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Dear Council Members;

Re: Haida Gwaii Timber Supply Review Public Discussion Paper

Thank-you for the opportunity to provide input on the Haida Gwaii Timber Supply Review Public Discussion Paper as it pertains to the HGMC's Haida Gwaii AAC determination as well as the Chief Forester's AAC determinations for the TSA and TFLs. This TSR represents an important opportunity to make critical changes to help confront multiple aspects of the global change crisis[1], and it comes as the IPCC warns us of runaway climate change in the absence of transformational mitigation measures aimed at fossil fuels and land use strategies[2]. We are providing this input as Canadian citizens and scientists, but the viewpoints expressed herein are our own, and do not represent that of our employer, The University of British Columbia.

The Timber Supply Review discussed in the Public Discussion Paper, and implications for the AAC, is focused on a base case for timber supply, as has been traditionally the case for the Provincial government. The base case for timber supply is subject to errors associated with growth and yield modeling, as well as uncertainties and an unpredictable future climate. Even more importantly, however, the range of eco-sociological goods and services provided by the forests of Haida Gwaii for mitigating climate change and increasing resilience of the ecosystems and human populations, particularly the Haida people, have not been fully considered in this review. The time when forests are managed primarily on the basis of even-flow long-run sustained yield, even under the umbrella of ecosystem based management, has long passed given the global change crisis.

To that end, we have four main concerns with the Timber Supply Review, including: (1) Loss of carbon stocks and contribution to climate change, (2) Unaccounted sources of variation in the base case, (3) Loss of biodiversity and endangered species, and (4) Inadequate consideration of the rights and well-being of the Haida people at present and in the future. In this letter, we are commenting only on the first three, particularly (1), as the Haida people will express their own concerns over the harvesting of forests on Haida Gwaii[3]. We follow these comments with two recommendations.

(1) Loss of carbon stocks and climate change:

British Columbia has committed to a 40% reduction in greenhouse gases by 2030 and 80% by 2050 as part of Canada's commitment to the United Nations Framework Convention on Climate Change[4]. So far, however, we are moving in the opposite direction, with our emissions increasing annually, and

more coming from forestry than all other sectors combined[5]. In 2017, BC reported that annual emissions from fossil fuels had increased to 65 million tonnes of C[6]. By comparison, 2017 emissions from logging (removal of trees and woody debris, plus accelerated decomposition of forest floor and soil) were estimated as 42 million tonnes C, and foregone carbon capture an additional 26.5 million tonnes C, for a total of 68.5 million tonnes C added to the atmosphere annually from forestry practices alone[5]. This has skyrocketed to 203 million tonnes C with wildfires in recent years[5]. While drastically reducing fossil fuel emissions to decarbonize the energy sector is essential, Canada cannot meet its commitments for carbon emission reductions without the provinces protecting carbon stocks in existing forests, or increasing sequestration capacity of managed forests[7].

While emissions from forestry are not included in official carbon budgets[8], there is sufficient science for us to know that ignoring them is abrogating our responsibility to current and future generations. Missing our targets are already starting to destabilize the Earth's climate, terrestrial, and aquatic systems, and continuing to do so will quickly have catastrophic consequences for biodiversity, ecosystem services, and humans[9]. Effective forest management has an essential role in helping meet global targets, especially where large existing carbon stocks can be protected through forest preservation, and carbon sequestration can be increased through sustainable forest management, particularly in high density C ecosystems such as Haida Gwaii[10]. Scientists estimate that forest preservation, reduced logging and improved management of second growth forests could provide 37% of the mitigation needed to stabilize global warming below 2ºC by 2039[11].

The forests and interconnected bog ecosystems of Haida Gwaii fall within the Pacific Coastal temperate ecosystem, which contains among the world's largest carbon pools, has among the highest carbon sequestration potential, and has the lowest vulnerability to disturbance by future fire and drought[10]. These Pacific Maritime ecosystems are considered by scientists to be a top priority for forest set-asides as carbon preserves[10]. Individual temperate rainforests and peatlands in BC's Pacific Maritime store up to 1,300 tonnes C/ha depending on site quality[12]. This is 3-5 times greater than BC's interior temperate forests, which store 220-500 tonnes C/ha[13] and are also highly vulnerable to disturbance by fire, bark beetles, and pathogens[14-15]. Buotte et al. (2019) write that "preserving high-carbon-priority forests (such as Haida Gwaii) avoids future CO_2 emissions from harvesting and mitigates existing emissions through carbon sequestration."[10]

The Haida Gwaii TSR presents a base case for a future even-flow annual harvest level of 842,782 m^3/yr over a 147,746 ha timber harvesting landbase[16]. With an average yield of 432 m^3/ha for Canada's west coast forests (three times the national average of 136 m^3/ha)[17], this would amount to an estimated 2,000 hectares being clearcut on Haida Gwaii annually. Our detailed carbon accounting in the Mother Tree project has found an average loss of 61% of the carbon within one year of clearcut harvesting[18], and it is safe to assume that this represents the low end of loss on Haida Gwaii given the large debris piles and buried logs that have been observed and documented[3]. These clearcuts are projected to remain carbon sources for 1-3 decades[19], and it is therefore realistic to expect that continuing soil decomposition will result in a loss of three-quarters of the site carbon before carbon neutrality is achieved[20]. Given these loss estimates, along with the large original carbon stocks of Haida Gwaii forests, we expect the proposed AAC of 842,782 m^3/yr to contribute approximately 2 million tonnes C emissions annually. Projecting these values over the next decade, when global carbon drawdown will be most crucial for avoiding catastrophic climate change, clearcutting on Haida Gwaii would contribute an estimated 20 million tonnes C in emissions.

