



## memorandum

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**from:** Tim Davies,  
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**re: Tulsequah Chief Mine – Proposed Air Cushion Barge Transportation System  
Response to Request for Additional Information**

### **Request for Additional Information**

This memo is provided in response to a Request for Additional Information contained in a memorandum dated December 21, 2007 received from the Department of Natural Resources. The responses listed below relate to the twenty-one specific requests (noted in italics). In addition, several attachments are included with this memo that provide supplemental information relevant to these requests.

1. *The manufacturer's specifications and engineered drawings for the ACB and the amphitrac.* The general specifications and preliminary drawings have been provided within the *Project Description, (Volume 1)* (dimensions; draft; weight, etc). Redfern has hired third party marine engineers to ensure that all the vessels are constructed to the specifications; furthermore, all the vessels will undergo classification by the American Bureau of Shipping. Detailed engineering drawings are proprietary information. It is unclear why the specified information that is above and beyond that provided in the *Project Description (Volume 1)* is needed to complete the fish and wildlife review of this proposed barge transportation system. If there were a particular specification that requires clarification, Redfern would be happy to provide this.
2. *The performance standards the third-party contractor will be evaluating and the methods the contractor will use for the field trials in Oregon. This must include, but is not limited to, measurements of amphitrac and ACB pressure on land and water, disturbance below the amphitrac and barge in the water column and on the substrates, the disturbance caused by the Archimedes screws and retractable metal wheels on both frozen and unfrozen*

*substrates, the disturbance caused by anchoring the amphitrac to winch a fully loaded barge out of the water and onto land, the manoeuvrability of the barge using the amphitracs in high velocity currents such as those at the Canyon Island transition site, manoeuvrability in rough seas and a wake analysis.*

Vessel commissioning observations will be carried out over the next several months, and will include field observations and measurements performed on the River Clyde, Scotland (January 2008), Columbia River, Oregon (late February – March), and the Taku River, Alaska (late March). The vessel commissioning will include the following measurements:

- Footprint impression left in various substrates (mud; cobble, vegetation)
- Wake resulting from ACB at various distances and relative speeds
- Noise (underwater and above surface) at various distances and hover heights
- Demonstration (video) of wind effect under the ACB as it moves from water onto land; wheel keel that prevents slippage on side slopes

Given the season and location of the commissioning, it may not be possible to obtain specific information related to operations on ice or in snow on the Columbia River in Oregon. At the current time, it is anticipated that the ACB and amphitrac will be delivered to Juneau in March 2008 (following vessel commissioning in Oregon). This will provide an opportunity for Redfern to test the ACB and amphitrac on ice and snow, and to determine the most favourable route across the tidal flats and up to Taku Lodge. A separate series of observations and measurements will occur after the ice is off the river to confirm aquatic operational procedures. During commissioning on the Taku River, a biologist and field technicians will collect fish and wildlife information. The following is a list of the types of data that will be collected at these times. The list focuses on collecting data on the potential biophysical effects of barging.

On Ice:

- Noise under ice at several discrete distances and depths from the barge and amphitrac
- Underwater noise in the marine environment
- Observations of sediment disruption and types of substrates where this occurs
- Marine mammal response to passage of barge

On Open Water

- Underwater noise in the Taku River at discrete distances and depths from the barge and tug
- Observations of the degree of substrate disruption of equipment on mud flats
- Substrate disruption in water depths from 0.7 to 1.5 m deep (ACB draft is 0.7 on hover)
- Observations of increased turbidity and collecting associated turbidity data
- Observations of fish displacement and injury around the barge skirt, at points where the barge enters or leaves the water
- Wave height of tug and barge wake

- Wave run-out distance of tug and barge wake on a discrete number of shallow beaches and search for stranded fish
- Observation of sediment re-suspension in shallow waters from either ACB or tug propeller wash

3. *Appendix B for Volume 2 of the Environmental Document (though Appendix B is referenced several times in relation to wildlife in Chapter 4, there is no Appendix B in the table of contents).*

Appendix B in Volume 2 was inadvertently omitted from Volume 2. The content of Appendix B is contained in the document entitled “*Supplemental Wildlife Information and 2007 Survey Results*”. This is provided as Attachment 1 to this memo.

