Newmont CANADA

PORCUPINE
4315 Gold Mine Road
South Porcupine, ON P0N 1H0

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F 705.235.2343
newmont.com

March 27, 2020

Ministry of Environment, Conservation and Parks
Attention: Permit to Take Water Director
Director, Environmental Approvals Access and Service Integration Branch
135 St. Clair Avenue West
1st Floor
Toronto, Ontario, M4V 1P5

RE: **Application for Permit to Take Water – Pamour Water Collection System**

Dear Director,

Goldcorp Canada Ltd. – Porcupine, operating as Newmont Porcupine is applying for a Category Three Permit to Take Water for the purposes of colleting impacted surface water runoff on the Pamour Mine Site. The following application has been submitted in accordance with the *Ontario Water Resources Act*, Section 34, 11 and Ontario Regulation 387/04 for Water Taking and Transferring. Furthermore, the following application fulfills Item No. 4 under Provincial Order, Reference Number 6324-BKVRKD from the Ministry of Environment, Conservation and Parks.

The Permit to Take Water is required to facilitate the construction of the surface water collection system as described in the submitted Category 3 Permit to Take Water Surface Water Study (Attachment 3). The collection system is instrumental to prevent impacted surface water runoff from leaving the Pamour Mine Site. All collected water will be stored in the Pamour Open Pit prior to treatment and discharge into the common receiver, the Porcupine River.

Description

The proposed surface water collection system includes three separate collection areas and a constructed ditch, see Attachment 1 for reference. The collection areas and ditch are summarized in Table 1 below.

Table 1: Summary of taking and catchment areas.

Feature Name[1]	**Catchment Area Reference[2]**	**Area[3] (Hectares)**	**Tributary**
West Ditch	Catchment Area 1 West	52.6	CC Tributary
Collection Area 1	Catchment Area 1 East	174.5	CC Tributary
Collection Area 2	Catchment Area 2	61.1	Three Nations Lake & Lower Three Nations Creek
Collection Area 3	Catchment Area 3	29.8	Upper Three Nations Creek

[1] Provided in the AMEC, 2017 Hydrologic Analysis.
[2] Assigned catchment area name (Calder Engineering, 2020).
[3] Estimated area for the respective catchment basins (Calder Engineering, 2020).

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Collection Area 1 will route impacted surface water from Catchment Area 1 East by means of a constructed ditch and or passive drainage structure to the "West Pit" located to the northwest. The Collection Area includes a constructed berm to the south designed to contain stormwater runoff up to a 1-in-100-year event. The "West Pit" is hydraulically connected to the Pamour Pit, which will act as the central sink for the collection system.

The West Ditch will route impacted surface water from Catchment Area 1 west by means of a constructed ditch to the "West Pit". Furthermore, the constructed ditch will facilitate drainage from Collection Area 3 and prevent the water from flowing south to Collection Area 1.

Collection Area 2 will route impacted surface water from Catchment Area 2 by means of an engineered pump station to the Pamour Pit located directly to the northeast. Collection Area 2 includes a constructed berm to the east designed to contain a stormwater runoff up to a 1-in-100-year event.

Collection Area 3 will route impacted surface water from Catchment Area 3 by means of an engineered pump station to the constructed ditch located to the southwest which subsequently drains to the "West Pit" via the constructed West Ditch.

Taking Quantities and Durations

Taking will occur continuously (365 days, 24-hour) for the foreseeable future. Estimated takings were determined by hydrologic and hydraulic analysis completed by Amec in 2017 for Collection Areas 1,2 and 3, whereby hydrologic computations were completed by Calder Engineering Ltd. for the West Ditch. Refer to Table 2 for a summary of taking volumes and duration.

Table 2: Estimated taking volumes and durations.

