Yukon Environmental and Socio-economic Assessment Board
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April 5th, 2024

RE: YESAB Executive Committee and Public Comment for Whitehorse Rapids Hydroelectric Generating Station and Federal Decision Bodies (Project Number:2023-0167)

Dear Executive Committee

Thank you for the opportunity to submit comments on the Whitehorse Rapids Generating Station Relicensing Project (hereafter 'Project'). We are submitting these remarks in our capacity as conservation scientists on behalf of Wildlife Conservation Society (WCS) Canada. WCS Canada is a national non-government organization of scientists conducting research on species and ecosystems to inform conservation decisions. Our role is to provide long-term, site-based research and scientific syntheses that inform policy and practice and that support the implementation of effective conservation measures. We do this by providing technical advice and by engaging relevant decision-makers at all levels, from local to federal.

WCS Canada scientists have been working in Yukon since 2004 on land use and protected areas planning, land and water management, wildlife conservation research, and policy applications for conservation science. Dr. Chrystal Mantyka-Pringle has contributed scientific expertise to land use planning and management, and environmental assessments in Yukon and Northwest Territories since 2014, and has over 15 years experience working in aquatic systems conducting field research focused on the cumulative effects of land-use and climate change on freshwater ecology. Dr. Alyssa Murdoch has 15 years of experience working in research, environmental consulting, and fish habitat management with expertise in northern fishes.

Recent declines of Chinook salmon in Canadian waters of the Yukon River represent a growing crisis for thousands of Indigenous and non-Indigenous people residing within the Yukon River drainage and beyond. While WCS Canada has expertise in numerous issues relevant to the application for project amendment, we focus our limited capacity at this time on comments related to **four areas** including (1) the significant effects of the fish ladder and other dam facilities, (2) potential violation of the *Fisheries Act*, (3) the consideration of conservation hatcheries as a potential offsetting measure, and (4) the need for a broad cumulative effects assessment to support the project proposal.

Based on these comments, we provide **six recommendations** (which we elaborate on below): (1) that the project receives a **temporary short-term license** given the high uncertainty of project effects on salmon and other fish species in the region, (2) that the proponent focuses primarily on **effective mitigation strategies** to reduce effects on salmon, with offsetting measures only considered as a last resort, (3) that detailed **alternative approaches** for reducing harm to salmon during their migrations through the dam facilities are provided, including leading-edge technologies, (4) that the role of **conservation hatcheries should not be considered as a primary offsetting measure**, (5) that the proponent provides a broad **assessment of cumulative effects on salmon**, and (6) that offsetting measures are identified in **collaboration with interested Yukon First Nations**.

Significant effects of fish passage obstructions on Chinook salmon

In a study of Chinook salmon migration in the Yukon River watershed and the consequence of the Whitehorse hydro dam as a fish barrier, Twardek et al. (2022)[1] found that fewer than half of tagged salmon approaching the dam (i.e., passing the footbridge) actually passed the dam. Surveys downstream where tagged fish returned indicate that egg retention is unusually high, suggesting that salmon fail to pass the dam and then fail to spawn[2]. The sampling is now being continued with Kwanlin Dun First Nation but impacts on adult migration and spawning are already a high cause for concern that must be addressed in this project amendment.

Any improvements to the fish ladder need to consider restoration for both salmon and Indigenous Peoples that have been deeply impacted by the loss of salmon. The current fish ladder design for this project requires adaptation for these unique Chinook salmon populations that are already in relatively low condition following a 3000 km migration from the Bering Sea. To enable transparent and balanced decision making, we recommend that the proponent provides fully scoped alternatives including multiple options for modifying or replacing the current fish ladder and changes to its operations (i.e., changing attractant flows) relative to the baseline state (i.e., current conditions)[3]. Details provided for each alternative option should include technical feasibility and financial cost as well as the expected impact on the passage of salmon and other fish species.