4. *Cross sections that show wetted width, water surface elevation at MLLW and low flow, and streambed elevations in the preferred channel between Swede Point and the US/Canada border using methods prescribed by the US Geological Survey. Please correlate the cross sections with the gage at Canyon Island.*

In Alaska, navigation on the Taku River is largely constrained by the tidally influenced sand flats at the mouth the river between Taku Lodge and Taku Point. Between the sand flats and the border, the mainstem river channel is quite well defined and presents fewer limitations to normal river navigation. In addition to the detailed bathymetric analysis included in Volume 1 (the “*Channel Depth Analysis of the Lower Taku River*”, Gartner Lee Limited 2007), a channel depth profile was measured along the mainstem in summer 2007. The results are summarized in Attachment 2, and confirm the presence of a continuous channel with depth adequate for the operation of shallow draft tug and barge during the open water season. The empirical evidence presented by the historical barging operations on the Taku River and the successful river barging completed in 2007 supports this conclusion.

5. *The qualifications, position description and employment term of the Environmental Monitor.*

An experienced biologist and fisheries crew would be on site during commissioning of the ACB and amphitrac on the Taku River. This person would be contracted by Redfern for the purposes of observing and identifying actual fish, fish habitat, and wildlife presence along the route, as described in #2 above. Redfern will work with DNR to develop an appropriate position description for an Environmental Monitor for monitoring during commissioning on the Taku River in Alaska.

The results of these observations would be compiled into a report, and include recommendations for ongoing assessment and routine monitoring that would be required once the barging operation begins. The report would identify the location of sensitive areas, the type of effects that did or are likely to occur, and recommendations for specific operational or route alignment in the vicinity of

sensitive areas. There would also be recommendations for site specific monitoring to assess the effect barge operations might have on substrates, bank erosion, fish stranding, etc.

Once the barging operation begins, there will be regular auditing of the operation in order that Redfern and regulatory agencies can assess the effectiveness of operational mitigations to avoid impacts.

6. *An explanation of the methods Redfern used to determine high value fish and wildlife habitat areas with all accompanying surveys with maps.*

The evaluation of high value wildlife habitats was completed through literature review, interviews with resource agency biologists, and aerial surveys. The methods and results of the evaluation are outlined in Attachment 1 *Tulsequah Chief Mine ACB Transportation System - Supplemental Wildlife Information and 2007 Survey Results*, attached to this memo.

The fisheries assessment focussed on salmonids and eulachon as the species of concern. In broad terms, high value fish habitat was considered to be those parts of the river that supported eulachon and salmonid spawning; rearing/overwintering habitat for juvenile salmonids was considered moderate (not limiting), although greater consideration was given to chinook and coho, as they tend to spend the most time in fresh water. Sections of river used primarily for migration were not considered high value.

7. *The species-specific protocol the Environmental Monitor will follow when mapping fish and wildlife resources and habitats, both temporally and spatially.*

GLL is developing a map that provides a best estimate of where high value spawning and rearing habitat is likely to occur along the barge route. This mapping will focus on salmonids and eulachon and will be based on the generic habitat requirements for the species and life stage of concern. This map will be updated with input (so far unavailable) from biologists that have years of experience on the Taku River.

8. *The species-specific protocol the Environmental Monitor will follow to monitor fish and wildlife resources and habitats both temporally and spatially. For instance, how will the Environmental Monitor observe and record juvenile fish that are entrained or stranded or spawning adults in the navigation route?*

Specific monitoring protocols for barge operation will be developed from results collected during commissioning. We anticipate that the biologist involved in monitoring during commissioning will identify areas of concern and methods for recording observations (this is expected to be challenging given the turbid nature of the Taku River). Potential areas of stranding will be identified, and observations of those specific areas will be carried out during the open water season of 2008 to determine whether, and at what rate, stranding occurs. This work would likely be undertaken by a fisheries consultant contracted by Redfern to carry out the rigorous

methodology that will be required to quantify effects such as stranding, or erosion at the sites identified during commissioning.

