29 May 2018

Assol Kubeisinova
Technical Advisor, NWB
P.O. Box 119
Gjoa Haven, NU X0B 1J0

RE: Mary River Project – Mine Site Crusher Pad Expansion
Modification Request No. 1
Water Licence 2AM-MRY1325

Baffinland Iron Mines Corporation (Baffinland) provides the following notification to the Nunavut Water Board (NWB) in response to the Decision[1] reached under Motion No. 2017-A1-007 for the Type "A" Water Licence 2AM-MRY1325, Amendment No. 1 (Type A Water Licence). Attached are the design drawings and technical brief for the changes proposed to the Crushing Pad Sedimentation Pond in response to the Indigenous and Northern Affairs Canada (INAC) recommendation[2] and subsequent review comments[3]. Additionally, Baffinland has provided responses to the comments received from the Qikiqtani Inuit Association (QIA)[4]

Baffinland contracted Golder Associates (Golder) to prepare responses to the concerns raised by INAC with respect to the design of the sedimentation pond (Attachment No. 1). In the attached response, Golder confirms that the design submitted in August 2017 (Attachment No. 2) is considered adequate based on the approved design criteria, the review of the site specific climate and hydrology data, and the site operating procedures. Baffinland's responses to the concerns raised by QIA are provided as Attachment No. 3.

[1] NWB (2017) Licence No. 2AM-MRY1352, Type "A" – Modification Request by Baffinland Iron Mines Corporation to Expand the Mary River Mine Site Crusher Pad and Associated Structures. 26 May 2017, File No. 2AM-MRY1325/G 1 Modification
[2] INAC (2017a) Indigenous and Northern Affairs Canada's (INAC) comments on Baffinland Iron Mines Corporation's modification request for expanding crusher pad under under water licence #2AM-MRY1325 Amendment #1 – Mary River Project. 9 May 2017
[3] INAC (2017b) Indigenous and Northern Affairs Canada's (INAC) comments on Baffinland Iron Mines Corporation's modification request for the Mine Site Crusher Pad Sedimentation Pond Expansion under water licence #2AM-MRY1325 Amendment #1 – Mary River Project. 10 November 2017.
[4] QIA (2017) Re:2AM-MRY1325 Mine Site Crusher Pad Sedimentation Pond Expansion Modification Request.

We trust that this notification satisfies the requirements of the NWB Decision issued 26 May 2017, for Baffinland to provide design drawings thirty (30) days prior to implementation for stakeholder review. As these drawings were provided on 27 September 2017 for review, Baffinland is confident the attached responses address the concerns raised by INAC and the QIA. Baffinland thanks all stakeholders for providing their feedback on the submission and looks forward to successful implementation of this design. Please do not hesitate to contact the undersigned should you have any remaining questions or comments.

Regards,

Christopher Murray
Environmental & Regulatory Compliance Manager

Attachments:

Attachment 1: Golder – Response to INAC's Letter Dated November 10, 2018 Regarding Baffinland's Proposed Crusher Pad Sedimentation Pond Expansion, Mary River Project.
Attachment 2: Golder - Crusher Pad Sedimentation Pond Expansion Detailed Design Brief
Attachment 3: Baffinland Responses to QIA Comments Received 7 November 2017

Cc: Fai Ndofor (Qikiqtani Inuit Association)
Karen Kharatyan (NWB)
Ian Parsons, Wajid Daouda, Spencer Dewar (INAC)
Grant Goddard, Megan Lord-Hoyle, Andrew Vermeer (Baffinland)

Attachment No. 1

Golder – Response to INAC's Letter Dated November 10, 2018 Regarding Baffinland's Proposed Crusher Pad Sedimentation Pond Expansion, Mary River Project.

GOLDER

May 9, 2018 Project No. 1775699-8000-Rev 0

Rodney Fagan
Baffinland Iron Mine Corp.
2275 Upper Middle Road East, Suite 300
Oakville Ontario
Canada L6H 0C3

RESPONSE TO INAC'S LETTER DATED NOVEMBER 10, 2017 REGARDING BAFFINLAND'S PROPOSED CRUSHER PAD SEDIMENTATION POND EXPANSION, MARY RIVER PROJECT

Dear Rodney,

As requested by Baffinland Iron Mines Corp. (Baffinland), Golder Associates Ltd. (Golder) has prepared this letter in response to Indigenous and Northern Affairs Canada (INAC)'s letter dated November 10, 2017 with regards to the "Crusher Pad Sedimentation Pond Expansion Detailed Design Brief" (Golder 2017a) that was prepared for Baffinland for their Mary River Project. INAC reviewed the design brief and provided comments and recommendations regarding the sedimentation pond containment, the design criteria used and the pond water management. This letter addresses the recommendations from INAC.

INAC's Recommendation:

INAC recommends that prior to modifying the pond, the licensee provide clarity on the initial size of the crusher pad, the size of the pad following the 10% increase and the current pond capacity. These are critical to being able to evaluate if the proposed pond capacity increase is adequate.

Response:

The areas and volumes presented in the August 29, 2017 design brief (Golder 2017a) are correct. Simplified assumptions were made in the April 5, 2017 memo (Golder 2017b) to evaluate the pond capacity and additional survey data was provided by Baffinland for the detailed design of the Crusher Pad Pond as presented in the August 29, 2017 design brief (Golder 2017a). Further clarification is provided in Attachment A - Section 1.0.

INAC's Recommendation:

We recommend that the licensee provide a discussion on the continued use of the 2013 Design Criteria without modification, including if incorporation of meteorological data gathered since 2013 would alter the estimated rainfall intensity, and if disregarding freshet flows when designing containment ponds is appropriate.

Response:

- Based on INAC's recommendation, Golder reviewed the available site climate data from the local meteorological station. Four years of hourly records of rainfall are available from the meteorological station installed at the Mary River Mine site and operated by Baffinland. The local records were compared against regional records, which are only available for coastal sites operated by Environment and Climate Change Canada (Pond Inlet and Clyde River climate stations). Golder found that there is a lack of correlation

between the precipitation data on the coastal sites and the Mary River Mine site meteorological data. Additionally, given the short period of concurrent (or near-concurrent) rainfall data available and the rarity of high-intensity events, a statistically acceptable relationship between elevation and extreme rainfall could not be developed at this time.

Knight Piésold (2012) proposed a set of sub-daily rainfall Intensity-Duration-Frequency (IDF) statistics for the Mary River Mine site based on IDF statistics for the Clyde River and Pond Inlet climate stations. These sub-daily rainfall IDFs are presented in the Hatch Design Criteria Report (2013). Although no details are provided in Knight Piesold (2012) regarding the methodology applied to develop the rainfall statistics, it was observed that the rainfall intensities proposed for the Mary River Mine site are much higher than the rainfall intensities for the two coastal stations obtained from Environment Canada rainfall IDF data. For the 1 in 10 year, 24 hour storm event used for design, the Mary River Mine site rainfall intensity is 42% to 55% higher. Details of this analysis are provided in Attachment A – Section 2.1.

It is also noted that the runoff resulting from the 1 in 10 year, 1 day snowmelt event (11 mm) derived by Golder from streamflow analysis (Attachment A - Section 2.2) is significantly lower than the runoff resulting from the 1 in 10 year, 24 hour storm event used in the design (36.7 mm considering the design runoff coefficient of 0.9 and rainfall intensity of 1.7 mm/hr). Based on these findings, Golder considers the Hatch (2013) design criteria for the rainfall intensity still valid for this pond design.

- Although there is no explicit requirement in the approved design criteria for the freshet flows, Golder reviewed the pond capacity and Baffinland's operating procedures with respect to various snowmelt events. Golder used local streamflow data to estimate runoff resulting from snowmelt events for return periods of 2, 5 and 10 years, and event durations ranging from 1 day to 105 days (refer to Attachment A - Section 2.2). The pond design capacity, as presented in the August 29, 2017 design brief (Golder 2017a), is sufficient to contain 12.9 days, 5.7 days and 3.9 days of runoff during snowmelt events with a return period of 2, 5, and 10 years, respectively. Based on Baffinland's operating procedures to have water quality test results within a 2-3 day period and then proceeding to pump and release the water, the design capacity and operating practice are considered adequate to contain the volume of water reporting to the pond for the 1 in 10 year snowmelt event.

INAC Recommendation:

INAC recommends that the licensee update the Surface Water and Aquatic Ecosystem Management Plan to explicitly include management practices necessary to meet the assumptions used for pond design.

Response:

Baffinland will update the Surface Water and Aquatic Ecosystem Management Plan in the next revision to include management practices of the Crusher Pad pond.

Conclusion:

The rainfall IDF statistics used to calculate the pond volume and presented in the Hatch (2013) design criteria report are considered to be still valid. No update is recommended at this stage, but, as the length of rainfall record at the Mary River climate station increases, Golder recommends that the new data be used to verify every two or three years the adequacy of the rainfall IDF statistics used for design.

The water management pond at the Crusher Pad was sized considering the runoff resulting from the 1 in 10 year, 24 hour storm event. Longer duration runoff events corresponding to the spring freshet were evaluated for comparison purposes. The results show that the proposed pond capacity can contain the runoff volume resulting from the 1 in 10 year, 3.9 day snowmelt event. Following discussions with Baffinland, we understand

that the water quality is analysed before release to the environment resulting in the need to contain water in the pond for a few days prior to discharge (typically two to three days). The pond capacity to contain the 1 in 10 year, 3.9 day snowmelt event should be sufficient to allow Baffinland to test for water quality prior to release.

The pond is to be operated near empty to provide containment for the design precipitation events. Baffinland is also to ensure that the means to discharge the water from the pond to the environment do not re-suspend the sediments that where deposited in the pond. Baffinland will update the Surface Water and Aquatic Ecosystem Management Plan in the next revision to include management practices of the Crusher Pad sedimentation pond.

In conclusion, the design presented in the Detailed Design Brief (Golder 2017a) is considered adequate based on the approved design criteria, the review of the site specific climate and hydrology data, and the site operating procedures.

Golder Associates Ltd.

Francis Filion
Water Resources Consultant

Luis Vasquez, M.Sc.
Senior Water Resources Specialist

Ken Bocking, P.Eng.
Principal

Michelle Tyldesley
Project Manager

FF/MJT/LV/KAB/sk

https://golderassociates.sharepoint.com/sites/11387g/shared documents/phase 8000 pond design criteria/inac response letter/rev 0/1775699-8000-rev0 inac response letter_09may2018.docx

References:

Golder (Golder Associates Ltd.) 2017a. Crusher Pond Sedimentation Pond Expansion Detailed Design Brief, Mary River Project, Nunavut. August 29, 2017.

Golder, 2017b. Crusher Pad Expansion Detailed Design Brief, Mary River Project, Nunavut. Golder Associates Ltd. April 17, 2017.

Golder, 2018. A Hydrological Study to Support Pond Design Calculations at the Mary River Mine, Baffin Island, Nunavut. Issued to Baffinland. 6 February 2018.

Hatch (Hatch Ltd.) 2013. Civil Design Criteria. Hatch Project No. H349000. Issued to Baffinland. 28 August 2013.

Hatch (Hatch Ltd.) 2015. Crusher Pad Sedimentation Pond, Earthworks & Drainage Plan, Mary River Project. Drawing No. H349001-4385-10-035-0001. Issued for Construction. 27-Mar-2015.

