## Review Comment Table

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<tr>
<th>Board:</th>
<th>WLWB</th>
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<tr>
<td>File(s):</td>
<td>W2015L2-0001</td>
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<tr>
<td>Proponent:</td>
<td>Diavik Diamond Mines Inc.</td>
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<tr>
<td>Document(s):</td>
<td>Waste Rock Management Plan - Version 7 (694 KB)</td>
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<tr>
<td>Item For Review Distributed On:</td>
<td>Apr 6 at 10:08 Distribution List</td>
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<td>Reviewer Comments Due By:</td>
<td>June 15, 2016</td>
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<td>Proponent Responses Due By:</td>
<td>June 30, 2016</td>
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### Item Description:


Part H, Item 7 of the Water licence (W2015L2-0001) requires DDMI to operate in accordance with the approved Waste Rock Management Plan, which must meet the requirements set out in Schedule 6. In Version 7, DDMI included a conformance table that identifies where the information pertaining to the Water Licence requirements are located (page 2). Part F, Item 5 of the Water Licence also addresses the Plan: "all rock used in Construction must meet the geochemical criteria specified in the approved Waste Rock Management Plan as per Part H, Item 7".

Please note that the GNWT Inspector required DDMI to update the Waste Rock Management Plan to address non-compliance issues, as described in the Inspector’s November 27, 2015, February 1, 2016, and February 24, 2016 Water Use Inspection Reports.

**Update:** On May 2, Board staff distributed an email to the DDMI distribution list with the following information:

The WLWB recently received a memo from DDMI that addresses the GNWT Inspector’s information requirements regarding deviations from the Waste Rock Storage Area Design Report. After reviewing this memo, Board staff have determined that it would be most efficient to include a public review of this information as part of the review of the Waste Rock Management...
Plan. To alleviate the inconvenience this may cause reviewers and in consideration of the number of ongoing public reviews, we have extended the comment deadline for these items to June 15 (proponent responses due June 22).

Reviewers are welcome to comment on the memo, the WRMP, and any issues related to the Inspector’s findings.

| Contact Information: | Anneli Jokela 867-765-4588  
Jessica Pacunayen 867-765-4591  
Patty Ewaschuk 905-852-1516  
Sarah Elsasser 867-765-4583 |
# Comment Summary

## Diavik Diamond Mines Inc. (Proponent)

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<tr>
<td>1</td>
<td>General File</td>
<td><strong>Comment (doc)</strong> DDMI Cover Letter and Responses to Review Comments on WRMP V7, including additional attachments</td>
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## Environmental Monitoring Advisory Board: From EMAB

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<tr>
<td>1</td>
<td>General File</td>
<td><strong>Comment (doc)</strong> See attached technical review by Arcadis Canada of WRMP ver 7. This review was commissioned by EMAB to address potential issues relating to placement of Type 3 potentially acid generating rock in areas of the mine site that had not been approved by the WLWB. <strong>Recommendation</strong></td>
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**Comment** The use of Type III waste rock in the buttress of Dike A21 within Lac de Gras would appear to be non-compliant with placement condition d) of the DDMI Version 7 Waste Rock Management Plan (and previous versions of the WRMP) which states Type III rock may be used only when “the construction area is not within Lac de Gras”. It should also be noted that DDMI rejected placement of Type III rock underwater during the environmental assessment of the project due to community concerns. **Recommendation** DDMI should provide data on seepage quality and potential effects of the Type III waste rock disposed in the A21 Buttress. DDMI should also ensure it explicitly informs communities that it has used Type III rock in the A21 buttress, and the reasons for this decision, to ensure accountability.

**July 4:** DDMI provided the following to the WLWB on March 10, 2016: DDMI would also like to highlight to the WLWB a construction method applied during the 2015 dike construction. DDMI placed waste rock as a toe buttress to stabilize the dike embankment during construction as shown in yellow in Attachment #2. (The yellow is a DDMI addition to BGC Drawing 14300-41D2-1006.1.) Type III waste rock was used in this toe buttress as the deep water provided a recognized geochemical mitigation alternative to surface disposal (Guidelines for the Closure and Reclamation of Advanced Mineral Exploration and Mine Sites in the Northwest Territories - MVLWB/AANDC 2013). A21 Dike Technical Specifications supporting the A21 Dike Design Drawings allow for use of Type III rock in areas of the dike provided it meets the criteria in the Technical Specifications (see Appendix M - Technical Specifications - Embankment Placement Section 2.1.4 submitted to WLWB December 10, 2014 - link here). The Waste Rock Management Plan however, had not been updated to include geochemical criteria for construction in Lac de Gras (Schedule 6, Item 5,b,ii of WL2015L2-0001). DDMI will...
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| 3 | Cover for Type III waste rock in the PKC North Dam | **Comment** It is unclear from the design report and drawings whether all Type III rock in the North Dam will be capped. During a meeting with EMAB on April 28 DDMI officials stated that the cover of 1.5 m of till and 3 m of waste rock over Type 3 rock on the North Country Rock Pile will extend over the PKC North Dam, and is included in the NCRP component in RECLAIM.  
**Recommendation** DDMI should ensure that all Type III waste rock in the PKC North Dam is capped with till and Type I waste. DDMI should confirm its statement that the cover of 1.5 m of till and 3 m of waste rock over Type 3 rock on the North Country Rock Pile will extend over the PKC North Dam, and the cost is included in the NCRP component in RECLAIM. |
|   |   | **July 4:** WLWB has addressed this requirement in the Directive and Reasons for Decision regarding the PKC North Dam (April 7, 2016). DDMI can confirm that the estimated volumes of Till and Type I rock in the recent RECLAIM model are understood to be inclusive of the PKC North Dam. |
| 4 | Future disposal area for Type III waste rock | **Comment** Maps and descriptions of the disposal areas are provided; however, it is unclear where future Type III waste is to be placed. Based upon Table 4, there is 0.73 Mt of Type III waste rock remaining to be mined from the underground workings and it is not clear where this waste will be placed.  
**Recommendation** DDMI should clarify where the 0.73 Mt of Type III waste remaining to be mined is to be placed during the 2016 to 2017 period, or later. |
|   |   | **July 4:** Please see response to GNWT- Lands #3 |
| 5 | Lack of information on the location, size, | **Comment** DDMI has identified total quantities of waste rock to be produced but has provided no information on the |
|   |   | **July 4:** The A21 open-pit will produce about 27 Mt of Type I rock. The design of the South Country Rock Pile has not yet been |
and quantity of waste rock for the South Dump. **Recommendation** DDMI should provide information on the location, size and quantity of waste rock for the South Dump. 

**Recommendation**

DDMI should provide information on the location, size and quantity of waste rock for the South Dump. Completed. Once complete it will be submitted to the WLWB, as per Part F Item 16, with relevant information added to an updated Waste Rock Management Plan, as per Part H Item 8. This will likely be later in 2017.

6 Storage of uncovered PAG rock on the surface of the CLR Cell

**Comment** In DDMI's written response to issues raised in the November 27, 2015 Inspection Report, commitments were made regarding concerns over the storage of uncovered PAG rock on the surface of the CLR Cell for 6-9+ years. **Recommendation** DDMI should ensure that Version 4 of the ICRP addresses actions proposed for addressing the storage of uncovered PAG on the surface of the CLR Cell for 6 to 9+ years.

**July 4:** As noted in the Arcadis Report, DDMI has proposed additional action regarding the storage of the uncovered Type III (PAG) to include: i) describe in Version 4 of the Closure and Reclamation Plan (CRP) the actions to be taken in the event of a premature closure; ii) describe in the Version 4 CRP the actions to be taken at closure if this stockpile still exists; and, iii) include a provision in the next RECLAIM update to cover the cost of closing this area.

### GNWT - ENR: Central Email GNWT

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<th>ID</th>
<th>Topic</th>
<th>Reviewer Comment/Recommendation</th>
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<tr>
<td>11</td>
<td>General File</td>
<td><strong>Comment</strong> (doc) ENR Letter with Comments and Recommendations</td>
<td>Proponent Response</td>
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<tr>
<td>1</td>
<td>Topic 1: Physical Stability</td>
<td><strong>Comment</strong> The Waste Rock Management Plan Version 7 (the Plan) notes the physical stability of the placed mine rock is not within the scope of the plan. ENR notes that the Plan describes how waste rock will be assessed, handled and disposed. Part of the disposal process includes placing the rock in the Waste Rock Pile which is a structure that has its own geotechnical properties. ENR is unclear why DDMI cannot make a comment in the Plan that rock will be placed in the rock pile that meets stability requirements as will be required in Waste Rock Pile designs and associated rock slope requirements. <strong>Recommendation</strong> 1) ENR recommends that a general statement about how rock will be placed should be provided in the plan that aligns with the Waste Rock Pile design.</td>
<td><strong>July 4:</strong> DDMI's preference is to maintain the geochemical scope for the plan (Schedule 6 Item 5). Physical stability was included in the NCRP Design Report (N7L2-1645 Part C Item 12). Waste rock stability is also covered by Sections 1.150 and 1.151 of the NWT Mine Health and Safety Regulations.</td>
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| 2 | Topic 2: A21 Geology | **Comment** Section 1.2 includes details on the geology of A154N, A154S and A418 but does not mention A21. It is anticipated that rock from A21 will be used in any covers designed for the Waste Rock Pile and as such some reference | **July 4:** As noted in Section 1 of the WRMP, "An updated Waste Rock Management Plan will be submitted at least six months prior to the construction of the SCRP, as per Part H Item 8 of Water Licence W2015L2-0001. As such, this version (Version 7)
| Topic 3: A21 | **Comment** Table 5 states that all mine rock from A21 is expected to be Type I however there doesn’t seem to be any contingency for rock segregation in the event that some waste rock from A21 is Type III.  
**Recommendation** 1) ENR requests that DDMI provide some statements of how A21 waste rock will be assessed and disposed in the event that a small portion of the rock is PAG.  
2) ENR recommends that a description of the A21 rock pile be included in the plan. | July 4: Please refer to EMAB-5. |
| --- | --- | --- |
| Topic 4: Mine Life | **Comment** Table 6 includes information on the mine life for Diavik which notes that processed kimberlite will be produced until 2024. Recent news reports notes that: "A report released earlier this month by Rio Tinto, the majority owner and operator of Diavik, suggests that thanks to that increase, Diavik’s mine life could be extended past its long-touted end date of 2023. "Diavik's life of mine plan is to have consistent production past 2023. Doing so would result in Diavik successfully achieving, and potentially exceeding, the high end of its projected mine life," the report stated. http://www.cbc.ca/news/canada/north/dominion-diamond-15m-loss-year-end-1.3535925 It is unclear if any decisions related to extension of mine life have been finalized. If so, an update to the Plan, and other applicable plans, will be required.  
**Recommendation** 1) ENR requests that DDMI provide an update on any potential extension of mine life. If mine life has been extended, DDMI should indicate if an update to the Waste Rock Management Plan will be required. | July 4: Table 6 is representative of current Life-of-Mine Plan. DDMI mine plans are revised numerous times each year and each revision has the potential to extend or shorten the mine life by months. Occasionally there is new resource information that can change the mine life by many months. Part H Item 12 requires DDMI to annually review the Waste Rock Management Plan and submit updates. It is DDMI’s understanding that Section 3.2 ("Schedule of waste rock mined and processed kimberlite produced") would be updated annually, as necessary. |
<p>| Topic 5: Mine Rock in Construction | <strong>Comment</strong> Section 3.5 outlines the criteria that must be met before Type II/III have been met, which include: a) use in the production of cemented rock fill (CRF) to be permanently | July 4: DDMI appreciates the ENR suggestion. This seems like a straight forward and clear approach however DDMI understands that the current structure of W2015L2-0001 does not allow this. |</p>
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<td>6</td>
<td>Topic 6: Closure Conditions</td>
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**Comment** ENR notes that general information about closure of the Waste Rock Pile should be included in this section. ENR is of the opinion that specific details about closure of the Waste Rock Pile are considered to be outside the scope of this Document (e.g. closure cover thickness, closure criteria, seepage water quality, etc.). These items are to be part of the Closure Reclamation Plan which is guided by reclamation July 4: DDMI included information about closure as this was interpreted to be a requirement of Schedule 6 Item 5f. DDMI agrees that closure details would be more appropriately left to the CRP. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of

It appears that the WLWB could not approve specific requests to use "other rock" in construction as that decision would be in conflict with Part F Item 5 unless the "geochemical criteria" in the Waste Rock Management Plan included enabling criteria. DDMI drafted Section 3.5 of the Waste Rock Management Plan to enable approval of the "some instances" as referenced by ENR. DDMI welcomes any recommended regulatory language or approach to resolve this issue. ENR's recommendation is aligned with DDMI's intent.
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<th>Topic</th>
<th>Comment</th>
<th>Recommendation 1)</th>
<th>Recommendation 2)</th>
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<tr>
<td>7</td>
<td><strong>Topic 7: Geochemical Segregation Criteria</strong></td>
<td>Page 2 of the April 19th, 2016 DDMI Memo (the memo) outlines variances from the original design report to the North Country Rock Pile development. Of note, one of the items listed refers to a change of the geochemical segregation criteria. It is unclear if this relates to specific approvals received from the Board or an operational decision made by DDMI. ENR recalls the only change to the Waste Rock Plan being the grouping of Type II rock with Type III which was requested by DDMI. Rationale provided was that the amount of Type II rock was small making the segregation impractical from a rock handling perspective. <strong>Recommendation</strong> 1) ENR requests clarification on differences between the original design report of the North Country Rock Pile (NCRP) and the development of the NCRP as it relates to geochemical segregation criteria.</td>
<td><strong>Recommendation</strong> 1) ENR recommends that DDMI remove specific details about closure of the Waste Rick Plan such as cover thickness, closure criteria, etc. as they are outside the scope of the Plan (similar to physical stability). Schedule 6 Item 5 (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.</td>
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<td>8</td>
<td><strong>Topic 8: PAG Rock Storage</strong></td>
<td>The GNWT inspector outlined concerns related to the storage of uncovered PAG rock for an extended period (6-9 years) on the surface of the CLR cell. DDMI responded that this material will used for underground backfill but there may be consequences including runoff during operations (into Pond 1), a chance that all material will not be used for backfill and a potential for pre-mature mine closure before. Regarding the runoff, it was stated that this could be addressed in future revisions of the the Plan. Regarding the premature closure eventuality and/or the potential of stockpiled PAG, DDMI has stated that this will be addressed in Version 4 of the Interim Closure and Reclamation Plan and a provision will be included in the next RECLAIM update to cover the cost. <strong>Recommendation</strong> 1) ENR recommends that the procedures for handling runoff from stockpiled PAG material be included in any revised iteration of the Plan.</td>
<td>July 4: The change in geochemical segregation criteria is documented in Waste Rock Management Plan Version 3 (2004). In summary, criteria were changed based on the first 18 months of operations data to achieve a more appropriate material balance. Type I criteria was changed from 0.04 to &gt;0.08%S. July 4: Pond 1 collects runoff from the CLR where the Type III rock is temporarily stored (and also receives water from other sources). Runoff management is described and quantified in the Water Management Plan, Section 3.2. DDMI has reviewed requirements of Schedule 6 Item 5 (Waste Rock Management Plan) and Schedule 6 Item 1 (Water Management Plan) and believes this information belongs most appropriately in the Water Management Plan. DDMI requests direction from the WLWB in this matter.</td>
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</table>
9 | None | **Comment** None  
**Recommendation** 2) ENR notes that it will review the provision in the security estimate for Type III rock that is stored on the surface of the CLR as part of the ICRP (v.4) as proposed by DDMI.

**July 4:** Acknowledged

10 | Topic 9: PAG Rock Placement | **Comment** DDMI notes that PAG rock placement in the SED cell in addition to the two designated cells, CLAR and QUAR, has direct implications on closure costs. It is unclear if this is currently reflected in liability estimates or if DDMI is proposing that this be reflected in the next RECLAIM update, similar to references regarding the stockpile.  
**Recommendation** 1) ENR recommends that DDMI clarify if closure implications related to the placement of PAG rock in the SED cell will also be addressed in Version 4 of the ICRP and in the RECLAIM estimate.

**July 4:** The RECLAIM estimate submitted with the NCRP Closure Plan includes placing a till/rock cover on Area #1 in Waste Rock Management Plan Figure 4 which includes all of SED. The cover area is also shown in Attachment #1 - Figure 4.

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| 1  | p. 3. Regulatory disclaimer. “This information (management practices, procedures and information) is subject to change without a requirement for WLWB/Inspector notification or approval” | **Comment** This disclaimer, if put into effect, would place DDMI in con-conformance with Part B, General Condition 16, which states that “the Licensee shall operate in accordance with any Plans approved pursuant to the conditions of Water Licence W2015L2-0001”. Compliance with all Plans approved under W2015L2-0001 is based on the Inspectors assessment of whether or not DDMI has adhered with the approved Plan on record. Compliance can’t be based on a version of a Plan which the Inspector is not fully aware of/privy to, and will not be based on a version of a Plan not approved/subjected to Board Review/Approval.  
**Recommendation** The entire disclaimer should be removed. Since the disclaimer would essentially authorize DDMI to ignore this public review/consultation process, it also appears that DDMI may need to re-evaluate its commitment to the public review process. | **July 4:** The intent of the disclaimer is to clarify which requirements of the plan should be included in Part H Item 12a versus items that can be updated based on an annual review of the Plan. Both processes would still allow for a public review/consultation to occur. DDMI expected that this approach would assist in determining compliance and providing clarity on approvals for all parties. As noted in DDMI’s letter to WLWB on April 8, 2016, certain aspects of Schedule 6 may be interpreted differently by different parties, and could result in unfeasible expectations for some aspects of the plan. For example, Schedule 6 Item 5a specifies a requirement for annual production by type, ton, etc. DDMI currently provides predicted values based on the mine plan, but structural or material availability issues may arise that dictate a need to mine from a different area and require a quick response. This may happen many times a year, and it is not practicable or valuable to amend the WRMP and wait 90 days for an approval (as per Part H, Item 12a) every time such an action is required. DDMI is attempting to find clarity with respect to Part H Item 12a. As such, DDMI would appreciate an opportunity to... |
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<td>2</td>
<td><strong>Comment</strong> For consistency with historic documents, the &quot;type I, II, III&quot; classification needs to be retained. However, the nomenclature currently in use should be refined so that it more explicitly and clearly identifies the character and nature of the rock in question. To ensure actual rock characteristics are effectively communicated, terminology explicitly identifying Potentially Acid Generating rock as &quot;PAG (Type III)&quot; would be preferable. The same goes for clean rock for construction, which could be classified as &quot;Clean Construction Rock (Type I)&quot;, which needs to be differentiated from Type 2 rock (which I guess can only be called &quot;Intermediate (Type II)&quot;. If Type 2 is &quot;being called Type III&quot;, as per recent DDMI practice, then for clarity it needs to be identified in a way which recognizes it is both types [perhaps &quot;Composite (Type II/III)&quot;]. <strong>Recommendation</strong> All future references to PAG rock should be communicated as &quot;PAG (type III)&quot;. Type I should be called &quot;Clean Construction Rock (Type I)&quot;.</td>
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<td><strong>Comment</strong> A column adding descriptive information on where the Clean Construction Rock (Type I) and PAG (Type III) rock are going to be stored should be added for each year. <strong>Recommendation</strong> Add information identifying where in the NCRP Clean Construction Rock and PAG will be stored for each year.</td>
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**July 4:** Type I, II and III rock are specifically defined using clear geochemical criteria. "PAG" and "Clean Construction Rock" on the other hand are general descriptions rather than defined terms. DDMI uses Type I, II, III in its site procedures, databases and communications. These terms are well entrenched. This requested change is not supported by DDMI.