9. *The reporting forms the Environmental Monitor will be using to document fish and wildlife sightings, foraging, movements, habitats, incidents, mortality, etc.*

An example *Wildlife Reporting Form* (extracted from The ACB Transportation System Wildlife Management Plan that is being developed) for wildlife sightings, habitats and behaviours is attached (Attachment 3). The reporting forms would be developed with input from biologists from Alaska Dept. Fish and Game. It is expected that this form will be modified over time based on input from the Monitor and assessments of the effectiveness of the data collection.

10. *A definition of fish and wildlife incidents and how Redfern will report them.*

A wildlife incident is defined as a situation where a wildlife species interacts with the ACB transportation system or personnel that results in an injury or death to the wildlife or personnel. Behaviours from the wildlife towards personnel or equipment that could be interpreted as threatening (e.g. bluff charges or rushes) would also qualify as wildlife incidents. A *Wildlife Incident Report Form* is attached that would be used to report the incident (Attachment 4). Behaviours such as movements away or fleeing from personnel or equipment would not be defined as incidents, although they would be recorded in the Wildlife Reporting Form when observed. Fish stranding would be considered an incident; a strike of a marine mammal would also be considered an incident.

11. *A definition of "significant" as used to describe impacts to fish.*

The factors considered in determining if an effect is significant is based on the following criteria:

- Magnitude of the effect: For a fish population this might be measured as the proportion of the population affected.
- Spatial extent: is the effect localized or wide spread?
- Duration and frequency of effect
- Reversibility: degree to which an adverse effect is reversible or irreversible
- Ecological context
- The assessment in Volume 2 concluded that there would not be any significant adverse effects of ACB operations in Alaskan waters.

12. *A description of Redfern's wildlife right-of-way policy for an animal on the travel route.*

The wildlife right-of-way policy is designed to reduce interactions between wildlife and the ACB, tugs and amphitracs. In general, wildlife will be avoided during the ACB towing operations by watching for wildlife and adjusting course and speed of the vessel(s) to maintain, where practical, a minimum distance of 200 m from the vessel(s) and wildlife. For example, if moose are observed crossing the river ahead of the vehicles/vessels, and where safety of the vessel(s) or personnel are not a concern, the vessel operator will adjust speed or course with a goal that the vessel(s)

remains at least 200 m away where practical and the moose is able to cross in front of the approaching vessel(s). Additional details on the policy and the procedures to use for various wildlife species and seasons will be contained in the *Wildlife Management Plan*.

13. *An explanation of how Redfern proposes to limit the effects of operations on terrestrial species (moose, bears, wolves, goats), aquatic species (fish, seals, sea lions, whales, amphibians) and avian species (waterfowl, raptors) during all seasons.*

The potential effects and proposed management practices to reduce those effects on terrestrial and aquatic species was evaluated within Volume 2 of the *Tulsequah Chief Mine Air Cushion Barge Transportation System*. Additional details on the evaluation of effects on wildlife will be available to resource agencies in late January 2008. The *Wildlife Management Plan*, which is being developed in conjunction with resource agencies and the TRTFN, provides the detailed management practices that are proposed to limit the effects on terrestrial and aquatic wildlife species.

14. *An explanation of the buffer distances described for each species.*

The buffer distance that will be set for vessel operation to avoid effects on wildlife such as eagles, swans, seals, whales, bears, moose, wolves, etc. is set at 200 m. This distance will be maintained when vessel or personnel safety is not compromised due to river width, river velocity or other hazards. Species and seasonal specific distances will also be set and outlined in the *Wildlife Management Plan* (e.g. Harbour Seal pupping areas on the ice at the mouth of the Taku River would have a 250 m minimum buffer distance established).

15. *An evaluation of the impacts to aquatic and avian species trying to escape the vessels but resurfacing under the ACB.*

The slow speed of the vessel will, to a very large degree, provide ample time for aquatic and avian species to avoid the approaching ACB and shallow draft tug during the aquatic season. Travelling upstream, the ACB will travel at an average speed of 4.4 mph. Downstream travel speed will average 9.3 mph. In the unlikely event that a duck surfaced under the ACB, the air is calm, with a pressure of 1 psi above atmospheric pressure. The duck would likely dive again, and surface on the outside of the inflated skirts unharmed.

