June 21, 2017

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

RE: Milne Port Accommodations Camp Pad and Proposed Surface Water Diversion System (Modification Request)
Water Licence 2AM-MRY1325 – Amend. No. 1

On June 9, 2017, Baffinland Iron Mines Corporation (Baffinland) received an Inspector's Direction from Indigenous and Northern Affairs Canada (INAC) following an inspection conducted by INAC of the Mary River Project from May 29 to June 1, 2017. The Inspector's Direction documented a stop work order issued to Baffinland for an accommodations camp pad that had been constructed during May 2017 at Milne Port in a location that impeded the flow of an intermittent drainage path(s). On June 14, 2017 Baffinland responded to the Inspector's Direction notifying INAC and other agencies of Baffinland's planned corrective actions to remedy the situation and intention to submit proper documentation, as required by Part D, Item 2 and Part G of Baffinland's Type "A" Water Licence 2AM-MRY1325 Amendment 1 (Type "A" Water Licence), to the Nunavut Water Board (NWB) by June 16, 2017.

In accordance with Part D, Item 2 and Part G of Baffinland's Type "A" Water Licence, the purpose of this letter is to submit a Request for Modification for the proposed surface water diversion system required to redirect surface water from the impeded drainage path(s) around the pad, as shown in Attachments 1 and 2.

It is Baffinland's intention to use the new accommodation camp pad to eventually upgrade the existing accommodations at Milne Port, replacing the existing soft wall camp and increasing accommodations infrastructure in order to support the increased camp populations required for full production (4.2Mt per annum). However, it should be noted that Baffinland is not requesting approval for the future accommodations upgrades in this submission. A subsequent Request for Modification will be made prior to the construction of the camp facilities.

Both the constructed accommodations camp pad and the proposed surface water diversion system are within the Project's Development Area (PDA) and are consistent with approved activities outlined in the Project Certificate (Project Certificate 005 – Amend. 1) issued for the Mary River Project by the Nunavut Impact Review Board (NIRB).

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

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

Baffinland has developed a new accommodations camp pad at Milne Port. The new accommodations camp pad is approximately 280m x 120m in size. The constructed accommodations camp pad is located south of the existing Milne Port Ore Stockpile Pad and west of the Tote Road (near Km 1). The proposed surface water diversion system will follow along the pad's southern perimeter and direct flow from the impeded drainage path(s) to the natural drainages west of the accommodations camp pad, as shown in Attachments 1 and 2.

Attachment 1 shows the constructed accommodations camp pad in relation to the Milne Port general layout. As shown in Attachment 2, the sub-grade of the accommodations camp pad was constructed using Type 12 (Run of Quarry <200mm) coarse material and capped with Type 5 (<32mm crushed) crushed granular surface material. Attachments 2 also shows the proposed diversion system and design details, including the associated hydrology and hydraulic design calculations. Attachment 3 details the construction methodology for the proposed diversion system in order to minimize potential environmental effects during construction. The exact dimensions of the proposed diversion system will be field fit during construction based on field observations of the impeded drainages path(s). The completed pad and diversion system will be documented in as-built drawings for the construction.

b. Proposed Location of the Structure

The constructed accommodations pad is located south of the existing Milne Port Ore Stockpile Pad and west of the Tote Road (near Km 1). The proposed surface water diversion system will follow along the pad's southern perimeter and direct flow to the natural drainages west of the accommodations camp pad, as shown in Attachments 1 and 2.

c. Identification of any Potential Impacts to the Receiving Environment

The impeded drainage path(s) are not classified as fish habitat and therefore the proposed diversion system will not cause harmful alteration, disruption or destruction of fish habitat. The main concern Baffinland foresees is sedimentation from the construction of the proposed diversion system. To prevent the release of sediment into the receiving environment during construction, Baffinland will employ a combination of sediment and erosion control measures (check dams, rip-rap, silt fences, etc.) to address sedimentation concerns, as outlined in Baffinland's Environmental Protection Plan (BAF-PH1-830-P16-0008 – Rev. 1) and Surface Water and Aquatic Ecosystems Management Plan (BAF-PH1-830-P16-0026 - Rev. 4).

d. Monitoring

During construction, daily environmental monitoring will be performed including before, during and after photographs of construction activities. Surface water runoff will managed as outlined in Baffinland's Surface Water and Aquatic Ecosystems Management Plan (BAF-PH1-830-P16-0026 - Rev. 4). 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 water quality discharge criteria established under Baffinland's Type "A" Water Licence. Additional monitoring stations may be established, if required.

e. Schedule for Construction

Construction of the accommodations camp pad was completed in May 2017. Construction of the proposed surface water diversion system is planned to start as soon as the Request for Modification approval has been received from the NWB.

f. Drawings of Engineered Structures

Hatch Ltd. (Hatch) was retained to design and provide issued-for-construction drawings for the constructed accommodations camp pad and proposed surface water diversion system. The issued-for-construction (IFC) drawings are provided in Attachment 2 of this letter.

g. Proposed Sediment and Erosion Control Measures

Baffinland will employ a combination of sediment and erosion control measures (check dams, rip-rap, silt fences, etc.), as outlined in Baffinland's Environmental Protection Plan (BAF-PH1-830-P16-0008 – Rev. 1)and Surface Water and Aquatic Ecosystems Management Plan (BAF-PH1-

830-P16-0026 - Rev. 4), to address and manage sedimentation concerns during construction. No sediment or erosion control measures are expected to be required once construction of the diversion system has been completed.