Knight Piesold 2012. Baseline Hydrology Report. Report No. NB102-181/30-7 Rev. 1. Issued to Baffinland. 4 January 2012.

ATTACHMENT A

Supporting Information

1.0 SEDIMENTATION POND CAPACITY

The inconsistencies of the crusher pad area and capacity of the sedimentation pond between the April 17, 2017 and August 29, 2017 technical memoranda are explained below. The review carried out on the existing pond sizing for the Crusher Pad Expansion (April 17, 2017) was a high level review of the current pond capacity, and the August 29, 2017 technical memorandum was the design brief for the sedimentation pond and the values presented are considered applicable to the design. The values presented in the design brief supersede those presented in the April 17, 2017 technical memorandum. The following table summarizes the differences between the values presented in the Design Briefs:

Table 1: Summary of Inputs for the April 17, 2017 and August 29, 2017 Design Basis

Parameter	April 17, 2017 Crusher Pad Expansion Design Brief	August 29, 2017 Crusher Pad Sedimentation Pond Design Brief	Comments
Initial Crusher Pad size	89,000 m^2	89,000 m^2	The area was not referenced in April 17, 2017 Design Brief, however 89,000 m^2 was used in the calculations
Crusher Pad expansion	8,350 m^2	18,500 m^2	Original area provided by Baffinland 8,350 m^2 vs. design area in IFC drawings 12,500 m^2 + additional area requested by Baffinland 6,000 m^2 for the future potential crusher pad extension west
Current pond capacity	3,490 m^3	2,750 m^3	The volume 3,490 m^3 was estimated based on the design drawings (Hatch 2015). For the detailed design, a volume of 2,750 m^3 was calculated from an as-built survey dated May 2017-05-22 provided by Baffinland.
Pond capacity necessary for 10% pad expansion	3,972 m^3	3,947 m^3	The volume 3,972 m^3 was calculated without applying a runoff factor whereas during detailed design a runoff factor of 0.9 was used as per the approved design criteria (Hatch 2013). This is the reason why the area is greater but the required volume is less.

2.0 DESIGN CRITERIA AND POND WATER MANAGEMENT

INAC commented on the use of the Hatch Design Criteria developed in 2013. Since 2013, Baffinland has collected local meteorological data. INAC also commented that the design brief did not evaluate spring freshet flows. Rainfall statistics used for design and spring freshet runoff are discussed separately in the following sections.

2.1 Rainfall

2.1.1 Available Data

The design of the Crusher Pad pond expansion completed by Golder used the Knight Piésold (2012) set of sub-daily rainfall Intensity-Duration-Frequency (IDF) statistics for the Mary River Mine site, which were based on IDF statistics for the Clyde River and Pond Inlet coastal climate stations operated by Environment and Climate Change Canada (ECCC). These sub-daily rainfall IDF statistics are also presented in the Hatch Design Criteria Report (2013). The 1 in 10 year, 24 hour rainfall intensity event used for design was 1.7 mm/hr.

Four years of hourly records are available from the meteorological station installed at the Mary River Mine site and operated by Baffinland. The Mary River Mine site is located at an elevation approximately 500 m higher than the elevation of the Clyde River and Pond Inlet regional climate stations. The records are continuous between August 2013 and October 2017. Monitored variables include: air temperature, relative humidity, solar radiation, wind velocity, wind direction, and rainfall. Snowfall is not measured.

2.1.2 Validity of Rainfall Statistics used for Design

While long-term climate data in the vicinity of the Mary River Mine site are unavailable, Baffinland has a climate monitoring station with four years of complete rainfall records. Golder analysed the climate data collected at the Mary River Mine site (local station) to verify the validity of the rainfall intensity design value of 1.7 mm/hr. The analysis of the data was performed by Golder (2018) and the observations resulting from this analysis include:

- While the temperature regimes at the local and at the coastal stations are similar (Figure 1), the precipitation regimes are very different. Seasonal rainfall appears to be higher at the local station (Figure 2), but the difference changes from year to year and not enough years of record are available to establish a robust correlation. Individual local rainfall events are not correlated in timing and intensity with rainfall events on the coast (Figures 3 and 4). No local snowfall or snowpack information is available, so these observations cannot be extended to winter precipitation regime. Based on the lack of correlation, it is concluded that the information reviewed by Golder does not support a direct transformation of precipitation statistics from Clyde River and Pond Inlet regional climate stations to the Mary River Mine site.
- Albeit based on only four years of record, there are indications that annual maximum daily rainfall at the Mary River Mine site may be comparable to values measured at the coastal stations. Pond Inlet values were more similar to Mary River Mine site values than Clyde River, whose records were lower than Mary River Mine site for two out of four years (Figure 5).
- The most direct approach to estimate extreme rainfall for the Mary River Mine site would be to use short-duration measured rainfall (such as maximum annual rainfall over 24 hours) at the climate stations to establish a relationship between extreme rainfall and elevation. However, given the short period of concurrent (or near-concurrent) rainfall data available and the rarity of high-intensity events, a statistically acceptable relationship between elevation and extreme rainfall could not be developed at this time.
- As indicated before, Knight Piésold (2012) proposed a set of sub-daily rainfall IDF statistics for the Mary River Mine site based on the IDF statistics for the Clyde River and Pond Inlet regional climate stations. These sub-daily rainfall IDF statistics are presented in the Hatch Design Criteria Report (2013). Although no details are provided in Knight Piesold (2012) regarding the methodology applied to develop the rainfall statistics, it was observed that the rainfall intensities proposed for the Mary River Mine site are much higher than the rainfall intensities for the two coastal stations obtained from ECCC rainfall IDF data (Table 2). For the 1 in 10 year, 24 hour storm event used for design, the Mary River Mine site rainfall intensity is 42% to 55% higher. No update of the rainfall statistics for the mine site is recommended at this stage, but, as the length of record at the Mary River Mine site climate station increases, Golder proposes that the data be used to verify the validity of the proposed rainfall IDF statistics for design.

Table 2: Comparison of Extreme Rainfall Intensity between the Mary River Mine Site and Regional Climate Stations for 24 hour Duration Storm Events

Return Period	Clyde River Station[1]	Mary River Mine Site[2]	Difference	Pond Inlet Station[1]	Mary River Mine Site[2]	Difference
	Rainfall Intensity (mm/hr)			Rainfall Intensity (mm/hr)		
2 year	0.6	1.0	67%	0.7	1.0	43%
5 year	1.0	1.4	40%	1.0	1.4	40%
10 year	**1.2**	**1.7**	**42%**	**1.1**	**1.7**	**55%**
25 year	1.6	2.1	31%	1.4	2.1	50%
50 year	1.8	2.4	33%	1.5	2.4	60%
100 year	2.1	2.7	29%	1.7	2.7	59%

[1] Rainfall intensity obtained from IDF analysis developed by ECCC.
[2] Rainfall intensity presented in Knight Piesold (2012).

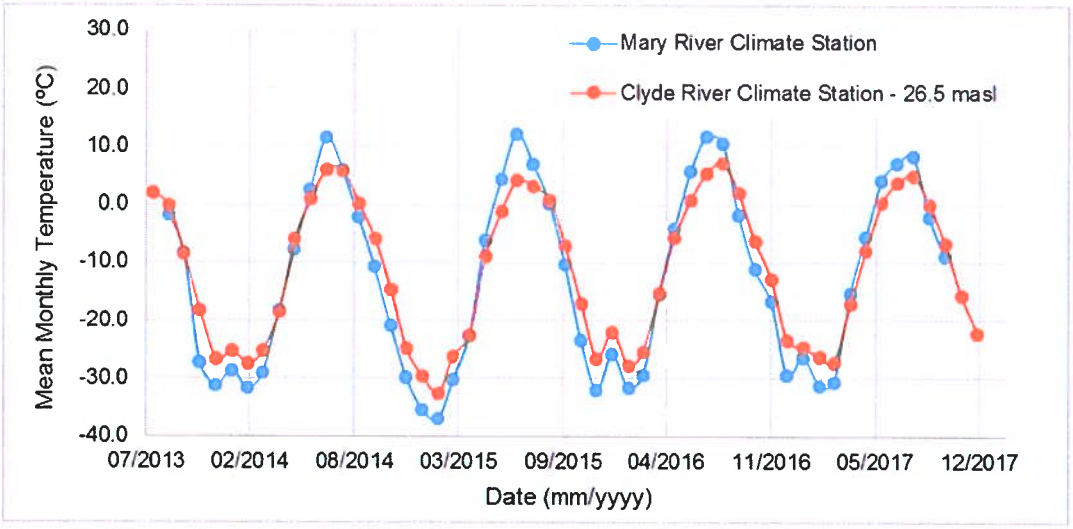


Figure 1: Comparison of Mean Monthly Temperature at Local and Regional Climate Stations

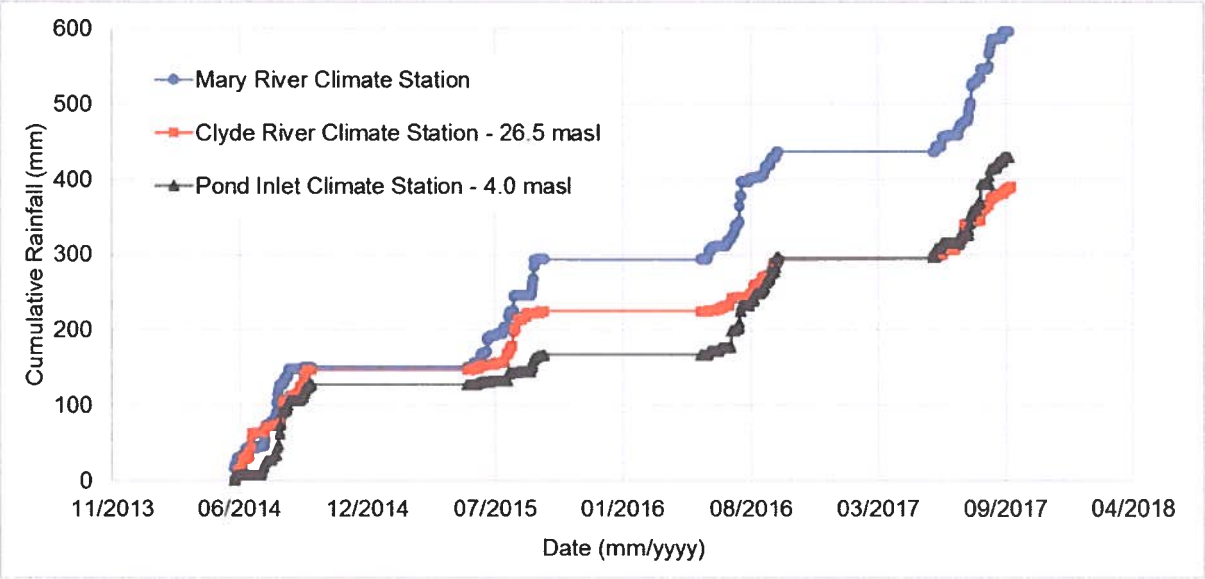


Figure 2: Comparison of Cumulative Rainfall at Local and Regional Climate Stations