**July 4:** Table 4 shows the estimated tonnages of Type I and Type III waste rock from the A154/A418 underground, and DDMI commits to including current destination plans for the use of the materials in Tables 4, 5 and 6 (refer to response to WLWB-8) . Also noted in the response to WLWB-8, DDMI requires flexibility in the specific volumes and destinations for material storage, in accordance with the areas outlined in Sections 3.3-3.5 of the WRMP (pending approval). DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding
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<td>4</td>
<td>p. 11. 3.3.</td>
<td>&quot;The SED drainage basin was designated a Type III storage area during A418 dike construction&quot;</td>
<td><strong>Comment</strong> This is an error in fact. A review of available information by the Inspector did not show any formal, written approval or authorization to store PAG in the SED cell. For the sake of historical accuracy, this paragraph should note that &quot;Type III rock was stored in the SED cell during A418 dike construction, circa 2005, to enable...&quot;. But the part stating that the SED drainage basin &quot;was designated a Type III storage area&quot; is incorrect and should be removed. PAG rock was stored there, and that storage should thus be noted, but that cell (SED cell) was not designated for PAG storage by the approved Design Report on record. <strong>Recommendation</strong> Note that &quot;Type III rock was stored in the SED cell during A418 dike construction to enable....&quot;. But remove the part of the sentence that the drainage basin &quot;was designated a Type III storage area&quot;.</td>
<td>July 4: DDMI will remove reference to &quot;designated&quot; as requested in the next version of the Plan.</td>
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<td>5</td>
<td>p. 12. 3.4.</td>
<td>&quot;Type III rock that is planned to be re-mined is temporarily stored in the CLR cell of the NCRP&quot;</td>
<td><strong>Comment</strong> This is a fact. However, the Inspector should point out that his review of this storage did not find any formal written approval or authorization for this &quot;temporary&quot; storage, which has been in place for a number of years (since I believe 2010). <strong>Recommendation</strong> No recommendation, just a comment.</td>
<td>July 4: No response requested.</td>
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<td>6</td>
<td>p. 12. 3.4. General comment on &quot;temporary&quot; storage.</td>
<td><strong>Comment</strong> Temporary needs to be defined. The maximum extent of temporary storage should be based on a timeframe which is conservatively protective &amp; ensures PAG (Type III) rock is not oxidized or weathered. This time limit for temporary storage should be set by an appropriate Professional Engineer independent of DDMI. <strong>Recommendation</strong> Have an appropriate Professional Engineer independent of Diavik define what length of time &quot;temporary&quot; should be (at the maximum).</td>
<td>July 4: DDMI agrees this term should be defined. DDMI's definition is that &quot;temporary&quot; means that it will be used or moved before/at closure. DDMI requested an external expert view as requested. A copy is provided as Attachment #3.</td>
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<td>7</td>
<td>p. 13. 3.5. Second paragraph. &quot;Re-</td>
<td><strong>Comment</strong> The Inspector needs to know where re-mining activities will be occurring. Some sort of table or graphical</td>
<td>July 4: Attachment #5 shows the primary re-mine areas of the NCRP: 1) Type I West, 2) Type I South, and 3) Type II/III. Type I</td>
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<td>8</td>
<td>3.5. Second paragraph</td>
<td>&quot;Type II/III rock will be used in construction when one or more of the following criteria are met&quot;. b (temporary use) <strong>Comment</strong> Temporary storage should only occur if explicitly and formally (i.e., written) approved. And temporary storage should have a clearly established, approved time-limit, which has been established by a qualified professional engineer to ensure oxidation and weathering issues have been adequately mitigated. <strong>Recommendation</strong> Provide written assurances that define the timelimits of &quot;temporary&quot; storage which will mitigate oxidation and weathering concerns associated with that storage. <strong>July 4:</strong> DDMI's definition is that &quot;temporary&quot; means that it will be used or moved before/at closure. DDMI requested an external expert view as requested. A copy is provided as Attachment #3.</td>
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<td>9</td>
<td>3.5. d.</td>
<td>&quot;The construction area is not within Lac de Gras but the Type II/III waste rock will remain water-saturated&quot;. <strong>Comment</strong> I normally might not think it reasonable to account for climate change. But in this case, sufficiently conservative/protective safety factors should definitely be in place to ensure that any PAG storage relying on water-saturation to control oxygen exposure and oxidation will actually remain under water into the foreseeable future (I believe we're talking timelables of 100's of years in length, in this case). The potential consequences of Acid Rock Drainage is very high, and failure to plan now to account for the possible drying out of currently submerged PAG would have serious long term consequences. Thus, estimates of water height into the foreseeable future should be quite conservative to ensure that we account for that potential danger. <strong>Recommendation</strong> Include a discussion of how changes in water table due to climate change will be accounted for (in a conservative/protective manner) in triggering the use of PAG for construction under this condition. <strong>July 4:</strong> DDMI agrees that any potential climate change impacts on maintenance of a saturated condition would need to be considered before making this decision. As stated in response to WLWB-17(1), the example provided in 3d is the only use that DDMI could currently envisage that would fit into this category. Should other options present themselves in the future, the specific approach to determining impacts would depend on the specific application.</td>
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<td>10</td>
<td>p. 14. 3.5. e. &quot;as specified in construction design drawings approved by the WLWB&quot;</td>
<td><strong>Comment</strong> The Inspector agrees with the sentiments expressed by the WLWB in its April 7th, 2016 letter that &quot;receipt of design and as-built submissions...that include statements about the use of PAG rock in construction...does not constitute Board approval&quot;. The proposed use directly violates an already established condition in the water licence to explicitly NOT use such rock in construction [Part F(5)] which the Inspector feels should be retained given the potential long-term negative environmental effects of Acid Rock Drainage. <strong>Recommendation</strong> Remove Part &quot;e&quot;. Or ask the WLWB to consider establishing conditions or wordings under which such a condition might be considered part of the list of pre-approved situations where PAG rock could be used for construction (the list should not include blanket authorization to assume “approval as specified in construction design drawings”).</td>
<td><strong>July 4</strong> The intent of 3.5e is to allow approval of Type III rock in construction in specific circumstances if approved by the WLWB. The details and applicability of specific circumstance would be addressed through direct approval of construction design drawings. As noted by the WLWB this would include making specific reference to this request within the cover letter of the submission to ensure all parties are aware. DDMI suggests including 3.5e will provide clarity regarding requirements for potential new uses of Type III rock use in construction.</td>
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<td>Enclosures 1 and 2, concerns with the source of responses to comments.</td>
<td><strong>Comment</strong> An important aspect of the information request forwarded by the Inspector to DDMI in the document provided on March 18th, 2016 (which differed slightly in content from that posted afterward on the registry) was that the responses to questions were to be coming from an Engineer (not Diavik). Page 2 of the March 18th document clearly specifies that the questions it raises were &quot;questions the Engineer in Charge of the NCRP (not Diavik) should re-evaluate and consider&quot;. When notified via March 31st email that NKSL was no longer the Engineer in Charge (or &quot;Engineer of Record&quot;, or &quot;EoR&quot;), the Inspector noted that &quot;the responses just needed to be provided by a professional engineer as per Part F(16) of the Water Licence (not necessarily NKSL)&quot;. He also indicated that &quot;I will need to know an Engineers (not Diaviks) thoughts&quot; (on those questions), which represent &quot;information I need to determine compliance&quot;. <strong>Recommendation Have a professional engineer</strong> (as per Part F(16) of the Water Licence) respond to the concerns raised by the Inspector in the March 18th document provided to DDMI. This recommendation applies to all.</td>
<td><strong>July 4</strong>: (Note: Part F Item 16 is specific to the South Country Rock Pile but the comments are in regard to the North Country Rock Pile. DDMI’s response is focused on the NCRP.) DDMI reviewed Water License N7L2-1645 which was in effect when the NCRP was designed and found Part C Item 12 which states: Prior to the start of construction of the Waste Rock Storage Facility, the Licensee shall submit to the Board, the final detailed design report stamped by a Geotechnical Engineer and/or Engineering Geologist. This plan shall include geothermal and short term stability analyses and be developed in accordance with Schedule 1, Item 4. DDMI complied fully with Part C Item 12 - N7L2-1645. The NCRP design report must be stamped by an engineer, but there is no Water License requirement that the engineer be independent of Diavik. In the case of the NCRP, the design was stamped by an engineer independent of Diavik (see also Golder response to GNWT-Lands #13). The NCRP was constructed under the supervision of Professional Engineers, as required by Part F Item 18 (W2015L2-0001), who are Diavik employees. While DDMI does not agree with the Inspector’s interpretation that the engineer should be &quot;not Diavik&quot;, in an effort to respond to this...</td>
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<td>Enclosure 2. page 3. Golder notes that it &quot;has not made any revisions or design modifications to the design by NKSL(2001)&quot;, and that they &quot;haven't performed NCRP site inspections or provided design or operational criteria for the Facility&quot;.</td>
<td><strong>Comment</strong> Just noting that Golder stated (on page 3 of Enclosure 2) that it &quot;did not track design modifications (DDMI did), and the responses provided in Enclosure 1 were DDMI's responses&quot;, not Golders. <strong>An important distinction.</strong> Golder also notes that &quot;the NCRP design modifications have been tracked by DDMI (not Golder, or NKSL, or similar Engineer) and presented in the memorandum submitted to the Inspector (Enclosure 1)&quot;. <strong>Golder thus did not officially support or contribute to the responses given in Enclosure 1.</strong> <strong>Recommendation</strong> See the recommendation for comment 11.</td>
<td>July 4: See Response to GNWT-Lands-11.</td>
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<td>DDMI Memo, Enclosure 2, April 18, 2016. Section 3.0. &quot;It is Golder's understanding that an EoR for the NCRP was not a requirement of the Diavik Water Licence...DDMI opted to develop and operate the NCRP without engaging external EoR for the NCRP&quot;</td>
<td><strong>Comment</strong> Golder also notes that &quot;engaging Engineer of Record (EoR) service is an industry-recognized best practice for owners seeking to reduce overall risk&quot;. Question for Golder (a): What concerns, or potential concerns, does Golder see in having a facility owner develop &amp; operate a Waste Rock Storage Facility without engaging an EoR? <strong>Recommendation</strong> Have Golder answer question (a).</td>
<td>July 4: Golder provided the following response: &quot;Golder considers the risk profile for the NCRP mine waste management facility to be low. DDMI is managing the NCRP well and this includes the involvement of external specialist and third party review on an as required basis. Golder does not see any significant concerns that an EoR has not been engaged.&quot;</td>
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<td>Enclosure 1. Inspector concern #1.</td>
<td><strong>Comment</strong> DDMI’s response does not fully address the part of the question of what environmental consequences would or might be incurred by having 6-9 years of internal seepage into</td>
<td>July 4: DDMI requested an external expert opinion on this recommendation for the Inspector. The response is included as Attachment #3.</td>
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the NWR/CLR cells vs. the intended maximum uncovered storage duration specified by the Engineer (NKSL) of less than 2 years. The possibility should be considered that not-covering cells adjacent to PAG storage cells would/could allow much more water than was originally intended/planned for from contacting PAG in cells adjacent to the NWR/CLR cells. This concern is based on several comments by NKSL (2001), including the following: "Type III rock will be stored into two "tub" cells and covered with an impermeable cover long before climatic water saturates the bottom rock layer and reached the "tub" perimeters" (p. 22). "Type III rock will be placed in "tub" depressions as described...the covers will be placed no later than 2 years after the cells are filled...during the time before the cover is in place, it is estimated that the climatic infiltrated water will saturate the rock at the bottom of the cells to about 3m...note that the total depth of the "tub" is about 20 m" (p. 63).

**Recommendation** Discuss what the environmental consequences of 6-9+ years vs. less than 2 years might be on PAG storage objectives, both short and long term. Include a discussion of the estimated degree of saturation of the bottom rock layer & buffer distance (if any) from the perimeters of the tubs in all cells with PAG rock storage (CLAR, QUAR, CLR).

| 15 | Enclosure 1. DDMI response to Inspector concern #2. "There was no plan to cover non-PAG rock and the NWR/CLR cells were not expected to be dry" | Comment | See Comment 14.  
Recommendation | See Comment 14 | July 4: DDMI requested an external expert opinion on this recommendation for the Inspector. The response is included as Attachment #3. |
| 16 | Enclosure 1. DDMI response to Inspector concern #3. "DDMI is not | Comment | Not being aware of impacts doesn't preclude the possibility or likelihood that there are or might in the future be impacts or consequences of this storage deviation. It would be prudent to know what (if any) consequences a | July 4: DDMI requested an external expert opinion on this recommendation for the Inspector. The response is included as Attachment #3. |
| 17 | Enclosure 1. DDMI response to Inspector concern #4. | **Comment** The question provided actually refers to till stored in the NCRP (at present), i.e., after the 418/154 pit development. Basically, there is less till at this stage (pre-A21 development) than was planned (NKS L, 2001) to cover the CLAR, QUAR, and SED cells with 1.5m till as per reclamation objectives? NKS L (2001) section 11.5 notes that "an abundance of till is available right from the beginning of mining when large quantities of till are produced from the stripping of footprint of Pit A154". Table 11.2 estimates that approximately 1,370,000 m3 of till will be needed to cover the QUAR and CLAR cells with 1.5m till. Given the similar surface areas of the SED and QUAR cells, it seems reasonable that approximately the same area of till (700,000 m3) would in turn be needed to cover the SED cell. That leaves a grand total of roughly 2,000,000 m3 of till needed to cover the 3 existing cells storing PAG rock (assuming my assumption of till needed for the SED cell is valid). (a) Does the till stockpile currently in the NCRP have sufficient volume of till to reclaim those cells (at present, without additional Till from A21)? **Recommendation** Answer question (a), and confirm that the amount of till (in m3) currently in place in the till stockpile of the N.C.R.P. is/is not sufficient to cover all PAG storage cells to 1.5m. | July 4: a) Current assessments show a sufficient amount of till in the existing stockpile (approximately 2.4 Mm3) to cover all of the Type II/III area (Area 1&3 WRMP Figure 4) with 1.5 m of till. The total till volume required is approximately 2.0 Mm3. |
| 18 | Enclosure 1. DDMI response to Inspector concern #5. "Possible inadequate supply of clean rock to cover waste rock and PKC areas "during all | **Comment** The amount of clean rock available for cover after A21 development is well described. But the question specifies "during all years of operation", so the question of whether enough clean rock is currently available to meet cover requirements at this stage of development has not been addressed (i.e., under the assumption that A21 didn’t proceed to completion). **Recommendation** Discuss whether or not enough clean rock | July 4: Current assessments indicate there is enough Type I rock without accounting for A21 material to address cover and reclamation requirements (PKC - 5.8 Mt, NCRP - 8.1 Mt). |
years of operations”. It is currently available to address cover and reclamation requirements (without accounting for additional/potential A21 material).

19 Enclosure 1. DDMI response to Inspector concern #8. "DDMI is not aware of negative impacts of not placing the closure cover within 2 years. ...placement of a cover would have reduced the amount of low quality seepage that needed to be managed during operations.

**Comment** See response 16. The same comments, concerns, and recommendations which were discussed in response 16 to the SED cell apply to the deviations identified in Enclosure 1, question 8 responses (i.e., consequences for the PAG island, the use of PAG in construction, much greater water infiltration to PAG and non-PAG storage areas of the N.C.R.P).

**Recommendation** Have a qualified engineer comment on the possibility or likelihood of negative environmental consequences resulting from prolonged storage of rock (i.e., longer than 2 years) in the N.C.R.P., the use of PAG in construction at several locations on the minesite, and the storage of PAG (type III) rock for a prolonged period in the CLR cell.

**July 4:** DDMI requested an external expert opinion on this recommendation for the Inspector. The response is included as Attachment #3.

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| 1 | Regulatory Disclaimer | **Comment** Page 3 of the WRMP provides a disclaimer indicating that information presented in the WRMP is subject to change without a requirement for WLWB/Inspector notification or approval with the exception of 3 specific items listed.  
**Recommendation** 1. Please explain the rationale for this disclaimer; why does DDMI believe this is necessary? 2. If DDMI is concerned that the management plan does not provide sufficient operational flexibility, please identify all aspects of the plan that require more flexibility and explain why flexibility is needed. 3. Is DDMI proposing that even those aspects of the Plan that are required by Schedule 6.5 can be changed without Board approval? | **July 4:** 1. The proposed "Regulatory Disclaimer" was included in an attempt to specify the "requirements in the approved Plan" that must be submitted for approval 90 days prior to making a change (Part H Item 12a), versus aspects of the Plan that could be reviewed/changed annually. DDMI identified its concerns with Part H Item 12a in its April 8, 2016 letter to the WLWB. The drafted disclaimer is DDMI's suggested approach to address the implementation issues identified in the letter, but DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of the Schedule (as per Part B Item 10) and/or structure of the Plan. 2. In relation to the WRMP, DDMI provided a view of these key items for consideration in the proposed Regulatory Disclaimer. As noted in the Disclaimer, all management plans currently include a description of management practices, procedures and other information that is... |
<p>|   | General comment | <strong>Comment</strong> As a result of the issues identified by the Inspector regarding deviations from the approved design (Country Rock and Till Storage Updated Design Report, 2001), and in consideration of DDMI's request to use Type II/III rock in construction, Board staff have identified (in our comments below) a number of aspects of the WRMP that could be expanded and/or improved upon to provide more information to the Board, the Inspector, and all parties regarding DDMI's waste rock management practices. Also, additional information in the Plan may help the Board to assess any future proposed changes to waste rock management practices in a more streamlined manner. <strong>Recommendation</strong> No response necessary. Staff make this comment to explain why we have asked DDMI about potential improvements to the Plan that were not previously required. | July 4: N/A |</p>
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<th>3</th>
<th>Monitoring and Evaluation</th>
<th><strong>Comment</strong> The MVLWB's Standard Outline for Management Plans requires proponents to include a section on monitoring and evaluation, as follows: &quot;a) All performance, environmental, and/or compliance monitoring related to the plan should be described along with identifying which individuals or departments are responsible for carrying it out. Describe links to Surveillance Network Program (SNP) and Aquatic Effects Monitoring Programs (AEMPs). b) A description of how the management plan will be evaluated to ensure its effectiveness should be included along with the frequency and triggers for when the plan will be updated.&quot; <strong>Recommendation</strong> Does DDMI agree that this information would be useful in the WRMP? If not, please provide a rationale.</th>
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<td><strong>July 4:</strong></td>
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<td>The Waste Rock Management Plan is very specific to the Water License requirements (Schedule 6 Item 5). Key objectives of DDMI's waste rock management plan are to identify acid-generating rock and direct appropriate use/storage. Any performance, environmental and/or compliance monitoring would need to be specific to those objectives, as would the approach for evaluating the plan. For example, existing SNP and AEMP monitoring would not be direct measures of DDMI's ability to identify acid generating rock and direct appropriate use. DDMI notes that including details such as identification of individuals or departments responsible for carrying out activities in a Waste Rock Management Plan (as per Section 4 of the WRMP) could be interpreted as requiring DDMI to obtain WLWB approval 90 days prior to making a staff resourcing or organizational change, as per concerns noted in response to WLWB-1. Presuming all of the suggested additional information is required as part of the Water License or other management plans, it doesn't seem necessary to repeat these in the Waste Rock Management Plan, particularly if there is no direct link to compliance with waste rock management principles. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of the Schedule (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.</td>
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<td>Deviations from original design; background information</td>
<td><strong>Comment</strong> DDMI has placed Type III rock in areas originally designated for Type I and Type II rock. The original basis for assigning certain basins to each type of rock (Type I, II, or III) is not provided in the waste rock management plan and is not entirely clear in the original design document (2001). This makes it difficult to assess the implications of deviations from the original design. <strong>Recommendation</strong> 1. Describe each basin (CLR, SED, etc.) and the characteristics that were considered when deciding whether PAG or non-PAG rock should be placed in that basin. 2. For each basin, discuss the rationale/strategy behind the original decision (per the 2001 design document) to place</td>
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PAG or non-PAG rock in that basin. In doing so, please explain how the original (2001) rock placement strategy addressed the design criteria stated on pages 4 and 5 of the 2001 design document. 3. Describe how the deviations from the 2001 design still meet the design objectives stated in the 2001 design document. 4. Has water filled these basins and if not, when does DDMI anticipate that each basin will be full. 5. Is the water in the basins currently frozen? If not, when does DDMI anticipate this will happen? 6. Where does each basin currently report? 7. For each basin, where does DDMI anticipate that water will report post-closure?

5  | Geochemistry and test pile research findings (Sections 1.3 and 5) |
---|---------------------------------------------------------------|
**Comment** These sections do not appear to identify all reference documents that the reader may wish to consult when reviewing the WRMP.  
**Recommendation** Has DDMI identified all useful reference documents in this section (e.g., regarding research results, geochemical testing, etc.)?

July 4: Due to the lag in reporting and publishing from a university-led research program, the summary was based on a review of the primary data collected, personal communication with the researchers and/or a review of multiple documents. More detailed results, including references and publications, are included in the Annual Closure and Reclamation Plan Progress Report. DDMI suggests the CRP Progress Report is a more appropriate location for these more detailed results and references. Schedule 6, Item 5(j) and (l) require the inclusion of results from geochemical sampling and testing. DDMI has included additional details, including previous results and results other than geochemical testing, from the Test Piles project for context in the WRMP V7. DDMI suggests that information to support these items are better provided in the Annual Water License Report (Schedule 1 Item 1) or Annual CRP Progress Report (Schedule 9, Item 2). DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of the Schedules (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.

6  | Waste rock segregation (Section 2) |
---|----------------------------------|
**Comment** There are no details on how the effectiveness of the segregation plan are verified. The segregation plan relies on visual estimates of biotite schist content. From the data provided, it is not clear how effective this approach has been.  
**Recommendation** Has DDMI verified that the visual

July 4: Appendix B of WRMP V4-2 details the verification of the visual classification method. The data set consisted of drilled blast hole samples that were both visually logged AND assayed (n=10,136). The analysis results indicated that visual classification produced few misclassifications (11%), and of
The classification method is effective? If not, please provide a rationale.

Those misclassifications 70% were conservative; i.e. Type I or Type II classified as Type III. DDMI notes that V4-2 was approved by the Board.

**Production schedules (Section 3.2)**

**Comment** Schedule 6.5(i) requires a comparison of predicted versus measured production for the previous year. The 2015 production amounts were reported, but not compared to predicted values. Given the small volumes of rock coming from underground, this information may not for be particularly useful for 2015 alone; however the Plan has not been updated since 2011; therefore this comparison was not provided for several other years as well. More broadly, comparisons of predicted amounts of materials to actual production for all years would be useful background information, and help the reader understand the context for rock management decisions that DDMI has made over the years.

**Recommendation** Has DDMI prepared a comparison of predicted amounts of materials (Type I, II, and III rock; ore; till; overburden; PK) compared to actual? Does DDMI agree that this would be useful information to include in the WRMP (or if more appropriate, another required submission)?

**July 4:** DDMI has not prepared a comparison of predicted amounts of materials versus actual but can prepare one if it would be helpful to the Board. DDMI does not believe there is value in comparing predicted amounts of Type I and II/III with actual any longer; this was only helpful early on to evaluate and refine the segregation criteria. As shown in Table 4, limited quantities of waste rock will be produced from A154 and A418 going forward. Actual quantities of A21 waste rock and till produced will be important to record but there does not appear to be a purpose relating to the WRMP in comparing predicted and actual, given there is no waste segregation for A21. Actual CPK:FPK ratios are important to record and forecast annually for each fraction in the PKC Facility. DDMI suggests this information is best retained within the PKC Facility Plan (Schedule 6 Item 2) rather than the Waste Rock Management Plan. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of the Schedules (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.

**Annual material schedules (Section 3.2)**

**Comment** Schedule 6.5(a) requires the Plan to include "an annual schedule for till storage, ore stockpiling, Processed Kimberlite generation and Waste Rock production by rock type, tonnage, and destination over the term of the Project including sources and volumes of each rock type;" DDMI indicates in the conformance table that this requirement is met in Section 3.2; however, that section does not indicate the destinations of any materials, till production for A21, or information about ore storage.

**Recommendation** Please provide destinations for materials in Tables 4, 5, and 6 and provide the volume and destinations for ore storage.

