



Memorandum

Date: February 10, 2018

Project #: 160021 – Red Mountain

To: Max Brownhill, IDM Mining Inc

From: Irene Mencke and May Mason, Palmer Environmental Consulting Group Inc. (PECG)
Lee Christoffersen and Kaitlyn Kooy, SRK Consulting (SRK)

cc: Andrea Buckman, Palmer Environmental Consulting Group

Re: Response to Canadian Environmental Assessment Agency (the Agency) Information Request
#1 for the Red Mountain Underground Gold Project
Comments # IR1-10

1. Introduction and Purpose

This memorandum responds to a request for outstanding information to address Information Request (IR) 1-10 received from the Canadian Environmental Assessment Agency (the Agency) following their review of the Application for an Environmental Assessment Certificate/Environmental Impact Statement (the Application/EIS) for IDM Mining Ltd.'s (IDM's) proposed Red Mountain Underground Gold Project (the Project).

IR1-10 was received as part of IR1, Annex 1 attached to a letter from the Agency to IDM, dated December 22, 2017. IDM provided a response to IR1-10 on January 16, 2018, in a memo responding to Annex 1 IRs.

On January 31, 2018, IDM received a letter from the Agency, following the Agency's review of IDM's Annex 1 IR responses. The Agency requested the following outstanding information for IR1-10:

Fish and Fish Habitat (IR1-10)

- a) *The Agency requested "a table showing linear length (m) and areal extent (m²) of the maximum flow changes (increases and decreases) as a result of the water supply changes in the affected streams." In response, IDM points back to the EIS and states that "These results were sufficient to assess effects from changes in flow on other valued components, namely Fish and Fish Habitat." Given that none of the requested information was provided, the Agency considers this response inadequate. The requested information is necessary to substantiate IDM's conclusions of the effects assessment.*



- b) *The Agency requested a description of "what these [maximum flow changes] would mean to available fish habitat (quality and quantity) during seasons when relative changes would be greatest." In response, IDM summarizes the information in the EIS which exclusively describes effects of increases to average monthly flow rates, and neglects to consider effects to maximum flow increases or flow decreases.*

Outstanding information:

- a) *Provide a table showing the linear length (m) and areal extent (m²) of the maximum flow changes as a result of water supply changes (increases and decreases) in the affected streams (e.g., 0, 5, 10, 15, 20% contours).*
- b) *Provide an analysis of what these changes would mean to available fish habitat (quality and quantity) during the seasons when relative changes would be greatest, for example overwintering.*

On February 2, 2018, a follow-up conference call between Max Brownhill (IDM), May Mason (PECG), Lee Christoffersen (SRK), and Andrea Raska (the Agency) provided further clarification on the outstanding information request. The Agency clarified that they would like to see the average changes in flow in both the Q20 wet year and the 7Q10 dry year and whether or not the differences between the average, dry, and wet conditions are enough to result in changes to the Fish and Fish Habitat Effects Assessment (Chapter 18 in the Application/EIS).

2. IDM Response to IR1-10 Outstanding Information Request

To fulfill the information request as clarified by the Agency on February 2, 2018, SRK prepared a summary of average percent difference in flow from baseline for the 7Q10 Dry Year and Q20 Wet Year, along with the Mean Hydrology that was presented in Chapter 12, Section 12.7-3 Table 12.7-3 of the Application/EIS and used in the effects assessment for Fish and Fish Habitat (Section 18.7.3.3 of the Application/EIS). These are presented as Appendix A of this memo.

The Fish and Fish Habitat residual effects assessment for changes in flow focussed on predicted average percent difference in flow from baseline for average conditions (Table A-1) at fish-bearing sites: BC06 (upper Bitter Creek), BC02 (lower Bitter Creek), and BR06 (Bear River). This memo considers the average percent difference in flow from baseline for the 7Q10 Dry Year (Table A-2) and the average percent difference in flow from baseline for the Q20 Wet Year (Table A-3).

The biggest changes in flow are predicted to occur during the Operation Phase, in the winter months (i.e., low flow period) in Bitter Creek. Maximum monthly (i.e., the month that had the highest change) flow reductions are 1% or less at the fish-bearing sites for all three conditions.

Maximum monthly flow increases, which occur because of mine discharge into Goldslide Creek, are summarized in **Table 1**. Maximum increases in Bear River (BR06) are negligible and not discussed further. Increases in flow are not predicted to exceed a 10% change from baseline, during average or wet conditions. During a dry year, increases in flow of 10% or greater are predicted to occur at BC06 and BC02 during November, December, and January. As BC06 is the most upstream fish-bearing site (i.e.,



closest to the source of flow input), the increases are largest at that site (15-22%). With accretion, these increases in flow are smaller at BC02 (10-14%).