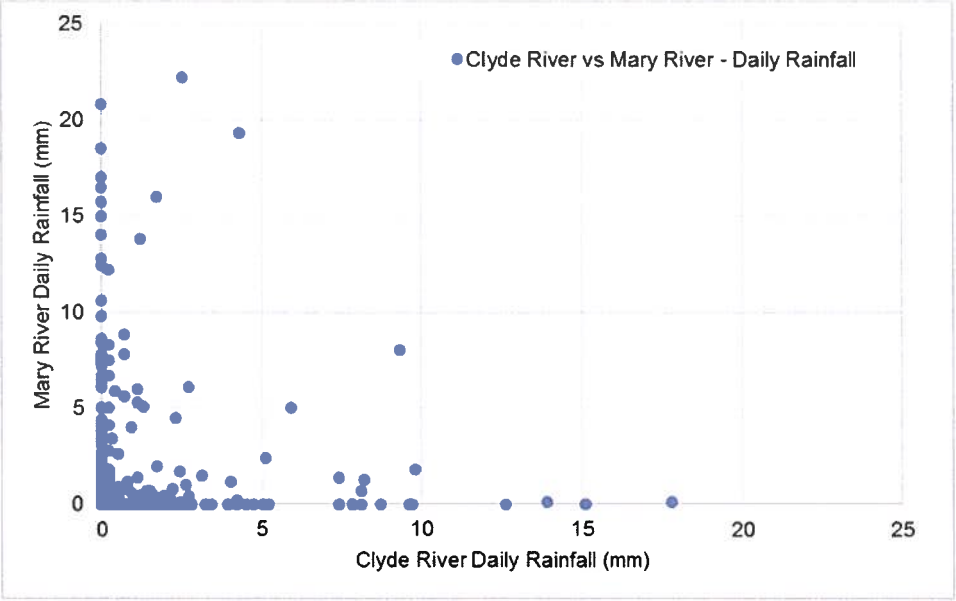


Figure 3: Comparison of Concurrent Daily Rainfall at Mary River and at Clyde River Climate Stations

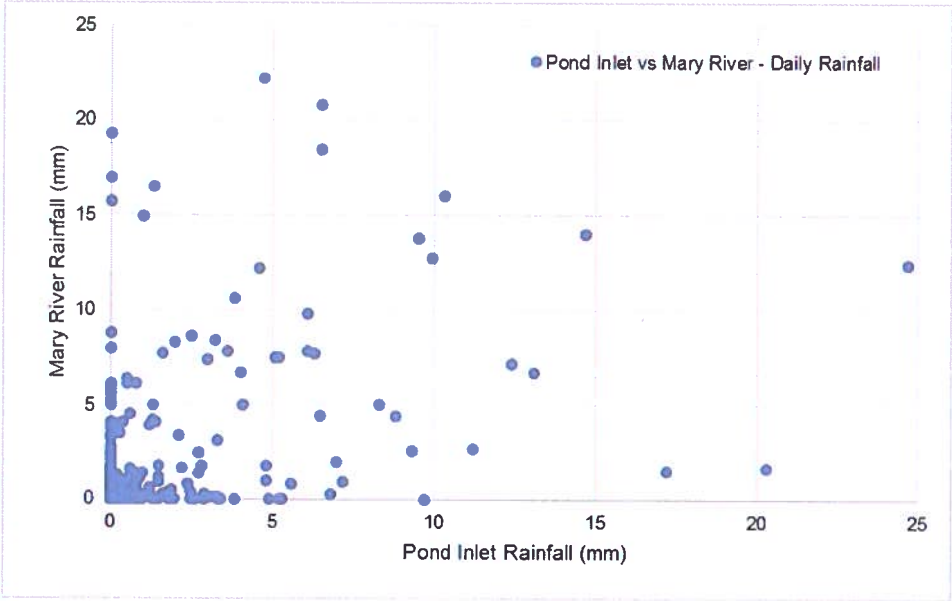


Figure 4: Comparison of Concurrent Daily Rainfall at Mary River and at Pond Inlet Climate Stations

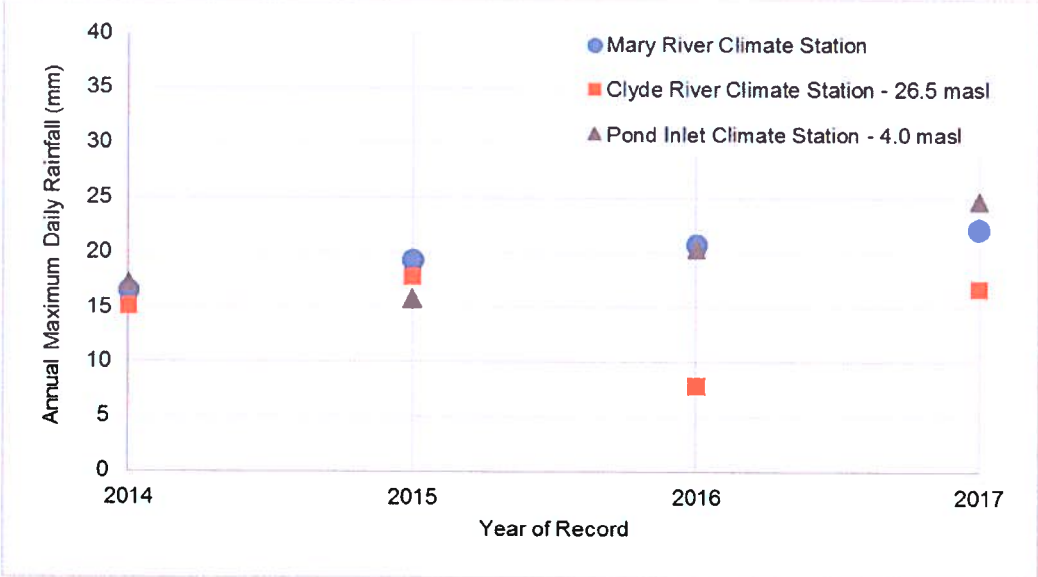


Figure 5: Comparison of Annual Maximum Rainfall at Local and Regional Climate Stations

2.2 Spring Freshet and Pond Water Management

The operation of the Crusher Pad water management pond as an event pond requires that the pond is maintained nearly empty to have adequate storage available to contain the runoff volume resulting from the design precipitation event. In this case, the critical event that leads to the greater daily water inflow is expected to be caused by rainfall events. However, the capacity of the pond to store runoff under freshet

conditions was evaluated for comparison purposes. To do so, the streamflow data collected at the Mary River Mine site were analysed.

Baffinland has an extensive streamflow monitoring program with 11 years of data at seven local stations (not all stations have data for all years). These data can be used as basis for an estimating flood events from local drainage areas. Streamflow data are available at streamflow monitoring stations H01, H02, H04, H05, H06, H07 and H11, each with 5 to 11 years of complete or quasi-complete records collected between years 2006 and 2017.

Based on the analysis of its properties, station H11 was selected as most representative for the hydrological conditions around the Crusher Pad Sedimentation Pond for the following reasons:

- Both drainage areas are at a similar elevation and have similar terrain characteristics. The drainage area of station H11 is relatively small (3.6 km^2), which is more representative of a small catchment such as the Crusher Pad area (0.11 km^2)
- Other stations do not have a good concurrent data correlation with station H11

Complete records for six years (2011, 2012, 2013, 2014, 2015 and 2016) are available for station H11.

It is noted that for four (4) out of the six (6) years, the streamflow records for the H11 time series begin in spring after the actual start from the freshet; the first value is significantly larger than zero, which suggests that the recording devices were installed while the freshet was already under way. In order to adjust for the missing period of data at the beginning of the freshet, Golder added seven days of values before the first record by linearly interpolating between 0 and the first record. It is likely that a non-negligible fraction of the actual runoff volume is not contained in the developed time series. However, the available data do not include the information on what that fraction might have been. This observation is noted as a limitation of the present analysis.

Golder applied frequency analysis to estimate runoff volumes from the Crusher Pad catchment area for the adjusted H11 time series for return periods up to 10 years and durations between 1-day and 105-days. Multiple functions were tested in the frequency analysis on the annual maximum records and the best fitting functions were selected for the estimation.

Table 3 presents the estimated runoff statistics for station H11. Of note, runoff resulting from the 1 in 10 year, 1 day snowmelt event (11 mm) is significantly lower than the runoff resulting from the 1 in 10 year, 24 hour storm event used in the design (36.7 mm considering the design runoff coefficient of 0.9 and rainfall intensity of 1.7 mm/hr [Hatch, 2013]).

Table 3: Estimated Runoff Statistics for H11 Streamflow Monitoring Station

Return Period (year)	Flood Event Duration (Days)																	
	1	2	3	4	5	6	7	8	9	10	15	20	30	45	60	75	90	105
	Runoff (mm)																	
2	5	9	13	17	20	23	25	28	30	32	40	51	72	91	123	135	139	139
5	9	16	22	28	33	38	42	45	48	51	61	73	102	126	146	167	168	168
10	11	22	30	37	44	50	54	59	62	65	76	88	118	142	153	174	177	177

Table 4 presents the number of days of incoming runoff (i.e., pond inflow from the freshet snowmelt event) that the pond can contain before exceeding the capacity and overflowing to the environment. The design pond storage capacity of 3,947 m^3 was used to carry out the calculations. For example, for a 2-year return period, 5 mm of runoff enter the pond in 1 day; an additional 4 mm are accounted for in two days (i.e., 9 mm), an additional 4 mm are accounted for in three days (i.e., 13 mm), etc. A spreadsheet was used to track the accumulated water volume resulting from the incoming runoff to identify for which duration the cumulative inflow exceeds the pond capacity of 3,947 m^3.

Table 4: Runoff Event Duration that the Pond can Contain without Discharge to the Environment

Return Period (Years)	Runoff Event Duration (Days of storage before discharge)
2	12.9
5	5.7
10	3.9

Note: The days of storage reflect a pond capacity at the proposed volume of 3,947 m^3.

Attachment 2

Golder - Crusher Pad Sedimentation Pond Expansion Detailed Design Brief

September 27, 2017

Sean Joseph
Senior Technical Advisor, NWB
P.O. Box 119
Gjoa Haven, NU X0B 1J0

RE: Mary River Project – Mine Site Crusher Pad Sedimentation Pond Expansion (Modification Request)
Water Licence 2AM-MRY1325 – Amend. No. 1

In accordance with Part G of Baffinland Iron Mines Corporation's (Baffinland) Type "A" Water Licence 2AM-MRY1325 – Amend. 1 (Type A Water Licence), the purpose of this letter is to request approval from the Nunavut Water Board (NWB) for a modification that involves increasing the capacity of the Crusher Pad Sedimentation Pond (Sedimentation Pond) at the Mary River Mine Site.

Background

On April 24, 2017, Baffinland Iron Mines Corporation (Baffinland) submitted a Request for Modification to the NWB to expand the Mine Site Crusher Pad by approximately 10 percent (%). On May 9, 2017 Baffinland received comments from Indigenous and Northern Affairs Canada (INAC) that identified that the Crusher Pad's stormwater management infrastructure, including the Sedimentation Pond, would not meet the approved civil design criteria (Hatch, 2013) for Project sedimentation ponds following the planned pad expansion.

On May 19, 2017, Baffinland responded to INAC's comments and proposed a temporary and permanent solution (Golder, 2017) to ensure the Crusher Pad's stormwater management infrastructure would meet the approved civil design criteria (Hatch, 2013) following the planned pad expansion. The proposed temporary solution involved increasing the elevation of the Sedimentation Pond's emergency spillway using sand bags until the long term permanent solution was implemented. The permanent solution proposed in Baffinland's response involved expanding the Sedimentation Pond by increasing the capacity of the pond and associated emergency spillway. On May 26, 2017, Baffinland received approval from NWB to conduct the planned pad expansion and implement the temporary solution (sand bags) on the condition that Baffinland submit a subsequent Request for Modification outlining the expansion of the

Sedimentation Pond (permanent solution). Subsequently, the sand bags were placed in the spillway (temporary solution) followed by the completion of the Crusher Pad expansion in May 2017.

