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Raven Underground Coal Mine
Canadian Environmental Assessment Agency
805-1550 Alberni Street
Vancouver BC V6G 1A5
Via Email: Raven@ceaa-acee.gc.ca

**RE: RAVEN UNDERGROUND COAL PROJECT, CANADIAN ENVIRONMENTAL
ASSESSMENT REGISTRY FILE NUMBER 10-03-55529**

I am a fishery biologist with over 30 years experience in western Canada as both staff and consultant to First Nations and citizens' groups. Among other things, I have designed and led studies of salmon biology including fishery management, stock assessment, habitat assessment, escapement enumeration and industrial impact assessments (including hydroelectric projects and acid mine drainage problems). I have also conducted studies of oyster population dynamics in the Strait of Georgia. I am now a volunteer technical advisor to CoalWatch Comox Valley Society.

SUMMARY RECOMMENDATIONS TO CEEA

1. I request that the Minister of Environment refer the Raven proposal to a joint federal/provincial independent expert review panel for full public hearings.
2. The assessment of climate impacts should include analysis of greenhouse gas emissions both within Canada (extraction, processing, transportation of coal) and at the destination of the final product (emissions resulting from combustion of the coal).
3. The aquatic study area should include all areas (freshwater and marine) that may be affected by the proposed project. At a minimum the area should include the four watersheds encompassed within the 3100 hectare Raven Coal tenure (Wilfred, Cowie, and Hindoo Creeks; and Tsable River) and the receiving waters of Baynes Sound.
4. A map and model of water quality, quantity and dynamics should be developed for the linked surface and groundwater systems of the aquatic study area. The model should be based on a comprehensive conceptual model and extensive field monitoring of surface and groundwater. Should the project proceed, the monitoring should continue for the life of the project and in perpetuity following abandonment.
5. In addition to assessment of fish habitat, actual fish populations within the aquatic study area should be enumerated over more than one year in order to establish a pre-project baseline, and, should the project proceed, monitoring should continue as part of the impact assessment.

DETAILED RECOMMENDATIONS

1. Independent Expert Review Panel with Full Public Hearings

The CEA Act provides for this level of review when the project will have significant adverse environmental impacts and in cases where there is considerable public interest and concern about the project.

Environmental impacts

Any mining project of this size is likely to have significant environmental impacts—some predictable, others unexpected.

Greenhouse gas (GHG) emissions associated with mine operations and transportation of the coal to the port of embarkation are likely to be significant relative to existing emissions in the region. GHG emissions due to the ultimate burning of the coal will be significant relative to total domestic emissions in Canada. I realize that it is customary to ignore the emissions outside of Canada; however, I find it irresponsible to ignore this impact given the urgency of the global threat of anthropogenic climate change.

Global climate change is already having impacts in our region. In the South and Central Coast regions of BC, El Niño-like conditions (reduced upwelling, warm surface water) are increasingly frequent, and these conditions are highly correlated with reduced ocean survival of juvenile salmon. In the Strait of Georgia a dramatic decline in marine survival of coho salmon since the late 1970s is correlates strongly with an increasing trend in sea surface temperature in the Strait.¹

If it proceeds, the proposed mine will certainly have impacts on quantity and quality of water in the vicinity of the mine works, both at the surface and underground. The voids created in the mining process would intercept and reroute groundwater, which in turn is linked in complex ways to surface water. This is very likely to result in changes in the dynamics, routing, timing and quantity of water in aquifers and in streams and wetlands, with consequent impacts on aquatic life and human users. Mining impacts on water quantity and seasonal timing of flows are likely to exacerbate the reduced summer flows and increased winter flooding currently forecast by regional climate change models. In addition, mines in this region historically have produced acid mine drainage that has raised concentrations of dissolved metals to unacceptable levels in receiving waters, including Baynes Sound. Preliminary work by the proponent indicates that acid mine drainage can be expected if the proposed mine proceeds.²

At least three of the four watersheds likely to be affected by the proposed mine contain migratory and resident populations of several species of salmon and trout as well as other aquatic species. All of these are at risk if there are significant changes in water quantity, timing of flows and water quality in their habitats.

¹ WR Crawford and JR Irvine. 2010. State of physical, biological, and selected fishery resources of Pacific Canadian marine ecosystems in 2009. DFO Can Sci Advis Sec Res Doc 2010/053

² AMEC. Feb 2010. Raven Underground Coal Project. Draft Work Plan for Environmental Studies. Version 2.2. Prepared for Compliance Coal Corporation, Vancouver.

The surface water and much of the groundwater of the Raven tenure eventually flows to Baynes Sound. Salmon, herring, prawns and clams occur in substantial numbers in Baynes Sound; they are harvested in commercial, recreational and food fisheries. In addition to native species, Baynes Sound supports a multi-million dollar shellfish aquaculture industry which employs over 600 people. Shellfish exports are subject to international health standards and are very sensitive to levels of metals and other contaminants.