**July 4:** Table 4. A154/A418 Underground Waste Rock. Type III rock will be used first for the PKC North Dam and then for underground fill. Type I rock will be used for general site construction. Table 5. A21 Till and Waste rock. Till will be used for the NCRP cover with surplus stockpiled with South Country Rock Pile (SCRP). Waste rock will be used for construction and closure cover but mostly placed in the SCRP. Table 6. Processed Kimberlite. Currently all processed kimberlite goes to the PKC. DDMI will be evaluating future options of transferring PK to one or more completed underground/pit area. DDMI will include the current destination plans for use of these materials in Tables 4,5 and 6. However, DDMI requires flexibility in the specific volumes and destinations for material storage, in accordance with the areas outlined in Sections 3.3-3.5 of the WRMP (pending
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| 9    | 3.3 and 3.5 | *Comment* The conformity table indicates that these sections address Schedule 6.5(f) of the water licence, which requires: "a description of the methods that will be used to construct till storage, ore stockpiling, Processed Kimberlite, and Waste Rock facilities such that generation of acidic drainage and/or Metal Leaching is limited." The plan describes only the segregation of rock, and not the other key elements that allow DDMI to limit ARD/ML (water management, water treatment, closure cover, freezing of pile, etc.)  
**Recommendation** Does DDMI believe that additional information regarding water management, water treatment, closure cover, freezing of pile, etc. would help to better address Schedule 6.5 (f)? | Schedule 6.5(f) is written in such a way that only a limited number of management elements apply. The clause is focused on operational methods to limit the generation of ARD/ML rather than the operational methods to enhance/enable management/closure of any ARD/ML that is generated. DDMI's primary operational approach is to manage the long term storage of ARD/ML rock such that any drainage can be more effectively controlled. However unlike methods such as sub-aqueous disposal, DDMI’s key operational methods do not limit (per se) the generation of ARD/ML. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of the Schedules (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP. |
| 10   | 3.4 | *Comment* In Section 3.4, DDMI states that Type I rock is temporarily stored in Pond 14. DDMI’s most recently submitted Water Management Plan (Version 14) indicates that Pond 14 has been decommissioned.  
**Recommendation** Please clarify. | Pond 14 was decommissioned as a collection pond and is being used as a temporary storage area for Type I rock. |
| 11   | 3.5 | *Comment* The Plan indicates that Type II and III rock are re-mined from the WRSA when supplies from the underground mine are not sufficient for construction purposes. It is assumed that the re-mining of these two rock types preferentially occurs from the temporary storage area on the WRSA to minimize accumulation of these rock types in the temporary pile. Also, the statement that Type II and III rock is re-mined suggests that Type II rock exists in the pile as a mineable unit distinct from Type III rock; it is not clear whether this is the case or whether all Type II is now blended with Type III rock. | Re-mining of Type II/III will occur preferentially from the temporary pile (area #2 in Figure 4) once A21 dike crushing is complete. Type II rock is not a mineable unit and DDMI uses Type II/III to indicate that rock is expected to have %S >0.04%. |
| Recommendation 1. Please clarify whether re-mining of Type II and III rock is preferentially from the temporary pile on the WRSA. 2. Please clarify whether or not all Type II rock is now blended with Type III rock or whether Type II rock exists as a mineable unit.  

| Use of Type III rock in construction (Section 3.5) | **Comment** It is unclear where DDMI will place Type II/III rock if the Board decides not to approve DDMI’s proposed criteria for use in construction. 
**Recommendation** 1. If the Board decided not to approve DDMI’s proposed criteria, where would DDMI place the Type II/III rock, and what are the associated implications? 2. If the Board does approve the criteria, will all Type III rock be used in Construction or will some of it be placed in the WRSA?  

| Criteria for use of Type II/III rock (Section 3.5) | **Comment** Part F, Item 5 says: "All rock used in Construction must meet the geochemical criteria specified in the approved Waste Rock Management Plan as per Part H, Item 7." DDMI has proposed that rock that does NOT meet geochemical criteria can be used in construction in certain circumstances. 
**Recommendation** Please explain how DDMI can comply with Part F, Item 5 if it uses Type II/III rock in Construction, given that this rock will not meet geochemical criteria. (For the purposes of ensuring that the Board obtains sufficient information to make a decision, staff have asked a number of questions about DDMI’s proposed criteria. These questions do not imply that staff have concluded that Part F, Item 5 would or would not allow use of Type II/III in Construction; staff are simply collecting information so the Board can make an informed decision.)  

| Section 3.5 - use of Type II/III rock and security estimate | **Comment** It is unclear whether the current security estimate includes the cost of covering all existing Type II/III storage areas (as shown on figure 4 of the WRMP). 
**Recommendation** Please confirm whether the security deposit includes the costs of covering all Type II and Type III on-site (e.g., in all basins of the WRSA, in the north PKC dam, in the CLR cell, etc.).  

| July 4: Type II/III rock is/will be used for underground backfill and North PKC Dam construction. If these construction uses were not permitted, DDMI would be required to expand the NCRP footprint (i.e. into Pond 3) resulting in increased operational (increased haul distances, double handling, etc.) and closure costs and ARD/ML risks. If the Board approves the criteria, no new Type II/III is expected to be added to the NCRP.  
**July 4:** It was DDMI's intent that the waste rock type classification criteria (Table 2) and criteria listed in Section 3.5 would collectively form the "geochemical criteria" referenced in Part F Item 5.  
**July 4:** The RECLAIM estimate submitted with the NCRP Closure Plan includes placing a till/rock cover on Areas #1 and 3 in Figure 4 and a water cover on Area 4. It does not include a till/rock cover on Area #2, as it is temporary, nor Area #5 as it is expected to be covered with A21 till/rock during operations. |
<p>| 15 | Criteria for use of Type II/III rock (Section 3.5, Criteria b) | <strong>Comment</strong> DDMI proposes the following criteria: &quot;b. use is temporary, within the site water collection system such that any drainage can be collected and treated as necessary, and material will be removed at closure to ensure no long-term exposure of Type III waste rock in un-designated areas (see for example the temporary Type III storage area in Figure 3)&quot;. Staff note that rock left exposed over an extended period of time may produce soluble oxidation products. DDMI has not proposed any limits on how long rock could be exposed before being relocated and covered. <strong>Recommendation</strong> 1. Please confirm that DDMI is proposing &quot;uses&quot; and not just temporary storage. 2. Please identify all possible uses that would fall under this category. 3. Discuss any research or monitoring results that may indicate how long rock can be exposed before soluble oxidation products become problematic. 4. Can DDMI propose a maximum amount of time that Type II/III rock should be exposed before being covered? | <strong>July 4:</strong> 1. No the intent of b) was to enable temporary storage. Use of this temporary stored Type III rock in construction would require conformance with other criteria, for example a). 2. Currently the only intended uses for temporarily stockpiled Type III is underground backfill and PKC North Dam. 3. Please see response Attachment #3. 4. DDMI has proposed that any Type II/III material stored temporarily would be removed (or covered) by end of operations - 2024. |
| 16 | Criteria for use of Type II/III rock (Section 3.5, Criteria c) | <strong>Comment</strong> DDMI proposes use of Type II/III rock for construction if the area is with a drainage basin already containing Type II/III rock. <strong>Recommendation</strong> 1. Please confirm that DDMI is referring to uses of Type III rock, and not simply storage. 2. Please list the possible uses of Type II/III rock that would meet criteria c. | <strong>July 4:</strong> 1. Yes DDMI is referring to use of Type II/III for construction. 2. Examples would include the PKC North Dam and/or haul roads within the PKC. |
| 17 | Criteria for use of Type II/III rock (Section 3.5, Criteria d) | <strong>Comment</strong> DDMI proposes use of Type II/III rock for construction if the rock will be saturated (but not placed in Lac de Gras). It is not clear what these types of uses might be. Further, use of Type II/III waste rock that has been stored for a period of time may lead to short-term release of soluble oxidation products to water. Therefore, if the waste rock deposition is outside of the water management system, AND the waste rock has already been weathering for an extended period of time then use for subaqueous construction may result in the release of soluble oxidation products into water. <strong>Recommendation</strong> 1. Please list the possible uses of Type II/III rock that would meet criteria d)? 2. Is DDMI proposing that rock could be disposed subaqueously regardless of how long | <strong>July 4:</strong> 1. The example already provided with 3d is the only use DDMI currently envisage that would fit into this criteria. 2. Yes, DDMI is proposing to use rock regardless of how long it had been exposed. DDMI's assumption was that the area was within the water management system, however it is now recognized that criteria d) does not state that the area would need to be within the water management area. This will be added in the next version of the WRMP. 3. As indicated above there would be no restriction provided the area was within the water management system. |</p>
<table>
<thead>
<tr>
<th></th>
<th>Section 3.5, Figure 4</th>
<th><strong>Comment</strong> The figure shows the current extent of Type II/III waste rock storage areas on site. The figure is small and not well-labelled. It is difficult to determine how the actual placement of rock compares to the original plan (2001) for placement. Also, there is no Type I rock or Type II rock identified on the figure. Finally, area 1 on the plan appears to extend into the NWR which is only approved for Type II waste rock storage. <strong>Recommendation</strong> 1. Please submit a figure that shows both the original basins and the actual placement of Type I, Type II, and Type III rock. 2. Clarify whether Type III rock was placed in the NWR area?</th>
<th><strong>July 4:</strong> 1. Please see Figure 4 in Attachment #1. All NCRP rock outside the &quot;Type II/III limit&quot; is Type I. 2. Type II/III was placed in the east part of NWR as shown in Attachment 1 - Figure 4.</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Use of Type III rock in the A21 dike (Section 3.5; Table 7)</td>
<td><strong>Comment</strong> DDMI has indicated that it used Type III rock in the Construction of the A21 dike. <strong>Recommendation</strong> 1. Does DDMI agree that this activity put DDMI out of compliance with its Waste Rock Management Plan? 2. Please explain how/why the decision to use Type III in the toe buttress was made 3. What measures has DDMI taken to prevent unauthorized use of Type III rock in the future?</td>
<td><strong>July 4:</strong> 1. Please refer to WLWB-21. 2. Internally DDMI considered ways to appropriately use Type II/III rock as source rock for the construction of the A21 Dike. It was considered for use where it would remain fully submerged - i.e. on the lake side of the cut-off wall and below the low water line. It was considered as a preferred method for limiting generation of ARD/ML relative to storage sub-aerially on-land and was included in Waste Rock Management Plan Version 5. However during the Feasibility Study it was determined that given the A21 construction methods Type II/III rock could not practically be placed in the dike embankment as required. There was no such construction limitation on the buttress placement (as it is placed using a clam) and so this remained in the Technical Specifications and construction plans. DDMI had recalled the wrong version of the Waste Rock Management Plan (V5) when internally approving the construction plan. Version 5 had never been approved by WLWB and the criteria for sub-aqueous disposal was removed for Version 6 and replaced with a statement that &quot;DDMI would apply to WLWB for approval before initiating any subaqueous waste rock management strategies.&quot; DDMI did not realize this error until after the buttress had been placed. Similarly when DDMI submitted the A21 construction drawings and Technical...</td>
</tr>
<tr>
<td>20</td>
<td>Use of Type II/III rock, ICRP, and security estimate (Section 3.5)</td>
<td><strong>Comment</strong> DDMI has proposed use of Type II/III rock in construction. Our understanding is that uses that meet criteria b, c, and potentially e, would require a cover at closure.  <strong>Recommendation</strong> 1. If the Board approved the WRMP and DDMI uses Type II/III rock in Construction, does DDMI plan to update the ICRP to identify new locations where Type III rock must be covered at closure? 2. How will DDMI ensure the security deposit includes the costs of covering Type II/III rock used in Construction? Does DDMI plan to submit security updates in advance of using Type II/III rock in construction?</td>
<td>July 4: 1. Where use of Type II/III in construction creates the need to expand the closure cover, for example with the PKC North Dam, it would make sense to include this change in the annual CRP Progress Report. 2. DDMI suggests the security updates would also form part of the CRP Progress Report.</td>
</tr>
<tr>
<td>21</td>
<td>On-site locations of Type III rock (Table 7, Section 3.5)</td>
<td><strong>Comment</strong> DDMI lists storage locations of Type III rock in Table 7. Some of these locations were not in the approved WRMP; Part H Item 7 requires DDMI to follow the WRMP. Part F, Item 5 requires that rock used in construction meet geochemical criteria in the WRMP.  <strong>Recommendation</strong> 1. Does DDMI agree that the company was out of compliance with Part H, Item 7 when it placed Type III rock in the A21 toe buttress, the PKC North Dam, and the CLR and SED basins of the WRSA? 2. Does DDMI agree that the company was out of compliance with Part F, Item 5 when it used rock in the A21 toe buttress and the PKC North Dam?</td>
<td>July 4: 1. In the case of the A21 toe buttress and the PKC North Dam DDMI submitted the required construction drawing and specification as per Part F Item 4 that include use of Type III rock but neglected to concurrently obtain approval for changes to the Waste Rock Management Plan. DDMI accepts that this would likely be viewed as an administrative non-compliance. 2. With regard to the SED and CLR cells DDMI accepts that there has been a lack of consistency between site operational practices communicated with the Inspector during site inspections and specifics of past versions of the Waste Rock Management Plan. DDMI accepts that this would likely be viewed as an administrative non-compliance. DDMI has tried to correct these in WRMP Version 7.</td>
</tr>
</tbody>
</table>
| 22 | Waste rock tests (Section 5 and Schedule 6.5(g)) | **Comment** Schedule 6.5(g) requires the Plan to include "design details for the Construction of large-scale tests for assessing the effectiveness of blending different combinations of biotite schist and granite. The Licensee shall undertake these tests as and when approved by the Board." The conformity table  | July 4: "Blending" is an ARD management approach that is not used at Diavik. The Test Pile program considers Type I (uncovered), Type III (uncovered) and Type III (covered). Because the segregation is based on geochemistry (%) rather than lithology (granite or biotite schist) both Type I and Type III are by
<table>
<thead>
<tr>
<th>No.</th>
<th>Section/Comment</th>
<th>Description</th>
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<tbody>
<tr>
<td>23</td>
<td>Temperature Analysis (Section 5, Schedule 6.5(a))</td>
<td>Indicates that Section 5 contains information on large scale field tests for blending. It is not clear that the University test pile program investigated different blends of biotite schist and granite. <strong>Recommendation</strong> Please indicate whether the university test pile program investigate different blends.</td>
</tr>
<tr>
<td>24</td>
<td>Testing and sampling (Section 5, Schedule 6.5(j))</td>
<td>The conformity table indicates that Section 5 contains a description of the temperature analysis in the waste rock storage area. There is some information on the thermal monitoring from the test piles, but none from the WRSA. <strong>Recommendation</strong> Please describe the temperature analysis in the waste rock storage area.</td>
</tr>
<tr>
<td>25</td>
<td>SNP sampling stations</td>
<td>Board staff note that the only SNP sampling for waste rock storage area seepage is for collection ponds, which also collect water from other locations. It is therefore difficult to assess trends in seepage water quality over time. <strong>Recommendation</strong> In DDMI’s view, are there opportunities to better monitor WRSA seepage? Can DDMI propose additional SNP stations to monitor WRSA seepage?</td>
</tr>
<tr>
<td>26</td>
<td>Letter from DDMI to Tracy Cover (April)</td>
<td>The response addresses potential water management and closure cost implications of Type III rock</td>
</tr>
</tbody>
</table>

**July 4:** A review of temperature data collected from the ~80 m deep borehole to bedrock and the 40 m deep borehole near the batter installed in the QUAR basin indicate that the active zone is approximately 7 m thick. The active zone has been ~7m thick since equilibration from drilling, suggesting that active zone thickness was established at some time prior to thermistor installation.

**July 4:** Additional testing/research has been initiated on processed kimberlite (PK). DDMI has included these updates in the annual CRP Progress Report (Schedule 9 Item 2), and suggests that this is the more relevant document for tracking results of this testing. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of Schedule 6 Item 5 (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.

**July 4:** The opportunity to monitor any actual NCRP seepage is described in the requirements for the Seepage Survey Report (Schedule 6 Item 6), however this requires that seepages exist. Without actual seepages to monitor the next best way to understand the potential for seepage has been with the Test Pile Research. Instrumentation installed within the NCRP is helpful for understanding thermal conditions but not seepage as the rock is frozen - i.e. no free water.

**July 4:** Please see Attachment #3.
<table>
<thead>
<tr>
<th></th>
<th>Comment</th>
<th>Recommendation</th>
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<tr>
<td>19, 2016), response to question 1</td>
<td>placement in the CLR basin of the WRSA, but it does not consider the potential for drainage from the Type III rock to affect underlying material such that it is no longer appropriate for use in covers. Some examples would be precipitation of secondary minerals or depletion of NP in the underlying materials. Water quality data from the Type III test piles may provide an indication as to whether this is or is not a concern. <strong>Recommendation</strong> Provide an evaluation of the potential effects of temporary Type III rock storage on the underlying Type I rock.</td>
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<td>27</td>
<td>The letter includes an enclosure by Golder Associates clarifying their role on matters related to waste rock management at the site. The letter notes that DDMI retained Golder Associates for a third party review of the ARD risk at the Diavik Mine in August 2012 as part of an internal review. The findings of this were not presented. <strong>Recommendation</strong> Can DDMI provide the results of Golder's review?</td>
<td>The findings of this were not presented. <strong>Recommendation</strong> Can DDMI provide the results of Golder's review?</td>
<td>July 4: Attachment #2 includes the findings from this review. Since the time of this review DDMI has advanced the following in relation to the two key review findings: 1. Operational and Post-Closure Impact of PKC. DDMI has continued the characterization program with Alberta Innovates; reviewed, analyzed and revised the closure design and has commenced trials to consider changing the CPK:FPK ratio for storage. Analysis and interpretation is ongoing and will become the focus of closure planning. 2. Re-Mining NCRP. Ultimate crest lines for the re-mine excavation were off-set from the as-built records by 10 m into the Type I area to provide a small buffer. Re-mine slope angles are shallower than the angle of repose at which Type II material was placed, thereby increasing the buffer distance with depth. The re-mine area is visually inspected by a qualified geologist.</td>
</tr>
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<td>28</td>
<td>The WLWB hired SRK Consulting to assist with the review of WRMP Version 7. SRK and Board staff jointly prepared the WLWB staff comments and recommendations. <strong>Recommendation</strong> NA; No response required.</td>
<td></td>
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Ms. Violet Camsell-Blondin  
Chair  
Wek'èezhii Land and Water Board  
Box 32  
Wekweeti, NT X0E 1W0

30 June 2016

Re: **DDMI Response – Waste Rock Management Plan v7**


Sixty-two review comments were received by DDMI on 15 June 2016 and DDMI has provided complete responses to each comment, including five additional attachments that specifically address reviewer questions relating to: North Country Rock Pile (NCRP) storage cell characteristics (#1), Acid Rock Drainage risks for site infrastructure (#2), details relating to the use of Type III material in the A21 buttress (#3 and #4) and a drawing showing NCRP re-mining locations (#5).

The Government of the Northwest Territories Inspector and the Wek’èezhii Land and Water Board staff both raised concerns with the proposed regulatory disclaimer and challenges associated with interpreting Part H Item 12a of the Water License, which relates to a requirement to submit updates to management plans “a minimum of ninety (90) days prior to any proposed changes to the requirements in the approved Plan” (emphasis added). The requirements of the Waste Rock Management Plan are those listed in Schedule 6 Items 5a-l.

Implementation concerns relating to Part H Item 12 were initially outlined in a letter from DDMI to the WLWB on 8 April 2016 (http://www.mvlwb.ca/Boards/WLWB/Registry/2015/W2015L2-0001/Diavik%20-%20DDMI%20Letter%20re%20Management%20Plans%20-%20Apr%2016.pdf). In that letter, and in DDMI’s attached response to WRMP v7 comments, DDMI provides an example relating to annual production values in the WRMP and requests that the Board recognizes the need for operational flexibility, as the responsiveness required to continue mine operations in some situations precludes the ability to provide 90 days’ notice for WLWB approval, without compromising compliance with the License or Plans. Additionally, many of the items listed (specifically Items 5a, f, g, h, i, j, k and l) would be more appropriately reported on an annual basis.

DDMI respectfully requests that the items listed in Schedule 6 Item 5 be re-evaluated with a focus on requiring 90 days’ notice for approval on the core commitments that DDMI has made in relation to the plan. The scope of the WRMP relates to DDMI’s geochemical commitments and the ability to achieve compliance with waste rock classification, segregation, use and storage requirements. DDMI suggests that the most relevant requirements from Schedule 6 Item 5 that align with the commitments and compliance considerations for the WRMP, and should therefore require 90 days notification to change, are the following:
classification criteria for different rock types (Schedule 6 Items 5b and e);
visual classification criteria/process (Schedule 6 Items 5c), and;
criteria and locations for waste rock use/storage (Schedule 6 Items 5d).

DDMI suggests that the WRMP could be re-formatted to include one section that clearly
describes the items and procedures requiring 90 days approval (i.e. Items 5b, c, d and e) and
another section consisting of ‘supporting information’ that would include the other items
identified above and listed under Schedule 6 Item 5, additional information to align with the
Standard Outline for Management Plans or information requested by reviewers to assist with
understanding a specific plan. The ‘supporting information’ section would be updated
annually, as required, including links to applicable plans or reports. It is expected that any
such updates would still be distributed for review and comment through the WLWB process.

In the response to reviewer comments for WRMP v7, DDMI has expressed an interest in
discussing the items under Schedule 6 Item 5 for which reviewers prefer having 90 days’
notice prior to a change, as well as suggestions on a preferred format for future management
plans that could improve communication of the core commitments, compliance objectives and
requirements for change. DDMI recognizes that this may include amending Schedules, as
per Part B Item 10 of the Water License.

DDMI is interested in an opportunity to meet and discuss the above-noted considerations with
Board staff or other interested parties once they have had an opportunity to review all
response comments. DDMI anticipates that Board staff and DDMI will be able to determine a
preferable approach to resolving the challenges of implementing Part H Item 12 and provide
the Board with a workable solution that meets the needs of all parties.

Should Board Staff have any questions or require any further information regarding this
submission, please contact me directly.

Responses have also been uploaded to the Online Review System.

Regards,

Gord Macdonald

cc  Sarah Elsasser (WLWB)
Ryan Fequet (WLWB)
Patty Ewaschuk (WLWB)

Attached:  DDMI Comment Responses for Waste Rock Management Plan V7
Storage Cell Summary (Attachment 1)
Summary of Findings – Golder ARD Review (Attachment 2)
Technical Memorandum – Geoscientist/Geochemist Response to Comments
on the Waste Rock Management Plan v7 (Attachment 3)
Type III Buttress Drawing (Attachment 4)
Re-mine Locations Drawing (Attachment 5)
allow much more water than was originally intended/planned for from contacting PAG in cells adjacent to the NWR/CLR cells.

This concern is based on several comments by NKSL (2001), including the following: “Type III rock will be stored into two “tub” cells and covered with an impermeable cover long before climatic water saturates the bottom rock layer and reached the “tub” perimeters” (p. 22). “Type III rock will be placed in “tub” depressions as described...the covers will be placed no later than 2 years after the cells are filled...during the time before the cover is in place, it is estimated that the climatic infiltrated water will saturate the rock at the bottom of the cells to about 3m...note that the total depth of the “tub” is about 20 m” (p. 63).

Recommendation:
Discuss what the environmental consequences of 6-9+ years vs. less than 2 years might be on PAG storage objectives, both short and long term. Include a discussion of the estimated degree of saturation of the bottom rock layer & buffer distance (if any) from the perimeters of the tubs in all cells with PAG rock storage (CLAR, QUAR, CLR)

Proponent response:
Enclosure 1, Inspector comment #1: refers to the temporary storage of Type III waste rock in the CLR cell (Figure 3 of WRMP V7), designated for permanent Type I storage (Section 3.3 of WRMP V7).