Modification Request

Baffinland has contracted Golder Associates (Golder) to design the expansion of the Sedimentation Pond. The proposed expansion involves increasing the capacity of the Sedimentation Pond to approximately 3,950 cubic metres (m^3) which exceeds the approved civil design criteria for Project sedimentation ponds given the Crusher Pad's current size and also incorporates contingency for an additional future pad expansion of 6,000 square metres (m^2). Golder's proposed design for the Sedimentation Pond expansion is provided in Attachment 1. It should be noted that Baffinland is not requesting approval for an additional pad expansion of 6,000 square metres (m^2) in this submission. Baffinland understands that a subsequent Request for Modification would need to be submitted to the NWB for any future expansions of the Mine Site Crusher Pad. Construction of the Sedimentation Pond expansion is planned to start in late March 2018 prior to the start of freshet (approx. May 15, 2018).

To expedite the Nunavut Impact Review Board's (NIRB) review of this submission and determination on whether it is consistent with the Project Certificate (Project Certificate 005 – Amend. 1) issued for the Mary River Project, Baffinland will submit a Request for Review to the NIRB in parallel with this submission to the NWB.

Details of the modification are provided in the subsections below and in the attached documentation, including issued-for-construction drawings, engineering documentation and environmental mitigation measures to be implemented during construction.

The requested modification is described below and is consistent with the requirements of Part G of the Type "A" Water Licence.

a. <u>Description of Facilitiies and/or Works to be Constructed</u>

   The proposed expansion involves increasing the capacity of the Sedimentation Pond to approximately 3,950 cubic metres (m^3) which exceeds the approved civil design criteria (Hatch, 2013) for Project given the Crusher Pad's current size and also incorporates contingency for an additional future pad expansion of 6,000 square metres (m^2). Golder's proposed design for the Sedimentation Pond expansion is provided in Attachment 1.

As shown in Attachment 1, the expansion will include raising and widening the existing berm and liner on the north, west and south sides of the Sedimentation Pond and constructing a 6 metre (m) wide spillway and stilling basin in the same location as the existing spillway. The expansion is designed to increase the pond's capacity without compromising the integrity or capacity of the existing Sedimentation Pond during construction.

b. Proposed Location of the Structure

The expansion of the Sedimentation Pond will occur at the Mary River Mine Site. Issued for construction drawings, developed by Golder, showing the design and coordinates of the expansion are provided in Attachment 1.

c. Identification of any Potential Impacts to the Receiving Environment

Baffinland foresees minimal impacts to the receiving environment due to the frozen ground conditions and minimal snow melt/runoff during the construction period. In the event meltwater/runoff is observed during the pond's expansion, Baffinland will employ a combination of sediment and erosion control measures to address sedimentation concerns, as outlined in Baffinland's Surface Water and Aquatic Ecosystems Management Plan (BAF-PH1-830-P16-0026).

The sandbags in the spillway (temporary solution) will remain in place until the Sedimentation Pond's expansion is completed to ensure the pond has sufficient capacity to contain the 1:10 design storm event, as required by the approved civil design criteria (Hatch, 2013) for the Project, during construction.

d. Monitoring

During construction, daily environmental monitoring will be performed including before, during and after photographs of construction activities. Minimal surface water runoff is expected during construction however in the event that meltwater/runoff is observed prior to the completion of construction, Baffinland will conduct daily water quality monitoring of surface water drainage originating from the construction area. Water quality impacts of construction activities on nearby water bodies will be assessed using established Surveillance Network Program (SNP) monitoring locations and water quality discharge criteria established under Baffinland's Type "A" Water Licence. Additional monitoring stations may be established, if

required. A map showing the SNP monitoring locations at the Mine Site is provided in Attachment 2 of this letter.

e. Schedule for Construction

Construction of the Sedimentation Pond expansion is planned to start in late March 2018 prior to the start of freshet (approx. May 15, 2018).

f. Drawings of Engineered Structures

Golder was retained to design the Sedimentation Pond expansion. Issued for construction drawings are provided in Attachment 1.

g. Proposed Sediment and Erosion Control Measures

Minimal surface water runoff is expected due to frozen ground conditions and sub-zero ambient temperatures during the planned construction period. However, in the event that runoff is observed prior to the completion of construction, Baffinland will employ a combination of sediment and erosion control measures, as outlined in Baffinland's Surface Water and Aquatic Ecosystems Management Plan (BAF-PH1-830-P16-0026), to address sedimentation concerns.

We trust that this information meets the requirements under Part G under Baffinland's Type "A" Water Licence and look forward to the NWB's response. Please do not hesitate to contact the undersigned or Andrew Vermeer should you have any questions or comments.

Regards,

Wayne McPhee,
Director Sustainable Development

Attachments:

Attachment 1: Golder - Crusher Pad Sedimentation Pond Expansion Detailed Design Brief
Attachment 2: Mine Site SNP Water Quality Monitoring Locations

Cc: Stephen Williamson Bathory (Qikiqtani Inuit Association)
David Hohnstein (NWB)
Justin Hack, Jonathan Mesher, Sarah Forté, Karen Costello (INAC)
Todd Burlingame, Adam Grzegorczyk, Andrew Vermeer (Baffinland)

Attachment 1

Golder - Crusher Pad Sedimentation Pond Expansion Detailed Design Brief

TECHNICAL MEMORANDUM

DATE August 29, 2017 **PROJECT No.** 1775699 (3000) Rev.0

TO Mr. Steven Dew
Baffinland Iron Mine Corp.

CC Cody Gagne, Adam Gyorffy, Marc Rougier, Ken Bocking

FROM Michelle Tyldesley **EMAIL** MTyldesey@golder.com

CRUSHER PAD SEDIMENTATION POND EXPANSION DETAILED DESIGN BRIEF, MARY RIVER PROJECT, NUNAVUT

1.0 INTRODUCTION

Baffinland Iron Mines Corporation (Baffinland) retained Golder Associates Ltd. (Golder) to prepare a detailed design for the expansion of the Crusher Pad Sedimentation Pond at the Mary River Project Iron Mine on Baffin Island, Nunavut. An expansion of this pond is required as a result of the expansion of the Crusher Pad area (Golder 2017). An assessment was completed to determine the impact of the increased runoff area from the Crusher Pad expansion on the existing water management infrastructure (Golder 2017). With the increase in the Crusher Pad area, the existing sedimentation pond had insufficient storage capacity to store the environmental design flood (EDF) and to safely pass the inflow design flood (IDF). Baffinland requested Golder carry out a detailed design to expand the existing sedimentation pond to accommodate the EDF and IDF requirements. This technical memorandum summarizes the background, design criteria and construction details of the proposed expansion of the existing Sedimentation Pond.

2.0 BACKGROUND

The Mary River Project is owned and operated by Baffinland. The Crusher Pad is where ore is stockpiled, crushed, and loaded into B-trains trucks for haulage to the Milne Port. Two ore crushing set-ups and a single aggregate crushing set-up are located on the Crusher Pad. The aggregates produced at the Crusher Pad are used across the site as required.

The Sedimentation Pond, which is adjacent to the west side of the Crusher Pad, is used to remove suspended solids from the surface water runoff on the Crusher Pad. A perimeter ditch conveys the flows from the Crusher Pad to the Sedimentation Pond. Water collected in the Sedimentation Pond is released by pumping to a discharge location downstream near Mary River. The existing Sedimentation Pond was designed by Hatch (Hatch, 2015). The Sedimentation Pond is fully lined with a high density geomembrane. The current sedimentation pond has a capacity to store approximately 2,750 m^3 at the high water level. An emergency spillway is located on the west berm.

3.0 CRUSHER SEDIMENTATION POND EXPANSION DESIGN

The design criteria and design elements (the berm raise and the spillway) for the Crusher Pad Sedimentation Pond are provided in the following section.

3.1 Design Criteria

The design criteria for the Sedimentation Pond were obtained from the original Hatch civil design criteria for the site (Hatch, 2013). The following design criteria were considered for the Crusher Pad Sedimentation Pond Expansion:

- Pond is sized to contain a 1:10 year, 24 hour design storm volume (EDF);
- Runoff coefficient to estimate runoff is 0.9;
- Emergency overflow spillway of sufficient capacity to safely convey a 1 in 200 year return period storm event (IDF); and
- Freeboard above the maximum water level is about 0.3 m.

These criteria meet or exceed the criteria that were part of the original approval documentation. The above criteria are also considered appropriate for the proposed expansion as they are in line with industry practice and the IDF criteria exceeds the Canadian Dam Association (CDA) guidelines for a "low" consequence dam. The Sedimentation Pond berms are considered to be of "low" consequence as the volume of water and sediments retained by the berm is relatively minimal. There is no potential for loss of life, the environmental impacts to the downstream environment would be minimal (minor erosion and sediment transport along flow path to Sheardown Lake with minor sediment deposition within the lake) and there would be no third party losses.

The contributing areas to the Sedimentation Pond are outlined below in Table 1. An additional 6,000 m^2 area was requested by Baffinland to be included in the sizing calculations to allow for future pad expansions.

Table 1: Crusher Sedimentation Pond Catchment Areas

Identification	Area (m^2)
Current Crusher Pad	89,000
Crusher Pad Extension East	12,500
Future Potential Crusher pad Extension West	6,000
Total Crusher Pad Area	**107,500**

3.2 Crusher Sedimentation Pond Expansion Design Elements

The expansion will include raising and widening the existing berm and liner on the north, west and south sides of the Sedimentation Pond and constructing a 6 m wide spillway and stilling basin in the same location as the existing spillway. Table 2 summarizes the design parameters of the proposed Sedimentation Pond expansion. The details on these design elements are described in the following sections. The attached Drawings 001 to 003 present the site plan, cross-sections and typical details, respectively.

Table 2: Sedimentation Pond Upgrade Design Parameters

Design Parameters	Unit	Value
Required Volume below EDF Water Level	m^3	3,947
EDF WL Elevation[1]	masl	192.28
Maximum Operating Level	masl	pond empty[2]
Water elevation at IDF (Max WL)	masl	192.52
Spillway Invert Elevation	masl	192.28
Spillway Width	m	6.0
Spillway Depth	m	0.54
Spillway Side Slope	xH:1V	3.0
Berm Crest Elevation	masl	192.82 (spillway invert + 0.24 m flow depth + 0.30 m freeboard)
Berm Width	m	6

[1] The EDF WL elevation was calculated based on the provided as built-survey of the Sedimentation Pond.

[2] The pond should be empty during normal operating conditions. After a storm event the resulting water volume is to be managed by discharging in a timely manner.

3.2.1 Berm

Along the north, west and south side of the existing Crusher Sedimentation Pond, the existing berm will be raised by approximately 0.5 m (to crest elevation 192.82 m). The berm crest will be widened to 6 m to allow for construction and maintenance access. The berm will be raised by extending the shell in the downstream direction. As shown on Dwg 003, the downstream shell may be constructed either entirely with Type 8 (150 mm minus) material, or with a combination of Type 8 material and Type 12 (Run of Quarry) material. In the latter case, the Type 12 material must be capped with a minimum of 300 mm of Type 8 material, so that the Type 8 material can act as a filter between the Type 12 material and any overlying layers of geomembrane bedding.