16. *An explanation of how Redfern would avoid aggregations of marine mammals.*

Aggregations of marine mammals would be avoided through knowledge of likely aggregation areas obtained from the available information from previous studies and local knowledge. At Flat Point, the approximate seaward extent of the tidal flats, Taku Inlet is approximately 2.5 miles wide. The narrowest point of Taku Inlet is at Cooper Point where it is about 1.7 miles wide. This will provide ample space for the ocean going tug and ACB to avoid aggregations of marine mammals. The main period of concern for sea lions will be in the spring when sea lions congregate in the area to feed on eulachon, and the tug and barge will have plenty of room to

steer clear of these animals. Sea lions will also likely feed on salmon in Taku inlet when the salmon are running. During this time there are also a number of commercial fishing vessels in the area that may make it more difficult to give a wide berth to the sea lions. Additional information on aggregation areas and timing will be obtained through the monitoring procedures that will be implemented in the *Wildlife Management Plan*.

The ACB routing will take the known and likely seasonal aggregation areas into account and the buffers maintained (e.g. 200m). As outlined previously regarding the wildlife “right-of-way” policy, any observed aggregations of marine mammals will be noted during the vessel(s) operations and routing or speed adjustments will be made to maintain minimum buffer distances. Further details regarding avoidance of marine mammal aggregations will be outlined in the *Wildlife Management Plan*.

17. *The protocol the Environmental Monitor will follow when monitoring ice stability during the transitional seasons, including the reporting forms the Environmental Monitor will use.*

The crew on the vessel will monitor the ice conditions during the transition season, and the winter. The route followed by the vessels will be recorded using GPS, and a daily log will be maintained to record the ice conditions (least stable, discontinuous). Ice thickness in several locations will be routinely measured during the winter season. The results of these observations would be used to adjust the route to avoid areas of instability (e.g. permanently or frequently open leads). In addition, the length of time each season that it takes for a solid stable ice cover to develop will be recorded, as would any mid-season thaws. These records will be reviewed during the season (to make necessary adjustments to operations) and at the end of each season to assess the need to refine operational procedures during the transitional and winter seasons.

18. *The protocol the Environmental Monitor will follow to measure channelization, siltation and sedimentation, wake height and bank erosion attributable to the ACB and amphitrac, including reporting forms.*

See response under # 2 regarding observation and measurements of biophysical effects during commissioning on the Taku River.

19. *The protocol that vessel operators will follow to circumnavigate woody debris in the navigation route, since woody debris cannot be removed from the Taku River.*

Removal of LWD on the Alaskan portion of the Taku River is not anticipated given the relatively wider and deeper channel on the US side of the border. Furthermore, LWD presents fewer navigational hazards in the channel within Alaska, than on the section of the river upstream of the US/Canada border. If LWD presents an unavoidable navigational hazard to either the safe operation of the ACB and/or a human health and safety risk, then the LWD will be removed from the channel. Such incidents will be recorded and reported on during the regular incident reporting.

20. *The protocol Redfern will use to update the Operations Plan.*

Redfern proposes to update the Operations Plan annually. This update will include any proposed operational adjustments, the results of monitoring surveys, a summary of the daily log record, and other relevant information obtained during the course of the year. It is anticipated that regulatory agencies will approve any major changes to the operational plan prior to implementation.

21. *The protocol that Redfern will use to implement the proposed adaptive management measures. Please document a protocol for each strategy that may be used to minimize impacts to resources and habitats.*

The implementation of any proposed adaptive management measures will be reflected in the annual updates of the Operations Plan. These measures may include routine operational procedures based on experience gained during the initial years of operating on the river in various seasons, and will also reflect any adjustments to operational procedures that may be implemented to minimize effects on fish, wildlife and their habitats recorded and observed during monitoring. Specific procedures and protocols for implementing the adaptive management measures will be outlined in the *Wildlife Management Plan* developed in conjunction with resource agencies, First Nations and Redfern.

Attachments:

1. Tulsequah Chief Mine ACB Transportation System, Supplemental Wildlife Information and 2007 Survey Results
2. Taku River Mainstem Channel Profile
3. Tulsequah Chief Wildlife Log Form
4. Wildlife Incident/Risk Report