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[1] Twardek, W.M., 2022. *Evaluating the consequences of physical barriers on fish during long-distance upstream migrations through rivers* (Doctoral dissertation, Carleton University).

[2] Twardek, W.M., Cooke, S.J. and Lapointe, N.W.R., 2023. Fishway performance of adult Chinook salmon completing one of the world's longest inland salmon migrations to the upper Yukon River. *Ecological Engineering*, *187*, p.106846.

[3] Johnston, A.J. and Ray, J. 2023. Assessing Biodiversity under the *Impact Assessment Act*. Principles and Guidance for Safeguarding Biodiversity Through Project Assessment.

Data from Appendix 7.2-A indicates that juvenile mortality associated with downstream migrations through the dam facilities (i.e., turbines, spillway) may be as high as 26% for age-0 salmon and 34% for age-1 salmon. We recommend that substantial changes are made to current turbine operations to mitigate this high level of mortality, and that implemented measures are evaluated using clear and scientifically rigorous approaches to support future adaptive management plans. For example, there are options for 'fish friendly' bypass systems or turbines referenced in Appendix 7.2-A. To support informed decision making of different potential mitigation measures, we recommend that the proponent provides detailed alternative options for reducing harm to outmigrating juveniles moving through the dam facilities, including information related to technical feasibility, cost, and expected impacts to juvenile mortality.

Uncertainty in meeting *Fisheries Act* requirements

The project proposal identifies past and current significant adverse effects on Chinook salmon due to the ongoing operations of the project, yet insufficient details are provided at this stage to understand how these effects will be mitigated or offset to counterbalance residual harm in accordance with the *Fisheries Act*. Given the proven high threat of the dam operations to these vulnerable and culturally significant salmon populations, we recommend that the proponent provides specific planning and contingencies to address this critical gap in their assessment rather than deferring to the *Fisheries Act* authorization stage. Further, given that it is unlikely that all residual harm can be adequately offset using standard approaches (e.g., offsite habitat restoration or hatcheries), we strongly suggest that the proponent should primarily focus on mitigation strategies that incorporate the best possible leading-edge technologies (e.g., see Whoosh Innovations and Fishheart). Following that, we recommend that offsetting measures are identified in collaboration with interested First Nations and are designed to support meaningful and reconciliatory actions that support salmon and Indigenous Peoples. Implementation of identified measures could also be in collaboration with interested First Nations as a step towards reconciliation – creating employment opportunities within communities and reconnecting people to severed salmon ties because of declines in abundance.

The potential role of conservation hatcheries for offsetting effects on salmon

Competitive interactions between hatchery and wild fish are complex, but studies have shown both positive and negative impacts on the reproductive success, reproductive fitness, genetic effects, and overall population sizes of vulnerable wild salmon populations[4,5]. As a last case scenario for the application of *mitigation hierarchy*[6], if hatcheries are necessary as an offset strategy, the research is clear that hatchery fish should not be treated as equal to wild fish to recover endangered populations and we must focus on supporting wild stock, not simply producing fish. We additionally note that hatcheries should only be considered as a partial

[4] Brannon, E.L., Amend, D.F., Cronin, M.A., Lannan, J.E., LaPatra, S., McNeil, W.J., Noble, R.E., Smith, C.E., Talbot, A.J., Wedemeyer, G.A. and Westers, H., 2004. The controversy about salmon hatcheries. Fisheries, 29(9), pp.12-31.

[5] Naish, K.A., Taylor III, J.E., Levin, P.S., Quinn, T.P., Winton, J.R., Huppert, D. and Hilborn, R., 2007. An evaluation of the effects of conservation and fishery enhancement hatcheries on wild populations of salmon. *Advances in marine biology*, *53*, pp.61-194.