The existing liner will be extended to the crest elevation by extrusion welding a new strip of liner to the existing liner. A minimum overlap of the liners of 0.30 m is required. The existing anchor trench is to remain in place. The liner will consist of the same material previously used (EnviroLiner 6000 HD). The liner will be placed on a 0.1 m thick bedding layer consisting of 9.5 mm minus material. Either screened sand or crusher fines can be used for the bedding, providing it meets the specifications. Placement of a geotextile between the bedding layer and the geomembrane is optional and depends on the angularity and fineness of the screened sand / crusher fines. Underlying the bedding layer, a 0.1 m thick layer of Type 5 (32 mm minus) material is required as a transition. The liner will be anchored into a trench at the crest of the berm. The extents of the raise are shown on Drawings 001 and 002. Typical details of the berm raise and liner raise are provided in Drawing 003.

3.2.2 Spillway

The spillway invert will be raised by approximately 0.3 m to elevation 192.28 m and the spillway will be widened to 6 m. The liner will be installed along the length of the spillway and the spillway will terminate in a stilling basin. The liner will be connected to the existing liner in the same manner as the berm raise, as described in Section 3.2.1. The outflow chute is to be contained by two side berms constructed of Type 19 erosion protection material which will also be used to anchor the geomembrane in the chute. The stilling basin is to be a minimum of 1 m thick Type 19 erosion protection underlain with geotextile (Layfield LP7).

4.0 CONSTRUCTION

4.1 Construction Considerations

The construction considerations related to the Crusher Pad Sedimentation Pond expansion are provided below:

- For safety reasons, the pond shall be drained prior to construction of the liner or alternative controls should be in place.
- Snow shall be removed from the footprint of the expansion prior to construction.
- Sedimentation and erosion mitigation measures shall be in place before commencing construction.
- All materials shall be placed in horizontal lifts with a nominal compacted thickness of 300 mm or less.
- Each lift shall be compacted by a minimum of 3 passes over all areas of a dozer, a loaded haul truck or the loader.
- Field fitting of the tie-in of the expansion into the east berm will be required.
- An as-built survey should be collected to properly document the construction.

4.2 Materials

The proposed construction materials are consistent with those previously used on site. A summary of the materials are listed below.

Table 3: Screened Material - Type 5 (32 mm minus) Fill Gradation Specification

Sieve Designation (mm)	Minimum Percent Passing, by weight	Maximum Percent Passing, by weight
32	100	100
25 (1 in.)	70	100
9.5 (3/8 in.)	40	70
4.75 (No. 4)	30	55
2.00 (No. 10)	22	42
0.6 (No. 30)	15	30
0.075 (No. 200)	4	8

Table 4: Jaw Run Material - Type 8 (150 mm minus) Fill Gradation Specification

Sieve Designation (mm)	Minimum Percent Passing, by weight	Maximum Percent Passing, by weight
200	100	100
150	95	100
100	50	100
50	30	60
19 (3/4 in.)	15	35
4.75 (No. 4)	10	25
0.075 (No. 200)	0	5

Table 5: Run of Quarry- Type 12 (1000 mm minus) Fill Gradation Specification

Sieve Designation (mm)	Minimum Percent Passing, by weight	Maximum Percent Passing, by weight
1000	100	100
600	95	100
300	50	100
150	0	80
19	0	30
4.75	0	10

Table 6: Erosion Protection material - Type 19 (D_{50} of 150 mm) Gradation Specification

Sieve Designation (mm)	Minimum Percent Passing, by weight	Maximum Percent Passing, by weight
300	100	100
285	85	100
240	65	85
210	50	75
150	25	50
135	15	45
75	0	15

Table 7: Screened Sand / Crusher Fines material - Gradation Specification

Sieve Designation (mm)	Minimum Percent Passing, by weight	Maximum Percent Passing, by weight
9.500	100	100
4.750	95	100
2.000	90	100
0.841	80	97
0.420	75	92
0.250	67	90
0.149	56	83
0.075	27	70
0.002	2	10

The proposed liner bedding material is either screened sand or crusher fines. A sample gradation of the crusher fines was provided by Baffinland and is provided below.

Table 8: Crusher Fines Material - Typical Gradation

Sieve Designation (mm)	Percent Passing, by weight
9.5 mm	100
#4	99.8

Sieve Designation (mm)	Percent Passing, by weight
#10	98.1
#20	90.2
#40	80.4
#60	72.6
#100	58.9
#200	43.2
0.051	19.0
0.037	15.8
0.026	12.7
0.019	9.5
0.014	9.5
0.01	6.4
0.007	6.4
0.005	3.3
0.003	3.7
0.002	4.0
0.001	4.2

5.0 CONCLUSIONS

Golder completed a detailed design for the Crusher Pad Sedimentation Pond expansion based on the 2017 expansion of the Crusher pad and proposed future expansion. Construction drawings for the Crusher Sedimentation Pond expansion site plan, sections, and typical details are presented in Drawings 001, 002 and 003, respectively.

6.0 CLOSING REMARKS

We trust that this technical memorandum satisfies your current requirements. Please contact the undersigned should you have any questions.

GOLDER ASSOCIATES LTD.

Michelle Tyldesley, P.Eng.(ON)
Geotechnical Engineer

Ken Bocking, P.Eng.
Principal, Senior Geotechnical Engineer

DB/MJT/KAB/jl

Attachments: Drawing 001- Site Plan
Drawing 002- Profile and Cross–Sections
Drawing 003- Typical Details

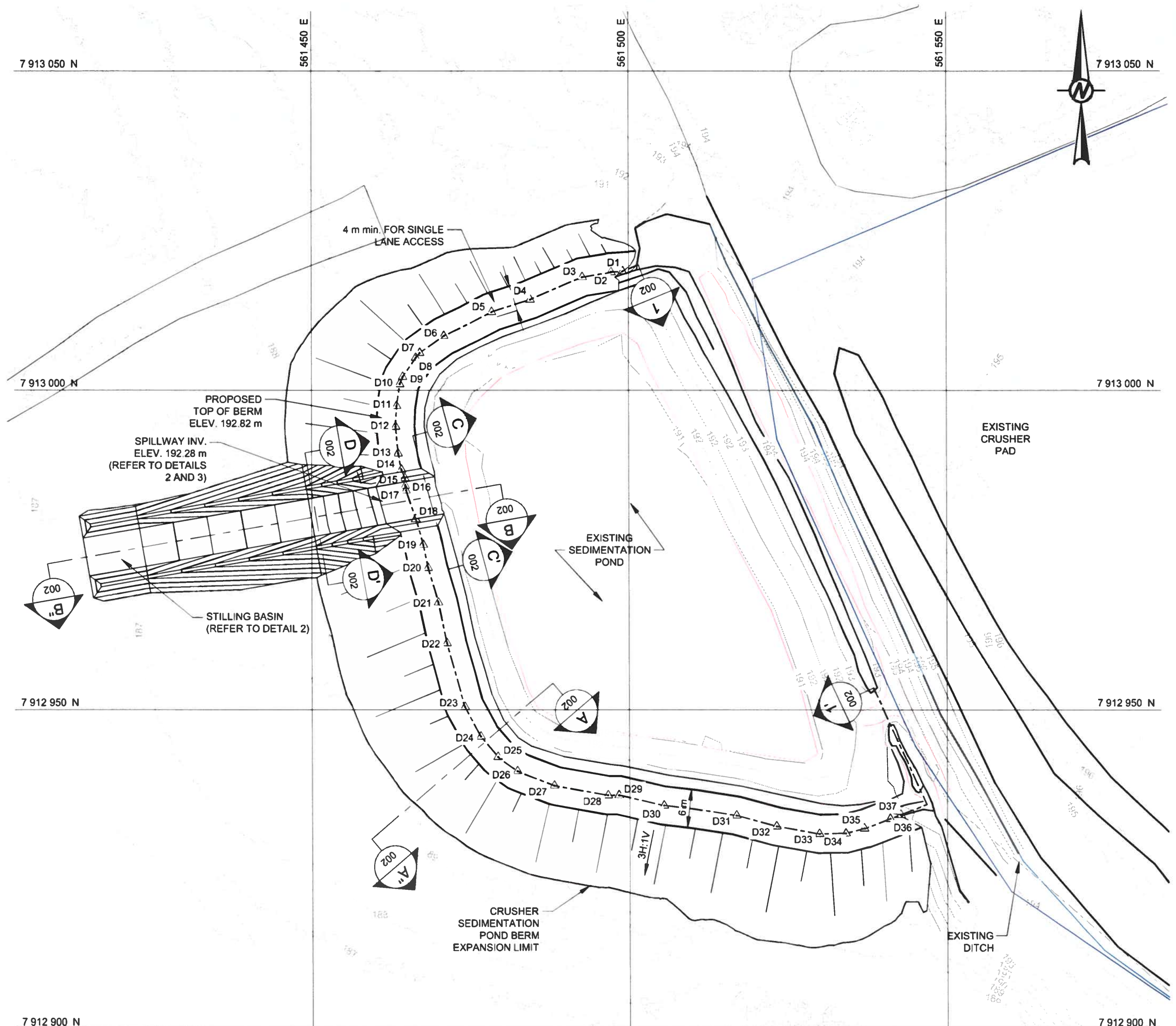
https://golderassociates.sharepoint.com/sites/11387g/shared documents/phase 6000- sedimentation pond upgrade/reporting/rev. 0/1775699 baffinland detailed design crusher pad_sedpondexpansion_29aug2017_rev0.docx

References

Golder (Golder Associates Ltd.) 2017. Crusher Pad Expansion Detailed Design Brief, Mary River Project, Nunavut. Issued to Baffinland. Golder Project No. 1775699 (3000) .17 April 2017.

Hatch (Hatch Ltd.) 2013. Civil Design Criteria. Hatch Project No. H349000. Issued to Baffinland. 28 August 2013.

Hatch (Hatch Ltd.) 2015. Crusher Pad Sedimentation Pond Earthworks & Drainage Plan. Drawing No. H34900-4385-10-035-0001. Issued for Construction. Issued to Baffinland. 27 Mar 2015.



