, the Ministerial Panel was the only process that offered them any avenue to make substantive comments on the emissions implications of the project.

53. The Ministerial Panel's report was delivered to the government on November 1, 2016. Four weeks later, the cabinet announced its decision In approving the two pipelines – without any public comment on the unanswered question other than:

> *Whereas the Governor in Council having considered the estimated **upstream greenhouse gas emissions** associated with the Project and identified in Environment and Climate Change Canada's Report entitled "Trans Mountain Pipeline ULC – Trans Mountain Expansion Project: Review of Related **Upstream Greenhouse Gas Emissions Estimates**" and measures under the Pan Canadian Framework on Clean Growth and Climate Change is satisfied that the project is consistent with Canada's commitments in relation to the Paris Agreement on Climate Change.[8] (emphasis added)*

Attached hereto and marked As **Exhibit "L**" pages 1-10 of the Order in Counsel. Significantly, Cabinet did not authorize or approve the downstream emissions and their impact on our international commitments.

The significance of "downstream emissions"

54. The greenhouse gas emissions released from the oil sands extraction and upgrading operations in Canada ("upstream emissions") are only a small proportion of the total emissions associated with the industry's overall emissions impact. In assessing the overall emissions impact of expanding Canada's oil sands production, the largest share of emissions are those associated with the final combustion of the fuel in vehicle engines.

55. A full analysis calculating the lifecycle GHG emissions for oil sands bitumen takes into account multiple stages of the production process through to final

[8] Exhibit "C" Order in Council PC Number 2019-0820, page 9.

use. A “well-to-refinery gate” analysis accounts for all emissions during the extraction and preliminary processing stage including, in the case of Canada’s oil sands industry, upgrading in Alberta and transportation to the refinery, but does not include emissions from refining (where the refining occurs in the U.S.). Those are the “upstream emissions” in Canada’s case. A “well-to-tank” analysis includes all emissions from extraction to the delivery of a transportation fuel to the tank of a vehicle, including refining, but does not include the emissions associated with burning that fuel. A well-to-wheel life cycle analysis accounts for all associated emissions, including fuel combustion in a vehicle’s engine. Attached hereto as **Exhibit “M”** is a true copy of Section 3 (“Emissions intensity of oilsands”) of a report, *The oilsands in a carbon-constrained Canada,* published in February 2020 by the Pembina Institute, and the introductory portion of that report. The appended Section 3 summarizes how the life-cycle emissions impact of crude oil is measured.

56. The Pembina Institute report at pp. 21-22 explains that about 20-30% of total emissions occur during the well-to-tank portion of the fuel life cycle. The remaining 70-80% of GHGs are emitted from the combustion of the fuel in vehicle engines. The “downstream emissions” associated with Canada’s currently expanding oil sands industry are the most significant part of any assessment of the climate implications of the Trans Mountain project. The “downstream emissions” are excluded from Canada’s annual reporting of its oil and gas sector emissions because they do not take place in Canada. However, these emissions impact Canada and the entire planet due to the shared atmosphere and global impact of the emitted GHGs.

DATA RELATING TO CANADA’S EMISSIONS

Emissions from Canada’s oil sands industry

57. The most recent data published by the Government of Canada shows that the oil and gas sector is the largest source of GHG emissions in Canada's economy, and that between 2005 and 2018 the oil sands sub-sector has been by far the largest source of emissions growth in Canada. I attach as **Exhibit "N"** to this my affidavit a true copy of sections and tables of data from the *National Inventory Report 1990-2018: Sources and Sinks in Canada,* published by Environment and Climate Change Canada in April 2020. It sets out emissions data for Canada's economy, up to and including 2018, and provides a breakdown of the annual emissions for specific sub-sectors and industries in each sector, including the oil sands industry. Table 2-12 at page 56 gives emissions data for 2018 for Canada's entire economy, which is divided into seven economic sectors.

58. The oil sands industry is projected to be the largest source of new emissions growth in Canada over the next eleven years to 2030. I attach as **Exhibit "O"** a true copy of a number of sections and tables from *Canada's Fourth Biennial Report on Climate Change* released on January 2, 2020, which is Canada's report to the United Nations Framework Convention on Climate Change. Table A2.1 at page 118 provides oil and gas sector emissions data for 2005 to 2017, and shows the annual level of emissions for each sub-sector. It also includes projections showing emissions to 2020 and 2030. The oil sands sub-sector since 2005 has accounted for all of the increase in oil and gas sector emissions up to 2018, and it is projected to account for all of the expected emissions growth in the oil and gas sector to 2030. I reproduce in Figure A below the emissions data found in Table A2.1 at page 118:

Figure A: Oil and gas sector emissions (Mt CO_2eq)

	Historical			Projected		Change
	2005	**2015**	**2017**	**2020**	**2030**	**2005-2030**
Natural Gas Production and Processing	57	52	50	45	38	**-19 Mt**

Conventional Oil Production	30	36	31	32	28	**-2 Mt**
Oil Sands	36	71	81	94	110	**+75 Mt**
Oil and Natural Gas Transmission	12	10	10	10	10	**-2 Mt**
Petroleum Products (Refining)	22	21	22	23	23	**1**
Natural Gas Distribution	1	1	1	1	1	**0**
Total	**158**	**192**	**195**	**206**	**213**	**+55 Mt**

Source: *Canada's Fourth Biennial Report* (January 2,2020), Table A2.1, page 118. The report notes that numbers may not sum due to rounding.

59. I attach as **Exhibit "P"** a true copy of a portion of the report entitled *Canada's Energy Future 2019: Supply and Demand projections to 2040* released by Canada's Energy Regulator (CER) on December 3, 2019. The report provides crude oil production data for the period 2005 to 2018, and projections of future production to 2030 and 2040, including oil sands production data. The attached section of that report under the heading "Results" provides a summary of Canada's projected oil output to 2040 and a discussion of the availability of pipeline capacity.

60. I attach as **Exhibit "Q"** a true copy of the relevant pages of the data sets appended to the *Canada's Energy Future 2019* report that provide details of the actual and projected oil sands production over the period from 2005 to 2040. The link to the data sets is found at https://apps.cer-rec.gc.ca/ftrppndc/dflt.aspx?GoCTemplateCulture=en-CA

61. The data available from the above sources show that since 2005 the rise in the annual level of GHG emissions from the oil sands industry has increased approximately in proportion to the increase in production and that pattern is projected to continue to 2030. I reproduce below in Figure B oil sands

emissions data taken from **Exhibit "O"** for the years 2005 to 2018. The projected annual level of emissions from the oil sands sub-sector in 2030 is taken from Table A2.1**.** The emissions figures are given in millions of tonnes of CO2eq (Mt). The production numbers on the bottom line are in millions of barrels per day (bpd):

Figure B: Canada's oil sands production and emissions data 2005-2030

	2005	2015	2016	2017	2018	2030
Emissions (Mt)	37	74	75	80	84	110
Production (millions bpd)	1.065	2.523	2.546	2.822	3.043	4.105

Source: Emissions data from the *National Inventory Report 1990-2018: Greenhouse Gas Sources and Sinks in Canada*, April 20, 2020, and *Canada's Fourth Biennial Report*, January 2, 2020. Production data from *Canada's Energy Future 2019, Supply and Demand Projections to 2040*, Canada's Energy Regulator, December 3, 2019.

62. Based on the data set out in **Exhibits "N", "O", and "P",** summarized above in Figure B, during the most recent reported three year period from 2015 to 2018 oil sands production increased by 520,000 barrels per day, accompanied by a 10 Mt increase in the annual level of emissions from the oil sands sub-sector, rising from 74 Mt in 2015 to 84 Mt in 2018.

63. Over the period 2018 to 2030, the level of oil sands production is projected to continue increasing, rising from 3.043 million bpd to 4.105 million bpd. Over that period, the annual level of emissions from Canada's oil sands industry is projected to increase by another 26 Mt, bringing the sub-sector's total emissions to by 2030 to 110 Mt.

64. The Government of Canada's data projects that Canada's oil sands output will increase by an additional 1.0 million bpd between 2018 and 2030.