We trust that this information meets the requirements under Part D, Item 2 and 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:

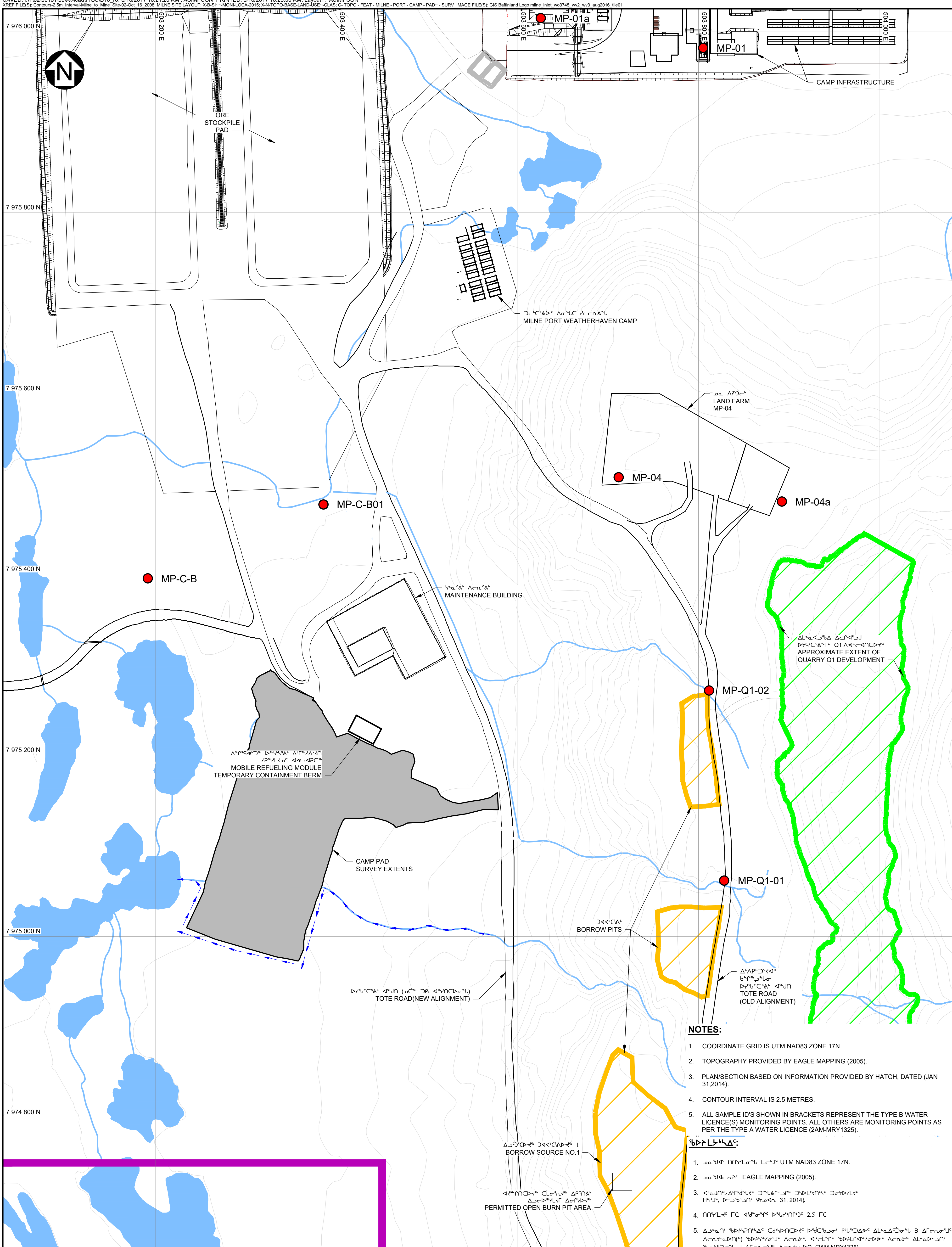
Attachment 1: Milne Port – New Camp Pad
Attachment 2: Milne Port – Camp Pad Natural Stream Diversion – Hydrology & Hydraulic Calculations (includes engineering/design drawings)
Attachment 3: Construction Methodology – Camp Pad Water Diversion System

cc. Matt Weaver, Laura Taylor, Andrew Vermeer, William Bowden, Todd Burlingame, Sylvain Proulx (Baffinland)
Manager of Licensing, David Hohnstein (NWB)
Justin Hack, Jonathan Mesher (INAC)
Stephen Williamson Bathory (Qikiqtani Inuit Association)

Attachment 1

Milne Port – New Camp Pad

SAVED: I:\1\02\00181\39\A\Acad\FIGS\B10_r0, 6/16/2017 10:21:25 AM , ASIMPSON PRINTED: 6/16/2017 10:23:53 AM, Layout1, ASIMPSON
XREF FILE(S): Contours-2.5m_Interval-Milne_to_Mine_Site-02-Oct_16_2008; MILNE SITE LAYOUT; X-B-SI~~-MONI-LOCA-2015; X-N-TOPO-BASE-LAND-USE~-CLAS; C- TOPO - FEAT - MILNE - PORT - CAMP - PAD~ - SURV IMAGE FILE(S): GIS Baffinland Logo milne_inlet_wo3745_wv2_wv3_aug2016_tile01



NOTES:

1. COORDINATE GRID IS UTM NAD83 ZONE 17N.
2. TOPOGRAPHY PROVIDED BY EAGLE MAPPING (2005).
3. PLAN/SECTION BASED ON INFORMATION PROVIDED BY HATCH, DATED (JAN 31,2014).
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).

ᖃᐅᔨᒪᔭᒃᓴᐃᑦ:

1. ᓄᓇᖑᐊᕐ ᑎᑎᕐᓯᒪᓂᖓ ᒪᓕᒃᑐᖅ UTM NAD83 ZONE 17N.
2. ᓄᓇᖑᐊᓕᕆᔨᑦ EAGLE MAPPING (2005).
3. ᐸᕐᓇᒍᑎᕐᔭᐃᒻᒥᒃᑰᖓᔪᑦ ᑐᙵᕕᒋᓗᒋᑦ ᑐᓴᐅᒪᔪᑎᒃᓴᑦ ᑐᓂᔭᐅᓯᒪᔪᑦ Hᕐᓯᒍᑦ, ᐅᓪᓗᖃᕐᓗᑎᒃ 9ᔭᓄᐊᕆ 31, 2014).
4. ᑎᑎᕐᓯᒪᔪᑦ ᒥᑕ: ᐊᕐᑯᓂᖏᑦ ᐅᖓᓯᒃᑎᒋᒃᑐᑦ 2.5 ᒥᑕ

