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Attn: David MacKinnon

Review of the Proposed Tulsequah Chief Mine Access Road – Fisheries Issues

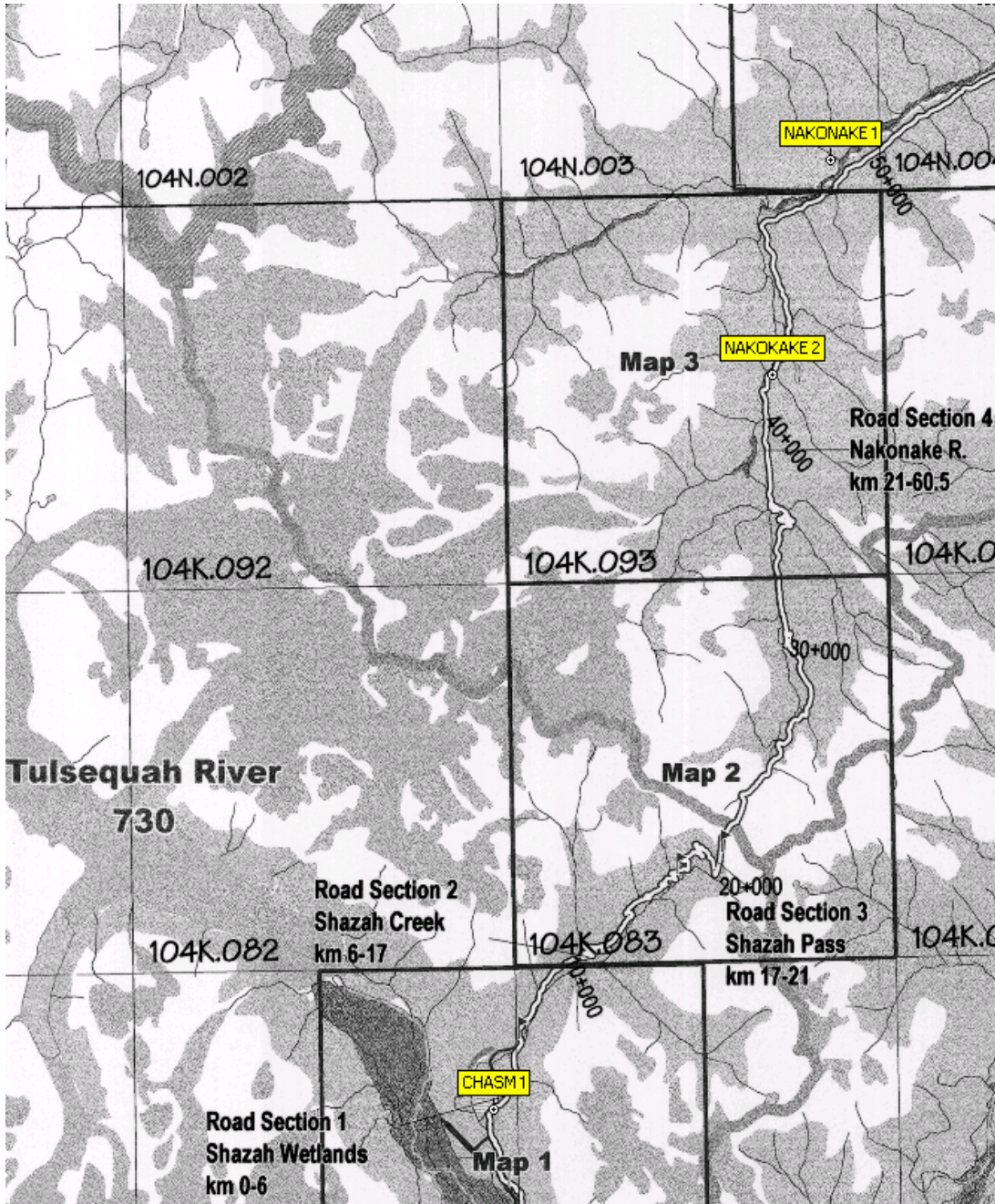
You have requested that I provide a letter that documents the findings of a site visit on October 7, 2004 and follows up on my previous review letter of July 14, 2004 with a more detailed review of the adequacy of the assessment of fisheries impacts from the access road of the proposed Tulsequah Chief Project. I have compiled notes and photographs from my field trip and integrated this with the available background information to provide a review.

This assessment is based on information provided to me including baseline studies by Redfern Resources Ltd., commentary by Fisheries and Oceans Canada on outstanding issues identified, and a response to these issues by the proponent. The objective of this work was to examine the proponent's work and DFO correspondence to determine whether the impacts have been properly identified and addressed within the context of the Fisheries Act.

Approach

The proposed Tulsequah Chief mine road is 162 km long and according to the proponents Environmental Impact and Mitigation Plan includes 69 stream crossings (36 from Shazah Cr. to the Sloko River, 21 from Sloko to Boyer Creek and 12 from Boyer Creek to Wilson Creek). Maps (TRIM 1:20,000) prepared by the proponent identify 268 culverts or bridges in total along the preferred road route, which include sites that may not be defined as streams but nonetheless require a structure to pass water at some times of year. A review of all these crossings presents a substantial task, far exceeding the resources available by the TWA at the time this review was commissioned. Accordingly, it was necessary to focus the study on a small number of crossings. These were selected to overlap with areas of important fish habitat because the purpose of this work was to identify and assess potential fish habitat impacts. We examined baseline 1:20,000 maps compiled by Redfern that we requested from the DFO office in Vancouver. These maps showed the road route and the locations of streams, stream crossings and sites sampled for fish habitat by either Redfern or the regulatory agencies. The road route and stream crossings were georeferenced based on these maps and uploaded into a GPS so that key locations could be identified in the field. GPS based locations may vary in accuracy from true locations, accordingly, in the field crossing locations were identified by flagging that was observed on site and was assumed to represent the proposed crossing location: this did not always agree with the location indicated by the GPS.