The Type III storage objectives are to segregate Type III waste rock and store it in separate areas of the NCRP, and to ensure the NCRP is designed to allow collection of surface runoff and seepage from the dump to reduce the likelihood that poor quality seepage enters Lac de Gras. The closure configuration for Type III areas of the NCRP is to re-contour to a 3H:1V slope, place a 1.5 m thick till layer and a 3 m thick Type I cover.

As the inspector suggests, when waste rock (of any Type) is stored under ambient conditions meteoric water will recharge the waste rock. Waste rock mined from open pits or underground has a very low initial moisture content. Waste rock piles must attain a minimum moisture content, the “field capacity”, before recharge will create drainage; this accumulation of water within the waste rock pile is commonly referred to as the “wet-up” phase. The duration of the wet-up phase depends on the recharge rate (which depends on rainfall/precipitation, temperature, solar radiation, wind speed, and the characteristics of the recharge surface), the height of the rock pile and the internal temperature of the rock pile.

For example, the wet-up phase for the full thickness of the 13 m high Test Pile was observed to be 62 months for the test pile that was exposed to natural precipitation (as opposed to the test pile that had extra water applied by the researchers; Fretz 2013). Based on this wet-up rate, the full thickness of the Type III waste rock stored in the CLR cell (approximately 30 m), or any other waste rock in the NCRP, would not attain field capacity in six to nine years, thus the bottom of the pile would not be fully saturated. Using the wet-up rate of 0.21 m/month from the Test Piles research program, the thickness of the waste rock that would attain field capacity after six years and nine years is 15.1 m and 22.6 m (Figure 1). The volume of waste rock in the
active zone and at field capacity could produce seepage at the base (in the active zone) if recharge rates were sufficiently high, particularly during spring freshet.

The active zone thickness will be determined by permafrost aggradation within the NCRP. Data collected as part of the Test Piles research program suggests that permafrost has formed within the NCRP, aggrading from the base. For example, thermistors installed as part of the Test Piles research program to approximately 80 m (to bedrock), and 40 m near the batter in uncovered Type III in the QUAR basin of the NCRP indicate permafrost conditions (temperatures always below 0°C) have developed below a depth of about 7m in 10 years or less of initial waste rock placement. Under these conditions, water that recharges the waste rock would be retained as ice within waste rock that is always below 0°C and would not report as seepage. DDMI has indicated that no seepage has been observed from the NCRP.

![Figure 1: Conceptual sketch (to scale) of a cross section the 30 m high Type III pile in CLR after (a) six years in situ and (b) nine years in situ. The grey core represents Type III that would not have attained field capacity and is likely to be under permafrost conditions within 6-9 years of placement. The hatched grey/blue areas represent Type III that could have attained field capacity, but is likely under permafrost conditions. The solid blue areas represent Type III that has attained field capacity and that is in a 7 m thick active zone. The area to the right of the dashed green lines indicates the proportion of the Type III that would have attained field capacity in a 7 m thick active zone and could contribute to seepage at the toe. The area to the right of the dashed orange lines indicates the proportion of Type III that would have attained field capacity and could contribute to seepage if the active zone thickness was greater than the thickness of Type III that attained field capacity (permafrost did not limit flow). The difference in thickness of the field capacity depth on the slopes compared to the crest is due to vertical flow of water compared to the orthogonal influence of air temperature (active zone thickness).](image)

The NKSL calculations and proposed benefits of installing a cover system within two years waste rock placement assumed a greater amount of recharge and that the cover system would be impermeable to water. Observations and modelling from the Test Piles research suggests that a till layer + Type I cover system is not necessarily impermeable, but it does act to moderate internal temperatures that permit and promote permafrost formation within the core and cover system, and that the active zone does not penetrate the till layer even under a warming climate scenario. These calculations and observations, based on in situ field
observations and measurements from the on-site Test Piles research program, suggest that the original calculations and assumptions by NKSL were not representative of the conditions at Diavik.

Although constructing a cover system sooner would be beneficial by reducing the active zone thickness and maintaining the active zone in the Type I cover, we suggest that the current configuration and would achieve the Type III storage objectives prior to being covered (i.e. in the short term). Provided the site collection pond system and water treatment plant are in operation, there would be a low risk of Type III seepage having deleterious impacts on the environment because the long wet-up phase as a result of initially low moisture content, permafrost encapsulation, low annual recharge rates would not produce large volumes of seepage water, and any seepage water produced would be captured in the collection pond system (Pond 1) and treated at the NIWTP before discharge to the environment. Similarly, it would not be expected that seepage from adjacent Type I waste rock would impact seepage quality or quantity from Type III waste rock. Removing the Type III in the CLR basin would achieve the long-term storage objective. Covering the Type III areas per the proposed closure design would maintain the active zone in the cover system and encourage permafrost formation, as suggested by the observations and modeling results from the Test Piles research, thus achieving Type III storage objectives in the long-term.

ID: 15
Reviewer: GNWT - Lands: Tracy Covey

Topic:
Enclosure 1. DDMI response to Inspector concern #2. “There was no plan to cover non-PAG rock and the NWR/CLR cells were not expected to be dry”

Comment:
See Comment 14

Recommendation:
See Comment 14

Proponent response:
Enclosure 1, Inspector concern #2 refers to the storage of uncovered Type I waste rock for 6-9+ years, subjecting the Type I to weathering and increased seepage.

As DDMI described in their response to Enclosure 1, Concern #2, the planned closure configuration for the Type I areas of the NCRP is uncovered at angle of repose, or “as-is”.

Although Type I rock is non-acid generating, oxidation and weathering will still release constituents to porewater, which can be released as seepage when the field capacity is exceeded. Concentrations of operational Effluent Quality Criteria (EQC) parameters were calculated for various closure configurations and are described in “Predictions of Seepage
Quality from the North Country Rock Pile at Closure” (Appendix II-5 of the 2013 ICRP Progress Update). The calculations for the Type I areas for an angle-of-repose, uncovered sections (as-is), with a 7 m thick active zone are summarized in Table 1. It was noted in the seepage prediction report that during the approach verification the operational EQC parameters Cu and Zn appeared to be over-estimated by 5-10x due to prediction method, differences in active zone geometries and/or geochemical behaviour (e.g. sorption).

Table 1: Predictions of seepage quality for EQC parameters from Type I

<table>
<thead>
<tr>
<th>Type I at angle of repose, 7 m thick active zone on slopes and crest (no cover system)</th>
<th>Al</th>
<th>As</th>
<th>Cd</th>
<th>Cr</th>
<th>Cu</th>
<th>Ni</th>
<th>Pb</th>
<th>Zn</th>
<th>pH</th>
</tr>
</thead>
<tbody>
<tr>
<td>NWR West (T1)</td>
<td>0.00016</td>
<td>0.012</td>
<td>0.00070</td>
<td>0.00068</td>
<td>0.16</td>
<td>0.15</td>
<td>0.0051</td>
<td>0.15</td>
<td>6.5</td>
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<tr>
<td>CLR (T1)</td>
<td>0.00007</td>
<td>0.012</td>
<td>0.00070</td>
<td>0.00067</td>
<td>0.16</td>
<td>0.15</td>
<td>0.0050</td>
<td>0.15</td>
<td>6.7</td>
</tr>
</tbody>
</table>

**ID:** 16  
**Reviewer:** GNWT - Lands: Tracy Covey

**Topic:**  
Enclosure 1. DDMI response to Inspector concern #3. "DDMI is not aware of any impacts of PAG rock in the SED cell on achieving closure objectives"

**Comment:**  
Not being aware of impacts doesn’t preclude the possibility or likelihood that there are or might in the future be impacts or consequences of this storage deviation. It would be prudent to know what (if any) consequences a qualified engineer would have with regards to this deviation from the approved design.

**Recommendation:**  
Have a qualified engineer comment on the possibility or likelihood of environmental consequences related to prolonged (greater than 2 yrs.) storage of PAG in the SED cell.

**Proponent response:**  
Enclosure 1, Inspector concern #3 refers to storage of Type III waste rock in the SED cell in the NCRP, a cell not originally designated to contain Type III waste rock.

Permanent storage of Type III waste rock in the SED cell would require the cell be covered according to the approved closure plan for Type III waste rock, which is currently a 1.5 m till layer and 3 m Type I cover. Observations and modelling of the thermal behavior of the NCRP from the Test Piles research suggest that an active zone would remain in the cover system and not penetrate the Type III material under current climate conditions as well as a warming climate scenario. Seepage predictions (Appendix II-5 of the 2013 ICRP Progress Update) suggest concentrations of dissolved constituents would be lower in a cover scenario compared to Type III exposed to ambient conditions. During operations, when the Collection Pond system is
operational, any seepage would be collected and treated prior to discharge to the environment. During operations, closure and post-closure, the likelihood of Type III in the SED cell causing deleterious environmental impacts would be the same as the Type III stored in the QUAR and CLAR cells.

**ID:** 19  
**Reviewer:** GNWT - Lands: Tracy Covey

**Topic:**  
Enclosure 1. DDMI response to Inspector concern #8. “DDMI is not aware of negative impacts of not placing the closure cover within 2 years. ...placement of a cover would have reduced the amount of low quality seepage that needed to be managed during operations.

**Comment:**  
See response 16. The same comments, concerns, and recommendations which were discussed in response 16 to the SED cell apply to the deviations identified in Enclosure 1, question 8 responses (i.e., consequences for the PAG island, the use of PAG in construction, much greater water infiltration to PAG and non-PAG storage areas of the N.C.R.P).

**Recommendation:**  
Have a qualified engineer comment on the possibility or likelihood of negative environmental consequences resulting from prolonged storage of rock (i.e., longer than 2 years) in the N.C.R.P., the use of PAG in construction at several locations on the mine site, and the storage of PAG (type III) rock for a prolonged period in the CLR cell.

**Proponent response:**  
The storage of Type III waste rock in the NCRP without a cover for more than two years during operations has been discussed in the responses to ID#14 and ID#16, above.

Type III waste rock should not be used indiscriminately for construction material on-site, but could be warranted under some circumstances.

The use of Type III waste rock for cemented rock fill to be placed underground permanently is advantageous because it encapsulates and removes a quantity of Type III waste rock from subaerial exposure and weathering, and reduces the volume of Type III waste rock that requires a closure cover.

The use of Type III waste rock for construction of some portions of the PKC dam that are within the SED and CLAR basins, i.e. NCRP basins that currently contain Type III waste rock, is considered neutral. If the Type III waste rock was not used for dam construction, it would have been deposited in the SED, CLAR and/or QUAR basins of the NCRP. Based on the current ICRP, all of these areas containing Type III waste rock will be covered with 1.5 m of till and 3 m of Type I.

The temporary storage of Type III waste rock in the CLR cell is discussed in the response to ID#14.

Subaqueous storage of waste rock and tailings is typically a preferred method to limit sulfide oxidation and associated seepage. The effects of permanently placing Type III waste rock in
Lac de Gras (as a toe buttress for the A21 dike) can be evaluated with respect to subaqueous seepage rates from Diavik waste rock <6.3 mm, as reported in the 1998 Diavik Water Quality Estimate report. The 0-28 day leach rates from the kinetic tests for EQC parameters from granite and biotite schist in lake water with temperatures of 5 °C are summarized in Table 2. Early-time leach rates are typically higher than later time as accumulated reaction products are flushed from the system, thus using the 0-28 day leach rates for calculations can be considered conservative.

With the exception of copper (Cu), nickel (Ni), and zinc (Zn), the leach rate of EQC parameters is lower from biotite schist than from granite. Cu, Ni and Zn leached from the biotite schist are primarily derived from the sulfides occurring in the biotite schist. As an example, Type III waste rock with 0.08 wt.% S would be comprised of 50% granite and 50% biotite schist containing 0.16 wt.%S, the mean sulfide content of biotite schist measured during geochemistry baseline program; Type I with the upper sulfide concentration of 0.04 wt.%S would be comprised of 75% granite and 25% biotite schist with 0.16 wt.%S.

Using these lithological blends, the 0-28 day release rates from the baseline study, the as-built volume of the A21 to buttress (converted to mass) that is submerged, and the planned volume of Type I submerged in the A21 dike, and the average lake temperature of 5°C, the subaqueous release rates for the A21 dike with the Type III toe buttress and an A21 dike if Type I had been used for a toe buttress were calculated and summarized in Table 2. These calculations assumed that the subaqueous release rates from large (>6.3 mm) particles are the same as from particles <6.3 mm on a per mass basis. Smaller size fractions are more reactive than large boulders, and the 0-28 day release rates are higher than for later-time release rates thus these estimates should be considered conservative.

The calculation results suggest that the release rates are similar from both scenarios for the A21 dike. Release rates are marginally higher in an all-Type I dike for aluminum (Al), arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), and nitrite-nitrogen (NO2-N) whereas release rates for a Type I dike with the Type III toe buttress are marginally higher for Cu, Ni and Zn.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Granite (mg/kg/d)</th>
<th>Biotite schist (mg/kg/d)</th>
<th>Type I estimate (mg/kg/d)</th>
<th>Type III estimate (mg/kg/d)</th>
<th>A21 dike with Type III toe buttress (mg/d)</th>
<th>A21 dike if Type I were used as toe buttress (mg/d)</th>
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</thead>
<tbody>
<tr>
<td>Al</td>
<td>1.36E-04</td>
<td>2.67E-05</td>
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<td>1.42E-04</td>
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<td>As</td>
<td>1.41E-05</td>
<td>3.96E-07</td>
<td>1.87E-05</td>
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<tr>
<td>Cd</td>
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<tr>
<td>Cr</td>
<td>8.38E-06</td>
<td>3.96E-06</td>
<td>1.27E-05</td>
<td>1.08E-05</td>
<td>5.73E+04</td>
<td>5.75E+04</td>
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<tr>
<td>Cu</td>
<td>2.24E-05</td>
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<td>5.21E-05</td>
<td>6.50E-05</td>
<td>2.37E+05</td>
<td>2.35E+05</td>
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<tr>
<td>Pb</td>
<td>3.48E-06</td>
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<td>3.57E-06</td>
<td>2.17E+04</td>
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<td>Ni</td>
<td>5.53E-05</td>
<td>6.56E-04</td>
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<td>1.62E+06</td>
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<tr>
<td>NO2-N</td>
<td>1.53E-04</td>
<td>3.77E-05</td>
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<td>1.67E-04</td>
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<td>Zn</td>
<td>1.79E-05</td>
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<td>8.35E-05</td>
<td>2.62E+05</td>
<td>2.59E+05</td>
</tr>
</tbody>
</table>
**ID:** 26  
**Reviewer:** Patty Ewaschuk

**Topic:** Letter from DDMI to Tracy Covey (April 19, 2016), response to question 1

**Comment:** The response addresses potential water management and closure cost implications of Type III rock placement in the CLR basin of the WRSA, but it does not consider the potential for drainage from the Type III rock to affect underlying material such that it is no longer appropriate for use in covers. Some examples would be precipitation of secondary minerals or depletion of NP in the underlying materials. Water quality data from the Type III test piles may provide an indication as to whether this is or is not a concern.

**Recommendation:** Provide an evaluation of the potential effects of temporary Type III rock storage on the underlying Type I rock.

**Proponent response:**

The Type I portion of the cover approved for NCRP Type III closure is part of the cover system that limits active zone thickness to maintain freezing and thawing within the cover system. The effectiveness of Type I to maintain the active zone within in the cover system would not be affected by any geochemical changes. For example, the thermal conductivity and permeability properties of Type I and Type III are essentially identical (Pham et al. 2013).

The geochemical effects of drainage from Type III rock on underlying Type I rock depends on the quantity and timing of seepage, which in turn depends on the pile geometry, moisture content, and duration of exposure (for example see response to comment #14). At this time, we understand that the only location where Type III is stored on Type I is in the CLR cell. As addressed in the response to comment #14, a limited volume of Type III waste rock would likely contribute to seepage.

Results from the Test Piles research indicate that drainage chemistry from the basal drain of the Type III test pile is more dilute during the early part of the season as a result of snow melt and batter flow. As the thaw-season progresses, concentrations increase and pH decreases, and flow decreases (Smith et al. 2013, Sinclair 2015, Bailey et al. 2016). The pH of the leachate ranges from 4 – 8 and buffering by aluminum hydroxides and ferric oxyhydroxides appears to be occurring times when the carbonate alkalinity has been depleted (Smith et al. 2013, Sinclair 2015, Bailey et al. 2016).

For secondary sulfate minerals, geochemical equilibration calculations using PHREEQCii and/or MINTEQA2 indicate the drainage water was typically undersaturated with respect to gypsum. Bailey et. al (2016) presented equilibrium modelling results that suggested supersaturation with respect to jarosite, which can be a source of acid and trace metals in drainage water when it re-dissolves. Although jarosite was briefly observed in the Type III humidity cells (before being re-dissolved; pers. comm), extensive precipitation of jarosite within the Type III test pile is unlikely. At the times when the drainage water was calculated to be supersaturated with respect to jarosite the pH of the drainage water was >5.5, conditions under which precipitation of Fe(III) (oxy)hydroxide phases is favoured, limiting jarosite formation. Similarly, basaluminite can be a source of acidity and trace metals when re-dissolved, and the drainage water was calculated to be supersaturated with respect to this phase at pH >4.5. In this pH range precipitation of Al
oxyhydroxide is favoured limiting formation of basaluminite. Basaluminite has not been observed by mineralogical studies of the Diavik waste rock, suggesting the effects of basaluminite precipitation and dissolution in acidity and trace metal transfer would not be important.

The depletion of neutralizing minerals, principally calcite, on underlying Type I from acidic drainage of overlying Type III could occur. However, the extent of depletion would be limited to times when Type III drainage is acidic, which is also times of lower flow (Sinclair 2015). Type III drainage discharge to underlying Type I is not likely to cause drainage from the Type I to attain trace metal concentrations or pH levels on the order of those observed in Type III drainage. Type III material contains a larger amount of the sulfide-bearing (principally pyrrhotite) biotite schist, which is the source of most of the acidity and many of the trace metals observed in the Type III drainage.

Given the likely limited amount of seepage from overlying Type III (i.e. in the CLR cell), we suggest that any depletion of neutralization potential, or the effect of secondary mineral precipitation/dissolution on underlying Type I would not preclude the use of Type I for cover material.
References


Type III Buttress Drawing (Attachment 4)
NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER SHOULD UNCERTAINTIES ARISE WITH THE DRAWINGS, SCOPE, AND/OR TECHNICAL SPECIFICATIONS.
3. BASE TOPOGRAPHIC DATA BASED ON CHALLENGER SURVEY OPERATIONS 1997. BATHYMETRY DATA SHOWN ARE FROM CORI SURVEY OPERATIONS JULY / AUGUST 1999, WITH 1995 / 1996 CHALLENGER SURVEY DATA USED TO FILL IN WHERE REQUIRED. CONTOUR INTERVAL IS 1.0 m.
4. PROJECTION IS UTM NAD 83 ZONE 12.
5. TOE BERM TOE IS DESIGNED TO INTERSECT THE TILL LAYER, HOWEVER SHOWN IS THE INFERRED LAKEBED SURFACE. TOE IS APPROXIMATE AND TO BE FIELD FIT.
6. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING SHALL NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES OR LOSS ARISING IN ANY WAY FROM ANY USE OR MODIFICATION OF THIS DOCUMENT NOT AUTHORIZED BY BGC. ANY USE OF OR RELIANCE UPON THIS DOCUMENT OR ITS CONTENT BY THIRD PARTIES SHALL BE AT SUCH THIRD PARTIES' SOLE RISK.
Re-mine Locations Drawing (Attachment 5)
Re: DDMI Response – Waste Rock Management Plan v7


Sixty-two review comments were received by DDMI on 15 June 2016 and DDMI has provided complete responses to each comment, including five additional attachments that specifically address reviewer questions relating to: North Country Rock Pile (NCRP) storage cell characteristics (#1), Acid Rock Drainage risks for site infrastructure (#2), details relating to the use of Type III material in the A21 buttress (#3 and #4) and a drawing showing NCRP re-mining locations (#5).

The Government of the Northwest Territories Inspector and the Wek’èezhii Land and Water Board staff both raised concerns with the proposed regulatory disclaimer and challenges associated with interpreting Part H Item 12a of the Water License, which relates to a requirement to submit updates to management plans “a minimum of ninety (90) days prior to any proposed changes to the requirements in the approved Plan” (emphasis added). The requirements of the Waste Rock Management Plan are those listed in Schedule 6 Items 5a-l.

Implementation concerns relating to Part H Item 12 were initially outlined in a letter from DDMI to the WLWB on 8 April 2016 (http://www.mvlwb.ca/Boards/WLWB/Registry/2015/W2015L2-0001/Diavik%20-%20DDMI%20Letter%20re%20Management%20Plans%20-%20Apr%208_16.pdf). In that letter, and in DDMI’s attached response to WRMP v7 comments, DDMI provides an example relating to annual production values in the WRMP and requests that the Board recognizes the need for operational flexibility, as the responsiveness required to continue mine operations in some situations precludes the ability to provide 90 days’ notice for WLWB approval, without compromising compliance with the License or Plans. Additionally, many of the items listed (specifically Items 5a, f, g, h, i, j, k and l) would be more appropriately reported on an annual basis.

DDMI respectfully requests that the items listed in Schedule 6 Item 5 be re-evaluated with a focus on requiring 90 days’ notice for approval on the core commitments that DDMI has made in relation to the plan. The scope of the WRMP relates to DDMI’s geochemical commitments and the ability to achieve compliance with waste rock classification, segregation, use and storage requirements. DDMI suggests that the most relevant requirements from Schedule 6 Item 5 that align with the commitments and compliance considerations for the WRMP, and should therefore require 90 days notification to change, are the following:
DDMI suggests that the WRMP could be re-formatted to include one section that clearly describes the items and procedures requiring 90 days approval (i.e. Items 5b, c, d and e) and another section consisting of ‘supporting information’ that would include the other items identified above and listed under Schedule 6 Item 5, additional information to align with the Standard Outline for Management Plans or information requested by reviewers to assist with understanding a specific plan. The ‘supporting information’ section would be updated annually, as required, including links to applicable plans or reports. It is expected that any such updates would still be distributed for review and comment through the WLWB process.

In the response to reviewer comments for WRMP v7, DDMI has expressed an interest in discussing the items under Schedule 6 Item 5 for which reviewers prefer having 90 days’ notice prior to a change, as well as suggestions on a preferred format for future management plans that could improve communication of the core commitments, compliance objectives and requirements for change. DDMI recognizes that this may include amending Schedules, as per Part B Item 10 of the Water License.

