Indigenous and Northern Affairs Canada | Affaires autochtones et du Nord Canada

Water Resources Division
Nunavut Regional Office
Iqaluit, NU X0A 0H0

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Our file - Notre référence
CIDM#1183354

William Bowden
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sent via email: william.bowden@baffinland.com

Re: Indigenous and Northern Affairs Canada's concerns regarding Follow-up report to spill #17-361 – Non-compliance at MS-08, waste rock sedimentation pond at Baffinland Iron Mines Corporation's Mary River Project

Dear Mr. Bowden,

Thank you for the Follow-up Report to spill #17-361 you sent on October 16, 2017. Since being made aware of non-compliant discharge from the waste rock sedimentation pond on August 8th, and particularly following observations made at the waste rock sedimentation pond during Indigenous and Northern Affairs Canada's (INAC) site visit in late August, we are concerned and interested in understanding what Baffinland Iron Mines Corporation (Baffinland) is doing to remedy the situation. This report is therefore appreciated.

We make the following observations from the information presented in the report:

1. The text of the report states that pH measurements from the ALS lab in Waterloo are less accurate than the field or ALS on-site lab measurements, yet Table 1 does not include field or ALS on-site lab pH measurements for August 24-29, 2017.
2. Results for pH are reported in both Tables 1 and 2 for MS-08, the west waste rock sedimentation pond discharge station identified in Nunavut Water Board licence 2AM-MRY1325. Table 1 is labelled as FDP and identified as the approved sample port location. Table 2 is labelled as Geotube (between August 24-29) and Discharge (between August 30-September 6). The text does not explain why results from an un-approved location are presented and what extra

information they provide. The pH column in Table 2 is labelled “Lab-Run pH”, and does not specify if this is the ALS lab in Waterloo or the ALS on-site lab.

3. Table 1 shows important differences in pH (even above 1 pH unit) for the same time (sample) depending on whether the measurements were made in the ALS Waterloo lab, the ALS on-site lab, or in the field. The magnitude of changes in pH from these surface water samples suggest that they are not in equilibrium, as posited in the text.
4. The text states that a batch treatment using sodium carbonate was completed from August 22-24, 2017. It is not clear how much sodium carbonate was added and if this treatment was also conducted at later dates.
5. The September 5, 2017 discharge failed the *Daphnia Magna* toxicity test. This is the second toxicity failure in one month, as another was reported on August 7, 2017 (Spill #17-289).
6. No metal concentration data was provided, though it is relevant because results from the September 25, 2017 Follow-up Report to spill #17-312 indicates nickel concentrations were above water licence discharge limits at that time. Though the sample location is not identified in the October 27, 2017 Follow-up Report to spill #17-312, both samples with metal chemistry reported had nickel concentrations above water licence discharge limits.
7. Water chemistry results are reported for stations from the Aquatic Effects Monitoring Plan (AEMP) in Table 3. As in Table 2, the pH column is labelled “Lab-Run pH”, and does not specify if this is the ALS lab in Waterloo or the ALS on-site lab.
8. Figure 1 shows that the waste rock sedimentation pond is in the Camp Lake watershed, and discharge is directed to the Mary River watershed through a discharge line shown in Photo 1.The text states that Mary River is the nearest fish bearing waters, at the confluence of Tributary F, which receives discharge from MS-08. This is true for the controlled discharge from the discharge line and monitoring AEMP stations downstream of Tributary F is relevant. It does not address seeps from the waste rock sedimentation pond, reported in as spill #17-312 and still uncontrolled as stated in the follow-up report from September 28, 2017. The October 27, 2017 follow-up reports construction of an additional berm on October 20th or 21st to further stop and capture seepage, but conditions do not allow the berm’s effectiveness to be evaluated. Water from these seeps would migrate to the Camp Lake system which is also fish bearing.

INAC has several concerns as described below:

1. If samples continued to show pH reductions with time due to the oxidation of ferrous iron to ferric iron, then it is reasonable to assume that water of the waste rock sedimentation pond (WRSP) would also undergo a similar pH reduction

after been discharged, potentially below the MMER criterion (i.e., pH=6.0) in certain cases.