Figure 1. Map showing locations of stream crossings examined during this study with reference to the road location. The basemap is the overview map prepared by Redfern Resources Ltd. for their impact assessment.



A helicopter was used to fly the entire road route from Atlin to the Tulsequah Chief mine. The overflight was conducted at a low level (~ 300 m) with an experienced pilot familiar with the proposed road route. Areas of fish habitat that were observed during the overflight were entered in the GPS for more detailed examination on the return flight. Key sites were examined by an overflight at ~150 m elevation, followed where possible by landing to survey three selected sites on foot.

Nakonake 1

Tributary to Nakonake River at Road km 46.76 N
Crossing UTM: 590488 E, 6542048 N

This site was a single bridge stream crossing located at km 46.76 along the proposed road. Moderate value fish habitat identified by the proponent was confirmed by an inspection on foot. Spawning and rearing habitat is likely present in this stream for bull trout and possibly also salmon. The bridge crossing proposed for this site appeared appropriate. Sediment concerns appeared manageable at this site. However, the risk of accidents and failure to maintain the road or sediment controls properly has not been considered here in a manner that integrates the potential risk with those of other, hydraulically connected sites.

Conclusion: Proponent properly assessed impact and prescribed the correct stream crossing. Potential impacts specific to this site can be assessed, however risks of impact have not been quantified for all stream crossings combined.

Nakonake 2

Tributary to Nakonake River at Road km 40.72
Crossing UTM: 588711 E; 6535843 N

A single 1200 mm diameter culvert is proposed for crossing this stream at km 40.72 along the road. No examination or quantification of fish habitat has been done at this site by the proponent. Salmon were observed spawning at the site on October 7, 2004, including one pair of sockeye salmon and one coho salmon. The bridge crossing was located within 20 m upstream of the spawning site and good quality spawning habitat was present at the proposed crossing. Moreover, a fish sensitive zone was identified adjacent to the stream and is traversed by the road, which will cause direct impacts by alienating wetted habitat and disrupting flow through this habitat. The 1200 mm diameter culvert prescription is incorrect, and a bridge should be provided, otherwise a Harmful Alteration, Disruption or Destruction of fish habitat (HADD) will occur at this site.

Conclusion: The proponent failed to adequately characterize baseline fisheries resources or prescribe correct mitigation.

Figure 2. Nakonake tributary. A clear span bridge is proposed for this crossing and should be adequate to protect fisheries resources. However, the cumulative effect of numerous stream crossings on water quality and fish habitat in downstream habitats has not been addressed.



Figure 3. Nakonake tributary 2. A 1200 mm culvert is proposed for this crossing. Spawning habitat was observed at the site and spawning salmon were observed 20 m downstream.



Chasm 1

Tributary to Shazah Creek crossing at km 4.4
Crossing UTM: 580993 E, 6515483 N

This creek and tributaries would be crossed with a clear span bridge at km 4.40 along the road. This will adequately protect habitat at the crossing site. However, there are a number of significant problems with the road design downstream of the crossing site between km 3.0 and km 4.4, as will be described in detail in the following sections.

Several small tributaries to Chasm Creek will be diverted from their natural courses, conveyed along ditches and diverted back into Chasm Creek at a downstream location. The map (Figure 5.2.1 b in Volume 5, Environmental Management) shows flow directions for these diversions, but clearly is in error as the flow is shown returning back to the creek across the road at locations where no culverts are planned, based on the 1:20,000 TRIM maps that identify culvert locations. Given this error, it is unclear whether the proponent plans to convey all diverted water to Chasm Creek at a single location or instead plans to install additional culverts that have not yet been planned as part of the road location.

Figure 4. Chasm Creek looking upstream at the proposed stream crossing. A clear span bridge will be used to cross the stream. Chasm Creek turns to photo right and then runs along the proposed road for 2 km.