5. ᐃᓘᓐᓇᑎᒃ ᖃᐅᔨᓴᕈᑎᒃᓴᐃᑦ ᑕᑯᔅᐅᑎᑕᐅᔪᑦ ᐅᕐᑰᑕᖃᓄᒃ ᑮᓪᖅᑐᐃᕗᑦ ᐃᒪᓐᓇᐃᑦᑑᓂᖓ B ᐃᒥᓕᕆᓂᕐᒧᑦ ᐱᓕᕆᔪᓐᓇᐅᑎ(ᑦ) ᖃᐅᔨᓴᖅᓯᓂᕐᒧᑦ ᐱᓕᕆᓃᑦ. ᐊᓯᖏᓪᓕᖏᑦ ᖃᐅᔨᒪᒋᐊᖅᓯᓂᐅᕗᑦ ᐱᓕᕆᓃᑦ ᐃᒪᓐᓇᐅᓪᓗᑎᒃ ᖃᓄᐃᑦᑑᓂᖓ J ᐃᒥᓕᕆᓂᕐᒧᑦ ᐱᓕᕆᔪᓐᓇᐅᑎ (2AM-MRY1325).

LEGEND:

- ᐃᒥᖅ / WATER
- ᐊᑐᖅᑕᐅᖑᐃᑲᐃᓇᕐᓂᐊᖅᑐᓄᑦ ᐃᓂᕆᔭᐅᔪᖅ (2013 ᐅᑯᑎᒎᓇ Q10C3001) / BORROW AREAS (2013 UNDER Q10C3001)
- ᐅᔭᕐᑲᑕᕐᕖᖏᑦ ᐃᓂᖓ (ᐱᑕᖄᓂᒃᑐᒥ ᐅᕙᓂ Q13C301) / QUARRY AREA (EXISTING UNDER Q13C301)
- NEW CAMP PAD CONSTRUCTED IN MAY 2017
- ᑰᒃᑐᖅ/ᑯᓚᓗᒃᑐᖅ/ᑯᕕᕕᐅᔪᖅ / RIVER/STREAM/DRAINAGE
- ᐊᕐᕈᑎ / ROAD
- ᕿᑭᖅᑕᓃ ᐃᓄᐃᑦ ᑲᑐᔾᔨᖃᑎᒌᒋᑦ ᖄᖓᓄᑦ ᓄᓇᐅᕐ ᑮᓇᐅᔭᓕᐅᕐᓱᐊᕈᑎᐅᑉ ᐊᑐᖅᑐᐊᖅᑕᐅᔫᑉ ᑭᒡᓕᖓ / QIA SURFACE COMMERCIAL LEASE IMPACT BOUNDARY
- DRAINAGE DIVERSION
- ᐃᒪᓕᕆᓂᕐᒧᑦ ᐱᓕᕆᔪᓐᓇᐅᑎᑦ ᐃᒪᐅᑉ ᐱᐅᓂᖓᓂ ᐅᔾᔨᕐᓱᐃᓂᕐᒧᑦ ᐃᓂᖓ / WATER LICENCE WATER QUALITY MONITORING LOCATION

SCALE A: 40 20 0 40 80 120 160 200 m

REV	DATE	DESCRIPTION	DESIGNED	DRAWN	REVIEWED
0	14JUN'17	ISSUED WITH TRANSMITTAL	AV	AS	RAC

Baffinland

MARY RIVER PROJECT

MILNE PORT - NEW CAMP PAD

Knight Piésold CONSULTING

P/A NO.	REF NO.
NB102-181/39	NB17-00415

FIGURE 1 REV 0

Attachment 2

Milne Port – Camp Pad Natural Stream Diversion – Hydrology & Hydraulic Calculations (includes Engineering/Design Drawings)

HATCH

Project Memo

H-353004

21 June 2017

To: Matt Weaver

From: A Grobbelaar

cc: Tyler Bruce

REGISTERED PROFESSIONAL ENGINEER
M. M. S. HASSAN
LICENSEE
21 JUNE
NT/NU

Baffinland Iron Mines LP
Mary River Project

Milne Port - Camp Pad Natural Stream Diversion- Hydrology & Hydraulic Calculations

1. Introduction

The accommodation camp pad intersects a minor seasonal stream. In order to maintain continuation of the stream, it has to be diverted around the camp pad. (See below camp pad location and streams identified)

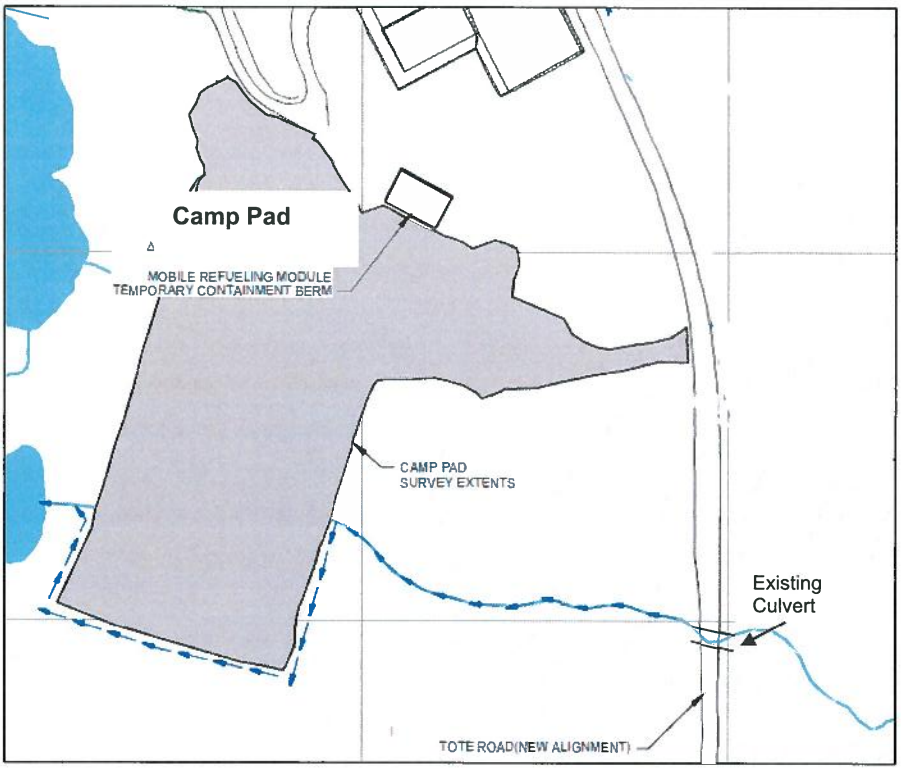


Figure 1: Accommodation Camp Pad Diversion

The catchment area for the seasonal stream is depicted below:

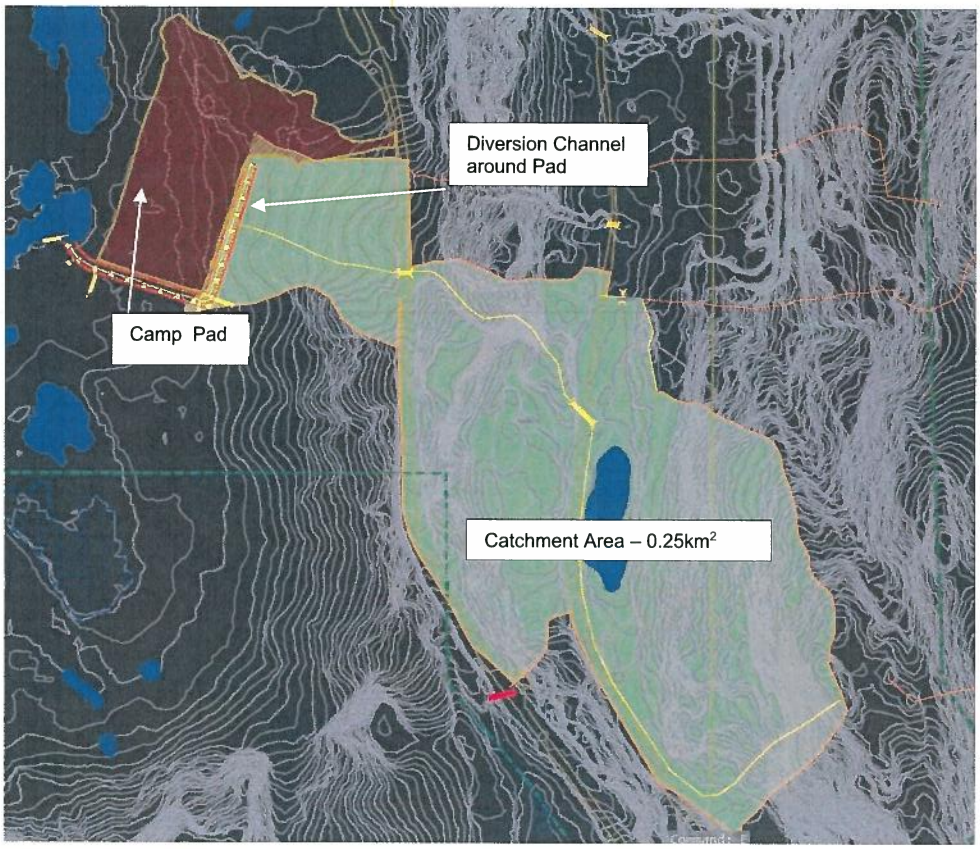


Figure 2: Seasonal Stream Catchment

A suitable sized culvert under the existing quarry access road will have to be installed in order to reduce the catchment size for the seasonal stream to 0.25km^2. Details, including elevations near the quarry access road, will need to be confirmed by onsite survey prior to finalizing culvert design and associated geotechnical engineering.

1.1 Design Calculations

1.1.1 Diversion Channel Catchment Runoff Calculation

In order to design the stream diversion, the expected storm water flow needs to be calculated (For the diversion design, Hatch used a 1:100 year return period storm in line with the previously approved design philosophy for external streams & stream diversions).

Rainfall intensities were obtained from a previous phase approved report by Hatch titled "Civil Design Criteria" – H-349000-1000-10-122-001 (Rev 1). In the report reference is made to the Knight Piesold calculated rainfall intensities for various return periods – See table 1-1 below:

Table 1-1: Rainfall Intensities for Various Return Periods

Duration	2 yrs	5 yrs	10 yrs	15 yrs	20 yrs	25 yrs	50 yrs	100 yrs	200 yrs
5 min	9.5	12.0	14.0	15.1	15.9	16.5	18.3	20.1	22.0
10 min	7.2	9.0	10.5	11.3	11.9	12.4	13.7	15.1	16.5
15 min	6.0	7.5	8.7	9.4	9.9	10.3	11.4	12.6	13.7
30 min	5.0	6.3	7.3	7.9	8.3	8.6	9.5	10.5	11.4
1 hr	4.0	5.2	6.1	6.6	7.0	7.3	8.1	9.0	9.9
2 hr	3.0	3.9	4.6	5.0	5.2	5.5	6.1	6.8	7.4
6 hr	2.0	2.7	3.3	3.6	3.9	4.0	4.6	5.1	5.7
12 hr	1.3	1.8	2.2	2.4	2.6	2.7	3.1	3.4	3.8
24 hr	1.0	1.4	1.7	1.9	2.0	2.1	2.4	2.7	3.0

The catchment area is 0.25km^2.

The Table 1-2 below indicates the calculation to determine the peak runoff from the 1:100 storm event:

Table 1-2: Peak Flow Calculation

Q = 0.28 C I A			Tc = 0.06628($L^{0.77}/S^{0.385}$)		Unit	
Q=	**0.78**	m^3/s	Tc=	0.25	hr	15.1 min
C=	0.9		L=	1.177	km	
I=	12.6	mm/hr	S=	0.04317	m/m	
A=	0.25	km^2				

The diversion channel was sized based on a peak catchment flow of **0.78m^3/s** for the 1:100year return period storm.