2. The recommendations and corrective actions proposed in the October 16, 2017 Follow-up Report for spill #17-361 seem insufficient. We are encouraged by the information provided in the October 27, 2017 Follow-up Report for spill #17-312, but still have concerns on the following items:
    - "*Conduct a detailed hydrologic review to determine the appropriate capacity or required increase in dimensions for the WRSP. Golder Associates Inc is currently conducting the review*."
        - There is no timeline presented, even though the September 5, 2017 INAC Inspector's direction required this by September 31, 2017. The October 27, 2017 Follow-up Report for spill #17-312 states Ken DeVos from Golder was on site last week, but there no indication of dates by when he might produce a report. Corrective actions should be completed before freshet 2018.
        - This does not address the seeps from waste rock sedimentation pond. The seeps are described in the September 25, 2017 Follow-up Report to spill #17-312 which explains containment measures taken, including construction of sumps and a containment ditch. The September 28, 2017 Follow-up Report to spill #17-312 indicates measures taken were inadequate because leaks were observed north of the new containment structures. The October 27, 2017 Follow-up Report describes construction of a berm for further containment, but its effectiveness has not been evaluated.
    - "*Initiate a geochemical review of the waste rock dump layout and materials to develop a better understanding of low pH conditions observed on site and, if necessary, develop supplemental mitigation measures to reduce or eliminate production of acidic water from entering the WRSP."*
        - The October 27, 2017 Follow-up Report lists the companies that have been retained for the review, but no time line has been proposed. It should be possible to do so quickly as geochemical characteristics of the waste rock in the dump, including the layout, should already be known if the Life-of-Mine Waste Rock Management Plan has been followed.
        - The development of supplemental mitigation measures will be developed "*if necessary*". Contrary to early predictions, it is apparent that acid mine drainages have already been produced in the waste rock pile and supplemental mitigation measures will be needed before the onset of freshet next spring.

- "*Review and amend the Waste Rock Management Plan to provide contingency plans for the treatment of non-compliant water.*"
    - Amendments to the Waste Rock Management Plan need to go further than simply adding treatment options for non-compliant water. According to the Plan, no acid water should be generated, and since it is, a revised Plan should address how this will be avoided.
    - It is not clear if the current Plan is being followed because of the non-compliant water problems and the lack of answers to questions regarding where acid generating rock is situated within the rock pile. No Plan, whether revised or not, will be effective if it is not fully implemented.
- "*Review and consider engineered mitigation measures to address water quality and capacity issues once the hydrological and geochemical review is complete."*
    - No dates are proposed. Corrective actions should be completed before freshet 2018.

3. Repeat toxicity failures and repeat occurrences of discharging water not within criteria set by water licence 2AM-MRY1325 indicate Baffinland is not treating this problem seriously enough to enact effective solutions.
4. Given that predictions by Baffinland, based on early waste rock geochemical characterization programs, indicated that (1) no potentially acid generating (PAG) waste rocks would be encountered during years 1-5 of mining operation and (2) the onset of acid rock drainage (ARD) formation by any PAG waste rocks would be beyond year five, the occurrence of ARD from the waste rock pile in 2017 is surprising. It is also of concern because the management plans and facilities on site have proven inadequate to contain the ARD.

We would appreciate answers to the following questions to help us understand the conditions on site. These questions touch on the same topics as those sent on Friday October 20th by Jonathan Mesher, and any information provided would be considered in conjunction with information sent to Jonathan.

1. Paragraph 3 of the Follow-up Report to spill #17-361 states: "*A significant rain event was experienced between August 26th and September 1st significantly increasing the water level and reducing the available freeboard of the WRSP. The rain event also potentially influenced the water chemistry of the WRSP.*" How much precipitation occurred during this period based on the on-site weather station? Did Baffinland take any samples of water in the WRSP for water chemistry analysis? INAC would like to have a copy of the precipitation data and the water chemistry results.