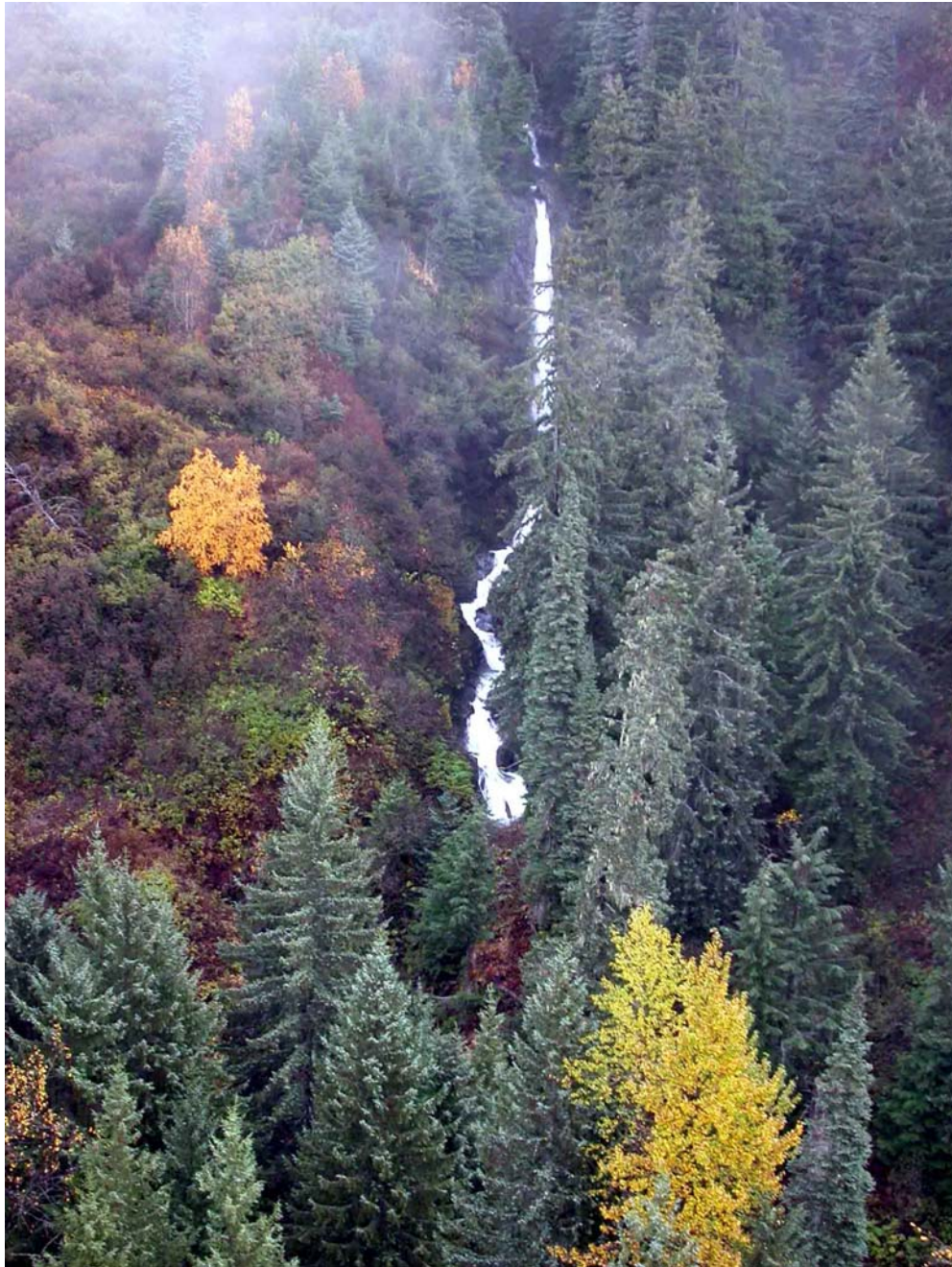


Figure 5. Chasm Creek looking upstream approximately 1 km above the Shazah Creek confluence. The road will run along photo right and in some locations lie adjacent to the stream channel without an adequate riparian management zone.



Figure 6. Chasm Creek and off-channel habitats looking east approximately 1 km above the Shazah Creek confluence. The road will run left to right along photo top and in some locations will lie adjacent to the stream channel without an adequate riparian management zone. Note the clear-water off channel habitats.



The road will run beside this tributary for 2.0 km, which is the entire extent of this stream along the valley bottom. The separation between the road and the stream centerlines ranges from 14 m to 296 m with a median separation of 59 m, based on 1:20,000 TRIM mapping. Factoring in a road and stream widths the median separation may be < 50 m. Certainly, off channel habitats will be even closer the proposed road. This road will be built along slopes of up to 45° through old growth coniferous forest. A low point pond to catch material from the pipeline in the event of a rupture will be located on the floodplain of Chasm Creek within 50 m of the channel.

Baseline Data on Habitat Quality

Chasm Creek has valuable habitat for salmonids. The proponent's baseline work was limited to 4 sites sampled for habitat parameters. Despite the low level of sampling, it was apparent to the proponent that "the lower 2.0 km of Chasm Creek mainstem area provides excellent salmonid spawning habitat." Fish sampling in Chasm Creek was minimal. The proponent sampled two sites two times. Electrofishing sampled 30 m² in 1994 and 200 m² in 1995, which we estimate represents <1% of the habitat present in the stream. In addition, the proponent placed one minnow trap for 24 hours in each of the two years of sampling. This intensity of sampling is not sufficient to establish the use of habitats in this stream. No directed observations of adult spawning were made by the proponent, however, one field sampling site description does comment "major sockeye spawning (est. 200 fish); site in adjacent side channel". Sampling by the Tulsequah River Salmon Habitat Cooperative Project in September and November 2000, and March, June, and November 2001 did not examine Chasm Creek based on a GIS map of sampling locations provided to TWA by the ADFG (Ben Kirkpatrick, ADFG, pers.comm. 2004).