Table 1. Predicted maximum monthly (worst month) increases in flow at fish-bearing sites during the Red Mountain Project lifetime, for average, dry, and wet conditions

Site	Average Year ¹	Dry Year (7Q10) ²	Wet Year (Q20)
BC06	5.3% (Dec)	15% (Nov), 22% (Dec), 16% (Jan)	8% (Nov)
BC02	3.5% (Dec)	10% (Nov), 14% (Dec), 11% (Jan)	5% (Nov)
BR06	1.3% (Dec)	0.1% (Dec)	0.1% (Dec)

¹ Increases for an average year were used in the effects assessment for Fish and Fish Habitat

² All predicted increases ≥10% (Nov-Jan) are shown

Federal guidance for assessing flow requirements is provided in an DFO advisory report that includes a general-purpose framework for the assessment of ecological flow requirements (DFO, 2013). This guidance defines the probability and potential risk of effects to ecosystems that support commercial, recreational, or Aboriginal fisheries based on the magnitude of cumulative flow alterations relative to a natural flow regime. Flow alterations that are less than 10% of the actual (instantaneous) flow in the river relative to a natural flow regime are considered to have a low probability of effect.

During a dry year, under natural conditions, lower-than-average winter flows can result in a reduction in overwintering habitat (e.g., fewer deeper areas that do not freeze to bottom). Increases in flow as a result of the Project may therefore increase the quantity of available overwintering habitat. Dolly Varden egg incubation occurs over the winter period and increases in flow could potentially effect incubating eggs and fry emergence timing (Newman and Newcombe 1977). However, increases in flow during a dry year would shift winter flow levels closer to conditions during an average year. Thus, effects from flow increases during a dry year could be beneficial to Dolly Varden overwintering habitat.

Bottlenecks to fish production can occur for either one or multiple life-stages simultaneously. Habitat bottlenecks are typically characterized by periods of high or low flow that limit the amount of critical habitat available for fish in a stream (Jowett and Hayes 2004). These habitat bottlenecks may limit overall production throughout the year, even once conditions return to optimal. Results from baseline studies (Appendix 18-A of the Application/EIS) indicate that overwintering habitat is limited in the Bitter Creek watershed and is characterized as poor to absent throughout. Availability of overwintering habitat is likely a bottleneck to fish production in Bitter Creek and is potentially compounded during a dry year. Increases to flow resulting from Project discharges during winter will improve poor conditions created by lower flows observed during baseline studies, potentially precluding a low-flow habitat bottleneck from occurring.

Based on the above rationale, the characterization of the residual effect on Fish and Fish Habitat from changes in streamflow is unchanged.

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3. References

Fisheries and Oceans Canada (DFO). 2013. Canadian Science Advisory Secretariat, Science Advisory Report 2013/017. Framework for assessing the ecological flow requirements to support fisheries in Canada. Available at: <http://waves-vagues.dfo-mpo.gc.ca/Library/348881.pdf>. Accessed February 2018.

Jowett, I.G and Hayes, J. 2004. Review of methods for setting water quantity conditions in the Environment Southland draft Regional Water Plan. Prepared for Environment Southland. June 2004.

Newman, H.R. & Newcombe, H.P. 1977. Minimum acceptable stream flows in British Columbia: A review. Fisheries Management Report No. 70. Habitat Protection Section, Fish and Wildlife Branch, Ministry of Recreation and Conservation, Victoria, B.C.

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Appendix A

Tables: Average Percent Difference in Flow from Baseline for Average, Dry, and Wet Conditions

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Table A-1 Predicted Average Percent Difference in Flow from Baseline (Average Conditions)