PLAN VIEW

SCALE: 1:400 m

BERM CREST CENTERLINE LAYOUT POINTS			
POINT ID	EASTING (m)	NORTHING (m)	ELEVATION (m)
D1	561499.02	7913018.62	192.82
D2	561497.24	7913018.50	192.82
D3	561492.69	7913017.73	192.82
D4	561484.48	7913014.20	192.82
D5	561478.42	7913012.26	192.82
D6	561470.89	7913008.52	192.82
D7	561467.11	7913005.86	192.82
D8	561466.47	7913005.10	192.82
D9	561464.41	7913002.11	192.82
D10	561463.94	7913000.99	192.82
D11	561463.42	7912997.56	192.82
D12	561463.26	7912994.31	192.82
D13	561463.67	7912990.12	192.82
D14	561464.16	7912987.57	192.82
D15	561464.73	7912986.24	192.82
D16	561464.78	7912985.04	192.82
D17	561464.90	7912984.33	192.82
D18	561466.42	7912979.82	192.82
D19	561467.61	7912975.82	192.82
D20	561468.35	7912972.19	192.82
D21	561469.95	7912966.78	192.82
D22	561471.31	7912960.42	192.82
D23	561474.09	7912950.42	192.82
D24	561476.59	7912945.79	192.82
D25	561479.28	7912942.61	192.82
D26	561482.33	7912940.37	192.82
D27	561488.18	7912938.11	192.82
D28	561496.57	7912936.60	192.82
D29	561498.29	7912936.61	192.82
D30	561505.37	7912934.98	192.82
D31	561516.73	7912933.44	192.82
D32	561523.05	7912931.75	192.82
D33	561529.80	7912930.56	192.82
D34	561533.92	7912930.64	192.82
D35	561536.84	7912931.42	192.82
D36	561540.92	7912932.92	192.82
D37	561542.62	7912933.56	192.82

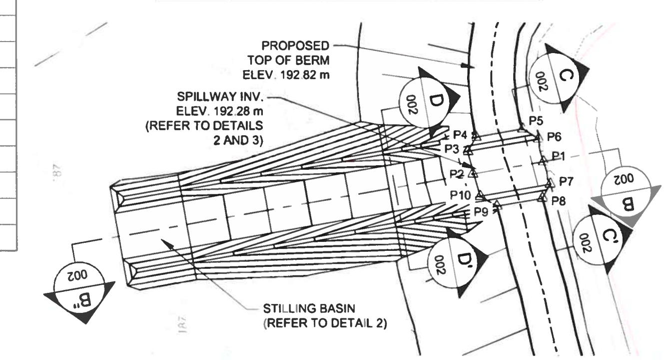
LEGEND

- 212 — EXISTING CONTOURS (1 m INTERVAL)
- 199 — DESIGN CONTOURS (1 m INTERVAL)
- CREST OF BERM
- △ P1 — SPILLWAY LAYOUT POINT
- △ D1 — BERM CREST LAYOUT POINT

NOTES

1. ALL DIMENSION AND ELEVATIONS ARE IN METRES UNLESS OTHERWISE NOTED.
2. COORDINATE SYSTEM IS UTM (NAD 83) ZONE 17.
3. TOPOGRAPHY PROVIDED BY BAFFINLAND.
4. THE GROUND SURFACE IS CONSIDERED APPROXIMATE.
5. IT IS THE RESPONSIBILITY OF THE USER OF THIS DRAWING TO ENSURE THE USE OF ITS MOST RECENT REVISION.
6. THE CONTRACTOR SHALL VERIFY THE COORDINATES AND ELEVATIONS BEFORE COMMENCING CONSTRUCTION.
7. THE OWNER'S REPRESENTATIVE (WITH INPUT FROM THE GEOTECHNICAL ENGINEER) SHALL APPROVE THE LAYOUT IN THE FIELD.
8. THE POND SHALL BE EMPTIED PRIOR TO COMMENCING THE LINER INSTALLATION WORK.
9. REFER TO DRAWING 002 FOR CROSS-SECTIONS AND DRAWING 003 FOR TYPICAL DETAILS.

EMERGENCY OVERFLOW SPILLWAY LAYOUT POINTS			
POINT ID	EASTING (m)	NORTHING (m)	ELEVATION (m)
P1	561470.03	7912983.57	192.28
P2	561460.82	7912981.96	192.28
P3	561460.16	7912984.89	192.28
P4	561461.28	7912986.73	192.82
P5	561467.33	7912987.79	192.82
P6	561469.40	7912986.51	192.28
P7	561470.89	7912980.68	192.28
P8	561469.88	7912978.85	192.82
P9	561463.94	7912977.81	192.82
P10	561461.80	7912979.08	192.28



PLAN VIEW OF SPILLWAY LAYOUT POINTS

SCALE: 1:400 m

0 20 40
1:400 METRES

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2017-08-29	ISSUED FOR CONSTRUCTION	MJT	DD	MJT	KAB
A	2017-08-04	ISSUED FOR CLIENT REVIEW	MJT	MLF	MJT	KAB

PERMIT TO PRACTICE
GOLDER ASSOCIATES LTD.
Signature ORIGINAL SIGNED
Date
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

ORIGINAL SIGNED AND SEALED

REGISTERED PROFESSIONAL ENGINEER K. A. BOCKING LICENSEE N.W.T.

STAMP/SEAL

CLIENT
Baffinland

CONSULTANT
Golder Associates

MISSISSAUGA OFFICE
6925 CENTERY AVENUE, SUITE 100
MISSISSAUGA, ON
CANADA
905-567-444
www.golder.com

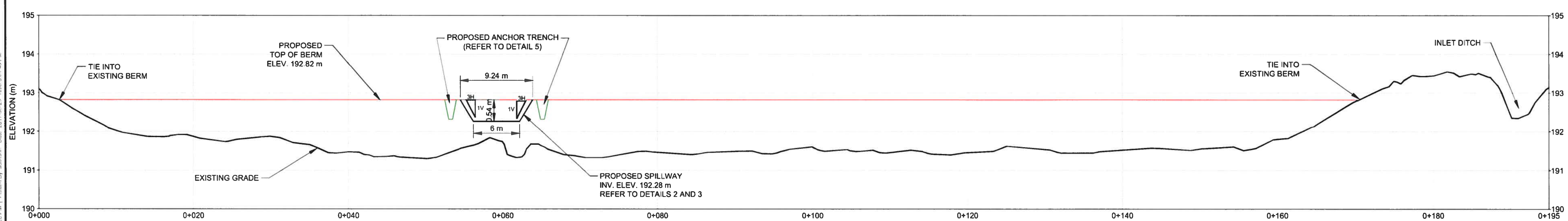
PROJECT
MARY RIVER PROJECT
CRUSHER PAD SEDIMENTATION POND EXPANSION

TITLE
SITE PLAN

PROJECT NO.	PHASE	REV.	of	DRAWING
1775699	6000	0		001

25 mm IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN THE SHEET SIZE HAS BEEN MODIFIED FROM ANSI D

NOTES
1. REFER TO DRAWING 003 FOR DETAILS.
2. REFER TO DRAWING 001 FOR ADDITIONAL NOTES.



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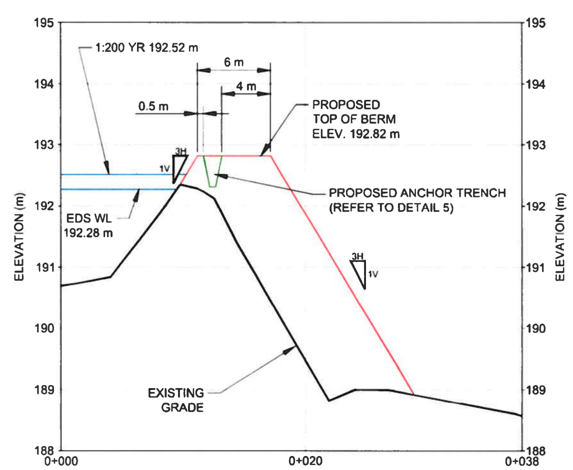

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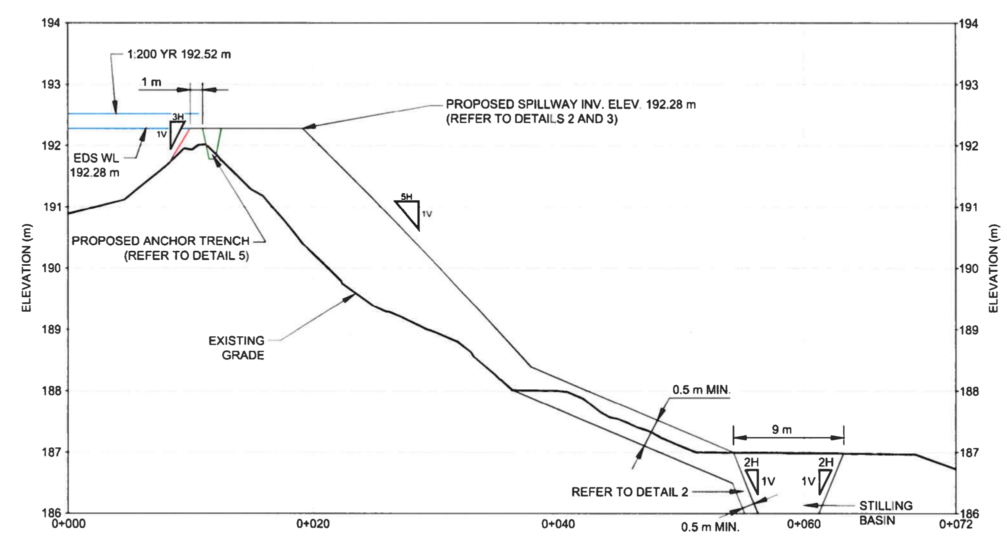

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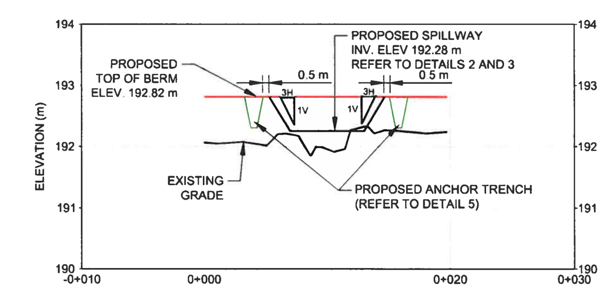

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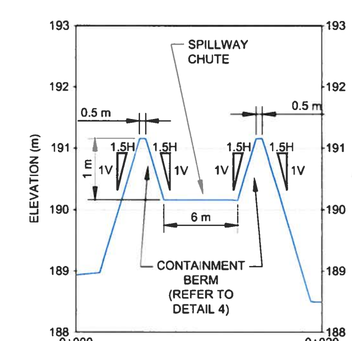

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0 10 20 — 1:250 METRES

REV	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2017-08-29	ISSUED FOR CONSTRUCTION	MJT	DD	MJT	KAB
A	2017-08-04	ISSUED FOR CLIENT REVIEW	MJT	MLF	MJT	KAB

PERMIT TO PRACTICE
GOLDER ASSOCIATES LTD.
Signature ORIGINAL SIGNED
Date
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

ORIGINAL SIGNED AND SEALED
REGISTERED PROFESSIONAL ENGINEER — K. A. BOCKING — LICENSEE — N.W.T.