Collection areas	**Typical Volume Per Day** (Liters/day)	**Maximum Volume Per Day** (Liters/day)	**Maximum Rate Per Minute** (Liters/minute)	**Taking Duration** Days [Hours]
West Ditch	593,000	146,880,000	102,000	365 [24]
Collection Area 1	3,112,000	25,920,000	18,000	365 [24]
Collection Area 2	1,217,000	4,320,000	3,000	365 [24]
Collection Area 3	428,000	2,592,000	1,800	365 [24]

Maximum taking limits are based on hydraulic modeling for the design stormwater events. Nominal taking volumes were based on the mean annual flow rates computed by Calder Engineering (Calder, 2020). For more details see enclosed Attachment 3 - Surface Water Study.

Water Conservation and Management Strategy

Management and conservation of water takings have been considered through the design and operation of the collection areas. The proposed collection areas have been designed to optimize water collection from impacted catchment areas and minimize taking from any unimpacted areas. This strategy will mitigate the takings by preventing unnecessary reductions in downstream flows and water levels. The provided Surface Water Study suggests monitoring the water taking rates, downstream flows and water levels to provide a trigger-response plans in preventing potential impacts on downstream tributaries and receivers.

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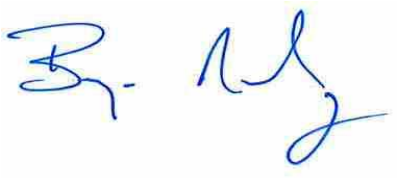
Furthermore, the takings are for the purpose of preventing impacted surface water from leaving site and entering the tributaries. The collection of this water will significantly reduce loadings from the associated runoff within the tributaries while reintroducing treated water into the Porcupine River.

I trust that the provided documents will suit your needs for the permit application. If you require any further information, do not hesitate to reach out to me by my email or telephone provided below.

Sincerely,



Bryan Neeley
Manager, Sustainability & External Relations
T:705.235.6505
E: Bryan.Neeley@newmont.com

Cc: Patrick Chabot, General Manger (interim), Newmont Porcupine
Desmond O'Connor, Senior Reclamation Coordinator, Newmont Porcupine
Dana Lajeunesse, Environmental Management and Planning Coordinator, Newmont Porcupine
Tyler Provencal, Environmental E.I.T., Newmont Porcupine

Encl.
Attachment 1 – 10:10,000 Ontario Base Map
Attachment 2 – Copy of Applicant's Master Business License
Attachment 3 – Surface Water Study
Attachment 4 – Completed Permit to Take Water Application Form