Based on an aerial overflight during October 2004 of Shazah Creek, the Tulsequah River and Chasm Creek, in which the physical characteristics of the habitats were observed along with spawning adult salmon, I suspect that Chasm Creek provides the highest quality spawning habitat in the Tulsequah drainage. This statement is qualified by uncertainty in that I was unable to examine the stream on the ground and did not examine all habitats in the Tulsequah River from the air. However, my assessment is grounded in experience gained through sampling hundreds of stream habitats throughout the Province. My assessment of the high potential of this creek to support spawning salmon results from the observation of a low gradient channel with intact riparian vegetation lying against the valley wall fed by clearwater tributaries and most likely groundwater. This arrangement, seen on other glaciated coastal valleys, creates a high potential for groundwater dominated incubation that promotes high egg-fry survival for salmonids. A good example of this is found in the Squamish River where similar tributaries provide the highest quality spawning habitat as well as good rearing habitat, in contrast to mainstem habitats which are dominated by cool, turbid glacial water and are of lower quality. I would expect that Dolly Varden char, sockeye salmon, and coho salmon spawn in Chasm Creek. Adult salmon were observed spawning in the creek during October 2004.

There has been no study of spawner abundance and egg-fry survival on Chasm Creek. There is no comparison of value of Chasm spawning habitat and Tulsequah spawning habitat. Neither the proponent nor the regulatory agencies understands the significance of the Chasm Creek spawning population, nor to my knowledge has any attempt been made to do so. This information is relevant to an assessment of potential impacts.

Potential Impacts to Fish Habitat

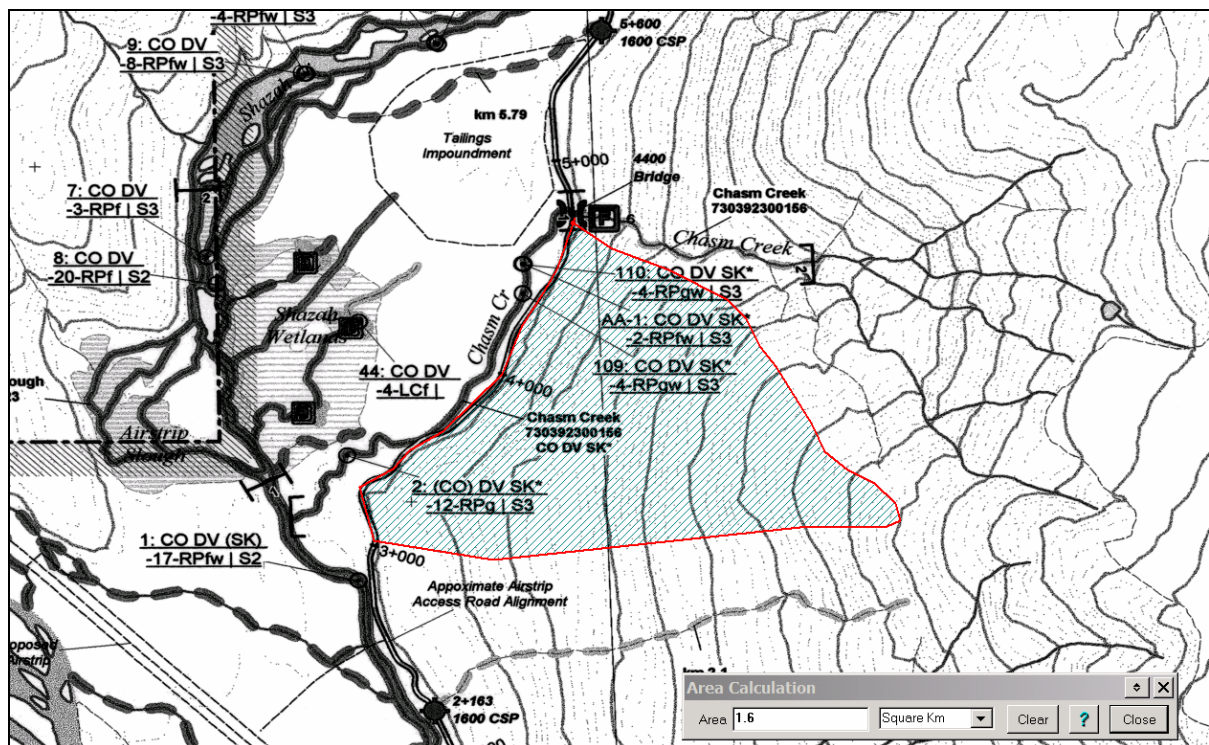
Given the high quality of the habitats in Chasm Creek, the steepness of the slopes and the presence of old growth riparian habitat along the entire channel, construction and operation of

the road as currently designed will likely create a HADD by affecting riparian vegetation, water flow, groundwater flow, water temperature, and nutrients.

Approximately 1 km of the road lies within 50 m of the stream channel and a substantial portion lies within 30 m. In addition, an upslope ditch will be constructed to capture surface flow from various unnamed tributaries and convey flow into Chasm Creek. This design intends to avoid direct run-off of sediment and oil contaminated water along the road between the mill and the tailings pond by capturing all surface water in ditches upslope of road along Chasm Creek. Unfortunately, some groundwater that would otherwise flow into Chasm Creek will be captured in these ditches because they will be excavated below grade. The proponent shows that all groundwater moves west at the tailings impoundment, therefore it is assumed that groundwater moves down slope from the road towards Chasm Creek.