1.1.2 *Diversion Channel Hydraulic Calculation*

Based on the previous phase approved report by Hatch titled **"Civil Design Criteria" – H-349000-1000-10-122-001 (Rev 1),** the channel properties were compiled. The side slopes of 2H:1V was used together with the rip rap and the Manning flow friction factor (n) value of 0.04 applied. Using the Flow Master software by Bentley Systems Inc, the flow depth was determined using the natural ground level slope along the accommodations camp pad. A minimum slope of 1:500 was applied where the natural ground was flatter.

Hatch Drawings No **H353004-4000-228-272-0001-0001 & H353004-4000-228-271-0001-0001** indicates the layout of the diversion channel and longitudinal profile respectively (see attached).

The seasonal minor stream is re-directed into the diversion channel through a long radius intercept channel, transitioning from the natural stream shape into the trapezoidal channel. This detail is apparent in the drawings referenced above. Some dimensional data will have to be determined on site and adjusted after consultation with the Engineer.

At the south east corner of the pad where the diversion channel turns through 90 degrees, the channel was sized and detailed to contain the specific energy calculated for the stream flow, thus ensuring that no spillage will occur during the storm event.

A general freeboard of 300 mm was applied throughout the channel design.

At the discharge end of the channel, a hydraulic flow dispersion structure is detailed to allow the energy of the 0.78^3/s flow to dissipate and not cause any erosion damage. The actual invert level of the natural water body that the diversion channel will drain into shall be confirmed on site and conveyed to the Engineer. This invert level cannot be above the diversion channel invert so as not to allow any capacity reduction of the channel. The Engineer must be consulted in the event that the invert of the natural water body is higher than the diversion channel to allow for adjustment in the details to be constructed.

In order to obtain the flow properties for the channel at various sections (change in gradient) the software by DEVOTECH was used. The EPA storm water management model - version 5.1 (build 5.1.006) calculates the flow properties at set sections and generates the long sections data as reflected on the drawing.

A Grobbelaar

AG:AG
Attachment(s)/Enclosure:

- Diversion Channel hydraulic calculation – Attachment 1
- Diversion Channel steady uniform flow calculation- Attachment 2
- H353004-4000-228-272-0001-0001- Attachment 3
- H353004-4000-228-271-0001-0001- Attachment 4

Attachment 1:
Diversion Channel Hydraulic Calculation

Project Description

Friction Method	Manning Formula
Solve For	Bottom Width

Input Data

Roughness Coefficient	0.040	
Channel Slope	0.20	%
Normal Depth	0.40	m
Left Side Slope	2.00	m/m (H:V)
Right Side Slope	2.00	m/m (H:V)
Discharge	0.78	m^3/s

Results

Bottom Width	2.95	m
Flow Area	1.50	m^2
Wetted Perimeter	4.74	m
Hydraulic Radius	0.32	m
Top Width	4.55	m
Critical Depth	0.18	m
Critical Slope	0.02947	m/m
Velocity	0.52	m/s
Velocity Head	0.01	m
Specific Energy	0.41	m
Froude Number	0.29	
Flow Type	Subcritical	

Attachment 2: Diversion Channel Steady Uniform Flow Calculation

PA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.006)

About: File generated by iDAS (www.devotech.co.za)

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NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
****

****
Analysis Options
****
Flow Units ..... CMS
Process Models:
  Rainfall/Runoff ..... NO
  RDII ..... NO
  Snowmelt ..... NO
  Groundwater ..... NO
  Flow Routing ..... YES
  Ponding Allowed ..... NO
  Water Quality ..... NO
Flow Routing Method ..... STEADY
Starting Date JUN-08-2017 00:00:00
Ending Date JUN-09-2017 00:00:00
Antecedent Dry Days 0.0
Report Time Step 00:01:00
Routing Time Step ..... 10.00 sec

Flow Routing Continuity	Volume hectare-m	Volume 10^6 ltr
Dry Weather Inflow	0.000	0.000
Wet Weather Inflow	0.000	0.000
Groundwater Inflow	0.000	0.000
RDII Inflow	0.000	0.000
External Inflow	6.739	67.389
External Outflow	6.739	67.389
Internal Outflow	0.000	0.000
Evaporation Loss	0.000	0.000
Seepage Loss	0.000	0.000
Initial Stored Volume	0.000	0.000
Final Stored Volume	0.000	0.000
Continuity Error (%)	0.000	

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Highest Flow Instability Indexes
****
All links are stable.

****
Routing Time Step Summary
****
Minimum Time Step : 10.00 sec
Average Time Step : 10.00 sec
Maximum Time Step : 10.00 sec
Percent in Steady State : 0.00
Average Iterations per Step : 1.00
Percent Not Converging : 0.00

****
Node Depth Summary
****

Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min
CN1	JUNCTION	0.40	0.40	13.68	0 00:00
CN4	JUNCTION	0.40	0.40	13.62	0 00:00
CN5	JUNCTION	0.39	0.39	13.06	0 00:00
CN6	JUNCTION	0.39	0.39	12.91	0 00:00
CN7	JUNCTION	0.20	0.20	11.76	0 00:00
CN8	JUNCTION	0.19	0.19	11.43	0 00:00
CN9	JUNCTION	0.31	0.31	10.94	0 00:00
CN10	JUNCTION	0.40	0.40	10.85	0 00:00
CN11	JUNCTION	0.40	0.40	10.78	0 00:00
CN12	JUNCTION	0.52	0.52	10.82	0 00:00
CN13	JUNCTION	0.52	0.52	10.82	0 00:00
CN14	JUNCTION	0.40	0.40	10.64	0 00:00
CN15	JUNCTION	0.40	0.40	10.63	0 00:00
MH70	OUTFALL	0.39	0.39	10.62	0 00:00

****
Node Inflow Summary
****

Node	Type	Maximum Lateral Inflow CMS	Maximum Total Inflow CMS	Time of Max Occurrence days hr:min	Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
CN1	JUNCTION	0.780	0.780	0 00:00	67.4	67.4	0.000
CN4	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
CN5	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
CN6	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
CN7	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
CN8	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
CN9	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
CN10	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
CN11	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
CN12	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
CN13	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
CN14	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
CN15	JUNCTION	0.000	0.780	0 00:00	0	67.4	0.000
MH70	OUTFALL	0.000	0.780	0 00:00	0	67.4	0.000

****
Node Surcharge Summary
****

No nodes were surcharged.