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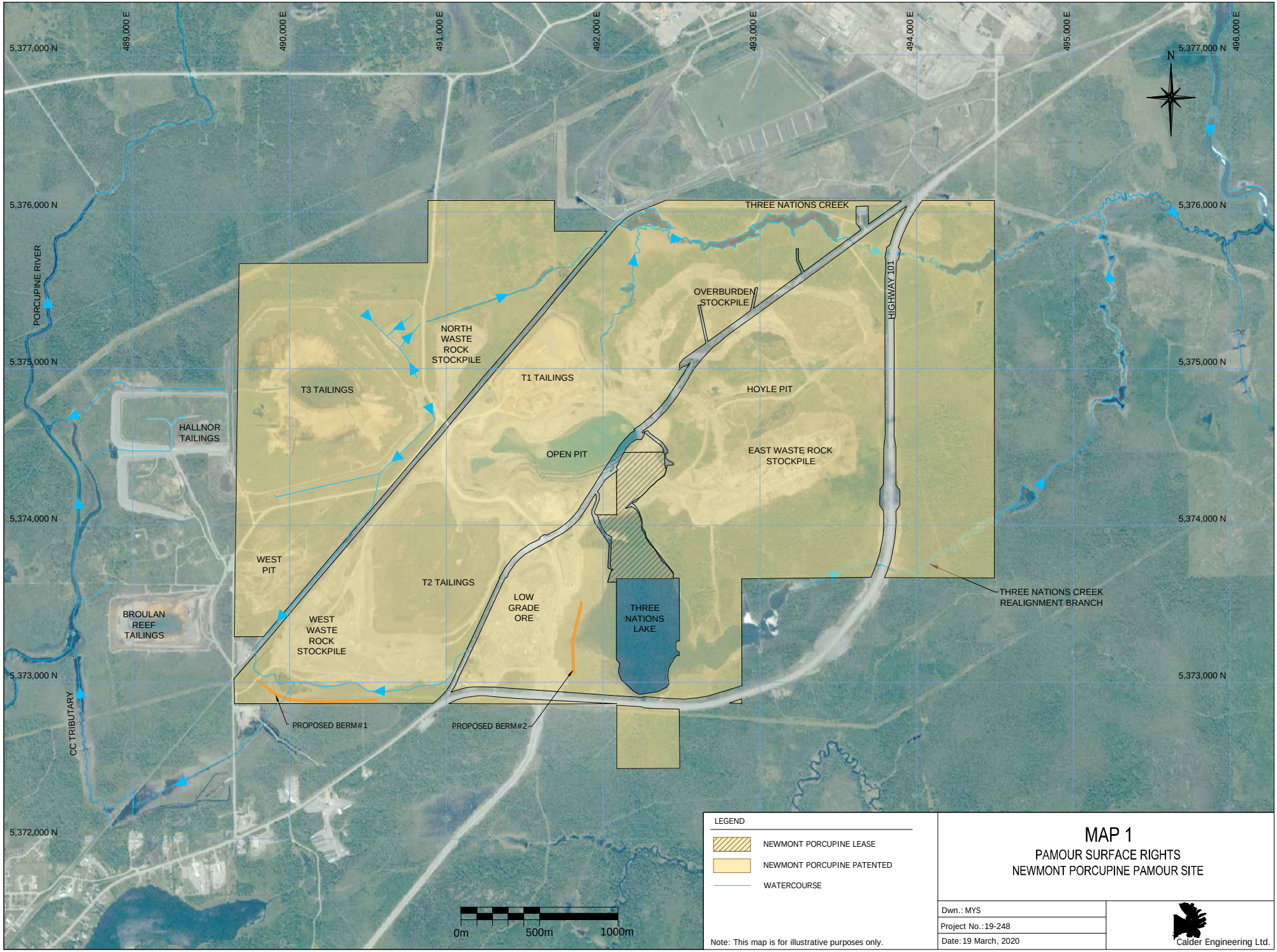
Attachment 1
10:10,000 Ontario Base Maps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N
PORCUPINE RIVER
THREE NATIONS CREEK
HIGHWAY 101
OVERBURDEN STOCKPILE
NORTH WASTE ROCK STOCKPILE
T1 TAILINGS
T3 TAILINGS
HOYLE PIT
HALLNOR TAILINGS
OPEN PIT
EAST WASTE ROCK STOCKPILE
WEST PIT
T2 TAILINGS
LOW GRADE ORE
THREE NATIONS LAKE
THREE NATIONS CREEK REALIGNMENT BRANCH
BROULAN REEF TAILINGS
WEST WASTE ROCK STOCKPILE
CC TRIBUTARY
PROPOSED BERM#1
PROPOSED BERM#2
0m
500m
1000m
LEGEND
NEWMONT PORCUPINE LEASE
NEWMONT PORCUPINE PATENTED
WATERCOURSE
Note: This map is for illustrative purposes only.
MAP 1
PAMOUR SURFACE RIGHTS
NEWMONT PORCUPINE PAMOUR SITE
Dwn.: MYS
Project No.: 19-248
Date: 19 March, 2020
Calder Engineering Ltd.


489,000 E
490,000 E
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492,000 E
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5,377,000 N
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N
PORCUPINE RIVER
THREE NATIONS CREEK
HIGHWAY 101
OVERBURDEN STOCKPILE
NORTH WASTE ROCK STOCKPILE
T1 TAILINGS
T3 TAILINGS
HOYLE PIT
HALLNOR TAILINGS
OPEN PIT
EAST WASTE ROCK STOCKPILE
WEST PIT
T2 TAILINGS
LOW GRADE ORE
THREE NATIONS LAKE
THREE NATIONS CREEK REALIGNMENT BRANCH
BROULAN REEF TAILINGS
WEST WASTE ROCK STOCKPILE
CC TRIBUTARY
LTM0608
LTM0609
LTM0914
LTM0952
LTM0512
LTM0533
LTM0603
LTM0613
LTM0529
LTM0542
LTM0754
LTM0547
1604170
1602345
1602034
LTM0631
LTM0911
7263970
LTM0649
LTM0927
0m
500m
1000m
LEGEND
LTM0649 MONITORING WELL LOCATION
1602345 DOMESTIC WELL LOCATION
Note: This map is for illustrative purposes only.
MAP 2
WELL LOCATIONS
NEWMONT PORCUPINE PAMOUR SITE
Dwn.: MYS
Project No.:19-248
Date: 19 March, 2020
Calder Engineering Ltd.