Given the foregone carbon sequestration of the forests and the cumulative effects of clearcutting over the island archipelago over time, the 20 million tonnes C emissions from logging on Haida Gwaii is an underestimate of total emissions from forestry. The additional opportunity cost associated with lost

sequestration capacity, estimated at 2 tonnes C/ha/yr[5], would add about 2,400 tonnes C/yr, or 24,000 tonnes C by 2030. In Canada's 2018 progress report to the UN, a 100 million tonne C gap has already been identified for meeting 2030 commitments[22], and these emissions from clearcutting on Haida Gwaii will make meeting this gap far more difficult. Moreover, clearcutting of the upland forests and eskers will affect the hydrology of the surrounding bog network, and it is reasonable to expect reduced water levels[21] and increased decomposition of the peatlands, raising emissions even further. The forest hydrology on Haida Gwaii has been severely disrupted as a result of careless logging practices and relentless clearcutting causing detrimental impacts to habitats for mammals, fish and birds.

The minimum harvestable age of the base case is 94 years for old-growth forests and 77 years for managed stands, or a minimum diameter of 30 cm, but current market value lumber grades are only realized when trees reach 150 years (and much larger diameters)[15]. The TSR sensitivity analysis shows that increasing the rotation age even to 150 years to maximize timber revenues would reduce the timber supply by 79%[15]. But old growth forests continue to sequester carbon for centuries[23], and the longevity of cedars on Haida Gwaii can be 1000 years or more, and the size of Sitka spruce upwards of 4 meters in diameter[3]. Scientists studying these types of ancient forests worldwide have shown that the carbon pools continue to increase even as they experience gap phase disturbances[15,23]. The largest 1% of the world's trees are thought to store 50% of the forest carbon globally[24], and old growth temperate rainforests are estimated to contribute 10% of global net ecosystem productivity[25]. Given this, maximizing carbon pools would reduce the timber supply even further; indeed, a clear-minded analysis indicates that clearcutting on Haida Gwaii makes no sense from a climate change perspective.

Given that cedars become suitable for totem poles or canoes when they reach 300 to 1000 years of age[3], the loss of old cedar indicates significant opportunity costs for cultural uses as well. It is clear from the TSR that these monumental trees will no longer exist in the TSA under TSR assumptions, unless there are specific allowances for their preservation within natural conditions of their life history. Because old trees become monumental in size as a result of whole ecosystem health[26-27], this means that forests, not just trees, would require protection. As mentioned above, scientists expect that when these old forests are logged, much of the carbon, even soil carbon, will move back to the atmosphere[23]. Likewise, with the loss of old cedar, the Haida culture will be irrevocably affected, in direct contradiction of Canada and BC's Truth and Reconciliation principals[28].

With B.C.'s carbon price increasing to $50 per tonne in 2021[29], the opportunity cost of emitting 20 million tonnes C with timber harvesting will amount to a value of $100 million over the next decade, assuming no further increases in the price of carbon and discounting foregone sequestration potential. In comparison, the processing of only 0.6% of the harvest on Haida Gwaii amounts to only 285 person years of local employment from 2015 to 2017[16], or approximately 100 person years annually. Assuming average annual earnings of $50,000 per person, this amounts to approximately $5 million in collective wages earned by local Haida Gwaii residents annually. These earnings pale in comparison to the value of carbon in the forests if they were preserved. They also pale in comparison to the person years it takes to carve canoes and poles from monumental cedars, not to mention the immeasurable cultural losses that clearcutting and industrial forestry represent to the Haida people. In addition, the harvest rate at the suggested AAC would preclude future employment in a sector doomed for failure.

(2) Unaccounted variation in the base case.

Timber supply projections are subject to measurement, sampling and modeling errors that have been documented in the literature by growth and yield specialists[30]. These errors, when propagated through long term projections, can amplify errors of estimates substantially[31]. For these reasons, it is reasonable to expect considerable error in the long-run even-flow projection in the TSR. In addition,

changing criteria and indicators from the base case of even-flow harvest derived from culmination of mean annual increment to include, for example, longer rotation ages, cultural preserves, or increased ecological resilience through maintenance of biodiversity, will result in large changes in annual yields. For example, the TSR estimates a 79% reduction by increasing the rotation age to 150 years alone.