CLIENT
Baffinland

CONSULTANT
Golder Associates

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905-567-444
www.golder.com

PROJECT
MARY RIVER PROJECT
CRUSHER PAD SEDIMENTATION POND EXPANSION

TITLE
PROFILE AND CROSS-SECTIONS

PROJECT NO	PHASE	REV	of	DRAWING
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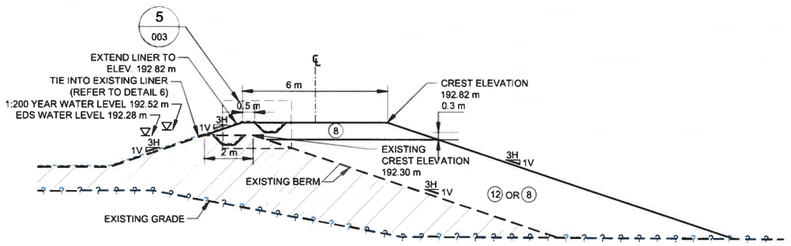
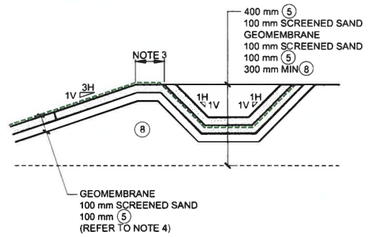


SCALE: 1:100 1 TYPICAL BERM SECTION DETAIL



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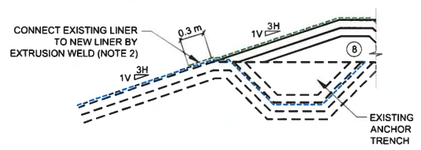

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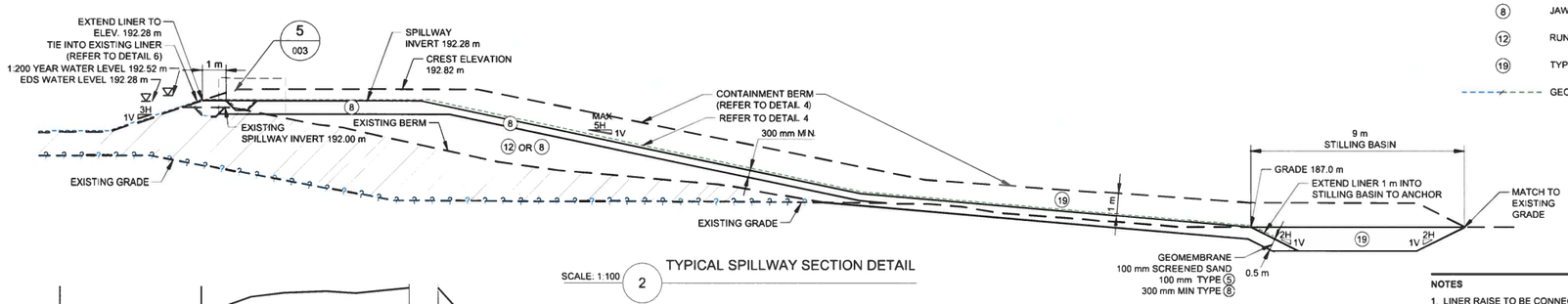
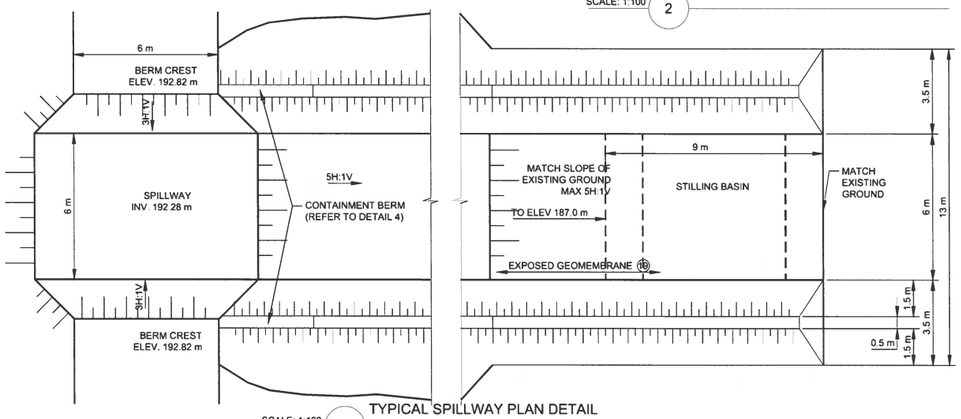


SCALE: 1:100 2 TYPICAL SPILLWAY SECTION DETAIL



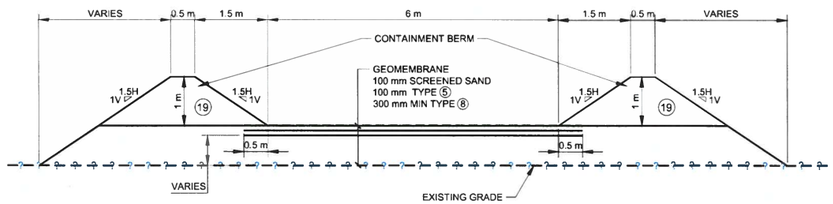
SCALE: 1:100 3 TYPICAL SPILLWAY PLAN DETAIL

LEGEND

- EXISTING GROUND
- SCREENED SAND/CRUSHER FINES (9.5 mm MINUS)
- 5 SCREENED MATERIAL (32 mm MINUS)
- 8 JAW RUN (150 mm MINUS)
- 12 RUN OF QUARRY (1000 mm MINUS)
- 19 TYPE 19 EROSION PROTECTION (SELECT 300 mm MINUS)
- GEOMEMBRANE (ENVIRO LINER 6000 HD OR APPROVED EQUIVALENT)

NOTES

1. LINER RAISE TO BE CONNECTED TO EXISTING LINER. EXISTING ANCHOR TRENCH NOT TO BE EXCAVATED.
2. EXISTING LINER TO BE CONNECTED TO NEW LINER USING AN EXTRUSION WELD. EXISTING LINER TO BE CLEANED AND GRINDED PRIOR TO WELD.
3. ANCHOR TRENCH TO BE OFFSET 0.5 m FROM BERM U/S CREST EDGE (AS SHOWN IN DETAIL 1) AND 1.0 m FROM SPILLWAY U/S CREST EDGE (AS SHOWN IN DETAIL 2). ALONG THE SPILLWAY CHANNEL, ANCHOR TRENCH TO BE OFFSET 0.5 m FROM THE TOP OF THE SIDE SLOPES (AS SHOWN IN CROSS-SECTION C-C ON DRAWING 002).
4. TYPICAL MATERIAL PROFILE FOR LINER. A GEOTEXTILE BETWEEN GEOMEMBRANE AND CRUSHER FINES OPTIONAL, DEPENDING ON THE ANGULARITY OF THE CRUSHER FINES. TO BE DETERMINED BY THE OWNERS REPRESENTATIVE WITH INPUT FROM THE GEOTECHNICAL ENGINEER.
5. REFER TO DWG 001 FOR ADDITIONAL NOTES.



SCALE: 1:50 4 TYPICAL SPILLWAY CHUTE DETAIL

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2017-08-29	ISSUED FOR CONSTRUCTION	MJT	DD	MJT	KAB
A	2017-08-04	ISSUED FOR CLIENT REVIEW	MJT	MLF	MJT	KAB

PERMIT TO PRACTICE
GOLDER ASSOCIATES LTD.
Signature ORIGINAL SIGNED
Date
PERMIT NUMBER: P 049
NT/NU Association of Professional Engineers and Geoscientists