65. In addition to oil sands production of 3.043 million bpd in 2018, Canada's total crude oil production in 2018 (including conventional oil) averaged 4.8

million bpd: *Canada's Energy Future 2019, Supply and Demand Projections to 2014,* **Exhibit "Q"** at pages 10 and 12. **Exhibit "P"** projects that Canada's total oil production including both oil sands and conventional oil output will increase to 6.038 million bpd by 2030

66. The International Energy Agency's (IEA) report *World Energy Outlook 2019*, published in November 2019, documents that global oil production (including Canada) is currently projected to increase from 97.7 million bpd in 2018 to 105.4 million bpd by 2030, and to further increase to 106.4 million bpd by 2040. The IEA also published in the same report a mitigation scenario, called the Sustainable Development Scenario, which estimates the reduction in global oil consumption that would be required by 2030 to give a 66% probability of limiting global warming to less than 2°C. The Sustainable Development scenario calculates the magnitude of the reductions in global fossil fuel use that would be required in order to limit the rise of global surface temperature to less than 1.8°C with a 66% probability, or 1.65°C with a 50% probability. It concludes that global oil consumption would have to be cut to 87.1 million bpd by 2030, and decline further to 66.9 million bpd by 2040, to meet that goal. Further particulars of the IEA's projections of global oil production to 2030 and the Sustainable Development Scenario are set out in paragraphs 117-127 of my affidavit below.

67. The IEA's Sustainable Development Scenario would require that global oil production from all producing countries be cut from 97.7 million bpd in 2018 to 87.1 million bpd by 2030, a net reduction of slightly more than 10 million bpd within the next decade, to keep warming to less than 1.8°C.

Canada's total emissions: all seven economic sectors

68. The most recent data published by the Government of Canada reporting Canada's total annual greenhouse gas emissions is *National Inventory Report 1990-20i8: Sources and Sinks in Canada***, Exhibit "N",** which covers emissions up to 2018. The emissions results for 2019 are not yet available. I

reproduce in Figure C emissions data taken from Table ES-3, found at page 10 of that report:

Figure C: Canada's GHG emissions by economic sector 2005-2018 (Mt CO_2eq)

	2005	2013	2014	2015	2016	2017	2018
Oil and Gas	158	185	191	191	187	188	193
Electricity	119	81	77	81	75	73	64
Transportation	161	174	172	172	174	179	186
Heavy Industry	87	79	80	79	77	76	78
Buildings	86	86	89	86	82	85	92
Agriculture	72	73	71	71	72	71	73
Waste & Others	46	43	41	41	41	42	42
National GHG Total	**730**	**721**	**721**	**720**	**706**	**714**	**729**

Source: *National Inventory Report 1990-2018: Sources and Sinks in Canada*, Table ES-3 at p.10.

69. The annual level of Canada's total emissions in 2018 was virtually the same as it was in 2005. Since 2005, emissions in Canada's largest emitting sector, oil and gas, have increased 35 Mt. The oil and gas sector accounts for 37% of Canada's total emissions. Based on Table 2-12 at page 56 of **Exhibit "N",** the combined emissions from conventional oil and natural gas activities have declined by 6 Mt in that period, but the annual level of emissions in the oil sands sub-sector increased by 47 Mt. The second largest emitting sector in Canada is transportation. Transportation sector emissions have also increased, by 25 Mt since 2005. The Transportation sector comprises all road transportation, both passenger vehicles and freight transport, as well as emissions from railways, marine shipping, and domestic aviation.

70. The only sector in Canada that has achieved substantial reductions is electricity generation, which have been cut by 55 Mt since 2005. But the entire reduction of electricity sector emissions has been more than offset by the combined 62 Mt increase in oil and gas sector and transportation emissions.

71. In December 2009, the Conservative government of that time under Prime Minister Stephen Harper made a commitment under the Copenhagen Agreement that Canada by 2020 would achieve a 17% reduction of its total annual emissions below the 2005 level, which would mean the annual level would decline to 613 Mt. Based on the Government of Canada's data published on April 20, 2020 providing the most recent emissions data up to 2018 (summarized above in Figure "C"), Canada's total emissions reached 729 Mt in 2018. Canada has achieved a net reduction of 1.0 Mt over the past thirteen years.

72. The most recent information published by the Government of Canada showing the projected level of Canada's total GHG emissions to 2030 is *Canada's Fourth Biennial Report on Climate Change* **Exhibit "O",** released by Environment and Climate Change Canada in April 2020. Projected emissions based on current policies are set out in Table 5.1 of that report, at page 29. Data taken from Table 5.1 are reproduced in Figure D below, showing Canada's emissions for each sector in 2005 and the projected increases or decreases to 2020 and to 2030. I have added the numbers listed in the column on the far right, which show the projected changes over the period between 2005 and 2030:

Figure D: Emissions projections to 2020 and 2030 (Mt CO_2eq)

	2005	**2020**	**2030**	**Change 2005-2030**
Oil and Gas	158	206	215	**+57 Mt**
Electricity	119	52	24	**-95 Mt**

Transportation	162	170	153	**-9 Mt**
Heavy Industry	87	77	84	**-3 Mt**
Buildings	86	84	77	**-9 Mt**
Agriculture	72	74	76	**+4 Mt**
Waste and Others	47	43	45	**-2 Mt**
Total	**730**	**705**	**673**	**-57 Mt**

Source: with respect to the above 2005 emissions data and projection to 2020 and 2030 and estimated changes, *Canada's Fourth Biennial Report to UNFCCC* (January 2, 2020), Table 5.3. The report notes that numbers may not sum due to rounding.

73. Based on current measures, *Canada's Fourth Biennial Report* (January 2020), total emissions from Canada's seven economic sectors are projected to decline to 673 Mt by 2030. "Current measures" means that these projections take into account future emissions reductions that will be obtained over the next decade from emissions reduction policies that have already been adopted and implemented by the Federal government and by provincial governments. The Canadian government calls these projections "with measures scenarios" (WM Scenarios). The report states that "WM Scenarios are based on policies and measures in place as of September 2019 and assume no further government action" (report, section 5.1.1. p. 29).

74. Canada's commitment under the December 2015 Paris Agreement, referred to as Canada's "Nationally Determined Contribution" (NDC), was to cut the country's total emissions 30% below the 2005 level by 2030, which would be a reduction of 219 Mt - down to an annual level of 511 Mt by 2030. Based on the most recent report by the Government of Canada, projected reductions by 2030 under current policies are only 57 Mt. The shortfall to meet Canada's target is another 162 Mt.

Additional measures scenarios

75. *Canada's Fourth Report* **Exhibit "O"** in section 5.2.1 at pages 34 – 35 outlines "additional measures" that it says will bring deeper reductions by 2030. These are described as policies and measures "that have not yet been fully implemented". The government's numbers incorporating the "additional measures" showing the projected annual level of emissions for each of Canada's seven economic sectors in 2020 and in 2030 are found in Table 5.9 of the *Fourth Biennial Report*, at page 35. I reproduce below in Figure E the emissions data given in Table 5.9 for the seven sectors:

Figure E: Canadian 2030 GHG Emissions Forecast (Mt CO_2eq) with additional measures

	Current Projections to 2020	Projections to 2030		
		Current Measures	Additional Measures	Difference
Oil and Gas	206	213	199	**-14 Mt**
Electricity	52	24	18	**-6 Mt**
Transportation	170	153	141	**-12 Mt**
Heavy Industry	77	84	80	**-4 Mt**
Buildings	84	77	62	**-15 Mt**
Agriculture	74	76	74	**-2 Mt**
Waste and Others	43	45	42	**-3 Mt**
Total	**705**	**673**	**616**	**-56 Mt**

Source: *Canada's Fourth Biennial Report on Climate Change*, Table 5.9 at p. 35.

76. With respect to the seven economic sectors, the *Fourth Biennial Report* shows that after taking into account the benefit of the proposed additional measures, and assuming they are effective and achieve the promised additional emissions cuts, Canada's emissions for those sectors will be reduced by 56 Mt down to 616 My by 2030. That would still leave a shortfall of 111 Mt to meeting Canada's 511 Mt target by 2030.