DDMI is interested in an opportunity to meet and discuss the above-noted considerations with Board staff or other interested parties once they have had an opportunity to review all response comments. DDMI anticipates that Board staff and DDMI will be able to determine a preferable approach to resolving the challenges of implementing Part H Item 12 and provide the Board with a workable solution that meets the needs of all parties.

Should Board Staff have any questions or require any further information regarding this submission, please contact me directly.

Responses have also been uploaded to the Online Review System.

Regards,

Gord Macdonald

cc  Sarah Elsasser (WLWB)
Ryan Fequet (WLWB)
Patty Ewaschuk (WLWB)

Attached: DDMI Comment Responses for Waste Rock Management Plan V7
Storage Cell Summary (Attachment 1)
Summary of Findings – Golder ARD Review (Attachment 2)
Technical Memorandum – Geoscientist/Geochemist Response to Comments on the Waste Rock Management Plan v7 (Attachment 3)
Type III Buttress Drawing (Attachment 4)
Re-mine Locations Drawing (Attachment 5)
DDMI Comment Responses for Waste Rock Management Plan V7
<table>
<thead>
<tr>
<th>ID</th>
<th>Reviewer Board: From EMAB</th>
<th>Topic</th>
<th>Comment</th>
<th>Recommendation</th>
<th>Proponent Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Environmental Monitoring Advisory</td>
<td>Use of Type III waste rock in the buttress of Dike A21</td>
<td>The use of Type III waste rock in the buttress of Dike A21 within Lac de Gras would appear to be non-compliant with placement condition d) of the DDMI Version 7 Waste Rock Management Plan (and previous versions of the WRMP) which states Type III rock may be used only when “the construction area is not within Lac de Gras”.</td>
<td>DDMI should provide data on seepage quality and potential effects of the Type III waste rock disposed in the A21 Buttress.</td>
<td>DDMI responded that the placement of Type III waste rock in the A21 Buttress is in compliance with the previous version of the WRMP that allowed its use if it is not within Lac de Gras. However, this decision is subject to future review and adjustments.</td>
</tr>
<tr>
<td>3</td>
<td>Environmental Monitoring Advisory</td>
<td>Cover for Type III waste rock in the PKC North Dam</td>
<td>During a meeting with EMAB on April 26, DDMI officials stated that the cover of 1.5 m of till and 3 m of waste rock over Type 3 rock on the North Country Rock Pile will extend over the PKC North Dam, and is included in the NCRP component in RECLAIM. Maps and descriptions of the disposal areas are provided, however, it is unclear where future Type III waste is to be placed. Based upon Table 4, there is 0.73 Mt of Type III waste rock remaining to be mined from the underground workings and it is not clear where this waste will be placed.</td>
<td>DDMI should confirm its statement that the cover of 1.5 m of till and 3 m of waste rock over Type 3 rock on the North Country Rock Pile will extend over the PKC North Dam, and the cost is included in the NCRP component in RECLAIM.</td>
<td>DDMI confirmed that the cover of 1.5 m of till and 3 m of waste rock over Type 3 rock on the North Country Rock Pile will extend over the PKC North Dam, and the cost is included in the NCRP component in RECLAIM.</td>
</tr>
<tr>
<td>4</td>
<td>Environmental Monitoring Advisory</td>
<td>Future disposal area for Type III waste rock</td>
<td>DDMI has identified total quantities of waste rock to be produced but has provided no information on the location, size, and quantity of waste rock for the South Dump. DDMI should provide information on the location, size, and quantity of waste rock for the South Dump.</td>
<td>DDMI should provide information on the location, size, and quantity of waste rock for the South Dump.</td>
<td>DDMI provided information on the location, size, and quantity of waste rock for the South Dump.</td>
</tr>
<tr>
<td>5</td>
<td>Environmental Monitoring Advisory</td>
<td>Lack of information on the location, size, and quantity of waste rock for the South Dump</td>
<td>DDMI has identified total quantities of waste rock to be produced but has provided no information on the location, size, and quantity of waste rock for the South Dump. DDMI should provide information on the location, size, and quantity of waste rock for the South Dump.</td>
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<td>DDMI provided information on the location, size, and quantity of waste rock for the South Dump.</td>
</tr>
<tr>
<td>6</td>
<td>Environmental Monitoring Advisory</td>
<td>Storage of uncovered PAG rock on the surface of the CLR Cell</td>
<td>In DDMI’s written response to issues raised in the November 27, 2015 Inspection Report, commitments were made regarding concerns over the storage of uncovered PAG rock on the surface of the CLR Cell for 6-9+ years.</td>
<td>DDMI should ensure that Version 4 of the ICRP addresses actions proposed for addressing the storage of uncovered PAG on the surface of the CLR Cell for 6 to 9+ years.</td>
<td>DDMI confirmed that Version 4 of the ICRP has addressed actions for addressing the storage of uncovered PAG on the surface of the CLR Cell for 6 to 9+ years.</td>
</tr>
</tbody>
</table>
The Waste Rock Management Plan Version 7 (the Plan) notes the physical stability of the placed mine rock is not within the scope of the plan.

ENR notes that the Plan describes how waste rock will be assessed, handled and disposed. Part of the disposal process includes placing the rock in the Waste Rock Pile which is a structure that has its own geotechnical properties.

ENR is unclear why DDMI cannot make a comment in the Plan that rock will be placed in the rock pile that meets stability requirements as will be required in Waste Rock Pile designs and associated rock slope requirements.

ENR recommends that a general statement about how rock will be placed should be provided in the plan that aligns with the Waste Rock Pile design.

Section 1.2 includes details on the geology of A154N, A154S and A418 but does not mention A21. It is anticipated that rock from A21 will be used in any covers designed for the Waste Rock Pile and as such some reference to the Geology should be provided.

ENR recommends that a brief description on the geology of A21 is included in Section 1.2. The description should be proportionate to the scale and scope of the use of A21 rock.

ENR requests that DDMI provide some statements of how A21 waste rock will be assessed and disposed in the event that a small portion of the rock is PAG.

DDMI appreciates the ENR suggestion. This seems like a straightforward and clear approach however DDMI understands that the current structure of W2015L2-0001 does not allow this. It appears this version (Version 7) does not include information about the SCRP. The Plan will comply with Part F Item 16 and Part H Item 8 of the License and a description of A21 geology could be included for information purposes.

Table 5 states that all mine rock from A21 is expected to be Type I however there doesn’t seem to be any contingency for rock segregation in the event that some waste rock from A21 is Type III.

ENR recommends that this section of the Plan be revised to state that construction at the mine site should be completed using Type I rock only. In some instances, other rock types may be used for construction purposes, following a request and approval of the WLWB.

DDMI’s preference is to maintain the geochemical scope for the plan (Schedule 6 Item 5). Physical stability was included in the NCRP Design Report (NTL2-1645 Part C Item 12). Waste rock stability is also covered by Section 1.150 and 1.151 of the WNT Mine Health and Safety Regulations.

Section 3.5 outlines the criteria that must be met before Type I/III have been met, which include:

a) use in the production of cemented rock fill (CRF) to be permanently placed in the underground;

b) use is temporary, within the site water collection system such that any drainage can be collected and treated as necessary, and material will be removed at closure to ensure no long-term exposure of Type III waste rock in un-designated areas (see for example the temporary Type III storage area in Figure 3);

c) the construction area is within a drainage basin that already contains Type III waste rock such that closure designs for Type III waste rock will be applied (for example the North PKC Dam);

d) the construction area is not within Lac de Gras but the Type III waste rock will remain water-saturated, which reduces oxygen exposure and subsequent sulfate oxidation and AMD production (INAC 2007; Environment Canada 2009) (for example road construction within the PKC that will become turfed and water-saturated); and/or

1) ENR recommends that this section of the Plan be revised to state that construction at the mine site should be completed using rock which has the approved geochemical criteria associated with Type I rock. In some instances, other rock types may be used for construction purposes, following a request and approval of the WLWB.

DDMI appreciates the ENR suggestion. This seems like a straightforward and clear approach however DDMI understands that the current structure of W2015L2-0001 does not allow this. It appears that the WLWB could not approve specific requests to use "other rock" in construction as that decision would be in conflict with Part F Item 5 unless the "geochemical criteria" in the Waste Rock Management Plan included enabling criteria. DDMI drafted Section 3.5 of the Waste Rock Management Plan to enable approval of the "some instances" as referenced by ENR. DDMI welcomes any recommended regulatory language or approach to resolve this issue. ENR’s recommendation is aligned with DDMI’s intent.
p. 3. Regulatory disclaimer. "This information (management practices, procedures and information) is subject to change without a requirement for WLWB/Inspector notification or approval."

"This disclaimer, if put into effect, would place DDMI in con-conformance with Part B, General Condition 16, which states that &quot;the Licensee shall operate in accordance with any Plans approved pursuant to the conditions of Water Licence 920152L2-0001 &amp;nbsp;Compliance with &amp;nbsp;the Plans approved under 920152L2-0001 &amp;nbsp;will be subject to an Inspector's assessment of whether or not DDMI has adhered with the approved Plan on record &amp;nbsp;including any amendment to the Plans approved under 920152L2-0001 &amp;nbsp;based on the Inspectors assessment of whether or not DDMI has adhered with the approved Plan on record &amp;nbsp;&quot;The entire disclaimer should be removed &amp;nbsp;Since the disclaimer would essentially authorize DDMI to ignore this public review/consultation process, it also appears that DDMI may need to &amp;nbsp;re-evaluate its commitment to the public review process.&quot;

ENR notes that general information about closure of the Waste Rock Pile should be included in this section. ENR is of the opinion that specific details about closure of the Waste Rock Pile are consistent to be outside the scope of this Document (e.g. closure cover thickness, closure criteria, seepage water quality, etc.). These items are to be part of the Closure Reclamation Plan which is guided by reclamation research.

Page 2 of the April 16th, 2016 DDMI Memo (the memo) outlines variances from the original design report to the North Country Rock Pile development. Of note, one of the items listed refers to a change of the geochemical segregation criteria. It is unclear if this relates to specific approvals received from the Board or an operational decision made by DDMI.

ENR recalls the only change to the Waste Rock Pile being the grouping of Type II rock with Type III which was requested by DDMI. Rationale provided was that the amount of Type II rock was small making the segregation impractical from a rock handling perspective.

The GNWT inspector outlined concerns related to the storage of uncovered PAG rock for an extended period (8-9 years) on the surface of the CLR cell. DDMI responded that this material will be used for underground backfill but there may be consequences including runoff during operations (into Pond 1), a chance that all material will not be used for backfill and a potential for pre-mature mine closure before.

Regarding the runoff, it was stated that this could be addressed in future revisions of the Plan.

Regarding the premature closure eventuality and/or the potential of stockpiled PAG, DDMI has stated that this will be addressed in Version 4 of the Interim Closure and Reclamation Plan and a provision will be included in the next RECLAIM update to cover the cost.

ENR recommends that the procedures for handling runoff from stockpiled PAG material be included in any revised iteration of the Plan.

1) ENR recommends that DDMI remove specific details about closure of the Waste Rock Plan such as cover thickness, closure criteria, etc. as they are outside the scope of the Plan (similar to physical stability).

1) ENR requests clarification on differences between the original design report of the North Country Rock Pile (NCRP) and the development of the NCRP as it relates to geochemical segregation criteria.

The change in geochemical segregation criteria is documented in Waste Rock Management Plan Version 3 (2004). In summary, criteria were changed based on the first 18 months of operations data to achieve a more appropriate material balance. Type I criteria was changed from <0.01 to <0.04%S and Type III was changed from >0.04 to >0.08%S.

It is unclear if this relates to specific approvals received from the Board or an operational decision made by DDMI.

ENR notes that general information about closure of the Waste Rock Pile should be included in Part H Item 12a versus items that can be updated based on an annual review of the Plan. Both DDMI and WLWB recognize that the approach taken for the WRMP may have implications to the management plans listed in Part H Item 12.

The entire disclaimer should be removed &amp;nbsp;Since the disclaimer would essentially authorize DDMI to ignore this public review/consultation process, it also appears that DDMI may need to &amp;nbsp;re-evaluate its commitment to the public review process.

The intent of the disclaimer is to clarify which requirements of the Plan should be included in Part H Item 12a versus items that can be updated based on an annual review of the Plan. Both processes would still allow for a public review/consultation to occur. DDMI expected that this approach would assist in determining compliance and providing clarity on approvals for all parties.

As noted in DDMI’s letter to WLWB on April 9, 2016, certain aspects of Schedule 6 may be interpreted differently by different parties, and could result in unfavourable expectations for some aspects of the plan. For example, Schedule 6 Item 5a specifies a requirement for annual production by type, ton, etc. DDMI currently provides predicted values based on the mine plan, but structural or material availability issues may arise that dictate a need to mine from a different area and require a quick response. This may happen many times a year, and it is not practicable or valuable to amend the WRMP and wait 90 days for an approval (as per Part H, Item 12a) every time such an action is required.

DDMI is attempting to find clarity with respect to Part H Item 12a. As such, DDMI would appreciate an opportunity to discuss a preferred approach to improve regulatory clarity regarding requirements in the management plan, including possible amendment of Schedule 6 Item 5 (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.

While this review is specific to the WRMP (Schedule 6 Item 5), DDMI recognizes that the approach taken for the WRMP may have implications to the management plans listed in Part H Item 12.
Type I, II and III rock are specifically defined using clear geochemical classification criteria. All future references to PAG rock should be communicated as "PAG (type III)". "PAG" and "Clean Construction Rock" on the other hand are general descriptions rather than defined terms. DDMI uses Type I, II, III in its site procedures, databases and communications. These terms are well entrenched. This requested change is not supported by DDMI. Table 4 shows the estimated tonnages of Type I and Type III waste rock from the A154/A418 underground. Table 4 shows that Type I should be called "Clean Construction Rock (Type I)" and Type III will be stored for each year.

A column adding descriptive information on where the Clean Construction Rock (Type I and PAG (Type III) rock are going to be stored should be added for each year.

This is an error in fact. A review of available information by the Inspector did not show any formal, written approval or authorization to store PAG in the SED cell. For the sake of historical accuracy, this paragraph should note that "Type III rock was stored in the SED cell during A418 dike construction".

This is a fact. However, the Inspector should point out that his review of this storage did not find any formal written approval or authorization for this storage, which has been in place for a number of years (since I believe 2010).

Temporary needs to be defined. The maximum extent of temporary storage should be based on a timeframe which is conservatively protective & ensures PAG (Type III) rock is not oxidized or weathered. This time limit for temporary storage should be set by an appropriate Professional Engineer independent of DDMI.

Temporary storage should only occur if explicitly and formally (i.e., written approval) "temporary" storage which will mitigate oxidation and weathering concerns associated with that storage.

The Inspector needs to know where re-mining activities will be occurring. Some sort of table or graphical representation (map) showing where rock will be re-mined in the future would help in the planning-out of effective inspection strategies.

Temporary storage should only occur if explicitly and formally (i.e., written approval) PAG (Type III) rock is not oxidized or weathered. And temporary storage should have a clearly established time-limit, which has been established by a qualified professional engineer to ensure oxidation and weathering issues have been adequately mitigated.

Provide written assurances that define the time limits of engineering to ensure oxidation and weathering concerns associated with that storage.

Type I and III rock are specifically defined using clear geochemical criteria. "PAG" and "Clean Construction Rock" on the other hand are general descriptions rather than defined terms. DDMI uses Type I, II, III in its site procedures, databases and communications. These terms are well entrenched. This requested change is not supported by DDMI.
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<td>9</td>
<td>GNWT - Lands: Tracy Covey</td>
<td>p. 14. 3. 5.  d. “The construction area is not within Lac de Gras but the Type III waste rock will remain water-saturated”.</td>
<td>The intent of 3.5e is to allow approval of Type III rock in construction in specific circumstances if approved by the WLWB. The details and applicability of specific circumstance would be determined by the WLWB, not DDMI.</td>
<td>DDMI agrees that any potential climate change impacts on maintenance of a saturated condition would need to be considered before making this decision. As stated in response to WLWB-17(1), the example provided in the context of the current DDMI proposal is not an acceptable basis for making this determination.</td>
<td>The intent of 3.5e is to allow approval of Type III rock in construction in specific circumstances if approved by the WLWB. The details and applicability of specific circumstance would be determined by the WLWB, not DDMI.</td>
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<td>10</td>
<td>GNWT - Lands: Tracy Covey</td>
<td>p. 14. 3. 5.  e. “as specified in construction design drawings approved by the WLWB”</td>
<td>DDMI agrees that any potential climate change impacts on maintenance of a saturated condition would need to be considered before making this decision. As stated in response to WLWB-17(1), the example provided in the context of the current DDMI proposal is not an acceptable basis for making this determination.</td>
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| 11  | GNWT - Lands: Tracy Covey | | An important aspect of the information request forwarded by the Inspector to DDMI in the document provided &nbsp; on March 18th, 2016 (which differed slightly in content from that posted afterward on the registry) was that the strategies to questions were to be coming from an Engineer (not Diavik) &nbsp; (see page 2 of the &nbsp; March 18th document clearly specifies that the &nbsp; questions it raises were &nbsp; not &nbsp; questions to the Engineer &nbsp; in charge of the NCRP &nbsp; (not Diavik) &nbsp; should &nbsp; review &nbsp; and &nbsp; respond &nbsp; to &nbsp; (if &nbsp; at all &nbsp; ) &nbsp; the &nbsp; Inspector &nbsp; noted &nbsp; that &nbsp; "the &nbsp; responses &nbsp; to &nbsp; the &nbsp; questions &nbsp; need &nbsp; to &nbsp; be &nbsp; professional &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &nbsp; &n...
DDMI’s response does not fully address the part of the question of what environmental consequences would or might be incurred by having 6-9 years of internal seepage into the NWR/CLR cells vs. the intended maximum uncontrolled storage duration specified by the Engineer (NWR/CLR) of less than 2 years.&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&n...
Page 3 of the WRMP provides a disclaimer indicating that information presented in the WRMP is subject to change without a requirement for WLWB/Inspector notification or approval with the exception of 3 specific items listed.

1. Please explain the rationale for this disclaimer; why does DDMI believe this is necessary? 2. If DDMI is concerned that the management plan does not provide sufficient operational flexibility, please identify all aspects of the plan that require more flexibility and explain why flexibility is needed. 3. Is DDMI proposing that even those aspects of the Plan that are required by Schedule 6.5 can be changed without Board approval?

The Waste Rock Management Plan is very specific to the Water License requirements (Schedule 6 Item 5). Key objectives of DDMI's waste rock management plan are to identify acid-generating rock and direct appropriate use/storage. Any performance, environmental and/or compliance monitoring would need to be specific to those objectives, as would the approach for evaluating the plan. For example, existing SNP and AEMP monitoring would not be direct measures of DDMI's ability to identify and generating rock and direct appropriate use. DDMI notes that including details such as identification of individuals or departments responsible for carrying out activities in a Waste Rock Management Plan (as per Section 4 of the WRMP) could be interpreted as requiring DDMI to obtain WLWB approval 90 days prior to making a staff resourcing or organizational change, as per concerns noted in response to WLWB-1. Presuming all of the suggested additional information is required as part of the Water License or other management plans, it doesn't seem necessary to repeat these in the Waste Rock Management Plan, particularly if there is no direct link to compliance with waste rock management principles. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of the Schedule (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.
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<td>4</td>
<td>WLWB: Patty Ewaschuk</td>
<td>Deviations from original design; background information</td>
<td>DDMI has placed Type III rock in areas originally designated for Type I and Type II rock. The original basis for assigning certain basins to each type of rock (Type I, II, or III) is not provided in the waste rock management plan and is not entirely clear in the original design document (2001). This makes it difficult to assess the implications of deviations from the original design.</td>
<td>1. Describe each basin (CLR, SED, etc.) and the characteristics that were considered when deciding whether PAG or non-PAG rock should be placed in that basin. 2. For each basin, discuss the rationale/strategy behind the original decision (per the 2001 design document) to place PAG or non-PAG rock in that basin. In doing so, please explain how the original (2001) rock placement strategy addressed the design criteria stated on pages 4 and 5 of the 2001 design document. 3. Describe how the deviations from the 2001 design still meet the design objectives stated in the 2001 design document. 4. Has water filled these basins and if not, when does DDMI anticipate that each basin will fill? 5. Is the water in the basins currently frozen? If not, when does DDMI anticipate this will happen? 6. Where does each basin currently report? 7. For each basin, where does DDMI anticipate that water will report post-closure?</td>
<td>Please see Attachment #1. Due to the lag in reporting and publishing from a university-led research program, the summary was based on a review of the primary data collected, personal communication with the researchers and/or a review of multiple documents. More detailed results, including references and publications, are included in the Annual Closure and Reclamation Plan Progress Report. DDMI suggests the CRP Progress Report is a more appropriate location for these more detailed results and references. Schedule 6, Item 5(g) and (h) require the inclusion of results from geochemical sampling and testing. DDMI has included additional details, including previous results and results other than geochemical testing, from the Test Pits project for context in the WRMP V7. DDMI suggests that information to support these items be better provided in the Annual Water License Report (Schedule 1, Item 1) or Annual CRP Progress Report (Schedule 6, Item 2). DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of the Schedules (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.</td>
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<td>5</td>
<td>WLWB: Patty Ewaschuk</td>
<td>Geochemistry and test pile research findings (Sections 1.3 and 5)</td>
<td>These sections do not appear to identify all reference documents that the reader may wish to consult when reviewing the WRMP.</td>
<td>Has DDMI identified all useful reference documents in this section (e.g., regarding research results, geochemical testing, etc.)?</td>
<td>Appendix B of WRMP V4-2 details the verification of the visual classification method. The data set consisted of drilled blast hole samples that were both visually logged and assayed (n=10,136). The analysis results indicated that visual classification produced few misclassifications (11%), and of those misclassifications 70% were conservative; i.e., Type I or Type II classified as Type III. DDMI notes that V4-2 was approved by the Board.</td>
</tr>
<tr>
<td>6</td>
<td>WLWB: Patty Ewaschuk</td>
<td>Waste rock segregation (Section 2)</td>
<td>There are no details on how the effectiveness of the segregation plan are verified. The segregation plan relies on visual estimates of biotite schist content. From the data provided, it is not clear how effective this approach has been.</td>
<td>Has DDMI verified that the visual classification method is effective? If not, please provide a rationale.</td>
<td>DDMI has not prepared a comparison of predicted amounts of materials versus actual but can prepare one if it would be helpful to the Board. DDMI does not believe there is value in comparing predicted amounts of Type I and II/III with actual any longer; this was only helpful early on to evaluate and refine the segregation criteria. As shown in Table 4, limited quantities of waste rock will be produced from A154 and A418 going forward. Actual quantities of A21 waste rock and till produced will be important to record but there does not appear to be a purpose relating to the WRMP in comparing predicted and actual, given there is no waste segregation for A21. Actual GPK/FPK ratios are important to record and forecast annually for each fraction in the PKC Facility. DDMI suggests this information is best retained within the PKC Facility Report (Schedule 6 Item 2) rather than the Waste Rock Management Plan. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of the Schedules (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.</td>
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<td>7</td>
<td>WLWB: Patty Ewaschuk</td>
<td>Production schedules (Section 3.2)</td>
<td>Schedule 6.5(i) requires a comparison of predicted versus measured production for the previous year. The 2015 production amounts were reported, but not compared to predicted values. Given the small volumes of rock coming from underground, this information may not be particularly useful for 2015 alone; however the Plan has not been updated since 2011; therefore this comparison was not provided for several other years as well. More broadly, comparisons of predicted amounts of materials to actual production for all years would be useful background information, and help the reader understand the context for rock management decisions that DDMI has made.</td>
<td>Has DDMI prepared a comparison of predicted amounts of materials (Type I, II, and III rock; overburden; PK) compared to actual? Does DDMI agree that this would be useful information to include in the WRMP (or if more appropriate, another required submission)?</td>
<td>DDMI has prepared a comparison of predicted amounts of materials versus actual but can prepare one if it would be helpful to the Board. DDMI does not believe there is value in comparing predicted amounts of Type I and II/III with actual any longer; this was only helpful early on to evaluate and refine the segregation criteria. As shown in Table 4, limited quantities of waste rock will be produced from A154 and A418 going forward. Actual quantities of A21 waste rock and till produced will be important to record but there does not appear to be a purpose relating to the WRMP in comparing predicted and actual, given there is no waste segregation for A21. Actual GPK/FPK ratios are important to record and forecast annually for each fraction in the PKC Facility. DDMI suggests this information is best retained within the PKC Facility Report (Schedule 6 Item 2) rather than the Waste Rock Management Plan. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of the Schedules (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.</td>
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Schedule 6.5(f) is written in such a way that only a limited number of management elements apply. The clause is focused on operational methods to limit the generation of ARD/ML rather than the operational methods to enhance/enable management/closure of any ARD/ML that is generated. DDMI's primary operational approach is to manage the long term storage of ARD/ML rock such that any drainage can be more effectively controlled. However unlike methods such as sub-aqueous disposal, DDMI's key operational methods do not limit (per se) the generation of ARD/ML. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of Schedule 6 Item 5 (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.