ORIGINAL SIGNED AND SEALED
REGISTERED PROFESSIONAL ENGINEER
K. A. BOOKING
LICENSEE
NWT
STAMP/SEAL

CLIENT
Baffinland

CONSULTANT
Golder Associates

MISSISSAUGA OFFICE
6925 CENTERY AVENUE, SUITE 100
MISSISSAUGA, ON
CANADA
905-567-444
www.golder.com

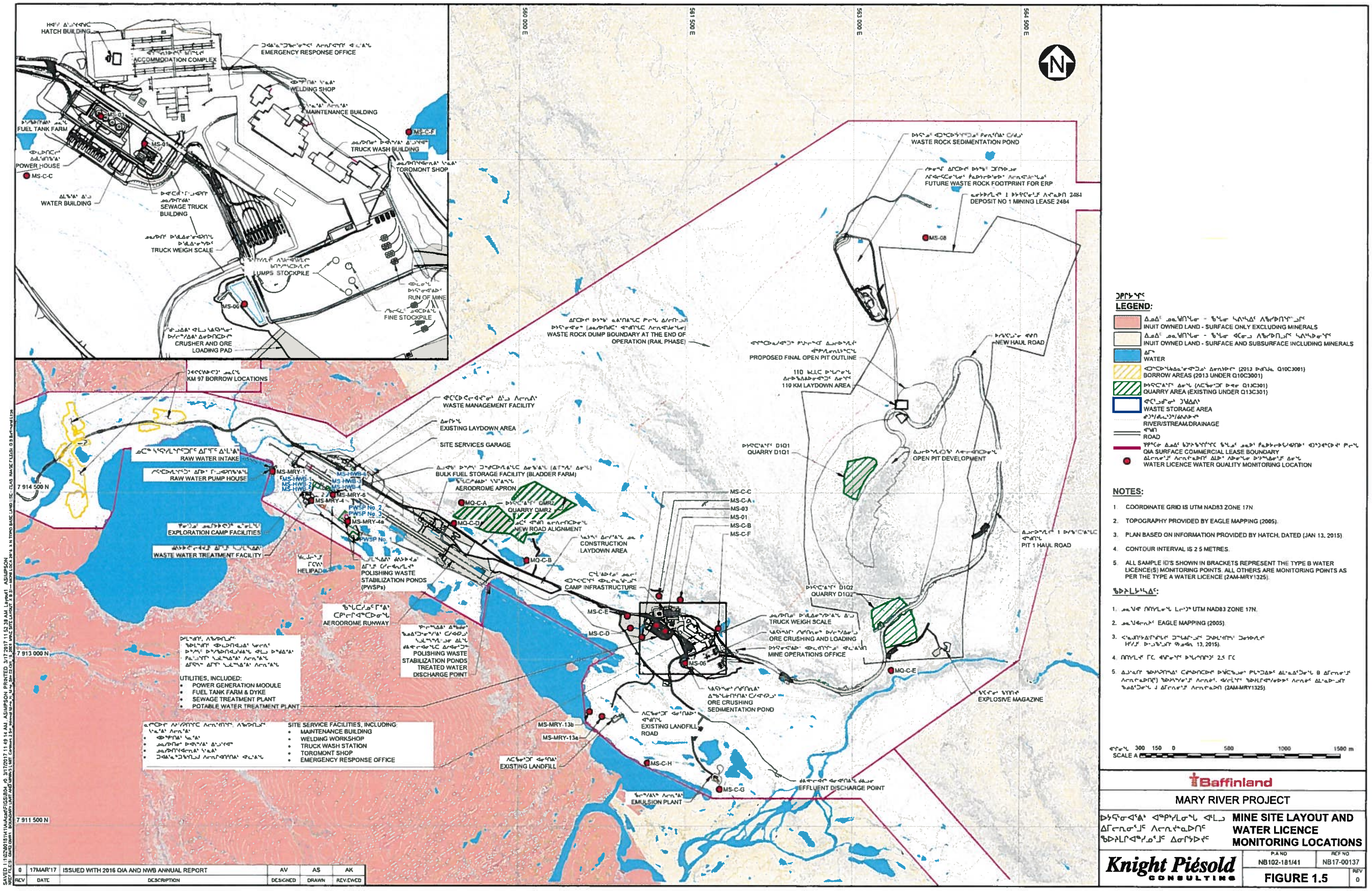
PROJECT
MARY RIVER PROJECT
CRUSHER PAD SEDIMENTATION POND EXPANSION

TITLE
TYPICAL DETAILS

PROJECT NO.	PHASE	REV.	of	DRAWING
1775699	6000	0		003

Attachment 2

Mine Site SNP Water Quality Monitoring Locations


HATCH BUILDING
EMERGENCY RESPONSE OFFICE
ACCOMMODATION COMPLEX
WELDING SHOP
MAINTENANCE BUILDING
FUEL TANK FARM
MS-01
MS-C-F
TRUCK WASH BUILDING
POWER HOUSE
MS-C-C
TOROMONT SHOP
WATER BUILDING
SEWAGE TRUCK BUILDING
TRUCK WEIGH SCALE
LUMPS STOCKPILE
MS-06
RUN OF MINE
FINE STOCKPILE
CRUSHER AND ORE LOADING PAD
560 000 E
561 500 E
563 000 E
564 500 E
WASTE ROCK SEDIMENTATION POND
FUTURE WASTE ROCK FOOTPRINT FOR ERP
DEPOSIT NO 1 MINING LEASE 2484
MS-08
WASTE ROCK DUMP BOUNDARY AT THE END OF OPERATION (RAIL PHASE)
PROPOSED FINAL OPEN PIT OUTLINE
NEW HAUL ROAD
110 KM LAYDOWN AREA
KM 97 BORROW LOCATIONS
WASTE MANAGEMENT FACILITY
EXISTING LAYDOWN AREA
SITE SERVICES GARAGE
QUARRY D1Q1
OPEN PIT DEVELOPMENT
RAW WATER INTAKE
BULK FUEL STORAGE FACILITY (BLADDER FARM)
RAW WATER PUMP HOUSE
AERODROME APRON
MS-MRY-1
MS-HWB-1
MS-HWB-2
MS-HWB-3
MS-HWB-4
MS-HWB-5
MS-MRY-4
MS-MRY-6
MQ-C-A
QUARRY QMR2
MQ-C-D
NEW ROAD ALIGNMENT
MS-MRY-4a
PWSP No. 1
PWSP No. 2
PWSP No. 3
EXPLORATION CAMP FACILITIES
WASTE WATER TREATMENT FACILITY
HELIPAD
POLISHING WASTE STABILIZATION PONDS (PWSPs)
MQ-C-B
CONSTRUCTION LAYDOWN AREA
CAMP INFRASTRUCTURE
MS-C-C
MS-C-A
MS-03
MS-01
MS-C-B
MS-C-F
PIT 1 HAUL ROAD
QUARRY D1Q2
7 914 500 N
7 913 000 N
7 911 500 N
AERODROME RUNWAY
POLISHING WASTE STABILIZATION PONDS TREATED WATER DISCHARGE POINT
MS-C-E
MS-C-D
TRUCK WEIGH SCALE
ORE CRUSHING AND LOADING
MINE OPERATIONS OFFICE
MS-06
MQ-C-E
ORE CRUSHING SEDIMENTATION POND
EXPLOSIVE MAGAZINE
UTILITIES, INCLUDED:
POWER GENERATION MODULE
FUEL TANK FARM & DYKE
SEWAGE TREATMENT PLANT
POTABLE WATER TREATMENT PLANT
SITE SERVICE FACILITIES, INCLUDING:
MAINTENANCE BUILDING
WELDING WORKSHOP
TRUCK WASH STATION
TOROMONT SHOP
EMERGENCY RESPONSE OFFICE
MS-MRY-13b
MS-MRY-13a
EXISTING LANDFILL ROAD
EXISTING LANDFILL
MS-C-H
MS-C-G
EFFLUENT DISCHARGE POINT
EMULSION PLANT
LEGEND:
INUIT OWNED LAND - SURFACE ONLY EXCLUDING MINERALS
INUIT OWNED LAND - SURFACE AND SUBSURFACE INCLUDING MINERALS
WATER
BORROW AREAS (2013 UNDER Q10C3001)
QUARRY AREA (EXISTING UNDER Q13C301)
WASTE STORAGE AREA
RIVER/STREAM/DRAINAGE
ROAD
QIA SURFACE COMMERCIAL LEASE BOUNDARY
WATER LICENCE WATER QUALITY MONITORING LOCATION
NOTES:
1. COORDINATE GRID IS UTM NAD83 ZONE 17N.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PLAN BASED ON INFORMATION PROVIDED BY HATCH, DATED (JAN 13, 2015).
4. CONTOUR INTERVAL IS 2.5 METRES.
5. ALL SAMPLE ID'S SHOWN IN BRACKETS REPRESENT THE TYPE B WATER LICENCE(S) MONITORING POINTS. ALL OTHERS ARE MONITORING POINTS AS PER THE TYPE A WATER LICENCE (2AM-MRY1325).
SCALE A 300 150 0 500 1000 1500 m
Baffinland
MARY RIVER PROJECT
MINE SITE LAYOUT AND WATER LICENCE MONITORING LOCATIONS
P/A NO NB102-181/41
REF NO NB17-00137
Knight Piésold CONSULTING
FIGURE 1.5
REV 0
0 17MAR'17 ISSUED WITH 2016 QIA AND NWB ANNUAL REPORT AV AS AK
REV DATE DESCRIPTION DESIGNED DRAWN REV.CWCD

Attachment No. 3

Baffinland Responses to QIA Comments Received 7 November 2017

Baffinland

Baffinland Responses to QIA Comments Received 7 November 2017

ID	Lease Condition	Licence Condition	Topic	QIA Comment	QIA Proposed Resolution	Baffinland Response
1	Article 8.1, item a)	Part G, item 3 c)	Environmental Impacts	Baffinland foresees minimal impacts to the receiving environment due to the frozen ground conditions and minimal snow melt/runoff during the construction period.	QIA requests information to support the assumptions into the potential impacts to the receiving environment. Specifically, stated that they foresee minimal impacts to the receiving environment due to the frozen ground conditions. QIA notes that the frozen ground assumption was used when designing the Waste Rock Sedimentation Pond which has been the subject of a spill[3] where the lack of depth of permafrost identified in the Construction Summary Report[4] has not been ruled out as the cause of the spill. QIA requests further information to substantiate that frozen ground exist at the construction location and will be maintained during operations. At a minimum the geotechnical data for the construction area and the thermal design of the facility is requested.	Due to changes in the proposed schedule, frozen ground conditions may not be present at the time of the construction to increase the pond capacity by raising and widening the berms. As described in the 27 Sept 2017 Baffinland submission to the NWB, Baffinland will mitigate impacts to the receiving environment utilizing sediment and erosion control measures, as outlined in the Surface Water and Aquatic Ecosystems Management Plan. Through effective mitigation techniques, Baffinland maintains that impacts to the environment are foreseen to be minimal.
2	Article 6.1, item c)	Part G, item 3 e)	Planning	Baffinland has provided a start date for construction but not a schedule for construction.	QIA interprets that a start date does not satisfy Part G, item 3 e) of the Licence. It is requested that Baffinland provides a construction schedule that includes construction considerations, timing, and sequencing and a schedule of milestones.	Construction will commence following approval by the NWB or 1 August 2018, whichever arrives earliest. Construction schedule will be subject to change and variable depending on weather conditions. It is anticipated work would be completed before freezing ground conditions, or no later than 1 October 2018.
3	Article 6.1 item c), and Article 8.1, item a)	Part D, item 1, 2, and 23	Engineered Designs	Baffinland has provided a design brief, not a final design as required.	QIA interprets the current design brief to not fulfill the requirements of Part D, item 2 of the Licence requiring Baffinland to provide final design and for construction drawings stamped and signed by an engineer. The current design brief does not provide sufficient information, preventing QIA from completing an analysis of design and performance adequacy. As per Part D, item 23 of the Licence, which requires Baffinland to operate facilities that withhold water to be in accordance with all applicable legislation and industry standards QIA requests a final design. As such, QIA recommends the use of the Canadian Dam Association Guidelines5 and Technical Bulletins6 for best practices for earthwork engineering. These are generally consistent with standard geotechnical engineering design principals for earthwork design, construction and operation. The following list are the outstanding items that should be the final design report: a. A final design report that is signed and stamped by an engineer that includes all required analysis and for-construction documentation, including complete specifications, and drawings. The design brief as provided is not a final design report and is not signed and stamped by an engineer. Further the design brief does not include all required specifications necessary for construction. b. Relevant background information, including the data from geotechnical investigations, the results of programs to characterize soil, rock, groundwater, ground ice, and ground temperature conditions to the depth expected to be affected by the proposed facilities, beneath the footprint of all containment and runoff control structures, as deemed adequate by the Professional Engineer responsible for the design. This is required to ensure design assumptions such as the use of frozen ground to ensure the facility is adequately designed. c. Quantities and the physical and geochemical characteristics of materials required for Construction. This is required to ensure the proper materials are used as specified, to eliminate the possibility of acid rock drainage occurring which will give rise to potential environmental impacts. d. Design drawings and specifications of Engineered Structures, stamped by a Professional Engineer to ensure the facility is constructed as designed. The specifications included in the design brief are deficient on standard construction items typically provided in for-construction documentation. e. Stability analyses to reduce the risk of failure of the structure. No stability analysis is provided in the design brief to substantiate design will perform to acceptable level of standard. f. Construction considerations, including timing, sequencing, and a schedule to ensure the appropriate steps and considerations are considered and can be analyzed post construction. g. Operations and maintenance requirements as the facility is anticipated to be required to operate in a specific way to avoid failure. h. Detailed instrumentation and monitoring plans, including but not limited to sampling locations, parameters measured, and frequencies of sampling to be carried out to ensure the facility is operated in a specific way to avoid failure. i. A Construction Quality Control Plan stamped by a Professional Engineer, a component of which includes a plan for a Professional Engineer to supervise and field check construction activities to ensure the design is achieved and maintained.	a) A design report signed and stamped by a Professional Engineer is not a requirement of a modification request submission. b) As the berms of the pond are being raised and the footprint of the pond remains consistent with the original design, no additional analysis is required at this time. c) Material used for construction will be either clean waste rock or quarry material from approved sources, which is tested for geochemical stability prior to use on Site consistent with the relevent Quarry Management Plans. Material specifications are provided in Section 3.2.1 of the Golder report dated 29 August 2017. d) Drawings signed and stamped by a Professional Engineer were provided in the 27 September 2017 Baffinland submission to the NWB. e) The design is not substantially modified from the existing pond design, as the footprint has not materially increased, therefore the design criteria used is consistent with the existing design and no additional stability analysis is required. f) Construction will commence following approval by the NWB or 1 August 2018, whichever arrives earliest. Construction schedule will be subject to change and variable depending on weather conditions, however it is anticipated that earthworks would be completed by the end of August, with geomembrane extension through early and mid-September. It is anticipated work would generally be completed before freezing ground conditions, or no later than 31 October 2018. g) Baffinland will update the Surface Water and Aquatic Ecosystems Management Plan in the next revision to include management practices of sedimentation ponds. h) Baffinland will update the Surface Water and Aquatic Ecosystems Management Plan in the next revision to include management practices of sedimentation ponds. i) A Construction Summary Report with as-built drawings signed and stamped by a Professional Engineer will be prepared within 90 days following construction, as per Part G, Item 4 of the Type 'A' Water Licence.
4	Article 9.2, item b)	Part C, item 1.	Security	Baffinland did not provide an estimate for changes to security based on this modification request.	As per Part C, item 1 of the Licence, Baffinland is to maintain security that is in accordance with the applicable regulations. It is required of Baffinland to provide an evaluation for security associated with this work and receive approval by QIA before work on this modification may be commenced. Once security is approved and received by QIA, total security may be reconciled in the 2018 Annual Security Review.	As the footprint of the sedimentation pond has not materially increased, there is no increase to the reclamation security required for the increase in berm height of the sedimentation pond. Baffinland is open to discussing this further with QIA during subsequent Annual Security Review processes if any clarification is needed.