77. In section 5.2 of the *Fourth Biennial Report*, **Exhibit "O",** Environment and Climate Change Canada states that Canada's total emissions by 2030 will be further reduced by means of two other arrangements or schemes that will account for a further 28 Mt reduction. Particulars of this further 28 Mt reduction are included in Table 5.9 of the Fourth Biennial Report. The additional deduction is as follows:

Total emissions in 2030 with additional measures:		616 Mt
Less:	LULUCF	-15 Mt
	WCI Credits	-13 Mt
Total after deducting WCI Credits and LULUCF reduction:		588 Mt

The LULUCF reduction

78. The *Fourth Biennial Report* **Exhibit "O"** at Section 5.2.1, starting at page 34, refers to the "LULUCF sector" (Land Use, Land Use Change, and Forestry), and makes this claim: "The LULUCF sector is expected to reduce Canada's emissions by 15 Mt in 2030" (page 35). Details of the LULUCF deduction and how it is calculated are set out in Annex 2.6 of the report, at pages 152 – 156 of the report. As described on page 153, *"the LULUCF sector reports GHG fluxes between the atmosphere and Canada's managed lands (Forest Land, Cropland, Wetlands, Settlements, and Other Land), including those associated with land-use change and emissions from harvested wood products (HWP) derived from those lands."*

79. The term "fluxes" refers to the interchange of CO_2 and other GHGs between the atmosphere and Canada's managed forest lands and other managed land. Section A2.6.2 on page 153 explains that, in the case of Forest Land, growing forests absorb CO_2 from the atmosphere (making them carbon sinks that account for "removals" of carbon). Conversely, the clearing of Forest Land to make way for agriculture or urban development, and the harvesting of wood products, reduce the capacity of Canada's forest land to absorb

GHGs. Similarly, methane and nitrous oxide released from drained wetlands are accounted for as emissions.

80. In 2017, the estimated net GHG flux in the LULUCF sector, calculated as the sum of GHG emissions and CO_2 removals, was a net removal of 24 Mt CO_2eq (the derivation of that net amount is given in Table A2.44 on page 154). The projected estimate for 2030 is a net removal 15 Mt, and that figure is presented in Table 5.9 (at page 35).

81. In the case of Forest Lands, the Fourth Biennial report **Exhibit “”** states that an estimated 140,000 ktCO_2eq (140 Mt CO_2eq) of removals is projected for 2030, but offsetting most of that an estimated 130,000 kt CO_2eq (130 Mt CO_2eq) representing emissions from harvested wood products: Table A2.45 at page 156. Forest Lands are the dominant part of the LULUCF sector, in terms of emissions. Table A2.45 demonstrates the capacity of Canada’s growing forests to “remove” carbon from the atmosphere every year in large amounts that offset the projected future emissions attributed to tree harvesting and to activities on Croplands, Settlements, and Wetlands.

82. The *National Inventory* report **Exhibit “N”,** addressing GHG Emissions/Removals reported for the LULUCF sector in 2018, also gives 140 Mt as the measure of forest land “removals” in 2018 and 130 Mt as the measure of emissions attributed to “harvested wood products”: Table 2-10 at page 47. After taking into account other much smaller emissions sources and removals in the LULUCF sector, Table 2-10 gives -13 Mt as representing the total net emissions figure for the LULUCF sector in 2018. That data and the net total is found in Table 2-10 at page 47 of Exhibit 1.

Wildfires and other “natural disturbances”

83. Environment and Climate Change’s own data shows, however, that the capacity of Canada’s forests to “remove” carbon from the atmosphere and the actual removals attributed to Forest Land in recent years has been very

significantly offset by emissions from forest fires in Canada, which include "wildfires" in British Columbia and Alberta. Emissions from wildfires are not accounted for in Table A2.45 of Exhibit 2, and are therefore not counted in calculating the net removal of -24 Mt in 2017 or in estimating the projected net removal in 2030.

84. Canada's *Fourth Biennial Report* **Exhibit "O"** in Annex 2.6, at section A2.6.4 on page 160, affirms that emissions resulting from "significant natural disturbances" are "excluded from the accounting". At page 155, significant natural disturbances are defined to include "wildfires and insect infestations". At A2.6.4 on p.160 the report explains that in 2012 the government informed the UNFCCC that Canada's accounting of GHG emissions towards its 2020 target would exclude natural disturbances.

85. The magnitude of GHG emissions from wildfires are not reported or disclosed in the *Fourth Biennial Report*. But emissions from wildfires in Canada are reported in the *National Inventory Report,* **Exhibit "N**", published by Environment and Climate Change Canada in April 2020.

86. The *National Inventory Report* in Chapter 6 discusses the LULUCF sector and the matter of "emissions and removals" from Forest Land at section 6.1 on page 141. The report acknowledges that the Forest Lands category has the largest influence on the total LULUCF sector, because of the magnitude of forest "removals" (which refers to absorption of CO_2 from the atmosphere) and the substantial size of the emissions attributed to the annual tree harvest. The combined net flux from Forest Lands and forest harvest amounted to net removals of 13 Mt in 2018 (counting removals of 140 Mt in 2018 and emission of 130 Mt from forest harvest, and taking into account other smaller emissions and removals). But those emissions discussed in section 6.1 do not include forest fires.

87. At Table 6-5 on p. 147, the *National Inventory Report* published data showing emissions from "natural disturbances". The largest category is

"Wildfires – immediate emissions", which were 260 Mt in 2018. In 2015, 2016, and 2017 the annual wildfire emissions numbers were 250 Mt, 130 Mt, and 230 Mt respectively. Those emissions are excluded from the calculation of net removals for the LULUCF sector.

88. Table 6-5 of **Exhibit "N"** shows that wildfire emissions in the years 1990, 2005, and 2013 were 38 Mt, 67 Mt, and 59 Mt respectively. Table 6-3 on p. 149 shows the pronounced increase in the annual level of emissions from "natural disturbances" to Forest Land areas over the period 1990 to 2018. Table 6-5 makes clear that the "natural disturbances" emissions are overwhelmingly attributed to wildfires.

89. As **Exhibit "N**" confirms, Canada's total GHG emission in 2018 were 729 Mt. In that same year, emissions from wildfires in Canada released another 260 Mt of CO_2 and other GHGs, all of which are added to the world's cumulative emissions. But the wildfire emissions are not included in the 729 Mt total.

90. The Government of Canada's emissions reporting, and in particular **Exhibit "N",** acknowledge the significance of economic activities such as logging that are reducing the capacity of our Forest Lands to operate as "sinks" that absorb CO_2 from the atmosphere (as noted in 2018 forest harvesting accounts for 130 Mt of deemed emissions). That 130 Mt amount of emissions attributed to forest harvesting in 2018 was offset by 140 Mt of "removals" by Forest Lands, which claims for Canada the benefit of our forests' capacity to absorb carbon from the atmosphere – and thus substantially reduces the emissions impact of our forest industries. The approach is the one adopted in both *Fourth Biennial Report* and in the *National Inventory Report*.

91. However, by excluding the impact of "wildfires" from the LULUCF calculation as Environment and Climate Change has done, Canada is claiming the full benefit of our Forest Lands as a carbon "sink" which provides a very

substantial *reduction* in the calculation of Canada's annual emissions and projected emissions to 2020 and 2030 (currently about 140 Mt annually) but Canada is entirely leaving out of account the 230 Mt to 260 Mt of direct annual emissions caused by wildfires in recent years. Counting the forest "removals" but excluding the annual emissions from forest fires seriously misrepresents the net impact of Canada's forests on global emissions.

92. If the LULUCF emissions were calculated in a way that included the full range of removals and emissions from Forest Lands, specifically including wildfires, the impact on Canada's total emissions in 2018 would increase in the annual level to something in excess of 900 Mt, or approximately 200 Mt higher than the 729 Mt reported by the *Fourth Biennial Report*. That approach, if followed would result in a commensurate increase in the projected annual level of Canada's projected emissions in 2030.

WCI Credits

93. The *Fourth Biennial Report*, **Exhibit "O",** calculates that a further 13 Mt reduction of Canada's total GHG emissions will be achieved by relying on what are described as "WCI Credits" which refers to the "Western International Climate Initiative". This is an arrangement that would allow industrial emitters in Canada who are unwilling or unable to cut their own emissions (to comply with future emissions reduction policies in Canada that set certain emissions limits on industries) will instead be permitted to purchase credits from foreign jurisdictions (where the reductions will actually occur) – allowing the Canadian enterprise to continue to emit CO_2 and other GHGs into the atmosphere unabated using their existing carbon-intensive processes and technologies. They will be permitted to delay until after 2030 the kinds of technological innovation needed to reduce emissions in Canada.