Chasm Creek has a drainage area of 8.6 km², based on 1:20,000 TRIM mapping: 7.0 km² lies upstream of the proposed road crossing and 1.6 km² (19%) lies downstream. Of the 7.0 km² lying upstream of the crossing, the majority is high elevation lying west of Mt. Eaton: only 2 km² lies at elevations < 1000 m. In contrast, all of the basin draining into Chasm Creek downstream of the proposed bridge crossing lies at elevations of <1000m. Considering all elevations in the basin of 1000 m elevation or less, an area equivalent to 44% drains into Chasm Creek downstream of the proposed bridge crossing.

Figure 7. Chasm Creek showing the drainage area that will be intercepted by ditches for surface water collection. Basemap is a TRIM 1: 20,000 prepared by the proponent and provided by DFO.



The proposed road will intercept all local inflow downstream of the proposed bridge crossing, amounting to 19% of the drainage area of Chasm Creek. Moreover, 44% of the low elevation (<1000 m) drainage area will be intercepted. Flow interception will likely also include some ground water that would seep down along the slope and interface with streambed gravels along Chasm Creek. The proposed surface water collection ditches will collect and convey surface and groundwater upslope of the road, then discharge this water to an existing minor tributary at km 3. No culvert or bridge is identified at this location, which appears to be an error in design. We assume that the flow will be conveyed under the road bed through a culvert. This will effectively reduce flow along 2 km of Chasm Creek by an annual average of 19% at the confluence with Shazah Creek, assuming equal run-off throughout the basin. The reduction in flow will vary with distance downstream of the bridge crossing. By season, flow will vary as well: the most severe reduction is expected in the lowest segment of the creek during late fall, winter, and early spring, when high elevation discharge will be minimized by low air temperatures.

In addition to reducing surface water and groundwater flow to Chasm Creek, the proposed interception ditches will alter the temperature of the water diverted in the ditches because it will be exposed to air for a longer period of time than under natural conditions. During cold weather periods in the winter, ditch water temperatures will be lower than in natural channels or in groundwater. During cold weather periods, ditch water may freeze, temporarily eliminating this source of inflow to Chasm Creek at the mouth. Existing groundwater infiltration to Chasm Creek gravels will likely be reduced because the ditches will intercept groundwater.

Despite the interception of surface flow in the ditches and conveyance away from Chasm Creek, rainfall and snowmelt will generate surface water along the road bed, which will be compacted and graded and relatively impervious. During high precipitation events, this flow will pool on the road surface, run down slope and eventually move off the roadbed towards either the ditch or stream side. On the ditch side no provision has been made for collecting and treating this water, instead a double ditch has been designed that will carry the tailing and reclaim pipelines and intercept upslope surface water. Based on this design, it is assumed that water from the road surface will be drained to the stream side. Sediment in this water can be conveyed into natural vegetation with the intention of filtering out the sediment. However, given the narrow riparian management zone and steep slopes, it is likely that sediment laden water will be conveyed down into Chasm Creek at various locations along the road. An additional impact will arise, albeit temporarily, during the construction of the road and ditches, when sediment will be generated and will be entrained and enter Chasm Creek, particularly in off channel habitats adjacent to the toe of slope.

The predicted physical changes in Chasm Creek will directly affect fish habitat. Upslope ditches will reduce instream flow by intercepting surface and groundwater flow, particularly during low flow periods during late fall, winter, and early spring, when salmonid eggs will be incubating. This in turn may dewater eggs, exposing them to freezing and desiccation, and result in low egg-fry survival. The magnitude of this impact cannot be quantified without detailed information on streamflow and groundwater contributions from the contributory basin area downstream of the proposed stream crossing, as well as data on the distribution and physical habitat conditions at

egg incubation sites. However, the impact may be significant, as the intercepted area represents 19% of the basin area and 44% of the lower elevation area.

Another impact of the interception of streamflow and groundwater will be an alteration in the thermal regime of Chasm Creek. Lower streamflows have a lower capacity to buffer air temperature changes; hence water temperatures will become more variable: colder during cold weather and warmer during warm weather. This may expose eggs to water temperatures sufficiently low to increase egg-fry mortality, or alter development rates, prompting juvenile salmonids to hatch and emerge late and suffer lower growth and higher mortality.

The proximity of the road and stream channel combined with steep slopes will promote the transport of sediment into Chasm Creek where it will be deposited, reducing gravel porosity and/or sealing the streambed surface with fines, both of which would be expected to reduce egg-fry survival for incubating salmon. Another likely effect is increased turbidity, which in extreme cases may create sublethal effects on fish, i.e. effects that cause stress, reduce feeding rates and slow salmonid growth. Even small increases in turbidity are of concern because they reduce the feeding ability of fish. For example, rainbow trout (*Oncorhynchus mykiss*) reduce their feeding activity with increases in turbidity of only 10 NTU (Barrett et al. 1992). This will reduce fish growth rate over time, affecting habitat productive capacity. Sigler *et al.* (1984) found that most coho salmon fry left artificial channels when turbidity increased. Those that remained in turbid water grew 70 % less quickly (0.025 g/day in clear water versus 0.007 g/day in turbid water). In the case of the clear water habitats adjacent to Chasm Creek, increases in turbidity are likely and will affect coho salmon feeding and growth. Furthermore, because these habitats are off channel and have low flows the turbidity will persist for prolonged periods. If road sediment contains clays and silts, and turbidity will persist for days or even weeks.