Hundreds of people live in the lower parts of the watersheds that would be affected by the proposed Raven mine. All of these residents depend on surface and groundwater.

Public Interest

The extent of public interest and concern regarding this proposal locally, regionally and nationally is evident from the hundreds of letters submitted to CEAA, attendance at public meetings, resolutions of local and regional governments, and media coverage.

2. Greenhouse Gas Emissions

Estimated GHG emissions by the proposed project within BC due to mining and shipping the coal would add significantly to provincial emissions. The emissions liberated by combustion at the coal's destination would add several million additional tonnes per year to the GHG load in the global atmosphere. Both provincial and federal governments have expressed their concerns about GHG emissions and their intention to reduce the Canadian contribution. Although the governments have yet to develop implementation strategies, it is clear that a significant increase in emissions is inconsistent with the stated intentions. In my opinion, it is essential that the assessment of the Raven proposal include environmental impacts of GHG emissions, both domestic and international, in the Terms of Reference.

Domestic

The mining operation itself would liberate an unknown quantity of CO₂ due to fuel combustion in vehicles and equipment. Transport of coal to Port Alberni as currently envisioned by the proponent would produce an estimated 5,700 tonnes of CO₂ per year.³ In addition, extraction of the coal, based on the proponent's estimates, would liberate 4 - 7 million cubic metres of methane per year⁴. Depending on how one evaluates the greenhouse impact of methane over time, this equates to an additional 65 - 320 thousand tonnes per year CO₂ equivalent.

Based on BC government statistics on provincial GHG emissions and population for 2007 (the most recent year for which I have data), total BC emissions per capita are 15.6 tonnes per year CO₂ equivalent.⁵ Thus the proposed Raven project would add the equivalent of 4,600 - 21,000 individual BC citizens' per capita shares to emissions produced within the province.

³ D Freeman. July 2010. *Denman Island Flagstone*, 15(7)

⁴ AMEC Earth and Environmental. Aug 2009. Raven Underground Coal Project. Project Description. Prepared for Compliance Coal Corporation, Vancouver. Table 3.2-1, p13.

⁵ BC Min Environment. July 2009. British Columbia Greenhouse Gas Inventory Report 2007.

And BCStats. BC Quarterly Population, 1951-2009.

<http://www.bcstats.gov.bc.ca/data/pop/pop/BCQrtPop.asp>

Combustion of Coal at Destination

Again based on the proponent's Project Description, depending on the grade of coal and quantity shipped, the final combustion of the exported coal would release between 1.7 and 2.8 million tonnes per year of CO₂ into the atmosphere. This quantity equates to 2.6 - 4.1% of total BC domestic emissions in 2007, or 110,000 - 176,000 per capita shares.

3. Aquatic Study Area

The aquatic study area delineated by the proponent in the project description addendum of February 2010 (Figure 2.5) is based on the 200ha surface footprint of the proposed mine works.⁶ On this basis the study area would include only the Cowie Creek drainage and two small tributaries of the Tsable River. The proposed study area excludes the watersheds of Wilfred and Hindoo Creeks and most of Tsable River, which substantially overlap the 3100ha underground coal tenure where mining and groundwater impacts will occur. The proposed study area also excludes the waters of Baynes Sound, into which all four streams empty.

Under the terms of the CEAA Background Document for this project (August 2010; File Number: 4302-391) spatial boundaries of the assessment of each factor will be determined "based on the zone of the proposed project's influence" (Section 6.2, p12). There can be no doubt that the underground mining activity will affect groundwater, and it is known that groundwater and surface water systems are linked in complex ways that have yet to be documented for the proposed tenure area. Therefore it seems obvious that the aquatic study area should include at least the four surface drainages of the tenure as well as the receiving waters of Baynes Sound.

4. Groundwater and Surface Water Mapping and Modelling

The structure and dynamics of the surface and groundwater systems in the Raven tenure are complex, difficult to study and poorly understood at present. Aquatic system impact assessment investigations should be based on a three-dimensional map and comprehensive conceptual model that can be reviewed and critiqued by all interested parties. Once there is agreement about the conceptual basis for the studies, extensive field studies will be required to establish baseline conditions regarding water quantity and quality, and to document the structure and functioning of the system.

The exploratory drilling conducted by the proponent in the course of delineating the coal deposit should provide a useful starting point for the structural component of the model (i.e. the map). Likewise the monitoring wells and piezometers now in place will provide preliminary information about the dynamics of the system, though a much more extensive network will ultimately be needed.⁷

The government environmental review processes should require the proponent to develop the model and make public the empirical data as they accumulate so that all parties can have the

⁶ AMEC. Feb 2010. Raven Underground Coal Project. Project Description. Addendum. Prepared for Compliance Coal Corporation, Vancouver.

⁷ AMEC. Feb 2010. Raven Underground Coal Project. Draft Work Plan for Environmental Studies. Version 2.2. Prepared for Compliance Coal Corporation, Vancouver.

information necessary to assess risks and suggest further collection of field data and ongoing monitoring.