[6] As required by the Fisheries Act, the mitigation hierarchy is a widely used tool that deploys a set of prioritized steps to anticipate and avoid impacts on biodiversity. First and foremost, it requires proponents to take all measures to first avoid effects on biodiversity, then minimize them, then restore them, and only as a final step – if necessary and if possible – to offset residual impacts. In the case of the 'Project', fish entrainment and any fish ladder issues must be avoided first prior to any mitigation, with salmon conservation hatcheries and other offsetting strategies as the last resort.

contribution to any offsetting plans as they do not meet Fisheries and Oceans (DFO) offsetting requirements to provide self-sustaining benefits to fish and fish habitat.

Improved understanding of cumulative effects

Given their extensive migrations, Yukon River Chinook salmon that originate upstream of the dam are encountering a variety of impacts throughout their lives that may be contributing to declining run sizes and productivity[7]. Understanding how these cumulative effects are likely to affect these salmon is important for ensuring that the project does not add additional stress to this already declining population or ultimately contribute to its possible future extirpation. We recommend that the proponent provide an assessment of cumulative effects including climate change based on the growing available literature on this topic[6,8,9], which we note is also required to support a *Fisheries Act* authorization. While the current project proposal does incorporate climate change projections in its lake and streamflow models, it does not currently include a broader assessment of cumulative effects such as past, present, and future works, undertakings, activities and threats to salmon. Where possible, the proponent may consider reducing impacts on Chinook salmon through mitigation or offsetting measures to compensate for known stressors such as warmer conditions during the upstream spawning migration[6,7].

Conclusion and Recommendations

We commend the approach that Yukon Energy has taken to work with Carcross/Tagish First Nation, Kwanlin Dün First Nation, Ta'an Kwäch'än Council and the Government of Yukon the last two years as the Planning Parties for its proposal. However, the hard work is not done, and Traditional Knowledge along with Indigenous Science and worldviews must be included in all stages of the relicensing process. The consideration and then implementation of any management actions to the hydro dam must consider all cultural, environmental and socio-economic components.

Based on our overall assessment, we recommend an initial shorter-term temporary license to allow Yukon Energy to continue to provide electricity for the Yukon, whilst the proponent continues to take part of larger discussions about rebuilding Yukon River Chinook populations and commits to the development of a strategic and rigorous mitigation hierarchy plan with Yukon First Nations, DFO and Yukon Government. Sask Power had similar issues with the E.B. Campbell Dam in the Saskatchewan River Delta and was only awarded a 1-year relicensing term until they could work with affected communities on mimicking the natural flood cycle in the Delta for better aquatic ecosystem health[10,11]. Ongoing discussions with Yukon First Nations are essential to provide a forum for concerns and solutions, as well as create the opportunity to address the intersection

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[7] Murdoch, A., Connors, B.M., Lapointe, N.W.R., Mills Flemming, J., Cooke, S.J., and Mantyka-Pringle, C. 2024. Multiple environmental drivers across life stages influence Yukon River Chinook salmon productivity. Can. J. Fish. Aquat. Sci. 81(1): 97–114.

8 Howard, K.G., and von Biela, V. 2023. Adult spawners: A critical period for subarctic Chinook salmon in a changing climate. Glob. Chang. Biol. 29(7): 1759–1773.

9 Cunningham, C.J., Westley, P.A.H., and Adkison, M.D. 2018. Signals of large scale climate drivers, hatchery enhancement, and marine factors in Yukon River Chinook salmon survival revealed with a Bayesian life history model. Glob. Chang. Biol. 24(9): 4399–4416

[10] Andrews, E., 2015. Environmental justice and dam management: a case study in the Saskatchewan River Delta (Doctoral dissertation, University of Saskatchewan).

[11] Patrick, R. and Baijius, W., 2021. A Parallel Approach to Water Stewardship Planning: Making Space for Traditional Knowledge and Western-Science. Canadian Planning and Policy/Aménagement et politique au Canada, 2021, pp.1-16.

between rights and responsibilities, sustainability, and visions for a renewable electricity future in the Yukon.

Thank you for your consideration of our comments. We are available to answer any questions regarding our submission. Please feel free to contact us below.

Sincerely,

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