Evaluation of Proponent's Baseline Data and Impact Assessment

The proponent has assessed impacts over a 162 km long section of road. They note that 131 aquatic habitat sites were sampled; however this is less than 1 per km of road. Some of the streams crossed by the road were not sampled by the proponent. The weakness of this partial sampling of habitats potentially impacted by the road is revealed by our field visit wherein we identified potentially significant habitat and impacts at two of three sites. The proponent's maps identify 253 culverts and 15 bridges along the road. Each of these sites represents a potential risk to aquatic habitat at and downstream of these structures. Of particular concern is the combined effect that sedimentation at multiple hydraulically connected stream crossings may have on downstream aquatic habitats.

Our finding of significant potential impacts contrasts starkly with the impact assessment provided by the proponent. The proponent concludes that there will be no net loss and that residual impacts will be negligible. We found at two locations a failure to identify impacts properly that underestimated the likelihood and significance of potential impacts. The assessment documented in this letter describes potential impacts that could cause a net loss in fish habitat. The significance of this loss is dependent on the magnitude of impact and quality and quantity of habitat, which cannot be estimated because only reconnaissance level data have

been collected. Nonetheless, we dispute the conclusion that the impact will be negligible, because the reconnaissance level data show excellent habitat is present and the proposed road design poses a significant risk of impact to aquatic habitat. Impacts to Chasm Creek could affect a distinct population and over more than one generation, leading to a major impact, particularly in the event of an accident or failure to adequately maintain mitigation measures such as road drainage.

The proponents impact significance methodology is flawed with respect assessing impacts to salmon species. The proponent aggregates population via ecosection and acknowledges impacts as significant only if the entire ecosection population is affected for more than one generation. Salmon are genetically adapted on a fine spatial scale to individual streams, not to ecosections, hence we disagree with the proponent's definition of a population. Even if the proponents did identify the impacts observed during our field visit, they would have deemed the impact negligible because of this flawed methodology. As an example of the error within this approach, they could extirpate all salmon in Chasm Creek or any other tributary and define this as a negligible impact. A probability of a reduction in the carrying capacity of an important salmon bearing stream such as Chasm Creek is significant and should be thoroughly assessed and mitigated.

Furthermore, extreme events and accidents pose unquantified risks to fish habitat. A seismic event that ruptures the pipelines may also rupture road bed and ditch, discharging tailings contaminants and sediment into Chasm Creek despite the presence of a capture ditch and low point pond. No risk assessment of this potential impact has been completed. This highlights a concern identified in our earlier letter concerning risks from improper erosion control measures, or failures to control sediment during extreme events.

HADD Assessment

DFO has not identified impacts on a site by site basis to the Nakonake River tributaries and Chasm Creek, however, generally they have expressed similar concerns through several comments in the letter of June 18, 2002 that provides Redfern Resources with an update of the issues unresolved and outstanding on the Tulsequah Chief project, as noted:

18. Likely inconsistencies between the above road design plans and the current Fish Stream Crossing Guide (2002) and contravention of DFO Pacific Region's position that corrugated metal pipes installed on fish-bearing streams usually result in a harmful alteration, disruption or destruction of fish habitat (Henderson, 16 August 2000).

23. Likely that mitigation measures proposed would be ineffective in reducing road-generated suspended sediment concentrations of many watercourses particularly in the Nakonake System, to levels compliant with CCME guidelines during storm events and during spring thaw in light of haulage rates and haul schedule proposed.

We addressed each of these issues in our letter of July 14, 2004. Regarding issue 18 we noted that a detailed review was required to provide a response. The field visit has provided sufficient information that we can now comment in more detail. The road design plan is not consistent with the Fish Stream Crossing Guide used in British Columbia (BC Ministry of Forests 2002), which directs forest and other resource managers and practitioners to plan, prescribe, and implement sound forest practices for fish-stream crossings to comply with both the Forest Practices Code and the federal Fisheries Act. The guidebook provides technical and process guidance for selecting and designing fish-stream crossings on forest roads as well as mineral and petroleum access roads that should avoid harming fish and fish habitat and provide fish passage at stream crossing sites. In 2 of 3 sites we examined, a HADD of fish habitat is likely. Regarding issue 23, our concerns have been elevated through the site visit. Not only are stream crossing prescriptions in some cases incorrect, the proximity of the road to the stream channel and channel slope indicates that there is a high risk of sediment pollution and impacts to fish habitat. Our field visit provides support to our initial assessment that “Identifying sediment mitigation measures such as ditches and culverts, and the potential to use natural filtration of sediment does not provide any assurance that such measures will work at specific sites.”

The Fisheries Act is implemented by DFO fish habitat managers through a decision framework for determining if a Harmful Alteration, Disruption or Destruction (HADD) of fish habitat is likely and whether an authorization under Subsection 35(2) of the Fisheries Act should be issued. The HADD framework (DFO 1998) consists of five steps:

1. Is fish habitat present at the project site or in an area potentially impacted by the project?
2. Could the proposed project cause a HADD of fish habitat?
3. Can the impacts to fish habitat be fully mitigated?
4. Should the HADD be authorized?
5. Can the HADD be compensated?