Newmont CANADA

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South Porcupine, ON P0N 1H0

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Attachment 2
Applicant's Master Business License

Ontario

Master Business Licence

Date Issued: 2019-07-08
(yyyy-mm-dd)

Business Number:

Business Name and Mailing Address:
PORCUPINE GOLD MINES
3400-666 BURRARD STREET
VANCOUVER, BRITISH COLUMBIA CANADA V6C 2X8

Business Address: 4315 GOLD MINE ROAD
SOUTH PORCUPINE, ONTARIO CANADA P0N 1H0

Telephone: **Ext:** **Fax:**

Email:

Legal Name(s): GOLDCORP CANADA LTD.

Type of Legal Entity: CORPORATION

Business Activity: MINING AND MILLING OF GOLD

Business Information	Number	Effective Date (yyyy-mm-dd)	Expiry Date (yyyy-mm-dd)
BUSINESS NAME REGISTRATION	290751379	2019-07-08	2024-07-07
INCORPORATED (CANADA)	001217701	1997-01-01	

To the Client: Clients should do a corporation search to ensure that the information pertaining to corporations contained on this Master Business Licence is correct and up to date.

To the Client: When the Master Business Licence is presented to any Ontario business program, you are not required to repeat information contained on this licence. Each Ontario business program is required to accept this licence when presented as part of its registration process.
If you have any questions about this Master Business Licence call the ServiceOntario Contact Centre at 1-800-565-1921 or 1-416-314-9151 or TTY 1-416-326-8566.
For more information, or to access other business-related services, call the Business Info Line, a collaboration between ServiceOntario and Industry Canada, at 1-888-745-8888 or 1-416-212-8888 or TTY 800-268-7095.
A business name registration is effective for 5 years from the date that it is accepted for registration. It is the registrant's responsibility to renew the business name prior to the expiry date and to pay the required fee.

To the Ontario business program: A client is not required to repeat any information contained in this licence in any other form used in your registration process.

2019-07-08

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Attachment 3
Surface Water Study

SURFACE WATER STUDY
CATEGORY 3 PERMIT TO TAKE WATER APPLICATION

PAMOUR MINE

Final Report Prepared for:

NEWMONT PORCUPINE
DOME MINE
P.O. Box 70
4315 Gold Mine Road
South Porcupine, Ontario
P0N 1H0

Prepared by:

Calder Engineering Ltd.
6440 King Street
Caledon, Ontario

and

EcoMetrix Incorporated
6800 Campobello Road
Mississauga, Ontario

March 2020
Reference: 19-248

Civil - Environmental - Water Resources
T (905)857-7600 E calder@caldereng.com W www.caldereng.com

NEWMONT PORCUPINE

SURFACE WATER STUDY

FINAL REPORT

MARCH 2020

REFERENCE NO. 19-248

Respectively submitted by:

Calder Engineering Ltd.

Robert J. Whyte, M.Sc., P.Eng
Project Manager

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APPENDICES

1.0 INTRODUCTION

Calder Engineering Ltd. and EcoMetrix Incorporated have been retained by Newmont Porcupine to prepare a Surface Water Study in support of a Category 3 Permit to Take Water application for the Pamour Mine in Timmins, Ontario. A water collection and pumping system is being proposed by Newmont Porcupine to manage impacted surface water on the Pamour Mine and improve downstream receiving water quality. The permitting and associated collection of impacted surface water directly fulfils the requirements under Provincial Officer's Order #6324-BKVRKD, Item No.4.