Schedule 6.5(a) requires the Plan to include "an annual schedule for till storage, ore stockpiling, Processed Kimberlite generation and Waste Rock production by rock type, tonnage, and destination over the term of the Project including sources and volumes of each rock type." DDMI indicates in the conformance table that this requirement is met in Section 3.2; however, that section does not indicate the destinations of any materials, till production for A21, or information about ore storage.

The conformity table indicates that these sections address Schedule 6.5(f) of the water licence, which requires: "a description of the methods that will be used to construct till storage, ore stockpiling, Processed Kimberlite, and Waste Rock facilities such that generation of acidic drainage and/or Metal Leaching is limited." The plan describes only the segregation of rock, and not the other key elements that allow DDMI to limit ARD/ML (water management, water treatment, closure cover, freezing of pile, etc.)

In Section 3.4, DDMI states that Type I rock is temporarily stored in Pond 14. DDMI's most recently submitted Water Management Plan (Version 14) indicates that Pond 14 has been decommissioned.

The Plan indicates that Type II and III rock are re-mined from the WRSA when supplies from the underground mine are not sufficient for construction purposes. It is assumed that the re-mining of these two rock types preferentially occurs from the temporary storage area on the WRSA to minimize accumulation of these rock types in the temporary pile. Also, the statement that Type II and III rock is re-mined suggests that Type II rock exists in the pile as a mineable unit distinct from Type III rock; it is not clear whether this is the case or whether all Type II is now blended with Type III rock.

1. Please clarify whether re-mining of Type II and III rock is preferentially from the temporary pile on the WRSA. 2. Please clarify whether or not all Type II rock is now blended with Type III rock or whether Type II rock exists as a mineable unit.

Please provide destinations for materials in Tables 4, 5, and 6 and provide the volume and destinations for ore storage.

Table 4. A164/A418 Underground Waste Rock. Type III rock will be used first for the PKC North Dam and then for underground fill. Type I rock will be used for general site construction.

Table 5. A21 Till and Waste rock. Till will be used for the NCRP cover with surplus stockpiled with South Country Rock Pile (SCRP). Waste rock will be used for construction and closure cover but mostly placed in the SCRP. Table 6. Processed Kimberlite. Currently all processed kimberlite goes to the PKC. DDMI will be evaluating future options of transferring PK to one or more completed underground/tilt area.

DDMI will include the current destination plans for use of these materials in Tables 4.5 and 6. However, DDMI requires flexibility in the specific volumes and destinations for material storage, in accordance with the areas outlined in Sections 3.3-3.5 of the WRMP (pending approval). DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of Schedule 6 Item 5 (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.

Schedule 6.5(f) is written in such a way that only a limited number of management elements apply. The clause is focused on operational methods to limit the generation of ARD/ML rather than the operational methods to enhance/enable management/closure of any ARD/ML that is generated. DDMI's primary operational approach is to manage the long term storage of ARD/ML rock such that any drainage can be more effectively controlled. However unlike methods such as sub-aqueous disposal, DDMI's key operational methods do not limit (per se) the generation of ARD/ML. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of the Schedules (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP.

PPR: Patty Ewaschuk
1. Please confirm that DDMI is referring to uses of Type III rock, and not simply storage. 2. Please list the possible uses of Type III rock that would meet criteria c.

1. Yes DDMI is referring to use of Type III for construction. 2. Examples would include the PKC North Dam and/or haul roads within the PKC.

1. The example already provided with 3d is the only use DDMI currently envisage that would fit into this criteria. 2. Yes, DDMI is proposing to use Type II/III rock regardless of how long it had been exposed. DDMI’s assumption was that the area was within the water management system, however it is now recognized that criteria d) does not state that the area would need to be within the water management area. This will be added in the next version of the WRMP. 3. As indicated above there would be no restriction provided the area was within the water management system.

1. Please refer to WLWB-21. 2. Internally DDMI considered ways to appropriately use Type III rock as source rock for the construction of the A21 Dike. It was considered for use where it would remain fully submerged – i.e. on the lake side of the cut-off wall and below the low water line. It was considered as a preferred method for limiting generation of ARDMIL relative to storage sub-aerially on land and was included in Waste Rock Management Plan Version 5. However during the Feasibility Study it was determined that given the A21 construction methods Type III rock could not practically be placed in the dike embankment as required. There was no such construction limitation on the buttress placement (as it is placed using a clam) and so this remained in the Technical Specifications and construction plans. DDMI had recalled the wrong version of the Waste Rock Management Plan (VR) when internally approving the construction plan. Version 5 had never been approved by WLWB and the criteria for sub-aqueous disposal was removed for Version 6 and replaced with a statement that “DDMI would apply to WLWB for approval before initiating any sub-aqueous waste rock management strategies.” DDMI did not realize this error until after the buttress had been placed. Similarly when DDMI submitted the A21 construction drawings and Technical Specifications, the WLWB was not specifically advised of this aspect of the design. 3. The A21 Construction team was subsequently directed to remove any plans to use Type III rock in 2016 and to revise the Technical Specifications. A single point of contact/responsibility (Environment Superintendent) for all site regulatory approvals was implemented to provide a greater level of administrative control.

1. No the intent of b) was to enable temporary storage. Use of this temporary stored Type III rock in construction would require conformance with other criteria, for example a). 2. Currently the only intended uses for temporarily stockpiled Type III is underground backfill and PKC North Dam.

1. Please see Figure 4 in Attachment #1. All NCRP rock outside the “Type III limit” is Type I. 2. Type II was placed in the east part of NWR as shown in Attachment 1 - Figure 4.

1. DDMI proposes the following criteria: "b) use is temporary, within the site water collection system such that any drainage can be collected and treated as necessary, and material will be removed at closure to ensure no long-term exposure of Type III waste rock in un-designated areas (see for example the temporary Type III storage area in Figure 3). Staff note that rock left exposed over an extended period of time may produce soluble oxidation products. DDMI has not proposed any limits on how long rock could be exposed before being relocated and covered.

1. Please confirm that DDMI is proposing "uses" and not just temporary storage. 2. Please identify all possible uses that would fall under this category. 3. Discuss any research or monitoring results that may indicate how long rock can be exposed before soluble oxidation products become problematic. 4. Can DDMI propose a maximum amount of time that Type III rock should be exposed before being covered? 1. Please confirm that DDMI is referring to uses of Type III rock, and not simply storage. 2. Please list the possible uses of Type III rock that would meet criteria c.

1. DDMI proposes use of Type III rock for construction if the rock will be saturated (but not placed in Lac de Gras). It is not clear what these types of uses might be. Further use of Type III waste rock that has been stored for a period of time may lead to short-term release of soluble oxidation products to water. Therefore, if the waste rock deposition is outside of the water management system, AND the waste rock has already been weathering for an extended period of time then use for subaqueous construction may result in the release of soluble oxidation products into water.

1. DDMI proposes use of Type III rock for construction if the rock will be saturated (but not placed in Lac de Gras). It is not clear what these types of uses might be. Further use of Type III waste rock that has been stored for a period of time may lead to short-term release of soluble oxidation products to water. Therefore, if the waste rock deposition is outside of the water management system, AND the waste rock has already been weathering for an extended period of time then use for subaqueous construction may result in the release of soluble oxidation products into water.
1. In the case of the A21 toe buttress and the PKC North Dam DDMI submitted the required construction drawing and specification as per Part F Item 4 that include use of Type III rock but neglected to concurrently obtain approval for changes to the Waste Rock Management Plan. DDMI accepts that this would likely be viewed as an administrative non-compliance. 2. With regard to the SEL and CLR cells DDMI accepts that there has been a lack of consistency between site operational practices communicated with the inspector during site inspections and specific of past versions of the Waste Rock Management Plan. DDMI accepts that this would likely be viewed as an administrative non-compliance. DDMI has tried to correct these in WRMP Version 7.

"Blending" is an ARD management approach that is not used at Diavik. The Test Pile program considers Type I (uncovered), Type III (uncovered) and Type III (covered). Because the segregation is based on geochemistry (%S) rather than lithology (granite or biotite schist) both Type I and Type III are by definition different blends of granite and biotite schist. However, DDMI agrees the description in the conformance table would be improved with removal of the word "blending". DDMI suggests reviewing (or removing) Schedule 6 item 5(g) as the clause does not properly describe the research program and the program is now complete. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of Schedule 6 item 5 as per Part B item 10 and/or structure of the Plan, prior to providing direction on this aspect of the WRMP. A review of temperature data collected from the <80 m deep borehole to bedrock and the 40 m deep borehole near the batter installed in the QUAR basin indicate that the active zone is approximately 7 m thick. The active zone has been ~7m thick since equilibration from drilling, suggesting that active zone thickness was established at some time prior to thermistor installation.

Additional testing/research has been initiated on processed kimberlite bedrock and the 40 m deep borehole near the batter installed in the QUAR basin indicate that the active zone is approximately 7 m thick. The active zone has been ~7m thick since equilibration from drilling, suggesting that active zone thickness was established at some time prior to thermistor installation. Additional testing/research has been initiated on processed kimberlite (PK). DDMI has included these updates in the annual CRP Progress Report (Schedule 9 Item 2), and suggests that this is... 6 Item 5 (as per Part B Item 10) and/or structure of the Plan, prior to providing direction on this aspect of the WRMP. A review of temperature data collected from the <80 m deep borehole to bedrock and the 40 m deep borehole near the batter installed in the QUAR basin indicate that the active zone is approximately 7 m thick. The active zone has been ~7m thick since equilibration from drilling, suggesting that active zone thickness was established at some time prior to thermistor installation.

The opportunity to monitor any actual NCRP seepage is described in the requirements for the Seepage Survey Report (Schedule 6 Item 6), however this requires that seepages exist. Without actual seepages to monitor the next best way to understand the potential for seepage has been with the Test Pile Research. Instrumentation installed within the NCRP is helpful for understanding thermal conditions but not seepage as the rock is frozen - i.e. no free water.

The conformity table indicates that Section 5 of the Plan contains results of geochemical sampling and testing during the preceding year. It is not clear whether the results from the test pile are the only results that were generated since approval of Version 6 of the WRMP in 2011. Please indicate whether the university test pile program investigated different blends.

Are there any other results of geochemical sampling and testing from 2011 to 2015?

DDMI lists storage locations of Type III rock in Table 7. Some of these locations were not in the approved WRMP. Part H Item 7 requires DDMI to follow the WRMP. Part F Item 5 requires that rock used in construction meet geochemical criteria in the WRMP.

1. Does DDMI agree that the company was out of compliance with Part H, Item 7 when it placed Type III rock in the A21 toe buttress, the PKC North Dam, and the CLR and SEL basins of the WRSA? 2. Does DDMI agree that the company was out of compliance with Part F, Item 5 when it used rock in the A21 toe buttress and the PKC North Dam?

21 On-site locations of Type III rock (Table 7, Section 3.5)

DDMI: Patty Ewaschuk

The conformity table indicates that Section 5 contains a description of the temperature analysis in the waste rock storage area. There is some information on the thermal monitoring from the test piles, but none from the WRSA.

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Please provide an evaluation of the potential effects of temporary Type III rock storage on the underlying Type I rock.

24 Testing and sampling (Section 5, Schedule 6.5(j))

DDMI: Patty Ewaschuk

Board staff note that the only SNP sampling for waste rock storage area seepage is... potential for drainage from the Type III rock to affect underlying material such is that there are no longer appropriate for use in covers. Some examples would be precipitation of secondary minerals or depletion of NP in the underlying materials. Water quality data from the Type III test piles may provide an indication as to whether this is or is not a concern.

In DDMI's view, are there opportunities to better monitor WRSA seepage?

Can DDMI propose additional SNP stations to monitor WRSA seepage?

25 SNP sampling stations

Letter from DDMI to Tracy Cover (April 19, 2016), response to question 1

The response addresses potential water management and closure cost implications of... the PKC North Dam. The CLR and SEL cells DDMI accepts that there has been a lack of consistency between site operational practices communicated with the inspector during site inspections and specific of past versions of the Waste Rock Management Plan. DDMI accepts that this would likely be viewed as an administrative non-compliance. DDMI has tried to correct these in WRMP Version 7.

"Blending" is an ARD management approach that is not used at Diavik. The Test Pile program considers Type I (uncovered), Type III (uncovered) and Type III (covered). Because the segregation is based on geochemistry (%S) rather than lithology (granite or biotite schist) both Type I and Type III are by definition different blends of granite and biotite schist. However, DDMI agrees the description in the conformance table would be improved with removal of the word "blending". DDMI suggests reviewing (or removing) Schedule 6 item 5(g) as the clause does not properly describe the research program and the program is now complete. DDMI welcomes an opportunity to discuss improvements for regulatory clarity regarding requirements in the management plan, including possible amendment of Schedule 6 item 5 as per Part B item 10 and/or structure of the Plan, prior to providing direction on this aspect of the WRMP. A review of temperature data collected from the <80 m deep borehole to bedrock and the 40 m deep borehole near the batter installed in the QUAR basin indicate that the active zone is approximately 7 m thick. The active zone has been ~7m thick since equilibration from drilling, suggesting that active zone thickness was established at some time prior to thermistor installation.

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The conformity table indicates that Section 5 contains a description of the temperature analysis in the waste rock storage area. There is some information on the thermal monitoring from the test piles, but none from the WRSA.

Please describe the temperature analysis in the waste rock storage area.

23 Temperature Analysis (Section 5, Schedule 6.5(k))

Letter from DDMI to Tracy Cover (April 19, 2016), response to question 1

The letter includes an enclosure by Golder Associates clarifying their role on matters related to waste rock management at the site. The letter notes that DDMI retained Golder Associates for a third party review of the ARD risk at the Diavik Mine in August 2012 as part of an internal review. The findings of this were not presented.

Can DDMI provide the results of Golder's review?

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<table>
<thead>
<tr>
<th>ID</th>
<th>Reviewer</th>
<th>Topic</th>
<th>Comment</th>
<th>Recommendation</th>
<th>Proponent Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>WLWB: Patty Ewaschuk</td>
<td>Use of consultant</td>
<td>The WLWB hired SRK Consulting to assist with the review of WRMP Version 7. SRK and Board staff jointly prepared the WLWB staff comments and recommendations.</td>
<td>NA; No response required.</td>
<td></td>
</tr>
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</table>
Storage Cell Summary (Attachment 1)
<table>
<thead>
<tr>
<th>Storage Cell</th>
<th>Till</th>
<th>QUAR</th>
<th>CLR</th>
<th>SED</th>
<th>CLAR</th>
<th>NWR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special Characteristic</td>
<td>• none</td>
<td>• formed by the quarry developed in 2000-2002 for A154 dike construction.</td>
<td>• bound on the west by the east dam by the original sedimentation pond</td>
<td>• bound on the east by the east dam of the original sedimentation pond.</td>
<td>• bound to the northwest by the clarification pond dam</td>
<td>• none</td>
</tr>
<tr>
<td>Original Rock Type</td>
<td>• till</td>
<td>• Type III</td>
<td>• Type I</td>
<td>• Type II</td>
<td>Type III</td>
<td>Type II</td>
</tr>
<tr>
<td>Storage Rationale</td>
<td>• proximity to pit</td>
<td>• maximize use of available internal water storage</td>
<td>• access for re-mining</td>
<td></td>
<td>maximize use of water storage capacity</td>
<td>maximize use of collection pond</td>
</tr>
<tr>
<td>Deviation from Original Rationale</td>
<td>• none</td>
<td>• none</td>
<td>• temporary storage of Type III</td>
<td>• placement of Type III</td>
<td>• none</td>
<td>added areas of Type I</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• proximity for re-mine to crusher</td>
<td>• less Type II than predicted</td>
<td></td>
<td>• less Type II than predicted</td>
</tr>
<tr>
<td>Water Status</td>
<td>• no ponded water</td>
<td>• frozen but depth of ponded water is unknown as moisture content probes do not measure when frozen</td>
<td>• no ponded water</td>
<td>• ponded water to about 438m elevation (full)</td>
<td>• ponded water to about 434m elevation (full)</td>
<td>• no ponded water</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• unknown time to fill</td>
<td></td>
<td>• uncertain depth of ice</td>
<td>• frozen</td>
<td></td>
</tr>
<tr>
<td>Current Drainage</td>
<td>Pond 13, North Inlet, A154 Pit, Lac de Gras</td>
<td>Internal</td>
<td>Pond 1</td>
<td>Pond 3</td>
<td>Pond 3</td>
<td>Pond 2</td>
</tr>
<tr>
<td>Post-Closure Drainage</td>
<td>Lac de Gras</td>
<td>Lac de Gras</td>
<td>Lac de Gras</td>
<td>Lac de Gras</td>
<td>Lac de Gras</td>
<td>Lac de Gras</td>
</tr>
</tbody>
</table>
Figure 1. NCRP “Storage Cells” from NKSL (2001).

Figure 2. Natural Drainage Basins – NCRP Area.

Figure 3. Pre-Development View – NCRP Area.
Figure 4. Current Limit of Type II/III with Original Storage Cell Boundaries from Figure 1
Summary of Findings – Golder Associates Ltd. ARD Review (Attachment 2)
4.0 2012 ARD RISK REVIEW

Two issues of high importance (i.e. significant findings) were identified during the 2012 review. In addition, two issues of moderate importance and six issues of low importance were identified. These are described in the following sections.

Significant Findings

Operational and Post-Closure Impact of PKC

Issue ranked as High: The PKC is a crucial component of any operational or closure plan aimed at preventing/minimizing environmental impacts. However, the understanding of operational and post-closure effects from the PKC is currently limited. Improving DDMI’s knowledge of the PKC will be particularly critical for predicting post-closure behavior.

The importance of the PKC in terms of the project’s environmental performance during operation and post closure is recognized by all DDMI staff that participated in the review. It is also recognized that the PKC represents a complicated system that is only partially understood. To remedy the knowledge gaps, a number of activities are recommended below. There is considerable overlap between these activities as all are ultimately aimed at understanding that portion of the PKC that is most likely to contribute to environmental impacts.

- Continue the characterization program for pore water and PK that is currently being executed by Alberta Innovates Technology Futures (AITF). This program involves in situ and laboratory measurement of many pertinent geochemical and physical characteristics of the PKC and PK, as well as a large-scale testing program of PK under known conditions.

- The active zone of the PKC is the most critical in terms of possible releases to the environment. A better definition and understanding of the active zone is recommended as follows:
  - Thermal conditions play an important role in establishing the active zone. Modeling of thermal behavior of the PKC is recommended to understand current conditions and simulate post-closure scenarios.
  - In parallel with an evaluation of the active zone, it is recommended that fate and transport analyses be conducted for a select number of parameters of potential environmental concern. This will support a better definition and understanding of the active zone, and help identify potential future issues of concern with regard to water quality impacts downgradient from the PKC.
  - A large amount of historic water quality data is available from monitoring locations in and downstream from the PKC, and continues to be generated as part of DDMI’s water quality monitoring program. However, relatively little effort is expended in terms of data interpretation. A more rigorous and comprehensive use of available water quality monitoring data for PKC and downstream area is recommended to increase DDMI’s understanding of the PKC and its behavior. Examples of such use include statistical analysis of water quality trends, evaluating relationships between chemical parameters, or geochemical modeling to identify possible release and/or attenuation mechanisms and predict future conditions.
**Re-Mining of NCRP for Backfill and Other Purposes**

Issue ranked as **High**: The NCRP will be re-mined for backfill and likely for other purposes, such as material for cover construction. Two issues were identified during the review:

- Proper identification of Type I vs. Type III material for re-use.
- The final shape of NCRP should not be compromised with respect to permafrost behavior.

**Proper Identification of Type I vs. Type III Material**

Re-mining of the NCRP will occur to extract material for underground backfilling and construction, such as covers. Underground backfill can consist of both Type I and Type III material and, therefore, segregation by material type is not required. However, when waste rock is used for construction purposes, it is imperative that only Type I be used to prevent reactive material from being distributed across the site in potentially uncontrolled settings.