We agree with DFO and the proponent that fish habitat is present in an area potentially impacted by the project. We further agree that the project could cause a HADD of fish habitat. However, as described in detail above, we disagree that the impacts can be fully mitigated by the proposed design. Without additional detailed studies and design one cannot conclude with sufficient certainty that the impacts can be fully mitigated. DFO’s HADD decision framework is very clear on how to deal with uncertainty:

“where there is doubt about the impact of a project on fish habitat and if sufficient information is not provided to enable for a conclusion that a HADD is not likely to result, reviewers should adopt a precautionary approach and conclude that a HADD is likely to result.”

This leads to step 4, in which DFO must determine whether or not to authorize a HADD. DFO has identified a number of factors to be considered when making this decision. Factors particularly relevant to this project include:

“whether the habitat is supporting an active fishery - where there is no active fishery, there may be more flexibility in the timing of the implementation of compensation”

The habitat in question supports salmon populations that in turn support important subsistence and commercial fisheries, including a fishery shared under international treaty with Alaska.

“importance of the habitat - as per the C&P Guidelines, whether the impacted habitat type is in low supply and/or may be of high value to fish production”

The habitat in question is in low supply, but is likely highly productive salmon habitat: groundwater fed, high water clarity habitats are not common along the Tulsequah, based on our aerial reconnaissance. Additional work should be undertaken to confirm this finding, however, based on the available information we believe that Chasm Creek and adjacent off-channel habitats may be of high value and possibly critical to salmon production.

“whether the HADD will cause a significant change in the capacity of the habitat to produce fish - either because the project will result in a relatively large change, or a small but significant, or cumulative change;”

We suspect that the proposed road design will cause a significant change in the capacity of habitat in Chasm Creek. To demonstrate this with standard scientific certainty would require detailed studies. In the absence of such studies and the high uncertainty, we expect DFO to conclude that a significant HADD is likely.

“the availability of technically feasible habitat compensation options, as well as evidence of past success in efforts to compensate for the loss of the type of habitat impacted by the project;”

The proponent has not identified specific habitat compensation options that could be effectively applied on-site to compensate for habitat losses. Compensation may be feasible; however, the past success of such efforts in directly analogous situations should be documented. Typically, sufficient on-site data must be generated regarding compensation options to ensure that the compensation is feasible. That in turn requires additional detailed study.

“whether the authorization would set a precedent that could lead to future cumulative impacts.”

This consideration may be intended to deal with the global application of the HADD framework, rather than for site specific situations. However, we believe it has bearing in this case where the acceptance of a HADD of fish habitat along 162 km of road with specific areas of potentially high impact would set a precedent for future HADD assessments. Acceptance of the road design will effectively ‘lower the bar’ for impact assessment. It is reasonable to predict similar road proposals in the Taku basin, with a similar lack of baseline data, lack of adequate impact assessment, and high probability of a HADD to fish habitat.

Evaluating the available data (and lack thereof) contained in the Tulsequah Chief road design according to the HADD framework indicates that authorization of the road design is not warranted. Additional detailed study is required. Regardless of whether additional studies are

completed or not, DFO is not obliged to issue an authorization in situations where adverse impacts to fish habitat are judged to be unacceptable.

The HADD decision framework includes the assessment of Cumulative Effects. DFO states:

“Cumulative effects are not a factor in determining whether a HADD is likely to occur in an individual project assessment, but they may influence the decision about whether a HADD will be authorized.”

Further, DFO integrates the level of certainty over impacts, which we believe to be low in this case, with the risk of establishing precedents that will lead to significant cumulative effects, providing habitat managers with specific direction:

“The uncertainty about acceptable levels of development and the risk of establishing precedents leading to significant cumulative effects will normally cause habitat managers to recommend against issuing a Subsection 35(2) authorization.”

Finally, DFO directs managers to deal with cumulative effects in the context of a broader planning process:

“In general, cumulative effects are best addressed through the development of habitat or integrated resource management plans based on fish community or fisheries management objectives. The Habitat Policy encourages and promotes the development and implementation of such plans, as well as the need for habitat decision making to be undertaken in the context of such plans.”

For the proposed Tulsequah Chief Project, where baseline information is limited, impact assessment inadequate, and uncertainty substantial, the potential impacts of the project can most effectively be addressed within the context of the HADD evaluation framework by implementing an integrated resource management plan based on fish community or fisheries management objectives. A Management Direction for Land and Resources (TRTFN 2003) has been directed by the Taku River Tlingit First Nation over the area of concern for the proposed project. This plan includes a Watershed-based Fish Sustainability Planning process for the Taku watershed, with objectives and strategies for the management of fish and aquatic habitat, consistent with the development of an integrated resource management plan. Joint implementation of the Tlingit Management Direction for Land and Resources by the governments of BC, Canada and the Taku River Tlingit First Nation would provide an appropriate, watershed-level context for understanding and evaluating project impacts, particularly the cumulative impacts likely to follow were this project completed. Since the Taku watershed and fisheries are an international resource, binational watershed planning involving Alaskan and US federal agencies as well as Southeast Alaska stakeholders may also be warranted to fully account for DFO policy as well as Canada’s international Treaty commitments.