2. Paragraph 7 of the Follow-up Report to spill #17-361 reads: "*Samples were also taken and shipped offsite to ALS Waterloo for external analysis. Results received from the ALS lab in Waterloo for pH from September 1st to 6th were below MMER and Water Licence criteria; however the samples were outside the recognized holding time and the accuracy of pH measurements were likely compromised by several days of potential acid rock drainage related redox reactions (Table 1,2). Samples of this source of water are known to exhibit pH changes (normally pH reduction) over time due to oxidation of Fe^{2+} to Fe^{3+}. In order to evaluate whether the accuracy of pH results were compromised by active redox reactions, follow up measurements of the samples for pH were taken; they continued to show pH reductions indicating that water chemistry was changing over time.*" What are the reasons for Baffinland to choose to send samples offsite for pH measurements instead of depending on in-situ pH measurements? A calibrated potable pH meter could obtain an in-situ pH value immediately with an accuracy better than 0.1 pH unit.
3. Section 3.4 of "Life-of-Mine Waste Rock Management Plan" submitted to the Nunavut Water Board in April 30, 2014 by Baffinland states: "*A modification of the mining plan has resulted in a smaller tonnage of waste rock being produced in the earlier years of operation. The new mining plan produces up to 3.5 Mt of direct shipping ore annually during the first five years of operations and* ***a total of 17.4 Mt of waste rock during years 1-5, none of which is PAG***". Based on the information contained in Baffinland's spill reports, it seemed that acid rock drainage (ARD) was generated in the waste rock pile during the summer of 2017. What may have caused the ARD formation in the waste rock pile?
4. Metal leaching (ML) is usually associated with ARD formation, as metal concentrations could be very high in drainages with low pH values. Have metal concentrations (total) of any drainages from the waste rock pile and water in the WRSP been analyzed, other than those reported in the September 25, 2017 Follow-up Report to spill #17-312? INAC would like to request a copy of all the analytical results.
5. Section 3.2 of "Life-of-Mine Waste Rock Management Plan" submitted to the Nunavut Water Board in April 30, 2014 by Baffinland reads "*Work is continuing to confirm the feasibility of developing field test pads at the site using selected waste rock material generated during early mine development. If feasible, field test piles will be setup and instrumented for both thermal monitoring and drainage quality. Operation and monitoring of such test piles would better inform the project about projected drainage quality and water quality modeling assumptions under site-specific cold climate conditions*." Could Baffinland provide an update on the development of the Field Test Piles?

6. Paragraph 2 of the Follow-up Report to spill #17-361 reads: "*On August 22-24th, batch treatment of the WRSP was completed using sodium carbonate to effectively raise the pH from approximately 4 to 7*." How much sodium carbonate was added on those dates? Was the same treatment used at a later date?
7. Paragraph 4 of the September 28, 2017 Follow-up Report to spill #17-312 reads: "*During a routine inspection of the Waste Rock Pond and ditching yesterday morning, it was noticed that there were noticeable new wet areas within the frozen snow covered tundra downstream of the Waste Rock Pond. It was discovered on the north side of the new containment ditch that was meant to capture the seepage from the Waste Rock Pond. Upon further inspection of the 2 new areas that were identified, there is evidence of flowing water and thus freezing in layers*." Paragraph 5 of the same report states: "*Further investigation is required and pending expert advice we will have more information in the follow up report.*" When will the investigation be completed? Can it be shared with INAC? What is the timeline for implementing the investigation's recommendations?

INAC recognizes Baffinland's efforts in providing information and dealing with this spill and its associated issues. However, given the significance of potential risks, INAC believes that additional actions are required, including, but not limited to:

a) stop placing any additional waste rocks in the waste rock pile unless the Phase I Waste Rock Management Plan is strictly implemented;
b) identify the locations and volumes of PAG waste rocks in the waste rock piles and carry out mitigation measures to stop or reduce further ARD formation (e.g., isolate and encapsulate PAG rock with non-PAG rock, add limestone to waste rock pile, etc.) before the onset of next year's freshet;
c) have a contingency plan in place to handle all the potential ARD/ML issues (e.g., sedimentation pond capacity, seepage leakage, water treatment, etc.) prior to next year's freshet;
d) quantify drainage water chemistry, particularly metal concentrations; and
e) re-evaluate and revise current waste rock geochemical characterization program, waste rock management plan, and ARD/ML predictions for the waste rock pile and the pit lake.

Please do not hesitate to contact Sarah at 867-975-3876 or sarah.forte@aandc-aadnc.gc.ca , or David at 867-975-4556 or david.zhong@aandc-aadnc.gc.ca for any clarifications.

Regards,

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