Station	Phase	Average Percent Difference in Flow from Baseline (Average Conditions)											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GSC02	Construction	-2.5%	-2.7%	-2.6%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-0.4%	-1.1%	-1.4%	-2.7%
	Operations	180.9%	146.8%	73.8%	21.3%	10.6%	12.3%	21.6%	30.5%	33.6%	82.5%	290.4%	392.2%
	Post-Closure	4.8%	6.7%	4.5%	1.3%	2.1%	5.2%	4.9%	4.2%	3.3%	4.0%	5.7%	6.0%
BC08	Construction	0.1%	0.1%	0.1%	0.1%	-0.2%	-0.8%	-1.1%	-0.9%	-0.4%	0.0%	0.1%	0.1%
	Operations	3.3%	2.7%	1.4%	0.1%	-0.2%	-0.2%	-1.1%	-0.8%	-0.1%	1.2%	5.4%	6.9%
	Post-Closure	2.1%	3.0%	2.1%	0.3%	0.4%	1.8%	0.8%	0.7%	0.9%	1.7%	2.5%	2.3%
BC06	Construction	0.1%	0.1%	0.0%	0.1%	-0.2%	-0.7%	-1.0%	-0.8%	-0.4%	0.0%	0.1%	0.1%
	Operations	2.5%	2.1%	1.5%	0.2%	-0.2%	-0.2%	-1.0%	-0.6%	-0.1%	1.4%	4.1%	5.3%
	Post-Closure	2.5%	3.2%	2.0%	0.3%	0.4%	1.6%	0.8%	0.7%	0.9%	1.9%	3.5%	3.9%
BC02	Construction	0.0%	0.0%	0.0%	0.1%	-0.1%	-0.5%	-0.7%	-0.5%	-0.3%	0.0%	0.1%	0.0%
	Operations	1.7%	1.4%	1.0%	0.1%	-0.1%	-0.1%	-0.6%	-0.4%	0.0%	0.9%	2.8%	3.5%
	Post-Closure	1.6%	2.1%	1.4%	0.2%	0.3%	1.1%	0.5%	0.5%	0.6%	1.3%	2.4%	2.6%
RBC02	Construction	0.0%	0.0%	-0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-0.2%	-0.2%	0.0%
	Operations	0.0%	0.0%	-0.3%	-0.9%	-0.3%	0.7%	-0.4%	-0.4%	-0.3%	-0.5%	-0.7%	0.0%
	Post-Closure	5.3%	7.8%	5.4%	1.9%	2.3%	5.3%	5.4%	4.5%	3.6%	4.4%	5.7%	5.9%
BR06	Construction	0.0%	0.0%	0.0%	0.0%	-0.1%	-0.2%	-0.3%	-0.2%	-0.1%	0.0%	0.0%	0.0%
	Operations	0.6%	0.5%	0.3%	0.0%	-0.1%	0.0%	-0.2%	-0.2%	0.0%	0.3%	1.0%	1.3%
	Post-Closure	0.6%	0.8%	0.5%	0.1%	0.1%	0.4%	0.2%	0.2%	0.2%	0.4%	0.9%	1.0%

Table Notes: Grey shaded cells are non-fish bearing sites

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Table A-2 Predicted Average Percent Difference in Flow from Baseline (Dry Conditions – 7Q10)

Station	Phase	Average Percent Difference in Flow from Baseline											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GSC02	Construction	-2.6%	-2.5%	-2.6%	-2.6%	-0.37%	-0.37%	-0.37%	-0.37%	-0.36%	-0.40%	-0.38%	-2.57%
	Operations	402%	180%	106%	51%	32%	24%	30%	58%	58%	109%	600%	599%
	Post-Closure	8.4%	9.8%	7.6%	1.9%	2.6%	5.5%	4.9%	5.1%	3.5%	4.7%	11.7%	10.7%
BC08	Construction	0.07%	0.07%	0.09%	0.11%	-0.22%	-0.84%	-1.1%	-0.92%	-0.38%	0.16%	-0.44%	0.07%
	Operations	20%	9%	4.9%	1.2%	0.25%	0.0%	-0.91%	-0.29%	0.7%	4.2%	15%	26%
	Post-Closure	3.4%	4.3%	3.3%	0.41%	0.62%	2.0%	0.85%	0.99%	1.05%	2.3%	2.4%	3.9%
BC06	Construction	0.052%	0.058%	0.069%	0.09%	-0.23%	-0.73%	-1.0%	-0.79%	-0.34%	0.13%	-0.39%	0.05%
	Operations	16%	7.4%	4.1%	1.2%	0.23%	0.02%	-0.77%	-0.19%	0.7%	4.1%	15%	22%
	Post-Closure	4.4%	4.4%	3.3%	0.45%	0.57%	1.8%	0.82%	0.92%	1.03%	2.5%	3.6%	5.9%
BC02	Construction	0.030%	0.035%	0.042%	0.097%	-0.13%	-0.48%	-0.66%	-0.57%	-0.21%	0.085%	-0.26%	0.030%
	Operations	11%	4.9%	2.7%	0.86%	0.15%	0.009%	-0.52%	-0.163%	0.48%	2.7%	10%	14%
	Post-Closure	2.9%	2.9%	2.2%	0.29%	0.38%	1.2%	0.53%	0.61%	0.69%	1.7%	2.4%	3.9%
RBC02	Construction	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Operations	0.0%	0.0%	-0.32%	-1.19%	-0.42%	0.76%	-0.42%	-0.48%	-0.37%	-0.68%	-0.87%	0.0%
	Post-Closure	8.7%	11.1%	8.9%	2.6%	2.9%	5.7%	5.5%	5.2%	4.0%	5.6%	7.3%	10.3%
BR06	Construction	0.00012%	0.00013%	0.00015%	0.00024%	0.00000%	-0.002%	0.00%	0.00%	-0.001%	0%	-0.001%	0.000%
	Operations	0.040%	0.018%	0.010%	0.0029%	0.0011%	0%	-0.0018%	-0.001%	0.00%	0.0%	0.0%	0.1%
	Post-Closure	0.01%	0.01%	0.01%	0.00%	0.002%	0.00%	0.00%	0.00%	0.00%	0.01%	0.0%	0.01%