Summary

During the field assessment we examined three stream crossings near important fish habitat. At two of the three the proposed road design fails to protect fish habitat and a Harmful Alteration, Disruption or Destruction (HADD) of fish habitat is likely. These observations demonstrate that stream crossings and some portions of the road are not properly designed to adequately protect fish habitat. These flaws in the proponent's impact assessment warrant more extensive investigation at other sites along the road to determine other locations where the design is inappropriate. The confidence in baseline studies is confirmed to be low given the project proponent's failure to identify spawning habitat and the consequent improper prescription of stream crossing technique. Furthermore, the confidence in the impact assessment is confirmed to be low given the project proponent's failure to identify a potentially significant impact to fish habitat at Chasm Creek, which may have the highest quality spawning habitat in the Tulsequah drainage. We conclude that adequate baseline data have not been collected, that impact assessment and mitigation measures are inadequate, and that as designed this project is likely to lead to Harmful Alteration, Disruption or Destruction (HADD) of fish habitat and Fisheries Act violations impacting an important, shared commercial and subsistence fishery. These concerns overlap with those identified in DFO's letter of June 18, 2002, which provides Redfern Resources with an update of the issues unresolved and outstanding on the Tulsequah Chief project, as well as my previous analysis submitted in July of this year.

This analysis also reconfirms my concerns, identified in July 2004, that approval and development of this project may not adequately protect fish and fish habitat from sediment pollution, and further reinforces the concerns raised regarding cumulative impacts. The potential for cumulative effects is particularly difficult to address because most of the potential development in the area has not yet been permitted. Despite this, there are tangible signs that development is imminent, which will increase the risk of sediment pollution. For example, (Canarc Resource Corp) has recently increased activity at its property adjacent to the Tulsequah Chief directly in response to the BC government approval of the road.¹ These activities reinforce our earlier comments that a cumulative effects assessment is warranted for this project.

Yours truly,
Ecofish Research Ltd.



Adam Lewis, M.Sc., R.P.Bio. No. 494
Fisheries Biologist/Principal

¹(Canarc Resource Corp press release, October 13, 2004: "The fact that Redcorp already received their final BC government approval (Project Approval Certificate) in 2002 to build the 2500 tpd Tulsequah Chief underground mine and 165 km access road bodes well for the future permitting of Canarc's New Polaris gold mine project." <http://www.canarc.net/news/pr101304.asp>

References

- B.C. Ministry of Forests. 2002. Fish-stream crossing guidebook. For. Prac. Br., Min. For., Victoria, B.C. Forest Practices Code of British Columbia guidebook.
- Barrett, J.C., G.D. Grossman, and J. Rosenfeld. 1992. Turbidity-Induced Changes in Reactive Distance of Rainbow Trout. *Transactions of the American Fisheries Society* 121: 437-443
- DFO 1998. Habitat conservation and protection guidelines. Communications Directorate, Fisheries & Ocean Ottawa.
- Dept. Habitat. Mgmt. DFO 1998. Decision Framework for the Determination and Authorization of Harmful Alteration, Disruption or Destruction of Fish Habitat. Department of Fisheries and Oceans Habitat Mgmt. and Env. Sci. Habitat Mgmt. Brch.
- Sigler, J.W., Bjornn, T.C., Everest, F.H. 1984. Effects of chronic turbidity on density and growth of steelheads and coho salmon. *Trans. Amer. Fish. Soc.* 113: 142-150.
- Taku River Tlingit First Nation. 2003. Our Land is our Future. Taku River Tlingit First Nation Vision and Management Direction for Land and Resources. Taku River Tlingit First Nation, Box 132, Atlin, B.C. V0W 1A0.

PROFESSIONAL SUMMARY

Adam Lewis, M.Sc., R.P.Bio. Fisheries Biologist

Mr. Lewis has a Master's degree in fisheries biology and is a Registered Professional Biologist (BC) with over 20 years experience in environmental consulting on fisheries issues. He focuses on the assessment and management of impacts from industrial developments. He has managed environmental assessments of dozens of development projects including hydroelectric projects, mines, forestry, pipelines and transmission lines, urban development, and marine foreshore projects. During these projects impacts to the aquatic and marine environments including water quality, primary production, invertebrates and fish were assessed. For many of these projects Mr. Lewis liaised with government, industry, the public, and First Nations as part of regulatory review process.

Lewis quantifies impacts to fisheries resources from industrial developments, designing and implanting mitigation and compensation as required. From 1997-1999 he assessed impacts from forest roads in northern BC for a major forest company, monitoring water quality effects at dozens of stream crossings, and prescribing mitigation to manage sediment impacts to salmon habitat. From 2002 to 2004 he was a consultant to the Ministry of Sustainable Resource Management on an interagency team that developed instream flow standards, and was the lead consultant developing methods for instream flow assessment. These methods were developed for use in all instream flow assessments in BC. In 1999 he developed a compensation plan for the Prosperity Gold-Copper Project near Taseko Lake BC, and in 1994 managed the development of an Environmental Impact Management and Monitoring Program for the Mamquam River hydroelectric project. In addition, he has monitored the effects of pulp mills, domestic water diversions, and aquaculture projects. He has acted as an expert witness on habitat impacts to fish in Provincial court cases and water license adjudications.

Mr. Lewis is a member of the American Fisheries Society, the Executive Director of the Eulachon Conservation Society, and a former Director of the Steelhead Society of British Columbia. Mr. Lewis has published two books on Pacific salmon in the popular literature.