5. Fish Population Enumeration

The three known fish-bearing streams of the Raven coal tenure (Tsable River, Wilfred and Cowie Creeks) all support sea-migrant salmonids: coho and chum salmon, and steelhead and cutthroat trout. In addition, Tsable River and Wilfred Creek have pink salmon runs. All three streams also host resident rainbow and cutthroat trout and sculpins.

DFO has estimated spawning escapements of the salmon species in the relevant streams in most years from the early 1950s through 2004, when monitoring ceased. Wilfred and Cowie Creeks normally have each had 100 - 300 coho spawners annually, and the larger Tsable system has typically supported 150 - 400. Maximum annual coho estimates for each stream are between 2,500 and 3,500 spawners. Chum escapements have averaged around 600 annually in Wilfred and Cowie and 3,500 in the Tsable; maximum estimates are 3,500 or more for the two smaller systems and 21,000 in the Tsable. Pink salmon estimates have ranged up to about 1,000 spawners in Wilfred Creek and 5,000 in Tsable River. Steelhead populations have not been reliably estimated, but spawning populations in the hundreds have been reported by federal fisheries officers in all three systems.

There are no quantitative estimates of sea-run cutthroat trout populations nor of the resident populations of trout and other fish species.

According to the Draft Work Plan, the proponent proposes to conduct field studies "to confirm species presence, distribution, relative abundance, and habitat utilization under current conditions to validate previous baseline data and complete baseline data needs."⁸ The proponent's consultant states specifically that "Enumeration of fall spawning fish (anadromous salmonids) in the Cowie Creek watershed is not proposed. The distribution of anadromous salmonids will be based on distribution of young-of-the-year fish, federal and provincial databases and habitat suitability."⁹

My e-mail correspondence with DFO officials (Wilf Luedke, Stock Assessment; and Dale Desroches, Major Projects) indicates that DFO has no current plans to conduct any baseline studies in relation to this project. They consider that baseline studies are the responsibility of the proponent.

It is my opinion that quantitative estimates of existing salmonid populations in all four stream systems within the Raven tenure are a requirement for adequate assessment of baseline conditions. (Hindoo Creek apparently does not support salmonids. The accuracy of this conclusion should be confirmed.)

Historically DFO has carried out annual escapement estimates for salmon populations of Cowie, Wilfred and Tsable. DFO records are essentially complete between 1953 and 2004, but

⁸ AMEC. Feb 2010. Raven Underground Coal Project. Draft Work Plan for Environmental Studies. Version 2.2. Prepared for Compliance Coal Corporation, Vancouver. p28

⁹ AMEC. Draft Work Plan: p31

escapement enumerations have not been carried out since 2004. Over the period of DFO records, annual escapement estimates for each species and stream have varied by two orders of magnitude (e.g. from hundreds to tens of thousands). This annual variation is typical of spawner escapement estimates and reflects both real year-to-year variation in population numbers and uncertainties inherent in the estimation methods. DFO recommends dealing with this annual variability by averaging recorded estimates over a period of years.

For example, in the Tsable system chum salmon escapement estimates have varied annually between 400 and 21,000 spawners.¹⁰ Averaging over 5-year periods to smooth annual variation reveals a period of minimal escapement (median 500 per year) in the period 1986-1990, followed by a steadily increasing trend to a 5-year median of about 6,400 for 2000-2004, at which point the recent period of record ends. It is of great interest to know whether the increasing trend has continued or reversed itself. Without further monitoring we cannot know the present status of Tsable chums. For other systems there has been similar variability, though in most cases trends in abundance have been less clear than for Tsable chums, and extrapolation based on trends would be even less reliable.

To my knowledge trout populations in the streams of interest have never been enumerated.

Studies of juvenile distribution and density, classification and mapping of habitat, plus analysis of age structure, as proposed by the proponent, may provide the basis for useful estimates of total populations of resident salmonids (currently envisioned for Cowie Creek only). For migratory coho, steelhead and sea-run cutthroat, such studies will at best provide estimates only of summer populations of juveniles. The proposed methods will produce little if any useful information about populations of chum and pink salmon, whose fry leave the stream almost immediately upon emergence from the gravel and would be difficult to census reliably by the proposed field methods.

Therefore, on the basis of the proponent's environmental assessment work plan, responsible government agencies and concerned residents would have no current estimates of adult population numbers for anadromous salmonids in the proposed project area against which to evaluate any impacts should the project proceed.

I recommend that CEAA ensure that either the proponent or the responsible government agencies initiate an ongoing program to estimate total populations of salmonids in the streams of the Raven tenure. Total estimates of anadromous populations should be based on monitoring of the numbers of returning spawners and/or of the numbers of juveniles migrating out of the streams in spring and early summer. As there are no historical estimates of outmigrants, only spawner estimates would provide a basis for comparison with historical records of coho, chum and pink salmon.

Respectfully submitted,

Mike Morrell

¹⁰ DFO NUSEDs database