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Dear Mr. Hamilton and Ms. McLean:

**Re: Morrison Mine Proposal Environmental Assessment, EAO 99939, CEAR 09-03-48445
Literature Review of Morrison Lake Sockeye salmon for the British Columbia Environmental
Assessment Office (BCEAO) by the Skeena Fisheries Commission (SFC)**

Attached is the report “**The Sockeye Salmon (*Oncorhynchus nerka*) of Morrison and Tahlo Lakes British Columbia, and Their Importance to the Salmon Fisheries of the Skeena Watershed**”. In this report we discuss the ecology and the importance of Sockeye salmon of the Tahlo/Morrison Conservation Unit. We were surprised to find within the Application or the Environmental Assessment (EA) little discussion of or appreciation for the Sockeye salmon that might be impacted by development of the Pacific Booker Minerals’ (PBM) Morrison Mine. We have therefore done our best to summarize the extensive literature on the Morrison and Tahlo Sockeye.

We would like to point out some of the shortcomings of PBM's Morrison Mine Application and its EA with reference to Morrison Lake and its associated Sockeye salmon resources. Some of these points have been made in previous correspondence between the SFC, BCEAO, CEAA and PBM. SFC strongly believes that the literature review supports our contention that the Application of PBM for an environmental assessment certificate for the Morrison Mine fails to address the Sockeye salmon resources of Morrison Lake in a meaningful fashion.

The areas of the Morrison Mine Application and EA that require more development include:

- (i) To date the biology of Morrison Lake Sockeye and the plankton populations which they depend on have not been considered by PBM during the development of the Morrison Mine Application and the concurrent EA.
- (ii) We are surprised that PBM never mentions the fact that Morrison Lake and Tahlo Lake Sockeye comprise a Conservation Unit protected under the Wild Salmon Policy (WSP) of Fisheries & Oceans Canada. The Morrison Sockeye stocks are subject to fisheries that remove the majority of returning sockeye. This needs to be taken into account by PBM. The Morrison and Tahlo Sockeye have been subjected to environmental disturbance by logging and other mine developments in the adjacent portion of Babine Lake. The cumulative impacts need to be addressed as part of the Application for the Morrison Mine.
- (iii) PBM's effluent diffuser and associated discharge appear to be sited in an inappropriate place. If this is built it will likely have adverse impacts to the Sockeye populations of Morrison Lake. Preliminary analysis of data acquired from a hydroacoustic survey of Morrison Lake by Fisheries and Oceans Canada in 1998 and preliminary studies by SFC in September 2011 indicate that Sockeye adults and juveniles use the lake bottom of Morrison Lake where PBM intends to place their effluent diffuser. Sockeye use all depths of the lake throughout the year. Concentration near the surface is probably a feature only of summer nights. This is in contradiction to what PBM presents in its Application.
- (iv) Another issue not adequately considered and addressed in PBM's Application nor in the EA is the size and residence pattern of Sockeye populations in Morrison Lake and Morrison Arm. A recent and up-to-date Sockeye population estimate and distribution is lacking. Additionally, PBM only considers Sockeye and fish populations in Morrison Lake itself on the sole basis of fish numbers which were derived from out of date sources using techniques that are notorious for underestimating what the true accurate numbers are (visual stream Sockeye estimate counts, gill nets in the lake). PBM also has taken a myopic approach when considering Sockeye populations by not taking into account other factors such as water quality and plankton abundance that their project would impact negatively and that are critical to Sockeye salmon population vitality. Productive

capacity is defined as the maximum natural capability of habitats to produce healthy fish, safe for human consumption, or to support or produce aquatic organisms upon which fish depend.

Based on reliable productive capacity estimation techniques there could be 3-6 million Sockeye fry in the Morrison Lake Conservation Unit. If the Morrison Mine were to become a reality as currently proposed with an effluent diffuser on the lake bottom; Morrison Lake Sockeye productive capacity stands a very high chance of being significantly negatively affected.

(v) Fisheries researchers such as Shortreed et al. 1998 estimate that there are 497,000 sockeye fry in Morrison Lake. This is likely a conservative estimate. Yet PBM asserts in its Application that the mine project and its associated mine effluent diffuser to be sited at the deepest point of the Morrison Lake bottom will not have significant impacts on the fisheries and water quality of Morrison Lake. In addition, Sockeye from Morrison River which would receive the effluent and ground water from the mining project rear in Morrison Arm. Their population was measured in 1994 by hydroacoustics by Hume and McLellan as 524,000. Sockeye salmon fry spend a year in Morrison Arm, Morrison Lake and Tahlo Lake. Consequently there is no season in which impacts on their population can be avoided.

(vi) None of the aforementioned Sockeye attributes for Morrison Lake have received any mention or consideration in the latest iteration of the Morrison Mine Application by PBM. Central to the discussion of Morrison Lake Sockeye rearing capacity are the issues of water quality and primary plankton production, neither of which receives any serious attention in the current version of the Application. A more technically rigorous compilation and evaluation of the resources currently available on Morrison Lake and its associated Sockeye resources needs to be conducted by PBM. We need a year-round study of the thermal structure of Morrison Lake, the Sockeye utilization of the Lake and the availability of plankton through the seasons. This would aid PBM in conducting a more technically rigorous analysis of the proposed Morrison Mine interactions and impacts on the fisheries and aquatic resources of Morrison Lake, in a more objective and transparent manner.

(vii) In the latest version of the Morrison Mine Application no mention or discussion is made by PBM of Morrison Lake Sockeye salmon production and rearing capacities and capabilities. Although more research is required to elucidate whether there are areas of Morrison Lake that are preferred over others by Sockeye salmon fry for rearing and feeding purposes, the points made earlier have emphasized there is a significant Sockeye salmon resource in Morrison Lake potentially being put at risk. PBM needs to more fully consider the scope and scale of the Sockeye resources of Morrison Lake when developing a risk assessment of their mining project's impacts on aquatic resources. Ideally, PBM will play a role in closing knowledge gaps on more specific understanding of Morrison Lake Sockeye salmon population dynamics.

Thus as SFC has mentioned previously, the current Morrison Mine Application and its associated EA should not proceed further until the fisheries information gaps cited above are rectified. There is a sizeable body of literature on Sockeye salmon resources in the Tahlo/Morrison Conservation Unit that has largely been ignored by PBM and that requires incorporation into the Application and EA. However, there still is a strong need for more studies of the Sockeye and their habitats in Morrison Lake. Better understanding of the nature, scope and population dynamics of Morrison Lake Sockeye needs to be sought before a meaningful discussion of the risks a large open pit mine would pose to aquatic resources can be seriously entertained.

The Sockeye from the Tahlo/Morrison Conservation Unit are not only valuable for recreational fisheries but contribute significantly to commercial fisheries from Alaska to the Babine fence and most importantly provide food for First Nations people. We believe PBM has failed to adequately consider the scale of the Sockeye salmon fisheries resources put at risk by their proposed project. Access to Tahlo/Morrison Sockeye supplies 3.2 to 8.8% of the Sockeye food supply of the Gitanyow and Gitx̄san First Nations. Access to these fish is an important and constitutionally guaranteed right. We expect the BCEAO, on behalf of the Crown, to fulfill its legal responsibilities to meaningfully consult with the Gitanyow and with the Gitx̄san First Nations, as well as to protect the significant public interest and environmental values put at risk by the Morrison Mine proposal.

Yours sincerely,



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Encls. SFC Morrison Lake Sockeye Literature Review, 19 October 2011

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