****
Node Flooding Summary
****

No nodes were flooded.

****
Outfall Loading Summary
****

	Flow Freq	Avg Flow	Max Flow	Total Volume

Outfall Node	Pcnt	CMS	CMS	10^6 ltr
MH70	100.00	0.780	0.780	67.389
System	100.00	0.780	0.780	67.389

****
Link Flow Summary
****

Link	Type	Maximum |Flow| CMS	Time of Max Occurrence days hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
CH21	CONDUIT	0.780	0 00:00	0.37	0.57	0.74
CH24	CONDUIT	0.780	0 00:00	0.52	0.35	0.56
CH1	CONDUIT	0.780	0 00:00	0.51	0.36	0.57
CH17	CONDUIT	0.780	0 00:00	1.24	0.10	0.27
CH11	CONDUIT	0.780	0 00:00	1.20	0.10	0.27
CH8	CONDUIT	0.780	0 00:00	1.35	0.08	0.25
CH9	CONDUIT	0.780	0 00:00	0.52	0.35	0.56
CH10	CONDUIT	0.780	0 00:00	1.17	0.11	0.28
CH18	CONDUIT	0.780	0 00:00	0.68	0.24	0.45
CH19	CONDUIT	0.780	0 00:00	0.52	0.36	0.57
CH20	CONDUIT	0.780	0 00:00	0.52	0.36	0.57
CH22	CONDUIT	0.780	0 00:00	0.52	0.35	0.56
CH23	CONDUIT	0.780	0 00:00	0.51	0.36	0.57

****
Conduit Surcharge Summary
****

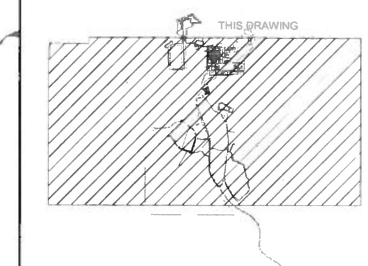
No conduits were surcharged.

Analysis begun on: Tue Jun 20 16:00:38 2017
Analysis ended on: Tue Jun 20 16:00:38 2017
Total elapsed time: < 1 sec

Attachment 3

LAYOUT

SCALE 1:5000



KEY PLAN

NTS

ACCOMMODATION CAMP PAD COORDINATES		
POINT	EASTING	NORTHING
T1	503408.977	7975209.046
T4	503326.171	7975279.119
T5	503373.873	7975264.133
T6	503423.018	7975187.011
T7	503356.128	7974974.084
T8	503337.047	7974980.078
T9	503241.644	7975010.049

FOR CONSTRUCTION

NOTES:

1. LIDAR SURVEY PROVIDED BY PHOTSAT (2016)
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METERS.
3. ALL DIMENSIONS ARE IN METERS
4. CONTOURS ARE IN METERS. CONTOUR INTERVAL IS 2m.
5. MODIFY EXISTING CULVERT OR CONSTRUCT A NEW CULVERT AT THE QUARRY ROAD TO ENSURE POSITIVE DRAINAGE (FLOW FROM SOUTH TO NORTH) THROUGH CULVERT.

LEGEND:

- MINOR SEASONAL STREAMS
- WATER BODY
- CATCHMENT AREA
- 20 LIDAR GROUND CONTOUR
- FLOW DIRECTION

0 50 100 150 200 250
SCALE IN METERS

DRAWING No.	DRAWING TITLE
H353004-40000-228-271-0001-0001	CAMP PAD NATURAL STREAM DIVERSION - PROFILE, SECTION AND DETAILS

REFERENCE DRAWINGS

NAME
SIGNATURE
ENG REG NUMBER
REVISION DATE
ORIGINAL DATE
REG. PROFESSIONAL

No.	DESCRIPTION	BY	CHK'D	DATE
0	APPROVED FOR CONSTRUCTION	FH	SRH	20/06/2017

REVISIONS

HATCH

ROLE	NAME	SIGNATURE	DATE
DRAFTSPERSON	F HUGO	NR	20/06/2017
DESIGNER	F HUGO	NR	20/06/2017
CHECKER	S HALL		20/06/2017
DESIGN COORD.	R GOOSEN		20/06/2017
RESP. ENG.	A GROBBELAAR		20/06/2017
LEAD DISC. ENG.	A GROBBELAAR		20/06/2017
AREA MANAGER	T BRUCE		20/06/2017
PROJ. MANAGER	S HEINER		20/06/2017
CLIENT			