To avoid inappropriate use of Type III waste rock, the following is recommended:

- Based on existing information, verify the existing "block model" for the NCRP to evaluate its accuracy and reliability in terms of properly locating the three types of waste rock within the pile.
- If the reliability of the block model is expected to be insufficient, develop a method for verifying the classification of the re-mined waste rock prior to its re-use. In concept, these methods would be very similar to those used during operation of the open pits and underground, i.e. visual identification and analysis of total sulfur analysis.

**Maintain Permafrost Protection**

The long-term environmental performance of the NCRP is to a large degree premised on the presence of permafrost throughout the pile. This, in turn, requires the presence of a pile geometry that promotes and maintains permafrost conditions. As waste rock is removed from the NCRP, it is important that the future performance of the permafrost is not compromised. It is recommended that an optimal final shape of the NCRP is ensured through an assessment of the dump geometry required to meet the permafrost requirements after re-mining and closure.

**Other Findings**

**More Rigorous and Comprehensive Interpretation and Use of Available Water Quality Monitoring Data**

Issue ranked as **Moderate**: A wealth of information is available in the existing and future water quality data set. However, there does not appear to be a systematic and comprehensive evaluation of these data.
As was already mentioned in the context of the PKC, the ongoing water quality monitoring program generates a significant amount of data, and will continue to do so throughout operation. However, relatively little effort is expended in terms of data interpretation. A more rigorous and comprehensive use of available water quality monitoring data for the site and downstream area is recommended. Although it is recognized that the site represents a complicated system, with many confounding factors that may hinder data interpretation, such an evaluation could improve DDMI’s understanding of a number of issues including, but not limited to, the following:

- Geochemical behavior (fate and transport) of constituents of interest
- Geochemical behavior of waste rock and PK
- Hydraulics of the PKC and downstream area (and possibly the NCRP as well)
- Effects of water management practices on PKC water quality

In addition, a greater understanding of the hydrogeochemical conditions on site would improve the function of the water quality monitoring program as an “early warning system” for possible non-compliance.

**Management of Water Quality Issues Related to the PKC**

Issue ranked as **Moderate**: DDMI does a commendable job monitoring and anticipating potential impacts from the PKC through water level measurements, water quality measurements, and visual observation. However, there is no formal system in place that ensures a timely response to an observed or anticipated impact.

Responses to observed or anticipated water quality impacts appear to be somewhat ad hoc, and instigated on a case-by-case basis by technical staff. Examples of such responses conducted to date include installation of a sump, reparation of liner tears, capture of seepage through interception wells, and active management of water between the ponds downgradient from the PKC.

Since establishment of the PKC Committee, the process for responding has improved, but a more formal and structured approach is recommended, for instance in the form of a Trigger Action Response Plan (TARP). Through a TARP, roles and responsibilities of appropriate DDMI staff would be established, thereby avoiding or minimizing reliance on the more informal and impromptu approach to management of water quality issues currently being practiced.

**Establish Realistic Expectations Regarding the Findings and Termination of the Test Pile Program**

Issue ranked as **Low**: The test pile program currently underway is very comprehensive, and has a high degree of sophistication. It will unquestionably lead to findings that have significant relevance to closure issues for the NCRP, and will also enhance the industry’s general understanding of waste rock and cover behavior in an arctic environment. However, as with all testing, there are limitations in terms of the test piles’ ability to simulate operational conditions. In addition, an “end point” for the test pile program should be established to avoid the expectation that this program will continue in perpetuity.
It is important to manage expectations with regard to the usefulness and applicability of the test pile results to operational and post-closure conditions of the NCRP. Due to limitations inherent to any sort of testing, it needs to be understood by all stakeholders that the piles are not perfect analogues for the operational and closed NCRP, but are intended to understand the sensitivity of waste rock pile hydraulic and geochemical behavior to a range of conditions, including cover systems. Also, it needs to be recognized that, even if the final cover design for the NCRP is not actually present on any of the test piles, results from the covered test piles can be extrapolated to other cover systems.

It is further important to decide on an “end point” for the test pile program to avoid testing in perpetuity. Reasons for termination can be technical, economic, and/or practical, but need to be communicated to all stakeholders in a timely manner to avoid unrealistic expectations by stakeholders, in particular regulators, regarding the duration of the test pile program. In the absence of a clear rationale for termination, it may be difficult to convince stakeholders that the test pile program was not ended prematurely.

**Role of Cryoconcentration in the Chemical Evolution and Movement of seepage for the NCRP and PKC**

Issue ranked as **Low**: Very little mention is made of cryoconcentration in the DDMI documentation that was made available for the review, even though permafrost is heavily relied upon for post-closure environmental protection. Cryoconcentration is a critical aspect of the anticipated post-closure performance of the NCRP and PKC, in particular with regard to environmental protection. However, the documentation made available for the review contained very little technical detail in terms of cryoconcentration. Due to cryoconcentration, the quality of NCRP and PKC pore water and seepage may deteriorate, possibly necessitating additional controls with regard to seepage management. In addition, the presence of more saline pore water “pockets” may adversely affect the freezing behavior in the NCRP and PKC, thereby promoting seepage pathways and chemical reactivity within the facilities.

A screening-level evaluation of the possible effects of cryoconcentration is recommended to address these potential issues related to seepage quality, freezing behavior, and hydraulic control. Based on the findings of this high-level assessment, the need for a more detailed investigation may be identified.

**Post-Closure Pit Water Quality**

Issue ranked as **Low**: Pit dewatering water qualities, as well as operational and closure pit lake water qualities, were presented in Blowes and Logsdon (1997) and Blowes and Logsdon (1998), respectively. A preliminary pit lake study for the A154 mine pit was conducted in 2010, with a focus on pit lake limnology and prediction of total dissolved solids (TDS) levels and water temperature (Golder 2010). Given the importance of pit water quality and stratification after pit inundation, a high-level re-evaluation is initially recommended to determine whether lake stratification and water quality for pit A154 need to be revisited in light of the availability of significant additional geochemical data, and whether pit A418 needs to undergo a similar exercise.
Pit dewatering water qualities are presented in Blowes and Logsdon (1997), and operational and closure pit lake water qualities are provided in Blowes and Logsdon (1998). In Golder (2010), surface water inflows and groundwater inflows to the pit are based on results from DDMI’s Aquatic Effects Monitoring Program and baseline groundwater data (also prior to mine development), respectively. The purpose of this work was to address pit lake mixing and stratification.

Although a re-evaluation of pit lake conditions may not result in different conclusions with respect to pit lake water quality and limnology, a high-level re-assessment of both pit lakes is recommended. More recent geochemical data, both from operational pit and underground dewatering and the test pile program should be used to assign water qualities to groundwater inflows and pit wall runoff into the pit. Should it be identified that the updated screening-level findings differ substantially from earlier predictions, a more formal and in-depth evaluation may be needed.

**Characterization of Material from Pit A21**

Issue ranked as **Low**: Despite the uncertain future of mining in pit A21, a formal waste rock characterization program should be implemented.

Although future operation of pit A21 has yet to be decided, it seems prudent to conduct a formal waste rock characterization program in anticipation of possible activities. It is our understanding that some static testing has already been completed and long-term testing (kinetic testing) has been proposed. It is recommended to implement a comprehensive testing program to proactively determine the geochemical characteristics of the A21 waste rock. The existing static testing information should be reviewed for completeness in terms of spatial and compositional representativeness, and the proposed long-term testing program may need to be augmented for the same reason.

**University Involvement in DDMI Studies**

Issue ranked as **Low**: The involvement of universities in studies at DDMI serves many purposes and should be encouraged. However, a few drawbacks may exist that need to managed such that they do not impede DDMI in its operation and planning.

DDMI is to be commended for its collaboration with academic institutions, in particular with regard to the test pile program. In addition to the positives, a few negatives were identified by DDMI staff, including a lack of timeliness of analytical results and reporting, scope creep, and presentation of results in a fragmented and discontinuous fashion. To the extent practicable, expectations should be set by DDMI, and the universities involved should be held to those expectations to avoid jeopardizing timely closure planning as well as any operational decisions that may be premised on the results of any ongoing investigations that involve universities.
Analysis of Fluoride in Water Quality Samples

Issue ranked as Low: Fluoride (F) is included in the analytical suite for the Water License W2007L2-0003 Monthly SNP Report, but not for any of the individual water quality monitoring locations. Because the analysis of fluoride may support interpretation of phosphorus results, inclusion of fluoride in the analytical suite is recommended.

Fluoride can be enriched in kimberlites, where it occurs primarily in apatite \([\text{Ca}_5(\text{PO}_4)_3(\text{OH,F,Cl})]\). Recent samples of underground mine water have indicated increases in concentrations of phosphorus, which also occurs in apatite. Therefore, analysis of fluoride may provide additional insight in the likely provenance of this phosphorus, as well future phosphorus and fluoride concentrations that can be expected over time once their origin has been determined.
Technical Memorandum – Geoscientist/Geochemist Response to Comments on the Waste Rock Management Plan v7 (Attachment 3)
1 Scope and Qualifications


Lianna Smith holds a M.Sc. in geochemistry, is a Professional Geoscientist registered as a practicing member with the Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists (NAPEG), and is the Principal of Lianna Smith Consulting. Ms. Smith has been evaluating Diavik waste rock for over 10 years and worked for Diavik Diamond Mines as an employee from 2007 to 2013.

David Blowes holds a Ph.D. in geochemistry, is the Principal of Sala Groundwater, is a Canada Research Chair and professor at the University of Waterloo, and is the Principal Investigator of the Test Piles research project at Diavik. Dr. Blowes has over 30 years of environmental geochemistry experience and has served on numerous acid rock drainage advisory panels world-wide. Dr. Blowes jointly prepared the Diavik Geochemistry Baseline Report (1998) and is considered a distinguished expert in the field of mining-related environmental geochemistry.

2 Responses to selected comments

ID: 14
Reviewer: GNWT - Lands: Tracy Covey

Topic:
Enclosure 1. Inspector concern #1.

Comment:
DDMI’s response does not fully address the part of the question of what environmental consequences would or might be incurred by having 6-9 years of internal seepage into the NWR/CLR cells vs. the intended maximum uncovered storage duration specified by the Engineer (NKSL) of less than 2 years. The possibility should be considered that not-covering cells adjacent to PAG storage cells would/could
allow much more water than was originally intended/planned for from contacting PAG in cells adjacent to the NWR/CLR cells.

This concern is based on several comments by NKSL (2001), including the following: “Type III rock will be stored into two “tub” cells and covered with an impermeable cover long before climatic water saturates the bottom rock layer and reached the “tub” perimeters” (p. 22). “Type III rock will be placed in “tub” depressions as described...the covers will be placed no later than 2 years after the cells are filled...during the time before the cover is in place, it is estimated that the climatic infiltrated water will saturate the rock at the bottom of the cells to about 3m...note that the total depth of the “tub” is about 20 m” (p. 63).

Recommendation:
Discuss what the environmental consequences of 6-9+ years vs. less than 2 years might be on PAG storage objectives, both short and long term. Include a discussion of the estimated degree of saturation of the bottom rock layer & buffer distance (if any) from the perimeters of the tubs in all cells with PAG rock storage (CLAR, QUAR, CLR)

Proponent response:
Enclosure 1, Inspector comment #1: refers to the temporary storage of Type III waste rock in the CLR cell (Figure 3 of WRMP V7), designated for permanent Type I storage (Section 3.3 of WRMP V7).

The Type III storage objectives are to segregate Type III waste rock and store it in separate areas of the NCRP, and to ensure the NCRP is designed to allow collection of surface runoff and seepage from the dump to reduce the likelihood that poor quality seepage enters Lac de Gras. The closure configuration for Type III areas of the NCRP is to re-contour to a 3H:1V slope, place a 1.5 m thick till layer and a 3 m thick Type I cover.

As the inspector suggests, when waste rock (of any Type) is stored under ambient conditions meteoric water will recharge the waste rock. Waste rock mined from open pits or underground has a very low initial moisture content. Waste rock piles must attain a minimum moisture content, the "field capacity", before recharge will create drainage; this accumulation of water within the waste rock pile is commonly referred to as the “wet-up” phase. The duration of the wet-up phase depends on the recharge rate (which depends on rainfall/precipitation, temperature, solar radiation, wind speed, and the characteristics of the recharge surface), the height of the rock pile and the internal temperature of the rock pile.

For example, the wet-up phase for the full thickness of the 13 m high Test Pile was observed to be 62 months for the test pile that was exposed to natural precipitation (as opposed to the test pile that had extra water applied by the researchers; Fretz 2013). Based on this wet-up rate, the full thickness of the Type III waste rock stored in the CLR cell (approximately 30 m), or any other waste rock in the NCRP, would not attain field capacity in six to nine years, thus the bottom of the pile would not be fully saturated. Using the wet-up rate of 0.21 m/month from the Test Piles research program, the thickness of the waste rock that would attain field capacity after six years and nine years is 15.1 m and 22.6 m (Figure 1). The volume of waste rock in the
The active zone and at field capacity could produce seepage at the base (in the active zone) if recharge rates were sufficiently high, particularly during spring freshet.

The active zone thickness will be determined by permafrost aggradation within the NCRP. Data collected as part of the Test Piles research program suggests that permafrost has formed within the NCRP, aggrading from the base. For example, thermistors installed as part of the Test Piles research program to approximately 80 m (to bedrock), and 40 m near the batter in uncovered Type III in the QUAR basin of the NCRP indicate permafrost conditions (temperatures always below 0°C) have developed below a depth of about 7m in 10 years or less of initial waste rock placement. Under these conditions, water that recharges the waste rock would be retained as ice within waste rock that is always below 0°C and would not report as seepage. DDMI has indicated that no seepage has been observed from the NCRP.

Figure 1: Conceptual sketch (to scale) of a cross section the 30 m high Type III pile in CLR after (a) six years in situ and (b) nine years in situ. The grey core represents Type III that would not have attained field capacity and is likely to be under permafrost conditions within 6-9 years of placement. The hatched grey/blue areas represent Type III that could have attained field capacity, but is likely under permafrost conditions. The solid blue areas represent Type III that has attained field capacity and that is in a 7 m thick active zone. The area to the right of the dashed green lines indicates the proportion of the Type III that would have attained field capacity in a 7 m thick active zone and could contribute to seepage at the toe. The area to the right of the dashed orange lines indicates the proportion of Type III that would have attained field capacity and could contribute to seepage if the active zone thickness was greater than the thickness of Type III that attained field capacity (permafrost did not limit flow). The difference in thickness of the field capacity depth on the slopes compared to the crest is due to vertical flow of water compared to the orthogonal influence of air temperature (active zone thickness).

The NKSL calculations and proposed benefits of installing a cover system within two years waste rock placement assumed a greater amount of recharge and that the cover system would be impermeable to water. Observations and modelling from the Test Piles research suggests that a till layer + Type I cover system is not necessarily impermeable, but it does act to moderate internal temperatures that permit and promote permafrost formation within the core and cover system, and that the active zone does not penetrate the till layer even under a warming climate scenario. These calculations and observations, based on in situ field
observations and measurements from the on-site Test Piles research program, suggest that the original calculations and assumptions by NKSL were not representative of the conditions at Diavik.

Although constructing a cover system sooner would be beneficial by reducing the active zone thickness and maintaining the active zone in the Type I cover, we suggest that the current configuration and would achieve the Type III storage objectives prior to being covered (i.e. in the short term). Provided the site collection pond system and water treatment plant are in operation, there would be a low risk of Type III seepage having deleterious impacts on the environment because the long wet-up phase as a result of initially low moisture content, permafrost encapsulation, low annual recharge rates would not produce large volumes of seepage water, and any seepage water produced would be captured in the collection pond system (Pond 1) and treated at the NIWTP before discharge to the environment. Similarly, it would not be expected that seepage from adjacent Type I waste rock would impact seepage quality or quantity from Type III waste rock. Removing the Type III in the CLR basin would achieve the long-term storage objective. Covering the Type III areas per the proposed closure design would maintain the active zone in the cover system and encourage permafrost formation, as suggested by the observations and modeling results from the Test Piles research, thus achieving Type III storage objectives in the long-term.

ID: 15
Reviewer: GNWT - Lands: Tracy Covey

Topic:
Enclosure 1. DDMI response to Inspector concern #2. "There was no plan to cover non-PAG rock and the NWR/CLR cells were not expected to be dry"

Comment:
See Comment 14

Recommendation:
See Comment 14

Proponent response:
Enclosure 1, Inspector concern #2 refers to the storage of uncovered Type I waste rock for 6-9+ years, subjecting the Type I to weathering and increased seepage.

As DDMI described in their response to Enclosure 1, Concern #2, the planned closure configuration for the Type I areas of the NCRP is uncovered at angle of repose, or “as-is”.

Although Type I rock is non-acid generating, oxidation and weathering will still release constituents to porewater, which can be released as seepage when the field capacity is exceeded. Concentrations of operational Effluent Quality Criteria (EQC) parameters were calculated for various closure configurations and are described in “Predictions of Seepage
Quality from the North Country Rock Pile at Closure” (Appendix II-5 of the 2013 ICRP Progress Update). The calculations for the Type I areas for an angle-of-repose, uncovered sections (as-is), with a 7 m thick active zone are summarized in Table 1. It was noted in the seepage prediction report that during the approach verification the operational EQC parameters Cu and Zn appeared to be over-estimated by 5-10x due to prediction method, differences in active zone geometries and/or geochemical behaviour (e.g. sorption).

Table 1: Predictions of seepage quality for EQC parameters from Type I

<table>
<thead>
<tr>
<th>Type I at angle of repose, 7 m thick active zone on slopes and crest (no cover system)</th>
<th>Average annual mg L⁻¹</th>
<th>mg L⁻¹</th>
<th>mg L⁻¹</th>
<th>mg L⁻¹</th>
<th>mg L⁻¹</th>
<th>mg L⁻¹</th>
<th>mg L⁻¹</th>
<th>mg L⁻¹</th>
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<tr>
<td></td>
<td>Al</td>
<td>As</td>
<td>Cd</td>
<td>Cr</td>
<td>Cu</td>
<td>Ni</td>
<td>Pb</td>
<td>Zn</td>
</tr>
<tr>
<td>NWR West (T1)</td>
<td>0.00016</td>
<td>0.012</td>
<td>0.00070</td>
<td>0.00068</td>
<td>0.16</td>
<td>0.15</td>
<td>0.0051</td>
<td>0.15</td>
</tr>
<tr>
<td>CLR (T1)</td>
<td>0.00007</td>
<td>0.012</td>
<td>0.00070</td>
<td>0.00067</td>
<td>0.16</td>
<td>0.15</td>
<td>0.0050</td>
<td>0.15</td>
</tr>
</tbody>
</table>

ID: 16
Reviewer: GNWT - Lands: Tracy Covey

Topic:
Enclosure 1. DDMI response to Inspector concern #3. "DDMI is not aware of any impacts of PAG rock in the SED cell on achieving closure objectives"

Comment:
Not being aware of impacts doesn’t preclude the possibility or likelihood that there are or might in the future be impacts or consequences of this storage deviation. It would be prudent to know what (if any) consequences a qualified engineer would have with regards to this deviation from the approved design.

Recommendation:
Have a qualified engineer comment on the possibility or likelihood of environmental consequences related to prolonged (greater than 2 yrs.) storage of PAG in the SED cell.

Proponent response:
Enclosure 1, Inspector concern #3 refers to storage of Type III waste rock in the SED cell in the NCRP, a cell not originally designated to contain Type III waste rock.

Permanent storage of Type III waste rock in the SED cell would require the cell be covered according to the approved closure plan for Type III waste rock, which is currently a 1.5 m till layer and 3 m Type I cover. Observations and modelling of the thermal behavior of the NCRP from the Test Piles research suggest that an active zone would remain in the cover system and not penetrate the Type III material under current climate conditions as well as a warming climate scenario. Seepage predictions (Appendix II-5 of the 2013 ICRP Progress Update) suggest concentrations of dissolved constituents would be lower in a cover scenario compared to Type III exposed to ambient conditions. During operations, when the Collection Pond system is
operational, any seepage would be collected and treated prior to discharge to the environment. During operations, closure and post-closure, the likelihood of Type III in the SED cell causing deleterious environmental impacts would be the same as the Type III stored in the QUAR and CLAR cells.

**ID:** 19  
**Reviewer:** GNWT - Lands: Tracy Covey

**Topic:**  
Enclosure 1. DDMI response to Inspector concern #8. "DDMI is not aware of negative impacts of not placing the closure cover within 2 years. ...placement of a cover would have reduced the amount of low quality seepage that needed to be managed during operations.

**Comment:**  
See response 16. The same comments, concerns, and recommendations which were discussed in response 16 to the SED cell apply to the deviations identified in Enclosure 1, question 8 responses (i.e., consequences for the PAG island, the use of PAG in construction, much greater water infiltration to PAG and non-PAG storage areas of the N.C.R.P).

**Recommendation:**  
Have a qualified engineer comment on the possibility or likelihood of negative environmental consequences resulting from prolonged storage of rock (i.e., longer than 2 years) in the N.C.R.P., the use of PAG in construction at several locations on the mine site, and the storage of PAG (type III) rock for a prolonged period in the CLR cell.

**Proponent response:**  
The storage of Type III waste rock in the NCRP without a cover for more than two years during operations has been discussed in the responses to ID#14 and ID#16, above.

Type III waste rock should not be used indiscriminately for construction material on-site, but could be warranted under some circumstances.

The use of Type III waste rock for cemented rock fill to be placed underground permanently is advantageous because it encapsulates and removes a quantity of Type III waste rock from subaerial exposure and weathering, and reduces the volume of Type III waste rock that requires a closure cover.

The use of Type III waste rock for construction of some portions of the PKC dam that are within the SED and CLAR basins, i.e. NCRP basins that currently contain Type III waste rock, is considered neutral. If the Type III waste rock was not used for dam construction, it would have been deposited in the SED, CLAR and/or QUAR basins of the NCRP. Based on the current ICRP, all of these areas containing Type III waste rock will be covered with 1.5 m of till and 3 m of Type I.

The temporary storage of Type III waste rock in the CLR cell is discussed in the response to ID#14.

Subaqueous storage of waste rock and tailings is typically a preferred method to limit sulfide oxidation and associated seepage. The effects of permanently placing Type III waste rock in
Lac de Gras (as a toe buttress for the A21 dike) can be evaluated with respect to subaqueous seepage rates from Diavik waste rock <6.3 mm, as reported in the 1998 Diavik Water Quality Estimate report. The 0-28 day leach rates from the kinetic tests for EQC parameters from granite and biotite schist in lake water with temperatures of 5 °C are summarized in Table 2. Early-time leach rates are typically higher than later time as accumulated reaction products are flushed from the system, thus using the 0-28 day leach rates for calculations can be considered conservative.