94. The Canadian emitter would purchase credits (also referred to as "offsets") that will be recognized in Canada as equivalent to achieving emissions

reductions. The concept assumes that the offsetting reductions in the foreign jurisdiction will actually occur, and that the actual reductions (which will take place in the foreign jurisdiction) will be in addition to any emissions reductions that would have ordinarily occurred in that place. The arrangement raises serious questions of integrity and compliance.

95. The reliance on WCI Credits is not really a plan to reduce Canada's emissions. It is an arrangement that will *defer* a share of the cuts needed in Canada until some time after 2030. It may also defer technological innovation in Canada. The theory is that while emissions are not actually reduced in Canada, reductions equivalent to amounts represented by the Credits will be achieved in a foreign jurisdiction so that, in global terms, a reduction of emissions is occurring. By adopting this kind of scheme, we are simply shifting the burden of eventually making this 15 Mt reduction of emissions in Canada to the next generation in charge in Canada after 2030 (our children) – but it will be, for them, an additional 15 Mt burden on top of all the other reductions they will have to make between 2030 and about 2050 when ultimately emissions in Canada must be reduced to "net-zero". WCI Credits are an arrangement to defer emissions reduction in Canada until after 2030. Eventually the higher level of emissions in Canada will have to be reduced.

Report of the Auditors General (March 27, 2018)

96. On March 27, 2018, the Auditor General of Canada in collaboration with the auditors general of all ten provinces (except Quebec) issued a joint report entitled *Perspectives on Climate Change in Canada*: *A Collaborative Report from Auditors General.* A true copy of the Report is attached hereto as **Exhibit "R"** to this my affidavit. Under the heading "Key issues identified in audits of climate change action in Canada", the 28-page report states (emphasis added):

> *Canada's auditors general found that most governments in Canada were not on track to meet their commitments to reducing greenhouse gas emissions. … Meeting Canada's 2030 target will require substantial effort and actions beyond those currently planned or in place.) (p.4)*
>
> *…*
>
> *For the most part, auditors found that government's plans to reduce greenhouse gas emissions consisted of high-level goals, with little guidance on how to implement actions. Details often missing from plans included timelines, estimates of the reductions expected from individual action items, and information about funding. (p.4)*

97. The Auditors General emphasize that "broad goals" are not sufficient:

> *It is unclear how Canada will meet this target. Although it is important for governments to set broad goals around climate change, they must also provide detailed timelines and interim steps for achieving those goals (p. 18)*

98. The Auditors General in their report acknowledged that Canada will fail to meet its 2020 Copenhagen target, a commitment made in 2009 by the Conservative Government of Stephen Harper to reduce emissions 17% by 2020, below the 2005 level. The target is 613 Mt. The Government of Canada's most recent emissions data, released on April 20, 2020, reported that Canada's total emissions reached 729 Mt in 2018. Total emissions in 2005 were 730 Mt. A link to the report is found at https://www.oag-bvg.gc.ca/internet/English/parl_otp_201803_e_42883.html

GLOBAL EMISSIONS

The global emissions gap

99. Since 2010, the UN Environment Programme has published a series of annual reports that document the annual level of global GHG emissions and provide projections showing the expected growth trend of global emissions. Initially, the annual reports projected the trend of emissions up to 2020,

based on current policies. Since at least 2016, the reports have provided, annually, updated calculations showing projected emissions to 2030, and estimate the magnitude of the emission reductions required on a global scale by 2030 to keep the increase in global warming from exceeding 2°C above the pre-industrial level. In more recent years the reports have also included calculations of the reductions that would be needed to stay within the 1.5°C warming limit. The most recent report in this series is the *Emissions Gap Report 2019*, released on November 26, 2019: https://wedocs.unep.org/bitstream/handle/20.500.11822/30797/EGR2019.pdf

100. The *2019 Emissions Gap Report* provides new data showing the actual level of total global GHG emissions in 2018. The document also provides a measure of the global emissions "gap", which is the difference between the currently projected annual level of global emissions by 2030 and the lower level of emissions that would be consistent with meeting the 1.5°C and 2°C goals. A true copy of the Executive Summary and Chapters 1 and 2 of the UN Emission 2030 Gap Report 2019 is attached hereto as **Exhibit "S".** The full report is 62 pages in length.

101. The emissions "gap", for meeting the 2°C goal, is the difference between the annual level of total GHG emissions in 2030 that would be consistent with a 66% probability of limiting the increase in global temperature to less than 2°C above the pre-industrial level, and the currently projected higher level of GHG emissions in 2030 based on current policies. Baseline projections estimate the future trajectory of emissions based on expected economic growth to 2030, population growth, expected improvements in efficiency, and other economic factors that drive total energy demand. Baseline projections do not generally take into account the benefits of any new carbon-reduction policies unless those measures have actually been implemented. The *UN Emission Gap 2019 Report* includes a baseline projection showing the currently expected growth of global emissions up to

2030. It also provides a projection that take into account all promised future emissions reductions pursuant to commitments made by countries under the 2015 Paris Agreement to reduce their own emissions, even where those promised future policies have not yet been implemented. The emissions "gap" calculation therefore *assumes* that all countries will in fact fully implement all of their future reduction commitments. It is, for that reason, a more optimistic projection of how global emissions will develop to 2030.

102. Under the terms of December 2015 Paris Agreement, all parties to the United Nations Framework Convention on Climate Change (including Canada) agreed to "holding the increase in global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C." Parties made voluntary commitments to achieve certain emissions reductions by 2030. The promised future reduction commitments by signatories to the Paris Agreement are called their "Nationally Determined Contributions" (NDCs).

103. With respect to the current level of global emissions and the projected level by 2030, the *UN Emissions Gap Report 2019* reports that total GHG emissions in 2018 reached 55.3 $GtCO_2eq$ (Executive Summary, XIV).

104. Based on current policies, total GHG emissions are projected to increase to 60 $GtCO_2eq$ by 2030. Assuming that all unconditional NDC are fully implemented by all signatories to the Paris Agreement, emissions are still projected to increase to 56 $GtCO_2eq$ by 2030. The report concludes that there is "no sign of GHG emissions peaking in the next few years" (Executive Summary, XV).

105. The report states that fossil fuel emissions from energy use and industry, which mainly comprise emissions from burning oil, coal, and natural gas, grew 2.0% in 2018, reaching a record of 37.5 $GtCO_2eq$. Emissions from oil, coal, and natural gas use account for about 70% of all global GHG emissions. Total GHG emissions have risen at a rate of 1.5% per years in

the last decade, stabilizing only briefly between 2014 and 2016. (Executive Summary, XIV).

106. Based on mitigation scenario studies that examine the magnitude of emissions reductions required to limit end-of-century warming to below about 2°C with about 66% or greater probability, the report concludes that the annual level of global emissions must be reduced down to an annual level of 41 $GtCO_2eq$ by 2030 (Executive Summary, Table ES.1 at XVIII and Chapter 3, section 3.2.3, p. 22.

107. Addressing the magnitude of the reductions in the annual level of global emission that would be required by 2030 to keep the increase in atmospheric warming to less than 2°C and 1.5°C, the *Emissions Gap Report 2019* states that global emissions in 2030 would need to be 25% and 50% lower (for 2°C and 1.5°C respectively) than the 2018 level to put the world on a least-cost pathway to stay within those warming limits. Those reductions would have to be achieved on a global scale within the next ten years (Executive Summary XV).

108. In absolute terms, annual emissions by 2030 would need to be 15 $GTCO_2eq$ lower than current unconditional NDCs imply for the 2°C goal (reduced from 56 $GtCO_2eq$ to 41 $GtCO_2eq$), and 32 $GtCO_2eq$ lower for the 1.5°C goal. That is the measure of the emissions “gap”, set out in the report (Executive Summary, Figure ES.4, XIX).