DRAWING APPROVAL STATUS: Approved for Construction

Baffinland

BAFFINLAND IRON MINES LP
MARY RIVER PROJECT

MILNE PORT
CAMP PAD NATURAL STREAM DIVERSION
LAYOUT

SCALE	DWG. No.	REV
1:5,000 OR AS NOTED	H353004-40000-228-272-0001-0001	0

SHEET SIZE: D

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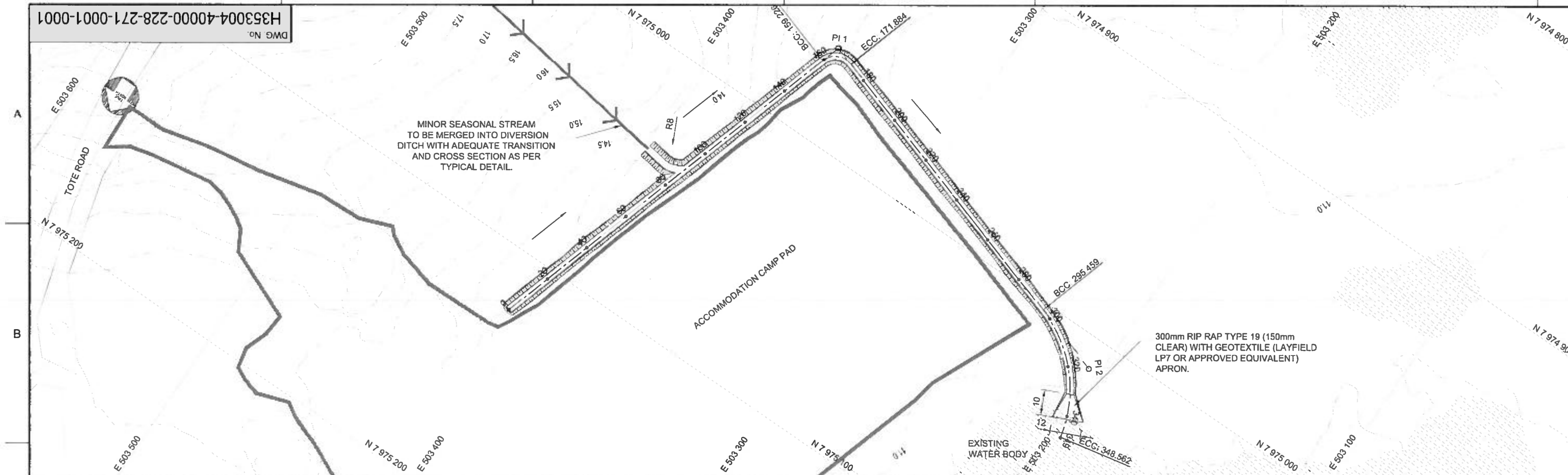
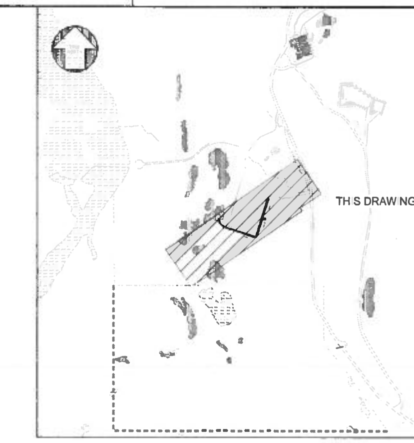
Attachment 4

H353004-40000-228-271-0001-0001
DWG No.



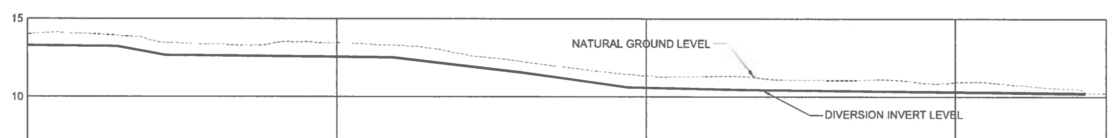
LAYOUT
SCALE 1:1000



KEY PLAN
NTS

SCALES:
Horizontal 1:1000
Vertical 1:200

DATUM 5.000



DISTANCE	DEPTH TO INVERT	INVERT LEVELS	GROUND LEVELS ON CL
0.000	0.723	13.277	14.001
20	0.780	13.238	14.018
28.900	0.698	13.221	13.919
40	0.795	12.822	13.617
44.399	0.810	12.664	13.474
60	0.723	12.632	13.355
80	0.870	12.592	13.462
100	0.910	12.551	13.461
117.923	0.785	12.514	13.299
120	0.813	12.467	13.279
140	0.761	12.008	12.769
159.226	0.722	11.567	12.289
	0.711	11.547	12.258
171.883	0.730	11.237	11.967
180	0.763	11.012	11.775
194.031	0.857	10.623	11.480
200	0.771	10.596	11.367
220	0.794	10.506	11.300
232.449	0.843	10.450	11.294
240	0.726	10.435	11.161
260	0.666	10.395	11.061
268.775	0.692	10.378	11.070
280	0.745	10.355	11.100
300	0.615	10.315	10.930
304.186	0.662	10.307	10.968
306.175	0.673	10.303	10.975
320	0.485	10.275	10.759
340	0.258	10.234	10.492
342.133 349	0.000	10.230	10.230 10.230

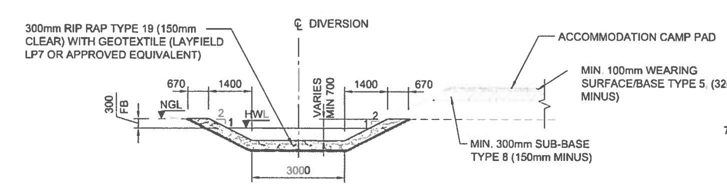
HORIZONTAL ALIGNMENT:
- DIRECTION 17°26'20"
- R=8.1m BCC1 159.226 171.884 ECC1 I=62°28'30" CURVE 1
- DIRECTION 107°30'30"
- BCC2 295.459
- CURVE 2 R=50.0m I=137°56'00"
- 348.562 ECC2

HYDRAULICS Q(m3/s)	HYDRAULICS V(m/s)	SLOPE / LENGTH
0.78	0.5	0.19% 1:513.2 28.90m
0.78	1.4	3.59% 1:27.8 15.50m
0.78	0.5	0.20% 1:490.1 73.52m
0.78	1.2	2.29% 1:43.6 41.30m
0.78	1.2	2.49% 1:40.2 13.28m
0.78	1.2	2.77% 1:36.1 22.15m
0.78	0.7	0.45% 1:222.3 38.42m
0.78	0.5	0.20% 1:499.7 36.33m
0.78	0.5	0.20% 1:498.2 35.38m
0.78	0.4	0.08% 1:1271.3 5.11m
0.78	0.5	0.21% 1:487.6 30.93m
0.78	0.5	0.20% 1:498.6 3.09m
0.78	0.5	0.20% 1:500.0 1.47m

DIVERSION LONGITUDINAL PROFILE

LEGEND:

(arrow)	MINOR SEASONAL STREAM
NGL	NATURAL GROUND LEVEL
CH	CHAINAGE
L	LENGTH
R	RADIUS
DA	DEFLECTION ANGLE
TL	TANGENT LENGTH
AL	ARC LENGTH
BCC	BEGINNING OF CURVE
ECC	END OF CURVE
PI	POINT OF INTERSECTION
HWL	HIGH WATER LEVEL
FB	FREE BOARD
(dashed line)	WATER BODY
(line)	FLOW DIRECTION
(dash-dot line)	DIVERSION CENTER LINE