The proposed water collection and pumping system will result in diversion of water from the upper areas of three local tributaries to the Pamour Pit. The three local tributaries drain to the Porcupine River and include two branches of Three Nations Creek and a constructed watercourse denoted as the CC Tributary. Ultimately, the water diverted to the Pamour Pit from the three tributaries will be returned to the Porcupine River. Storage of impacted surface water runoff will be within the Pamour Pit under an existing Environmental Compliance Approval Amendment, reference number 1943-AUFR5D. Treatment and discharge from the Pamour Pit will be considered in a subsequent amendment to the existing Environmental Compliance Approval.

The objective of this study is to describe the proposed water taking and evaluate potential effects on surface water, groundwater, water quality, and aquatic resources of the three affected tributaries.

The surface water study has been prepared in general conformance with the Ministry of the Environment, Conservation and Parks technical guidance document for a surface water studies in support of Category 3 applications under the Ontario Water Resources Act and Ontario Regulation 387/04 "Water Taking and Transfer". The surface water study has been prepared, signed, and stamped by a Qualified Person (QP) who is a member of the Professional Engineers of Ontario and holds a Master of Science in Engineering degree with specialization in hydrology and hydraulics.

2.0 BACKGROUND

2.1 Study Area

The Pamour Mine is located approximately 5 kilometres east of South Porcupine and immediately north of Highway 101 in Northeastern Ontario. The legal description of the property is part of lots 1, 2, and 3, Concession 5, Whitney Township, District of Cochrane. It is located within the municipal boundaries of the City of Timmins.

The Pamour Mine is a historic mining operation that was opened in the 1930's as an underground mine and was expanded to include open pit mining in the mid 1970's. A major open pit expansion occurred in mid-2000 which included realignment of Highway 101 and alterations to water features including Three Nations Lake and Three Nations Creek. Mining operations ceased at the Pamour Mine in 2009. The current mine footprint includes several open pits, former tailings areas, waste rock and overburden stockpiles, ore stockpile pads, and road infrastructure. The mine site can be accessed from the Hallnor Road or via a haul road from the Dome Mine. An aerial photograph of the Pamour Mine is provided in Figure 2.1.

Studies conducted by Newmont Porcupine have identified three areas on the Pamour Mine where diversion of water will improve water quality in the downstream receiving environment. A water collection and pumping system has been proposed by Newmont Porcupine to divert impacted surface water and route it to the Pamour Pit, where the water will be stored, treated, and discharged back to the Porcupine River.

2.2 Proposed Water Taking

2.2.1 General Description

The proposed water collection and pumping system will result in diversion of water from the upper areas of three tributaries to the Porcupine River: two branches of Three Nations Creek and a tributary to the Porcupine River denoted as the CC Tributary. A feasibility level study for the proposed water collection and pumping system design was completed by Amec Foster Wheeler Environment & Infrastructure (2017) and is provided in Appendix A. For reference purpose the catchment areas to be diverted have been labelled as CATCH 1W, CATCH 1E, CATCH 2, and CATCH 3 for this report hereon. The respective catchment areas are shown in Figure 2.2. A summary of the catchment areas is provided in Table 2.1. The total drainage area diverted to the Pamour Pit is 318.0 hectares (ha).

Table 2.1: Summary of Diverted Catchment Areas

Catchment Area	Tributary	Drainage Area diverted (ha)	Diverted To	Method of Diversion
CATCH 1W	CC Tributary	174.5	West Pit and Pamour Pit	Ditch
CATCH 1E	CC Tributary	52.6	West Pit and Pamour Pit	Ditch and pump
CATCH 2	Three Nation Lake and Three Nations Creek (lower branch)	61.1	Pamour Pit	Collect and Pump
CATCH 3	Three Nations Creek (upper branch)	29.8	West Pit and Pamour Pit	Collect and Pump, Ditch

FIGURE 2.1

AERIAL PHOTOGRAPH OF PAMOUR MINE SITE
NEWMONT PORCUPINE

Dwn.: MYS	
Project No.: 19-248	
Date: 19 March, 2020	Calder Engineering Ltd.