109. Because about 70% of total global GHG emissions are accounted for by the burning of coal, oil, and natural gas, any reductions on the scale needed (that is cuts in the order 25% to 50 % of total emissions) will require very deep reductions in consumption of coal, oil, and natural gas between now and 2030.

110. The *2019 Emissions Gap Report* also finds that in order to limit warming to 1.8°C with a 66% probability, global GHG emissions would have to be

reduced to an annual level of 35 $GtCO_2eq$ by 2030 (6 $GtCO_2eq$ lower than the annual level consistent with staying within the 2°C warming limit). The emission "gap" for 1.8°C is therefore 21 $GtCO_2eq$, which measures the reduction in the annual level of emissions required between now and 2030 to keep warming within that limit.

The atmospheric carbon concentration level

111. The available scientific evidence, to which I refer below, shows that it is the increasing *cumulative emissions* of CO_2 and other GHGs that are driving the observed warming of the earth's atmosphere. Cumulative CO_2 emissions and global mean surface temperature are approximately linearly related. The three most prevalent GHG's (carbon dioxide, methane, and nitrous oxide) have increased in the atmosphere since pre-industrial times, and this increase is the main cause of climate change. That increase has been caused by the use of fossil fuels as a source of energy and also to a lesser degree by changes in land use and agriculture.

112. A key measure that reflects the increasing cumulative emissions of CO_2 is the atmospheric carbon concentration level. The relevant evidence on these matters is presented in two comprehensive reports: *Climate Change 2013: The Physical Science Basis: Contribution of Working Group 1 to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (released September 2013); and Climate Change 2014: *Mitigation of Climate Change. Contribution of Working Group III* (released April 2014). Those two reports formed part of the IPCC's Fifth Assessment Report (the AR5 Report). The AR5 report recently been supplemented by the IPCC's *Special Report on Global Warming to 1.5°C*, in released October 2018. In addition, other recent data relating to atmospheric warming has been published by the World Meteorological Organization in the *WMO Statement on the State of Climate Change in 2019*, released May 25, 2020.

113. Multiple studies, including the IPCC reports cited above, affirm that an atmospheric carbon concentration level of 450 parts per million (ppm) is equivalent to a 2°C increase in global average temperature above the pre-industrial level. That number measures the atmospheric concentration solely of carbon dioxide. Climate scientists add together the warming effect of all the GHGs, principally carbon dioxide, methane, and nitrous oxide. The combined atmospheric concentration of all GHGs is given as "CO_2 equivalent" (CO_2eq).

114. The globally averaged level of atmospheric CO_2 in 2018 increased to 407.8 ppm CO_2 (*WMO Statement on the State of the Global Climate 2019*, at p. 7). I attach hereto as **Exhibit "T"** to this my affidavit a true copy of the *WMO Statement on the State of Climate Change in 2019* (released May 25, 2020). To my knowledge, the concentration level for 2019 has not yet been published.

115. I attach hereto as **Exhibit "F"** to this my affidavit a true copy of the Summary for Policymakers for Climate Change 2013: The Physical Science Basis: Contribution of Working Group 1 to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Seven years ago, Climate Change 2013 reported that the carbon concentration level in 2011 was 390.5. The carbon concentration level reached an annual average of 405.0 ppm in 2017.

116. The *WMO Statement*, **Exhibit "T"** reported that global mean temperature for 2019 was around 1.1°C above the 1850–1900 baseline, used as an approximation of the pre-industrial level. The WMO has also reported that 2019 was "likely to be the second warmest on record"; that 2016 was the warmest year on record; and that "the past five years, 2015–2019, are the five warmest on record." (WMO Statement, p. 6–7). Seven years ago, *Climate Change 2013* reported that warming was 0.85°C above the baseline, using temperature data to 2012. In October 2018, the *IPCC*

Special Report on Global Warming to 1.5°C reported that warming has increased 1.0°C above the baseline.

117. CO_2 is the dominant GHG gas, and it is also particularly problematic because, unlike methane, CO_2 once in the atmosphere does not dissipate or break down. It has an effective atmospheric residence time of centuries to millennia (IPCC 2018 Chapter 1 at 1–23). It is only removed from the atmosphere when it is absorbed by the earth's surface – by dissolving into the upper ocean (and slowly into the deep ocean) or by biological uptake into forests and plants. That happens over a very long period, and the problem is that we keep releasing more CO_2 into the atmosphere every year. Only after large-scale human caused emissions cease will atmospheric CO_2 begin to decline, albeit very slowly – only over decades and centuries. From the perspective of the time frame that concerns us, slowing down the rise in concentration level is crucial.

118. A comprehensive review of the long-term record of atmospheric carbon concentration levels is found in **Exhibit "F",** *Climate Change 2013*. The unprecedented and extraordinary character of the rise in the concentration level observed during our lifetime is described in the Summary for Policymakers published with that report:

> *The atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased to levels unprecedented in at least the last 800,000 years. Carbon dioxide concentrations have increased by 40% since pre-industrial times, primarily from fossil fuel emissions and secondarily from net land use change emissions. The ocean has absorbed about 30% of the anthropomorphic carbon dioxide, causing ocean acidification.*
>
> — IPCC 2013, Summary for Policymakers, B5 at page 11

119. The *Climate Change 2013* report also sets out details of the evidence that places the recent rate of increase in the atmospheric concentration level in a long-term context. CO_2 increased 40% from a concentration level of 278 ppm in about 1750 to 390.5 ppm in 2011. The report confirmed that the

concentrations of carbon dioxide, methane, and nitrous oxide "exceed any level measured for at least the past 800,000 years" (Chapter 6, Executive Summary at p. 467). It reports:

> *During the last 7000 years prior to 1750, atmospheric CO_2 from ice cores shows only very slow changes (increase) from 260 ppm to 280 ppm.*
>
> *…*
>
> *Further back in time, during the past 800,000 years prior to 1750, atmospheric CO_2 varied from 180 ppm during glacial (cold) up to 300 ppm during interglacial (warm) periods.*
>
> — IPCC 2013, Chapter 6 at p. 468

120. Other evidence establishes that by 1958, the atmospheric carbon concentration had risen to 315 ppm, an increase of only 35 ppm above the 1750 level. Since 1958, the level has risen over 90 ppm.

121. The extraordinary and unprecedented rise of the atmospheric concentration level since 1958 reflects the massive growth in the absolute scale of total global CO_2 emissions in recent decades. I attach hereto as **Exhibit "G"** to this my affidavit a true copy of the Summary for Policymakers for *Climate Change 2014*: *Mitigation of Climate Change. Contribution of Working Group III* (released April 2014). *Climate Change 2014* reported: "About half of cumulative anthropogenic CO_2 emissions between 1750 and 2010 have occurred in the last 40 years", that is, since 1970 (Summary for Policymakers, SPM.3 at page 6).

122. **Exhibit "G",** in Figure SPM.1 at p. 7, sets out data showing the rise in the level of total anthropogenic GHG emissions over the period 1970–2010. The annual total of 27 $GtCO_2eq$ in 1970 had increased to 40 $GtCO_2eq$ by the year 2000, and increased again to 49 $GtCO_2eq$ by 2010. Figure SPM.1 also provides data showing the relative share of the principal GHGs in the annual total. In 2010, CO_2 accounted for 75% of total emissions, and 65% of the total was released by the burning of coal, oil, and natural gas and industrial

processes. The UN *Emissions Gap Report 2019*, **Exhibit "S"** reports that the total GHG emissions reached an annual level of 55.3 $GtCO_2eq$ in 2018.

123. In the 1960s the incremental annual rise in the atmospheric carbon concentration level was about 0.6 ppm per year. In the four years since 2015, it has averaged about 2.5 ppm per year.