The TSR analysis is based on the assumption that growth and yield of future forests will be the same as past growth and yield that has produced what is remaining in the current forests. Climate change projections have already shown these assumptions to be false, and changing climate will likely reduce yield in the coming decades[2]. Already we are seeing maladaptation of certain species in Pacific Coastal ecosystems, including diebacks of cedar, salal and sword fern[32]. Such diebacks are projected to increase as temperatures warm and precipitation patterns shift[33] and reductions in free-to-grow stocking by half due to a range of climate-related damaging agents has already been documented in plantations elsewhere in British Columbia[34].

Reforestation practices for clearcuts of Haida Gwai, based on personal observations, have followed the industrial model of planting nursery-grown plug stock of cedar, spruce and lodgepole pine. In primary forests of Haida Gwaii, cedar naturally reproduces primarily by layering, where gap phase disturbances facilitate regeneration of cedar around parent trees. These saplings grow up in the neighborhood of their elders, where they are protected and their growth facilitated. The industrial approach of planting cedar plugs in clearcuts does not emulate these natural processes. Moreover, the planting of lodgepole pine in the clearcuts of Haida Gwai appears to be geared at achieving early free-growing, and we should expect these trees to decline with age past free-to-grow age even more so than has been observed in the interior rainforests[35]. Furthermore, the changes clearcutting brings to the hydrology of forests will cause a redistribution of water in the soil profile, likely with saturation at depth and surface drying[36], and this could serve to amplify drought-related diebacks among planted stock. For these reasons, the industrial approach of clearcutting and planting does not emulate natural disturbance regimes and regeneration dynamics on Haida Gwaii. With climate change, the second growth forests will likely severely underperform relative to primary forests as measured in permanent sample plots.

(3) Loss of biodiversity and endangered species

Haida Gwaii hosts a number of endemic and endangered species that are discussed in the TSR[16]. How well this list represents the full biodiversity in the TSA is not clear. It is notable that conservation of northern goshawk habitat alone, where all 67 northern goshawk territories are managed for nesting and foraging, an 18.2% reduction in the base case yield would result[16]. Further reductions needed for conserving the habitat of all at-risk species in the Haida Gwaii forests is unknown. The effect of clearcutting on dwindling salmon populations, for example, is not well understood except as observed by the pronounced absence of salmon stocks. A full risk analysis of potential losses of biodiversity is needed before there is further clearcutting on Haida Gwaii. Canada has made commitments to maintain biodiversity in the United Nations Convention on Biological Diversity (Earth Summit in Rio, signed by Canada in 1993). Notably, the convention is "based on the precautionary principle which demands that where there is a threat of significant reduction or loss of biological diversity, lack of full scientific certainty should not be used as a reason for postponing measures to avoid or minimize such a threat."

The forests of Haida Gwaii are high-productivity, low-vulnerability forests that have high above- and belowground carbon stocks[10], as detailed above. Researchers have found that carbon rich forests, including forests in British Columbia[13], are also among those with the highest tree species richness and highest proportion of critical habitat for endangered species[10,37]. Scientists have identified forests with the greatest potential to sequester carbon during this century to also provide multiple ecological co-benefits, including greater biodiversity and reduced vulnerability to disturbance.[10] Buotte et al. (2019)

have suggested that preservation of high carbon density Pacific Northwest forests "serves the greatest public good by maximizing co-benefits such as biological carbon sequestration and unparalleled ecosystem services including biodiversity enhancement, water and air quality, flood and erosion control, and low impact recreation. The development of governance programs to promote preservation" of these high priority forests will be critical as global climate changes.

Summary and Recommendations:

Forests are the core of the BC carbon budget, home for many indigenous people, sources of biodiversity and clean water, and they provide the ecological goods and services that underlie economic resilience if properly conserved. The forests of the Pacific Maritime region, including Haida Gwaii, stand out as among the most productive, carbon rich and biodiverse of the world, and there is a global expectation that Canada is committed to protecting these ecosystems to mitigate global change now and for the future. To that end, Canada has made global commitments to protect carbon stocks, biodiversity and the rights of indigenous people by signing these United Nations conventions and declarations: (1) the UN Framework Convention on Climate Change (Paris Agreement, signed by Canada in 2016); (2) the UN Convention on Biological Diversity (Earth Summit in Rio, signed by Canada in 1993); and (3) the UN Declaration on the Rights of Indigenous People (supported by Canada in 2010). In reviewing the TSR, we have low confidence that the proposed base case will meet any targets or goals of these interrelated commitments. Therefore, we recommend:

(1) Upon review of the Public Discussion Paper, and given the weight of current scientific understanding of the crucial role Maritime forest ecosystems play in mitigation of greenhouse gas emissions, biodiversity loss, and infringement of Aboriginal and indigenous rights, it is our professional opinion that a moratorium ought to be placed on further clearcutting of Haida Gwaii. This moratorium should be implemented to allow quantification of the full ecological and socio-economic impacts of the harvesting.

(2) Considering the cultural and ecological importance of Haida Gwaii globally, we further recommend that Haida Gwaii be proposed as a UNESCO Biosphere Protected Area Reserve.

We would be happy to discuss this letter and provide further expert advice. Thank you for the opportunity to comment on the Haida Gwaii Timber Supply Review Public Discussion Paper.

Sincerely,

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