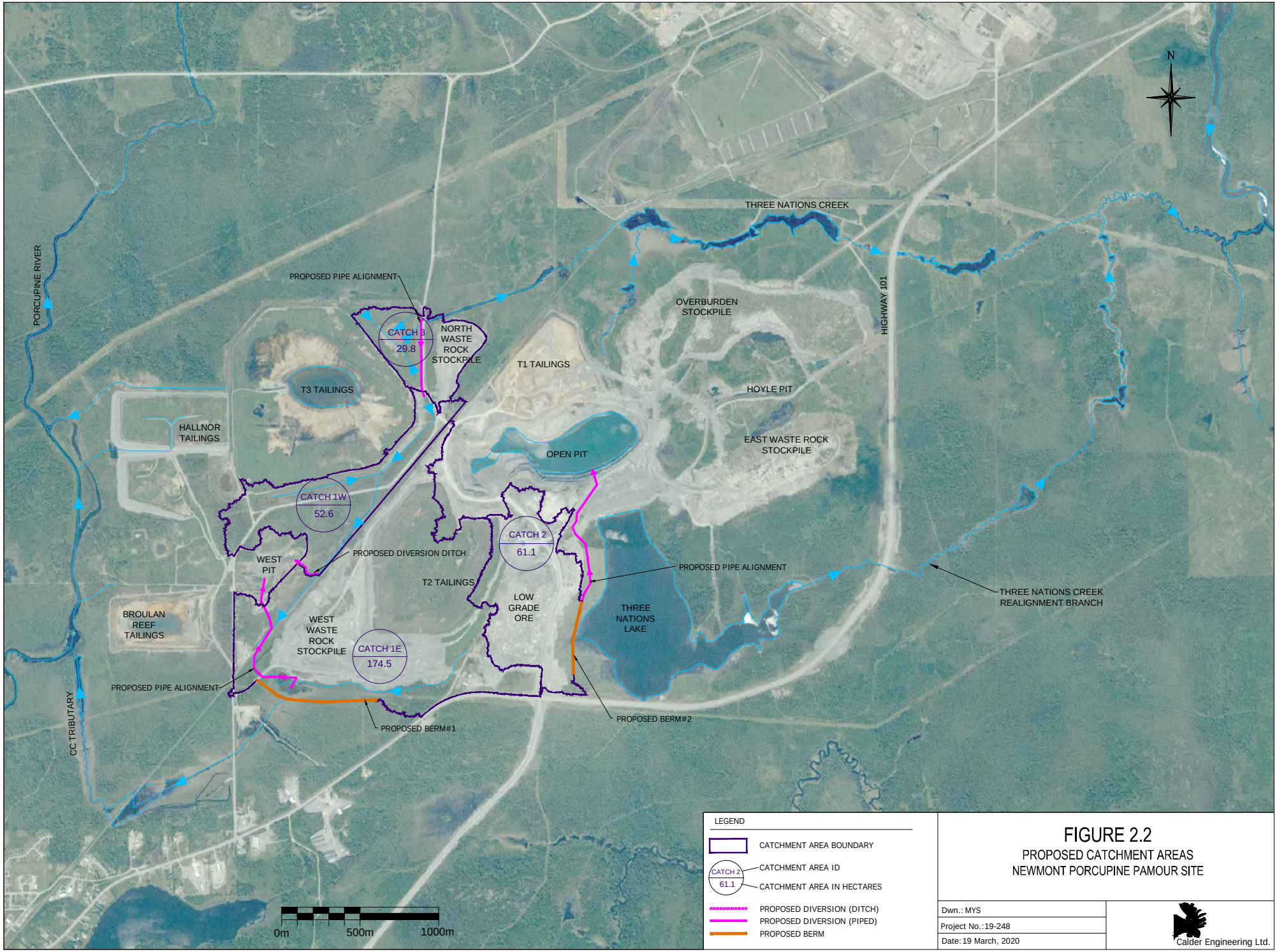

FIGURE 2.2

PROPOSED CATCHMENT AREAS
NEWMONT PORCUPINE PAMOUR SITE

Dwn.: MYS	
Project No.: 19-248	
Date: 19 March, 2020	

Calder Engineering Ltd.