124. The evidence is clear that if the rise in the carbon concentration level cannot be kept from exceeding 450 ppm, the goal of staying within the 2°C warming limit will almost certainly be foreclosed:

> *Mitigation scenarios in which it is likely that the temperature change caused by anthropogenic GHG emissions can be kept to less than 2°C relative to pre-industrial levels are characterized by atmospheric concentrations in 2100 of about 450 ppm CO_2eq (high confidence).*
>
> — *Climate Change 2014,* Summary for Policymakers, SPM.4.1 at page 10

125. As I have noted above, the carbon concentration level reached 407.8 ppm in 2018. The margin remaining before it reaches 450 ppm is about 42 ppm. Even assuming the rise in the carbon concentration level over the next decade does not exceed the recent incremental amount of about 2.5 ppm every year, if the current volume of global emissions continues at the current rate it is unavoidable that the 450 ppm CO_2 threshold will be reached in another 16 or 17 years, which means by about 2035. The only way to extend that timeline is if, in the meantime, very deep reductions in the annual level of global emissions can be quickly implemented, thus allowing the incremental increase in the concentration level (which is driven by the annual level of emissions from global economic activity) to be reduced so the annual rise is less than 2.5 ppm. In that way, the timeline for exceeding the 450 ppm CO_2 level could be extended for a few more years.

126. But the remaining timeline is even shorter. In addition to the dominant CO_2 emissions, the warming effects of other GHG emissions must also be taken into account. If the warming effects of GHGs are included in the calculation, the combined measure of 450 CO_2eq will be exceeded by 2030, based on

current annual level of global emissions for all greenhouse gases. The baseline studies considered by the *Climate Change 2014* concluded as follows, **Exhibit "G"**:

> *Baseline scenarios (scenarios without explicit additional efforts to constrain emissions) exceed 450 ppm CO_2eq by 2030, and reach CO_2eq concentrations between 740 and more than 1300 ppm CO_2eq in 2100.*
>
> — Summary for Policymakers, SPM.3, p.8 (emphasis added)

The evidence shows that the annual level of total GHG emissions has in fact continued to increase during the past six years, since the IPCC's *Climate Change 2014* report was published.

Future emissions: baseline scenarios and mitigation studies.

127. Baseline projections published in the *UN Emissions Gap Report 2019,* **Exhibit "S"** show that the annual level of total global emissions is currently projected to continue to increase to at least 2030. Baseline scenarios, as that report explains, are based on the current actual level of emissions and then calculate whether, by a future date (by 2030, in the case of *Emissions Gap Report*), the annual level of emissions will increase, or whether it might decline sufficiently to achieve emissions reduction goals. Baseline projections take into account existing emissions reduction measures that have already been implemented, but assume that *no new or additional emissions reduction measures will be implemented*. Baseline studies are based on other assumptions about the rate of future economic growth, growth of energy demand, and take into account normal improvements in efficiency and technology. Baseline projections are also referred to as "business-as-usual" projections.

128. The expected trend of continuing future increases in global emissions was reported six years ago in the *Climate Change 2013* and *Climate Change 2014* reports, **Exhibits "F" & "G",** which reviewed multiple baseline studies that examined the projected pathway of global emissions to the end of the

21st century. Those baseline studies found that, without additional new policies that would very substantially reduce the future level of global emissions, projected growth in cumulative emissions to 2100 will result in warming in the range of 3.7°C to 4.8°C above the pre-industrial level. The Summary for Policymakers in *Climate Change 2013* (Exhibit F) concluded:

> *Without additional efforts to reduce GHG emissions beyond those in place today, emissions growth is expected to persist driven by growth in global population and economic activities. Baseline scenarios, those without additional mitigation, result in global mean surface temperature increase in 2100 from 3.7°C to 4.8°C compared to pre-industrial levels (median values: the range is 2.5°C to 7.8°C when including climate uncertainty, see table SPM.1) (high confidence)*
>
> — IPCC WG3 Summary for Policymakers SPM.3, at page 8

129. The same report also calculated the expected rise in the atmospheric concentration level that would result from the projected ongoing increase in total global emissions, based on the baselines studies. It concluded that by 2100, all of the baseline scenarios show that the atmospheric concentration level of CO_2eq (all GHGs) will increase to between more than 750 ppm and 1300 ppm CO_2eq (IPCC 2014, SPM.3 at p. 8).

130. The baseline scenarios also show that even by 2040–2050 the GHG concentration level will exceed 550 ppm CO_2eq.

131. The IPCC in its Fifth Assessment Report published the results of four other related scenarios, referred to as the Representative Concentration Pathways: RPC2.6, RPC4.5, RCP6.0, and RCP8.5. Each was based on different assumptions about the future path that emissions will follow over the rest of this century. They examine the relationship between the rising level of global emissions to 2046-2065 and to 2081-2100; the accompanying rise in the atmospheric concentration level over that period; and the resulting change in temperature.

132. RCP8.5 is a projection that was designed to model the outcome to 2100 if the global economy continues to follows a path of highly carbon-intensive development, assuming continued high levels of economic growth, continued heavy reliance on coal and other carbon-based fuels, high per-capita CO_2 emissions, and high levels of global population growth. It therefore assessed the future outcome based on a very negative scenario that assumes emissions will continue to increase without abatement. The Representative Concentration Pathway (RCP) studies all measure the expected temperature increase above the 1986-2005 average (which was already 0.6°C above the pre-industrial level). The high-emissions pathway (RCP8.5) shows that by 2081-2100 global mean surface temperature will likely be 2.6 to 4.7°C above the 1986-2005 average. If the additional 0.6°C already experienced up to 1986-2005 is taken into account, the outcome under the high-emissions RCP8.5 scenario to the end of the 21st century is 3.2 to 5.3°C warming above the pre-industrial level. That result, as well as the results for the other three RCP scenarios, is set out in the Summary for Policymakers for the *Climate Change 2013* report, **Exhibit "F",** in section E.1. p. 20.

133. **Exhibit "F"** also reports findings that, under the same high-emissions RCP8.5 pathway, by the nearer period of 2046-2065 which is well within the working lives of children now in high school the mean surface temperature will be 1.4 to 2.6°C warmer the 1985-2005 level – equivalent to 2.0 to 3.2°C above the pre-industrial level.

134. The other three RCP scenarios are mitigation studies: they calculate the implications (in terms of temperature increase) of delaying the timing of implementing future cuts in the annual level of global emissions. RCP4.5 assumes that the present rising trend of global emissions does not "peak" until about 2040, and then starts to decline. Under that scenario, by 2081-2100 warming increases to the range of 1.1 to 2.6°C above the 1986-2005 average: if we add to that the 0.6°C of warming already experienced up to

1986-2005, the projected rise for the end of the 21st century is between 1.7 to 3.2°C above the pre-industrial level. Based on the RCP6.0 scenario, which delays the start of deep emissions reductions until after 2040, the full amount of warming by 2081-2100 is projected to be 2.0 to 3.7°C above the pre-industrial level.

135. The scenario with the lowest cumulative emissions, referred to as RCP2.5, assumes that industrial countries adopt stringent policies to reduce their emissions at an early date. When the RCP2.5 scenario was first published, in 2013, it was based on the assumption that the total level of global emissions would "peak" by 2020 and then begin to decline annually. Under the lowest-emissions pathway (RCP2.5), the earth's surface temperature would likely be 0.3 to 1.7°C warmer than 1986-2005. Assuming deep emissions reductions start by 2020 and that they are sustained with further cuts thereafter, this scenario found that warming by the end of this century will be about 0.9 to 2.3°C above the pre-industrial level.

136. Table SPM.3 at p. 27 of the *Climate Change 2013* Summary for Policymakers **Exhibit "F"** shows the very substantial difference in the amounts of the *cumulative* CO_2 emissions (measured in $GtCO_2$) that would be released into the atmosphere over the period between 2012 and 2100 under each of these four RCP scenarios. The earlier start date of the annual reductions in RCP2.4 is material and it is shown to very significantly affect the outcome. Delay in starting deep reductions will increase cumulative emissions, unless the delay can be compensated for by more rapid and deeper cuts later. The Summary affirms that relationship:

> *"Cumulative total emissions of CO_2 and global mean surface temperature response are approximately linearly related (see SPM.10). Any given level of warming is associated with a range of cumulative CO_2 emissions, and therefore, e.g., higher emissions in earlier decades imply lower emissions later."*
>
> — **Exhibit "F",** *Climate Change 2013*, Summary for Policymakers, p. 27)

137. Findings based on the RCP scenarios are further reported in *Climate Change 2014*, **Exhibit "G"**, in the Summary for Policymakers at SPM.4, page 10. Figure SPM.4 on page 11 represents the four RCP scenarios. It depicts RCP2.6 as the only one of the four emissions pathways that would keep the GHG concentration level to about 450 ppm CO_2eq. The Summary affirms that "mitigation scenarios in which it is likely that the temperature change caused by anthropogenic GHG emissions can be kept to less than 2°C relative to pre-industrial levels are characterized by atmospheric concentrations in 2100 of about 450 ppm CO_2eq."