TYPICAL DIVERSION CROSS SECTION
SCALE 1:100

FOR CONSTRUCTION

ACCOMODATION CAMP PAD DIVERSION SETTING OUT DATA				
NAME	CH	E	N	DETAILS
START	0 000	503 408.443	7 975 122 942	L 159.226m
BCC1 PI1 ECC1	159.226 171.884	503 360.722 503 358.306 503 350.618	7 974 971 035 7 974 963 344 7 974 965 770	R 8.052m DA 90°04'10" TL 8 062m AL 12.658m
BCC2 PI2 ECC2	295.459 348.562	503 232.767 503 204.763 503 198.838	7 975 002 947 7 975 011 782 7 975 040 543	R 50.000m DA 60°51'10" TL 29.365m AL 53.103m
END	348.739	503 198.802	7 975 040 543	L 0.177m

NOTES:

1. LIDAR SURVEY PROVIDED BY PHOTSAT (2016)
2. COORDINATE GRID IS SHOWN IN UTM (NAD83) ZONE 17 AND IS IN METERS.
3. CONTOURS ARE IN METERS. CONTOUR INTERVAL IS 0 5m
4. CROSS SECTION DIMENSIONS ARE IN MILLIMETERS ALL OTHER DIMENSIONS ARE IN METERS.
5. THE STREAM BED ELEVATIONS ARE BASED ON LIDAR DATA. THERE COULD BE DIFFERENCES BETWEEN THE ACTUAL STREAM BED ELEVATIONS AND LIDAR DATA. NOTIFY THE COMPANY'S REPRESENTATIVE IF ANY DIFFERENCE IS FOUND AND FIELD ADJUST THE DITCH/BERM INVERT ELEVATIONS AS PER COMPANY'S REPRESENTATIVES DIRECTION, AS REQUIRED.
6. AS A GUIDELINE THE DIVERSION INVERT ELEVATION AT THE UPSTREAM START SHALL BE AT LEAST MATCHING OR LOWER THAN THE CONNECTING STREAM BED ELEVATION AND THE DIVERSION INVERT ELEVATION AT THE DOWNSTREAM END SHALL BE AT LEAST MATCHING OR HIGHER THAN THE CONNECTING STREAM BED / WATER BODY ELEVATION TO ENSURE POSITIVE FLOWS AT THE DITCH START AND END.
7. PROVIDE 300mm RIP RAP TYPE 19 OVER GEOTEXTILE FOR THE ENTIRE LENGTH AND SECTION OF THE DIVERSION.

0 10 20 30 40 50
SCALE IN METERS

DRAWING No.	DRAWING TITLE
H343004-40000-228-271-0001-0001	CAMP PAD NATURAL STREAM DIVERSION - LAYOUT

REFERENCE DRAWINGS

NAME
SIGNATURE
ENG REG NUMBER
REVISION DATE
ORIGINAL DATE
REG. PROFESSIONAL

No.	DESCRIPTION	BY	CHK'D	DATE
0	APPROVED FOR CONSTRUCTION	FH	SRH	20/06/2017

REVISIONS

HATCH

ROLE	NAME	SIGNATURE	DATE
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DRAWING APPROVAL STATUS: Approved for Construction

Baffinland

BAFFINLAND IRON MINES LP
MARY RIVER PROJECT

MILNE PORT
CAMP PAD NATURAL STREAM DIVERSION
PROFILE, SECTION AND DETAILS

SCALE	DWG. No.	REV
1:1,000 OR AS NOTED	H353004-40000-228-271-0001-0001	0

SHEET SIZE: D

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Attachment 3

Construction Methodology – Camp Pad Water Diversion System

(H353004-40000-400-050-0001)

Plan

Construction Methodology - Camp Pad Water Diversion System

2017-06-16	0	Approved for Use	T Bruce	L Langlois	S Heiner	M Weaver
DATE	REV.	STATUS	PREPARED BY	CHECKED BY	APPROVED BY	APPROVED BY
						Employer

1. Overview

A diversion channel is required to divert a seasonal stream that runs through the accommodations camp pad at Milne Port that was constructed in May 2017. The seasonal stream flows briefly in the spring freshet and during significant rain events. Due to the timing and criticality of this diversion, a sequential plan must be in place and followed to ensure impacts to the downstream receiving environment are minimized.

2. Design

The diversion which has been designed to pick up the flows, divert and discharge into the natural drainages west of the constructed accommodations camp pad, run along the southern perimeter of the pad and has a cut throughout several hundred meters which reaches a depth of 1.0 meters at its deepest. This cut must be performed in to maintain flow while eliminating any ponding water.

3. Construction Methodology

The accommodation camp pad has previously been constructed and remains in place. Although flows for the remainder of this year will only occur during any significant rain events, the diversion must be fully constructed as soon as possible in the event flows do occur.

The diversion shall be constructed starting at the downstream end and progressing to the upstream to eliminate the possibility of encountering flows during construction. The sequence of construction shall be as follows:

1. Create a sump upstream of the diversion consisting of an excavated hole armored with rip rap to prevent erosion.
2. Setup of a pump with an intake in the sump and discharge hose running to a determined discharge location that flows to the natural drainages west of the pad.
3. Install a dam which does not allow water to travel downstream of the sump to the proposed construction area and downstream drainages. It should be noted that above pumping setup will only be used if flows are encountered during construction.
4. Complete all excavation for the full alignment of the diversion. Note that frozen conditions will be encountered in areas of cut deeper than 300 mm. To achieve the cuts an iterative process will be taken involving cutting to maximum depth allowed by local frozen conditions, allowing the frozen ground to thaw over 5-7 days and then revisiting the area until design depths have been achieved.
5. Place geotextile and rip rap on all areas of new diversion system to mitigate erosion and scouring from flow.

6. Upon completion of all ditching and placement of geotextile and rip rap, the diversion system will be complete and the upstream sump, dam and pumping setup will be removed to allow for flow through the diversion system.