With the exception of copper (Cu), nickel (Ni), and zinc (Zn), the leach rate of EQC parameters is lower from biotite schist than from granite. Cu, Ni and Zn leached from the biotite schist are primarily derived from the sulfides occurring in the biotite schist. As an example, Type III waste rock with 0.08 wt.% S would be comprised of 50% granite and 50% biotite schist containing 0.16 wt.%S, the mean sulfide content of biotite schist measured during geochemistry baseline program; Type I with the upper sulfide concentration of 0.04 wt.%S would be comprised of 75% granite and 25% biotite schist with 0.16 wt.%S.

Using these lithological blends, the 0-28 day release rates from the baseline study, the as-built volume of the A21 to buttress (converted to mass) that is submerged, and the planned volume of Type I submerged in the A21 dike, and the average lake temperature of 5°C, the subaqueous release rates for the A21 dike with the Type III toe buttress and an A21 dike if Type I had been used for a toe buttress were calculated and summarized in Table 2. These calculations assumed that the subaqueous release rates from large (>6.3 mm) particles are the same as from particles <6.3 mm on a per mass basis. Smaller size fractions are more reactive than large boulders, and the 0-28 day release rates are higher than for later-time release rates thus these estimates should be considered conservative.

The calculation results suggest that the release rates are similar from both scenarios for the A21 dike. Release rates are marginally higher in an all-Type I dike for aluminum (Al), arsenic (As), cadmium (Cd), chromium (Cr), lead (Pb), and nitrite-nitrogen (NO2-N) whereas release rates for a Type I dike with the Type III toe buttress are marginally higher for Cu, Ni and Zn.

<table>
<thead>
<tr>
<th>Table 2: Subaqueous leach rates for EQC parameters</th>
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<tbody>
<tr>
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<td>--------------------------</td>
</tr>
<tr>
<td>Al</td>
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<td>Cu</td>
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<tr>
<td>Pb</td>
</tr>
<tr>
<td>Ni</td>
</tr>
<tr>
<td>NO2-N</td>
</tr>
<tr>
<td>Zn</td>
</tr>
</tbody>
</table>
ID: 26  
**Reviewer:** Patty Ewaschuk

**Topic:** Letter from DDMI to Tracy Covey (April 19, 2016), response to question 1

**Comment:** The response addresses potential water management and closure cost implications of Type III rock placement in the CLR basin of the WRSA, but it does not consider the potential for drainage from the Type III rock to affect underlying material such that it is no longer appropriate for use in covers. Some examples would be precipitation of secondary minerals or depletion of NP in the underlying materials. Water quality data from the Type III test piles may provide an indication as to whether this is or is not a concern.

**Recommendation:**
Provide an evaluation of the potential effects of temporary Type III rock storage on the underlying Type I rock.

**Proponent response:**
The Type I portion of the cover approved for NCRP Type III closure is part of the cover system that limits active zone thickness to maintain freezing and thawing within the cover system. The effectiveness of Type I to maintain the active zone within in the cover system would not be affected by any geochemical changes. For example, the thermal conductivity and permeability properties of Type I and Type III are essentially identical (Pham et al. 2013).

The geochemical effects of drainage from Type III rock on underlying Type I rock depends on the quantity and timing of seepage, which in turn depends on the pile geometry, moisture content, and duration of exposure (for example see response to comment #14). At this time, we understand that the only location where Type III is stored on Type I is in the CLR cell. As addressed in the response to comment #14, a limited volume of Type III waste rock would likely contribute to seepage.

Results from the Test Piles research indicate that drainage chemistry from the basal drain of the Type III test pile is more dilute during the early part of the season as a result of snow melt and batter flow. As the thaw-season progresses, concentrations increase and pH decreases, and flow decreases (Smith et al. 2013, Sinclair 2015, Bailey et al. 2016). The pH of the leachate ranges from 4 – 8 and buffering by aluminum hydroxides and ferric oxyhydroxides appears to be occurring times when the carbonate alkalinity has been depleted (Smith et al. 2013, Sinclair 2015, Bailey et al. 2016).

For secondary sulfate minerals, geochemical equilibration calculations using PHREEQCi and/or MINTEQA2 indicate the drainage water was typically undersaturated with respect to gypsum. Bailey et. al (2016) presented equilibrium modelling results that suggested supersaturation with respect to jarosite, which can be a source of acid and trace metals in drainage water when it re-dissolves. Although jarosite was briefly observed in the Type III humidity cells (before being re-dissolved; pers. comm), extensive precipitation of jarosite within the Type III test pile is unlikely. At the times when the drainage water was calculated to be supersaturated with respect to jarosite the pH of the drainage water was >5.5, conditions under which precipitation of Fe(III) (oxy)hydroxide phases is favoured, limiting jarosite formation. Similarly, basaluminite can be a source of acidity and trace metals when re-dissolved, and the drainage water was calculated to be supersaturated with respect to this phase at pH >4.5. In this pH range precipitation of Al
oxyhydroxide is favoured limiting formation of basaluminite. Basaluminite has not been observed by mineralogical studies of the Diavik waste rock, suggesting the effects of basaluminite precipitation and dissolution in acidity and trace metal transfer would not be important.

The depletion of neutralizing minerals, principally calcite, on underlying Type I from acidic drainage of overlying Type III could occur. However, the extent of depletion would be limited to times when Type III drainage is acidic, which is also times of lower flow (Sinclair 2015). Type III drainage discharge to underlying Type I is not likely to cause drainage from the Type I to attain trace metal concentrations or pH levels on the order of those observed in Type III drainage. Type III material contains a larger amount of the sulfide-bearing (principally pyrrhotite) biotite schist, which is the source of most of the acidity and many of the trace metals observed in the Type III drainage.

Given the likely limited amount of seepage from overlying Type III (i.e. in the CLR cell), we suggest that any depletion of neutralization potential, or the effect of secondary mineral precipitation/dissolution on underlying Type I would not preclude the use of Type I for cover material.
References


Type III Buttress Drawing (Attachment 4)
NOTES:
1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ACCOMPANYING DRAWINGS AND TECHNICAL SPECIFICATIONS. THE CONTRACTOR SHALL IMMEDIATELY NOTIFY THE ENGINEER SHOULD UNCERTAINTIES ARISE WITH THE DRAWINGS, SCOPE, AND/OR TECHNICAL SPECIFICATIONS.
3. BASE TOPOGRAPHIC DATA BASED ON CHALLENGER SURVEY OPERATIONS 1997. BATHYMETRY DATA SHOWN ARE FROM CORI SURVEY OPERATIONS JULY / AUGUST 1999, WITH 1995 / 1996 CHALLENGER SURVEY DATA USED TO FILL IN WHERE REQUIRED. CONTOUR INTERVAL IS 1.0 m
4. PROJECTION IS UTM NAD 83 ZONE 12.
5. TOE BERM TOE IS DESIGNED TO INTERSECT THE TILL LAYER, HOWEVER SHOWN IS THE INFERRED LAKEBED SURFACE. TOE IS APPROXIMATE AND TO BE FIELD FIT.
6. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING SHALL NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES OR LOSS ARISING IN ANY WAY FROM ANY USE OR MODIFICATION OF THIS DOCUMENT NOT AUTHORIZED BY BGC. ANY USE OF OR RELIANCE UPON THIS DOCUMENT OR ITS CONTENT BY THIRD PARTIES SHALL BE AT SUCH THIRD PARTIES' SOLE RISK.
Re-mine Locations Drawing (Attachment 5)
Type I
Re-Mine South

Type I
Re-Mine West

Type I/III
Re-mine
INTRODUCTION

Further to your request we are pleased to provide our review comments on Version 7 of the DDMI Waste Rock Management Plan submitted to the Wek’eezhii Land and Water Board on 31 March 2016. The background documents reviewed as part of the scope of work included:

- Diavik WRMP Version 7
- Part F, Item 5, Part H, Item 7, and Schedule 6, Item 5 of Water Licence W2015L2-0001
- GNWT Inspector Reports dated November 27, 2015, February 1, 2016, and February 24, 2016
- WLWB letter of April 7/16 stating Decision and Reasons for Decision for approving DDMI’s proposed modification to the North Dam of the PKC.

BACKGROUND INFORMATION

In October 2015, the GNWT inspector noted that DDMI was not placing waste rock in accordance with its approved Version 6 Waste Rock Management Plan. Specific issues identified included:

- Unapproved deposition of Type III waste rock (potentially acid generating rock) into the clean rock storage cell (CLR Cell)
MEMO

- Unapproved deposition of Type III waste rock within the SED Cell (designated for sediments and Type II rock storage)
- Unapproved deposition of Type III waste rock in the Waste Rock Storage Area 3, which is adjacent to the PKC Facility North Dam.
- Non-conformance with the areal limits for placement of waste rock materials as specified in the Version 6 Waste Rock Management Plan.

The inspector requested that DDMI provide:

1. An up-to-date map showing actual, current storage locations of rock/till/sediment in the NCRP. It was requested that the map be to scale and include a legend.

2. An estimate of the timing/schedule of re-mining of the current Rock Pile through to the time when a revised Waste Rock Management Plan (Version 7) is approved (or as far into the future as is practical). It was noted that a corresponding map or diagram illustrating when/where re-mining will be occurring would be ideal.

3. A summary of the rationale/justification for the deviations from the Detailed Design Storage Report and potential consequences (if any).

Subsequent review determined that DDMI had also placed Type III waste rock in additional unauthorized areas which included:

- the toe buttress of the A21 dike
- the Phase 5 and Phase 6 PKC North Dam raises

DDMI requested in December 2015 a modification to the North Dam construction that permits use of Type III waste. This plan was previously reviewed by Arcadis (memo to J. McCullum 11 February 2016). The primary concern identified at that time was the rationale for placement of acid-generating waste in a clean area and the potential effect on seepage quality at closure. Arcadis viewed this plan as acceptable if the closure plan was revised to assure covering the Type III rock in the North Dam with 1.5 meters of till and 3 meters of Type I rock. We understand, based upon comments in the Board’s Reason for Decision in the approval of the use of Type III waste in the PKC Facility North Dam, that DDMI has agreed to apply the cover and will include this change in the Version 4 Closure Plan Update due in December 2016. It is unclear from the design drawings whether all Type III waste will be covered.

The Version 7 update of the Waste Rock Management Plan was requested by the Wek’éezhii Land and Water Board to update the Version 6 plan to include all items in Schedule 6.5 of the Water Licence. This includes:

a) an annual schedule for till storage, ore stockpiling, processed kimberlite generation and waste rock production by rock type, tonnage, and destination over the term of the Project, including sources and volumes of each rock type;

b) geochemical decision criteria for managing waste rock extracted from quarries and pits. Criteria will facilitate classification of rock which is suitable and not suitable for the following uses in terms of acid generation and heavy metal leaching potential:
   a. construction of on-land roads and facilities;
   b. construction in Lac de Gras;
MEMO

c. reclamation;
d. disposal in waste rock piles; and,
e. segregated as potentially acid generating rock.

c) a description of operational procedures that will be used to segregate and manage the rock that is identified for construction;
d) a complete description, including site maps to scale, of each till, ore and Waste Rock Storage Area, including the PKC Facility;
e) a description of the sampling design and analytical methods that will be used to support the operational classification of all rock types;
f) a description of the methods that will be used to construct till storage, ore stockpiling, processed kimberlite, and waste rock facilities such that generation of acidic drainage and/or metal leaching is limited;
g) design details for the construction of large-scale tests for assessing the effectiveness of blending different combinations of biotite schist and granite. The Licensee shall undertake these tests as and when approved by the Board;
h) a description of the temperature analysis that will be implemented in all Waste Rock Storage Areas having Acid Rock Drainage (ARD) potential to evaluate the potential for oxidation reactions and to determine predicted ARD generation rates;
i) a comparison of predicted and measured quantities of each rock type produced in the preceding year;
j) results of geochemical sampling and testing of till, ore, processed kimberlite, and waste rock produced during the preceding year;
k) geochemical characteristics of each rock type and area of exposure in the current pit wall(s);
l) updated predictions of the water chemistry of the leachate from the waste rock based on measured results, from all sources; and,
m) the results and interpretation of any additional geochemical testing on various rock types or processed kimberlite.

DDMI RESPONSE TO INSPECTOR REPORTS

DDMI has provided a detailed response to issues raised during the November 27 Water Board Inspection Report (by Inspector Tracy Covey). The responses are thorough and appear to address all issues raised by the Inspector. DDMI did make some additional commitments regarding the Inspector’s concerns over the storage of uncovered PAG rock on the surface of the CLR Cell for 6 to 9+ years.

DDMI proposed action regarding the storage of the uncovered PAG:

i) describe in Version 4 of the Interim Closure and Reclamation Plan (ICRP) the actions to be taken in the event of a premature closure;

ii) describe in the Version 4 ICRP the actions to be taken at closure if this stockpile still exists; and,

iii) include a provision in the next RECLAIM update to cover the cost of closing this area.
FINDINGS OF THE REVIEW

The following are our findings:

1) The Version 7 Waste Rock Management Plan appears to be responsive to both the inspector’s orders and the conditions of the licence.

2) The use of Type III waste in the buttress of Dike A21 within Lac de Gras would appear to be non-compliant with placement condition d) of the DDMI Version 7 Plan which states Type III rock may be used only when “the construction area is not within Lac de Gras”.

3) The maps and descriptions of the disposal areas are provided; however, it is unclear where future Type III waste is to be placed. Based upon Table 4, there is only 0.73 Mt of Type III waste rock remaining to be mined from the underground workings. Where will this waste be placed?

4) DDMI has identified total quantities of waste rock to be produced but has provided no information on the location, size and quantity of waste rock for the South Dump.

IMPLICATIONS FOR MINE CLOSURE

DDMI has completed intensive monitoring, modelling and investigations on the effects of mine waste at closure. With the approved cover of 1.5 m till and a cap of 3 m Type I waste over Type III waste, it is apparent that ARD will be controlled and that seepage quality should meet EQC levels. However, it is our understanding that the effects of Type III waste placed in the North Dam of the PKC or placed in the A21 buttress have not been specifically modelled. DDMI should provide data on seepage quality and potential effects of the Type III waste disposed in these areas to confirm no impacts are expected.

It is our opinion, based upon the data provided, that the Version 7 Waste Rock Management Plan is consistent with the approved closure plan and modification as proposed should not materially affect closure.

RECOMMENDATIONS

1) DDMI should provide data on seepage quality and potential effects of the Type III waste disposed in the A21 Buttress. DDMI should ensure that all Type III waste rock in the PKC North Dam is capped with till and Type I waste. It is unclear from the design report and drawings whether all Type III rock in the North Dam will be capped.

2) DDMI should clarify where the 0.73 Mt of Type III waste is to be place during the 2016 to 2017 period.

3) DDMI should provide information on the location, size and quantity of waste rock for the South Dump.

4) DDMI should ensure that Version 4 of the ICRP addresses actions proposed for addressing the storage of uncovered PAG on the surface of the CLR Cell for 6 to 9+ years.
Violet Camsell-Blondin  
Chair  
Wekeezhii Land and Water Board  
#1-4905 48th Street  
Yellowknife, NT  
X1A 3S3

Dear Ms. Camsell-Blondin,

Re: Diavik Diamond Mine Inc.  
Water Licence – W2015L2-0001  
Waste Rock Management Plan Version 7  
Request for Comment

The Department of Environment and Natural Resources, Government of the Northwest Territories has reviewed the plan at reference based on its mandated responsibilities under the Environmental Protection Act, the Forest Management Act, the Forest Protection Act, the Waters Act and the Wildlife Act and provides the following comments and recommendations for the consideration of the Board.

**Topic 1: Physical Stability**

**Comment(s):**

The Waste Rock Management Plan Version 7 (the Plan) notes the physical stability of the placed mine rock is not within the scope of the plan.

ENR notes that the Plan describes how waste rock will be assessed, handled and disposed. Part of the disposal process includes placing the rock in the Waste Rock Pile which is a structure that has its own geotechnical properties.

ENR is unclear why DDMI cannot make a comment in the Plan that rock will be placed in the rock pile that meets stability requirements as will be required in Waste Rock Pile designs and associated rock slope requirements.

**Recommendation(s):**

1) ENR recommends that a general statement about how rock will be placed should be provided in the plan that aligns with the Waste Rock Pile design.
Topic 2: A21 Geology

Comment(s):

Section 1.2 includes details on the geology of A154N, A154S and A418 but does not mention A21. It is anticipated that rock from A21 will be used in any covers designed for the Waste Rock Pile and as such some reference to the Geology should be provided.

Recommendation(s):

1) ENR recommends that a brief description on the geology of A21 is included in Section 1.2. The description should be proportionate to the scale and scope of the use of A21 rock.

Topic 3: A21

Comment(s):

Table 5 states that all mine rock from A21 is expected to be Type I however there doesn’t seem to be any contingency for rock segregation in the event that some waste rock from A21 is Type III.

Recommendation(s):

1) ENR requests that DDMI provide some statements of how A21 waste rock will be assessed and disposed in the event that a small portion of the rock is PAG.

2) ENR recommends that a description of the A21 rock pile be included in the plan.

Topic 4: Mine Life

Comment(s):

Table 6 includes information on the mine life for Diavik which notes that processed kimberlite will be produced until 2024. Recent news reports notes that:

“A report released earlier this month by Rio Tinto, the majority owner and operator of Diavik, suggests that thanks to that increase, Diavik’s mine life could be extended past its long-touted end date of 2023.

“Diavik’s life of mine plan is to have consistent production past 2023. Doing so would result in Diavik successfully achieving, and potentially exceeding, the high end of its projected mine life,” the report stated.

It is unclear if any decisions related to extension of mine life have been finalized. If so, an update to the Plan, and other applicable plans, will be required.

Recommendation(s):

1) ENR requests that DDMI provide an update on any potential extension of mine life. If mine life has been extended, DDMI should indicate if an update to the Waste Rock Management Plan will be required.

Topic 5: Mine Rock in Construction

Comment(s):

Section 3.5 outlines the criteria that must be met before Type II/III have been met, which include:

a) use in the production of cemented rock fill (CRF) to be permanently placed in the underground;

b) use is temporary, within the site water collection system such that any drainage can be collected and treated as necessary, and material will be removed at closure to ensure no long-term exposure of Type III waste rock in un-designated areas (see for example the temporary Type III storage area in Figure 3);

c) the construction area is within a drainage basin that already contains Type II/III waste rock such that closure designs for Type III waste rock will be applied (for example the North PKC Dam);

d) the construction area is not within Lac de Gras but the Type II/III waste rock will remain water-saturated, which reduces oxygen exposure and subsequent sulfide oxidation and AMD production (INAC 2007; Environment Canada 2009) (for example road construction within the PKC that will become buried and water-saturated); and/or

e) as specified in construction design drawings approved by the WLWB (for example under Part F Item 4).

ENR believes that construction at the mine site should be completed using Type I rock only. However, in some circumstances, following a request for approval, other rock types may be used for construction purposes. However, this should only occur if it is approved. ENR requests that this section of the Plan be revised to indicate that PAG rock will not be used for construction unless approval is received from the WLWB prior to its use.
Recommendation(s):

1) ENR recommends that this section of the Plan be revised to state that construction at the mine site should be completed with rock which has the approved geochemical criteria associated with Type I rock. In some instances, other rock types may be used for construction purposes, following a request and approval of the WLWB.

Topic 6: Closure Conditions

Comment(s):

ENR notes that general information about closure of the Waste Rock Pile should be included in this section. ENR is of the opinion that specific details about closure of the Waste Rock Pile are considered to be outside the scope of this Document (e.g. closure cover thickness, closure criteria, seepage water quality, etc.). These items are to be part of the Closure Reclamation Plan which is guided by reclamation research.

Recommendation(s):

1) ENR recommends that DDMI remove specific details about closure of the Waste Rock Plan such as cover thickness, closure criteria, etc. as they are outside the scope of the Plan (similar to physical stability).

Topic 7: Geochemical Segregation Criteria

Comment(s):

Page 2 of the April 19th, 2016 DDMI Memo (the memo) outlines variances from the original design report to the North Country Rock Pile development. Of note, one of the items listed refers to a change of the geochemical segregation criteria. It is unclear if this relates to specific approvals received from the Board or an operational decision made by DDMI.

ENR recalls the only change to the Waste Rock Plan being the grouping of Type II rock with Type III which was requested by DDMI. Rationale provided was that the amount of Type II rock was small making the segregation impractical from a rock handling perspective.

Recommendation(s):

1) ENR requests clarification on differences between the original design report of the North Country Rock Pile (NCRP) and the development of the NCRP as it relates to geochemical segregation criteria.
Topic 8: PAG Rock Storage

Comment(s):

The GNWT inspector outlined concerns related to the storage of uncovered PAG rock for an extended period (6-9 years) on the surface of the CLR cell. DDMI responded that this material will used for underground backfill but there may be consequences including runoff during operations (into Pond 1), a chance that all material will not be used for backfill and a potential for pre-mature mine closure before.

Regarding the runoff, it was stated that this could be addressed in future revisions of the the Plan.

Regarding the premature closure eventuality and/or the potential of stockpiled PAG, DDMI has stated that this will be addressed in Version 4 of the Interim Closure and Reclamation Plan and a provision will be included in the next RECLAIM update to cover the cost.

Recommendation(s):

1) ENR recommends that the procedures for handling runoff from stockpiled PAG material be included in any revised iteration of the Plan.

2) ENR notes that it will review the provision in the security estimate for Type III rock that is stored on the surface of the CLR as part of the ICRP (v.4) as proposed by DDMI.

Topic 9: PAG Rock Placement

Comment(s):

DDMI notes that PAG rock placement in the SED cell in addition to the two designated cells, CLAR and QUAR, has direct implications on closure costs. It is unclear if this is currently reflected in liability estimates or if DDMI is proposing that this be reflected in the next RECLAIM update, similar to references regarding the stockpile.

Recommendation(s):

1) ENR recommends that DDMI clarify if closure implications related to the placement of PAG rock in the SED cell will also be addressed in Version 4 of the ICRP and in the RECLAIM estimate
Comments and recommendations were provided by ENR technical experts in the Water Resources Division and the North Slave Region and were coordinated and collated by the Environmental Impact Assessment Section, Conservation, Assessment and Monitoring Division (CAM).

Should you have any questions or concerns, please do not hesitate to contact Patrick Clancy, Environmental Regulatory Analyst at (867) 767-9233 Ext: 53096 or email patrick_clancy@gov.nt.ca.

Sincerely,

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