138. *Climate Change 2013,* **Exhibit "F",** concluded, with respect the four RCP pathways, that global surface temperature "is *likely* to exceed 2°C for RCP 6.0 and RCP8.5, and *more likely than not* to exceed 2°C for RCP.4 (emphasis in original). Warming will continue beyond 2100 under all RCP scenarios except RCP2.6." (**Exhibit "F"**, Summary for Policymakers, E.1 at page 20).

The 1.5°C warming limit

139. *Climate Change 2014,* **Exhibit "G"** reported that, based on the mitigation studies it had assessed, mitigation scenarios in which the temperature increase is more likely than not kept to be less than 1.5°C relative to pre-industrial levels by 2100 are characterized by concentrations in 2100 of below 430 ppm CO_2eq. A lower temperature goal requires a lower atmospheric carbon concentration level. The report acknowledged at that time (in 2014) that only a limited number of studies had explored the question of the magnitude of the emissions reductions needed to meet the 1.5°C goal **(Exhibit "G**", Summary for Policymakers at p. 16).

140. It was not until December 2015, when the Paris Agreement was signed, that countries including Canada agreed "*to pursue efforts to limit the temperature increase to 1.5°C."* I attach hereto as **Exhibit "U"** to this my affidavit a true copy of the Summary for Policymakers of the *IPCC Special*

Report on Global Warming to 1.5°C, which was released October 7, 2018. The Summary explains that the Conference of the Parties of the United Nations Framework Convention on Climate Change in its decision adopting the Paris Agreement in 2015 requested that the IPCC prepare a Special Report on the impacts of warming to 1.5°C and on the related emissions pathways that would be required to meet that goal**, Exhibit "U"** at page 6. Accordingly, it was not until the Special Report was released that more comprehensive and definitive research became generally available about the magnitude of the emissions reductions that would be required to keep the warming increase to 1.5°C.

141. The 2018 IPCC *Special Report,* **Exhibit "U",** sets out the findings of multiple studies showing that in order to limit global warming to the lower range of 1.5°C, global emissions must decline by 45% below 2010 levels by 2030 (about 50% below the present level). That would require a 20-30 $GTCO_2eq$ reduction in the annual global emissions by 2030, below the projected level of 52-58 $GtCO_2eq$ that the *Special Report* projected based on current policies. The required mitigation pathways are graphically depicted in Figures SPM.3a and SPM.3b on pages 15 and 16 of **Exhibit "U**".

142. In describing the details of the emissions reductions required to stay within the 1.5°C warming limit, I refer to the reported findings of the IPCC *Special Report* set out in the Summary for Policymakers, at section D1 and D1.1 on page 20, **Exhibit "U"**. The Summary sets out its estimates showing that, even assuming the full implementation of all "nationally stated mitigation ambitions as submitted under the Paris Agreement", global greenhouse gas emissions will reach <u>52-58 $GtCO_2eq$</u> by 2030. I note that range of 52-58 $GtCO_2eq$, published in October 2018, corresponds to the more recent projections presented in the UN *Emissions Gap Report 2019*, referred to in paragraph 71 of my affidavit, **Exhibit "S"** which provides a baseline projection of 60 $GtCO_2eq$ to 2030, which the UN Report reduces to 56

$GTCO_2eq$ on the assumption that all of the NDCs submitted by the signatories to the Paris Agreement are fully implemented.

143. IPCC *Special Report,* **Exhibit "U"** states at section D1 that, in the case of mitigation pathways that limit global warming to 1.5°C, all but one show a decline in the annual level of global greenhouse gas emissions to below 35 $GtCO_2eq$ in 2030, and half of the available pathways fall within the 25–30 $GtCO_2eq$ range, which as the report notes is a 40%–50% reduction below the 2010 level. In order to reduce global emissions down to those levels, reductions in the order of 20–30 GtCOeq would be required, below the projected 52–58 $GtCO_2$ range based on current policies.

144. It is evident, therefore, that the reductions in the annual level of global emissions that would be required by 2030 to stay within the 1.5°C warming limit, which are in the range of 25–30 GtCOeq, are vastly greater than the 15 $GtCO_2eq$ emissions gap to stay within the 2°C warming limit, reported in the *UN Emissions Gap Report,* **Exhibit "S"**.

Carbon dioxide removal (CDR) technologies

145. The *IPPC Special Report on Warming to 1.5°C,* **Exhibit "U"** reviews multiple mitigation scenarios based on different assumptions about future levels of energy use, future economic growth, technological innovation and the future development of non-renewable energy, to assess whether it will be possible to cut global emissions rapidly and deeply enough to keep the warming increase to less than 1.5°C. The *Summary for Policymakers* (Exhibit 10) in section C3 concludes that none of these mitigation scenarios will lead to sufficient reductions of greenhouse gas emissions to meet that goal and that, without additional measures that have the capacity to remove CO_2 from the atmosphere, the concentration of greenhouse gases in the coming decades will exceed the level consistent with the 1.5°C threshold. The report finds that in order to "return global warming" to less than 1.5°C it will be necessary in future to find a way of removing a substantial amount of

excess CO_2 emissions from the atmosphere, which will depend on developing and deploying future carbon dioxide removal (CDR) technologies:

> *All pathways that limit global warming to 1.5°C with limited or no overshoot project the use of carbon dioxide removal (CDR) on the order of 100–1000 $GtCO_2$ over the 21st century. CDR would be used to compensate for residual emissions and, in most cases, to achieve net negative emissions to return global warming to 1.5°C following a peak (high confidence). CDR deployment of several hundreds of $GtCO_2$ is subject to multiple feasibility and sustainability constraints (high confidence). Significant near-term emissions reductions and measures and lower energy and land demand can limit CDR deployment to a few hundred $GtCO_2$ without reliance on bioenergy with carbon capture and storage (BECCS) (high confidence). (emphasis added)*
>
> — **Exhibit "U",** Summary for Policymakers, *IPCC Special Report 2018*, page 19

146. The term "residual emissions" refers to the amount of CO_2 emissions that exceed the maximum level that is consistent with keeping within the 1.5°C limit. The report finds that in order to stay within that limit, it will be essential in future to deploy CDR technologies on a substantial scale to "compensate" by removing CO_2 from the atmosphere. The report estimates that in order to remove enough CO_2 from the atmosphere to return the carbon concentration to a level consistent with 1.5°C, removal of an amount in the range of 100 $GtCO_2$–1000 $GtCO_2$ would be required.

147. The world's economies are presently releasing about 42 $GtCO_2$ every year (**Exhibit "U**", at C.1.3 on p. 14). The magnitude of the future CO_2 removals required by CDR – up to 1000 $GtCO_2$ – is equivalent to removing more than 20 years worth of our accumulated CO_2emissions. The report states that the viability of these schemes is *"subject to multiple feasibility and sustainability constraints"*. At present, these CDR technologies do not exist or in some cases they exist only in very small-scale experimental projects, and accordingly we have no assurance that these schemes will in future be viable on the vast scale envisioned. They would impose enormous economic

costs and social burdens on our children and the following generations. One proposed CDR technology, bioenergy combined with carbon capture and storage (BECCS), would require allocating a substantial share of the world's available croplands to grow adequate plant material and trees that would be burned in these future CCS facilities to extract their CO_2 (hence the report's reference to "sustainability constraints"). Uncertainties and risks of CDR technologies are addressed in sections C3.1–C3.4 on page 19 of **Exhibit "U**".

148. **Exhibit "U"** in Figure SPM.3b shown on page 19 provides particulars of four mitigation scenarios, which rely on CDR technology to different degrees. The Summary reports that in the case of depicted scenario P1 which relies to the smallest degree on future CDR technology, in order to keep warming within the 1.5°C limit global oil consumption by 2030 must be reduced 37% below the level of oil consumption in 2010. In the case of scenarios P2, P3, and P4, which are premised on much greater future reliance on the viability of CDR technology, the envisioned reductions in oil, coal, and natural gas consumption to 2030 and to 2050 are more gradual.