Table Notes: Grey shaded cells are non-fish bearing sites

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Table A-3 Predicted Average Percent Difference in Flow from Baseline (Wet Conditions –Q20)

Station	Phase	Average Percent Difference in Flow from Baseline											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
GSC02	Construction	-2.6%	-2.6%	-2.6%	-0.36%	-0.37%	-0.37%	-0.37%	-0.36%	-0.36%	-0.38%	-0.33%	-2.59%
	Operations	137%	78%	41%	24%	22%	22%	30%	49%	48%	138%	163%	184%
	Post-Closure	2.8%	4.0%	2.7%	0.7%	1.6%	4.9%	4.8%	4.2%	2.8%	6.1%	2.9%	3.0%
BC08	Construction	0.07%	0.06%	0.08%	0.16%	-0.26%	-0.87%	-1.2%	-1.02%	-0.17%	-0.46%	0.47%	0.07%
	Operations	7%	4%	2.0%	0.7%	0.05%	-0.2%	-0.96%	-0.57%	0.9%	2.8%	8%	8%
	Post-Closure	1.3%	1.9%	1.4%	0.32%	0.29%	1.6%	0.63%	0.36%	1.22%	1.3%	1.9%	1.3%
BC06	Construction	0.056%	0.050%	0.067%	0.14%	-0.23%	-0.75%	-1.0%	-0.88%	-0.11%	-0.41%	0.40%	0.06%
	Operations	6%	3.2%	1.6%	0.62%	0.055%	-0.12%	-0.81%	-0.49%	0.9%	2.9%	8%	7%
	Post-Closure	1.6%	1.9%	1.3%	0.27%	0.30%	1.4%	0.65%	0.35%	1.20%	1.6%	2.3%	1.9%
BC02	Construction	0.034%	0.029%	0.041%	0.046%	-0.15%	-0.51%	-0.67%	-0.59%	-0.13%	-0.28%	0.26%	0.034%
	Operations	3.7%	2.1%	1.1%	0.40%	0.05%	-0.085%	-0.55%	-0.295%	0.60%	1.9%	5%	4%
	Post-Closure	1.1%	1.3%	0.9%	0.18%	0.20%	0.9%	0.42%	0.27%	0.80%	1.0%	1.5%	1.2%
RBC02	Construction	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	Operations	0%	0%	-0.14%	-0.56%	-0.28%	0.65%	-0.38%	-0.35%	-0.36%	-0.53%	-0.40%	0.0%
	Post-Closure	3.1%	4.8%	3.5%	1.2%	1.9%	4.9%	5.0%	3.8%	3.8%	4.6%	3.5%	3.1%
BR06	Construction	0.00012%	0.00013%	0.00015%	0.00024%	0%	-0.002%	-0.0021%	-0.0020%	-0.001%	0%	-0.0010%	0.00012%
	Operations	0.040%	0.018%	0.010%	0.0029%	0.0011%	0%	-0.0018%	-0.001%	0.0018%	0.010%	0.038%	0.1%
	Post-Closure	0.011%	0.011%	0.008%	0.0011%	0.0019%	0.0042%	0.0021%	0.0023%	0.0026%	0.0063%	0.0088%	0.014%

Table Notes: Grey shaded cells are non-fish bearing sites