149. These theoretical schemes that place heavy reliance on the viability of future CDR schemes hold out promise that governments, businesses, and individuals might continue for another decade to defer any deep reductions to burning oil, natural gas, and coal (and thus continue to release additional CO_2 into the atmosphere in very substantial amounts) and then, a few decades in the future, require the world's children spend the next hundred years attempting to remove the same amount from the atmosphere at enormous economic cost and by technological means that do not yet exist and which may not prove viable.

Global oil consumption

150. New data published on November 8, 2019 by the International Energy Agency (IEA) in *World Energy Outlook 2019* provides projections for world

oil supply to 2030 and 2040, as well as newly available data showing actual oil production for 2017 and 2018. The numbers are given in millions of barrels per day (million bpd). I attached hereto as **Exhibit "V"** to my Affidavit a true copy of the title page and extracts from the index pp. 16–22 and from the Executive Summary 23–24 from International Energy Agency (IEA) in *World Energy Outlook 2019,* (WEO 2019); section 2.4 describing the Sustainable Development Scenario at p. 88; an extract from section 3.1 including Table 3.1 showing data for global oil production at pp.132–133; pp. 219–223 with data for global coal production; and pp. 175–178 with data for natural gas production. The full report is 700 pages in length.

151. With respect to projected future oil production and consumption, *World Energy Outlook 2019* (WEO 2019), **Exhibit "V"** provides three scenarios, each of which is based on different assumptions about the expected level of future oil use up to 2030 and to 2040. I summarize here the oil production figures for each of the three scenarios. I have taken these numbers from Table 3.1 of the report:

Figure F: *World Energy Outlook 2019*: oil production scenarios: projections (in millions bpd)

	2017	2018	2025	2030	2035	2040
Current Policies Scenario				111.5		121.0
Stated Policies Scenario	95.1	97.7	103.5	105.4	106.0	106.4
Sustainable Development Scenario				87.1		66.9

Source: *World Energy Outlook 2019*, Table 3.1, p. 132 and Annex A, Table A.1 p.672–673.

152. The recent WEO 2019, **Exhibit "V"** report explains the assumptions underlying each of the three scenarios. The "Current Policies Scenario" is a baseline projection of oil production:

> *"The Current Policies Scenario shows what happens if the world continues along its current path, without any additional changes in policy. In this scenario, energy*

demand rises by 1.3% each year to 2040, with increasing demand for energy services unconstrained by further efforts to achieve efficiency."

— *WEO 2019*, Executive Summary p. 23

The "Stated Policies Scenario" is also a baseline projection, but it shows more moderate growth in oil consumption. It incorporates existing policies already implemented, but also takes in to account additional measures *announced but not yet implemented*, that are expected to moderate the growing demand for oil over the next two decades. According to the Executive Summary at p. 23, the Stated Policies Scenario

"… incorporates today's policy intentions and targets. Previously known as the New Policies Scenario, it has been renamed to underline that it considers only specific policy initiatives that have already been announced."

153. The "Sustainable Development Scenario" is a mitigation scenario. It is based on *assumptions* that governments will soon adopt significant carbon-reduction policies that will achieve substantial reductions in global oil consumption – absolute reductions that in this scenario would be start by 2020 – and that are large enough to bring about declining emissions from the energy sector consistent with the goal of limiting the long-term rise of average global surface temperature to 1.8°C. WEO 2019, **Exhibit "V"** provides the following summary describing the assumptions and framework for this mitigation scenario:

The Sustainable Development Scenario is constructed on the basis of limiting the rise to below 1.8°C with a 66% probability without the implied reliance on net-negative global CO_2 emissions, or 1.65 degrees with a 50% probability. Because emissions do not turn net-negative, this means there is no "overshooting" of the 1.8°C temperature rise (see section 2.9). However, the emissions trajectory of the Sustainable Development Scenario to 2050 leaves open the possibility that – if emissions were to turn net-negative during the second half of the century – the temperature rise could be limited to 1.5°C with a 50% probability. (figure 2.5).

— **Exhibit "V",** *World Energy Outlook 2019*, p. 88 (emphasis added)

154. The IEA's Sustainable Development Scenario is therefore based on an assumption that oil consumption will be reduced to 87.1 million bpd by 2030, and further decline to 66.9 million bpd by 2040, in order to meet the goals of this scenario, which is to give a 66% probability that the increase in global warming can be limited to 1.8°C above the pre-industrial level.

155. To meet those goals, the Sustainable Development Scenario also assumes there would be even deeper reductions in coal use worldwide: a 38% reduction in coal consumption by 2030 below the current level, and a 40% cut by 2040. It also requires absolute reductions in natural gas consumption starting after 2030 (but affirms that natural gas consumption is expected to continue to increase to 2030).

156. The IEA's new Sustainable Development Scenario provides that if CDR (Carbon Dioxide Reduction) technologies with a capability to achieve direct removal of CO_2 from the atmosphere were to become viable in the second half of the 21st century (allowing us to achieve in future what are called "net-negative emissions"), the Sustainable Development Scenario could be consistent with a 50% probability of keeping temperature rise to 1.5°C.

157. But in the absence of such technologies (which do not yet exist), the IEA's new Scenario acknowledges that even reducing global oil consumption down to 66.9 million bpd by 2040 and implementing all the other specified cuts of coal use and natural gas consumption offer no chance of keeping warming under 1.5°C.

158. The IEA has published an updated edition of its *World Energy Outlook* report every year since at least 2010. *World Energy Outlook 2015* was published in late 2015. The 2015 edition of the WEO report was the most current global production data available in 2016, when the Government of Canada's approval process for the Trans Mountain expansion project was being completed. I attach hereto as **Exhibit "W**" to my Affidavit a true copy of *IEA World Energy Outlook 2015* page 114 of the 2015 edition, which

includes Table 3.1 showing the IEA's projections of global oil production to 2040 under the three different scenarios. The WEO 2015 report included the following data about the projected growth of global oil consumption to 2040:

Figure G: *World Energy Outlook 2015*: oil production scenarios: projections (in millions bpd)

	2014	2020	2040
Current Policies Scenario	90.6	97.5	117.1
New Policies Scenario	90.6	95.9	103.5
450 Scenario		93.7	74.1

Source: *World Energy Outlook 2015*, Table 3.1, p. 114 and Annex A pp.582–583.

159. The IEA's previous mitigation scenario, the "450 Scenario", published in the 2015 edition of *World Energy Outlook,* **Exhibit "W"** was based on the assumption that global oil consumption would decline to 74.1 million bpd by 2040. In contrast, the new scenario requires a significantly deeper cut to 2040 (down to 66.9 million bpd). In the 2015 edition of *World Energy Outlook* and through previous annual editions during the past decade, the IEA's 450 Scenario" was based on assumed reductions in the global consumption of oil, coal, and natural gas by 2040 sufficient to give a 50-50 probability of keeping global warming to less than 2°C. The 450 Scenario in recent years became the subject of criticism, because a 50–50 chance of a successful outcome was not considered adequate to make that scenario suitable for policymaking. The 450 Scenario also failed to take into account the more stringent goals adopted in the December 2015 Paris Agreement to keep warming "to well below" 2.0°C. It offered no chance at all that the very modest cuts it proposed could limit warming to less than 1.5°C.

160. Comparing the projected growth of global oil production in these two editions of World Energy Outlook, published in November 2015 and November 2016 respectively, it is clear that in the case of the Stated Policies Scenario (which is identical to the New Policies Scenario except for the

change in name) the expected level of global production by 2040 is now 106.4 million bpd, compared to the lower figure of 103.5 million bpd given in the 2015 report. In the 2019 report, global production is now projected to reach the 103.5 million bpd as early as 2025. Not only does the new IEA report confirm that oil production is projected to continue increasing over the next two decades, but the estimated increase to 2040 is larger in absolute terms than it was four years ago.

SWORN BEFORE ME at the City of Vancouver in the Province of British Columbia on this day of November, 2020 _____ A COMMISSIONER FOR TAKING AFFIDAVITS	)))))))))
	_____ Dr. Timothy Takaro