Note:
1. Units: ha – hectares.
2. The West Pit is hydraulically connected to the Pamour Pit.

As shown in Table 2.1, surface water in CATCH 1W, CATCH 1E, and CATCH 3 will be directed to the West Pit on the Pamour Mine. It is reported by Amec Foster Wheeler Environment & Infrastructure (2017) that the West Pit is hydraulically connected to the main Pamour Pit by underground workings at Level 4 and Level 6. Surface water in CATCH 2 would be directed to a collection area and pumped directly to the Pamour Pit.

With respect to CATCH 3, located in the upper branch of Three Nations Creek, surface water would be collected and pumped to the Hallnor Road ditch which would subsequently direct flow to the West Pit.

2.2.2 Proposed Rates of Water Taking

A hydrologic and hydraulic analysis was completed by Amec Foster Wheeler Environment & Infrastructure (2017) to determine pumping rates required to manage a 25-year 24-hour duration design storm event from the CATCH 1E, CATCH 2, and CATCH 3 catchment areas (i.e., maximum rate and maximum volume per day of water taking). Summarized in Table 2.2 are proposed water taking rates based on the information provided by Amec Foster Wheeler Environment & Infrastructure (2017) for CATCH 1E, CATCH 2, and CATCH 3. The proposed maximum rate of water taking for CATCH 1W is from hydrologic computations completed by Calder Engineering Ltd. for this study and is based on the estimated peak flow for the 100-year design event. The proposed maximum volume per day of water taking for CATCH 1W is from hydrologic computations completed by Calder Engineering Ltd. and is based on the estimated runoff volume associated with the Timmins Storm. The typical volume per day of water taking numbers provided in Table 2.2 are based on the mean annual flow computed for the respective catchment areas by Calder Engineering Ltd. for this study.

Table 2.2: Proposed Rates of Water Taking

Catchment Area ID	Maximum Rate (cms)	Maximum Volume per Day (cu.m)	Typical Volume per Day (cu.m)	Maximum Number of Days of Taking in a Year
CATCH 1W	1.70[3]	91,404[3]	593[5]	365
CATCH 1E	0.30[4]	25,920[4]	3,112[5]	365
CATCH 2	0.05[4]	4,320[4]	1,217[5]	365
CATCH 3	0.03[4]	2,240[4]	428[5]	365

Note:
1. Units: cms – cubic metres per second; cu.m – cubic metres.
2. The maximum rate and maximum volume per day for CATCH 1W is based on the estimated peak flow for the 100-year design event and estimated runoff volume associated with the Timmins Storm, respectively
3. The maximum rate and maximum volume per day for CATCH 1E, CATCH 2, and CATCH 3 are based on managing a 25-year 24-hour duration design storm by collecting surface water in a collection area and pumping.
4. The “Typical Volume per Day” is based on the mean annual flow computed for the respective catchment areas by Calder Engineering Ltd.

2.3 Study Area Characterization

2.3.1 Surface Water Hydrology

The Pamour Mine is situated in the Porcupine River Watershed which drains to Night Hawk Lake and subsequently drains to the Frederick House Lake via the Frederick House River. Surface water from the Pamour Mine drains predominately to the Three Nations Creek watershed. Three Nations Creek has two main branches: one to the north of the Pamour Mine denoted as the upper branch and one to the southeast of the Pamour Mine denoted as the realigned branch. The realigned branch of Three Nations Creek is the constructed outlet channel for Three Nations Lake.

The key surface water features in the study area include:

- the Porcupine River
- Three Nations Creek (upper branch)
- Three Nations Lake
- Three Nations Creek (realigned branch)
- the CC Tributary

A discussion of the surface water characteristics of these features is provided in the following sections.

Porcupine River

The Porcupine River flows from Porcupine Lake, approximately 6 kilometres upstream of the Pamour Mine, to Night Hawk Lake, which subsequently discharges to the Frederick House River. The drainage area of the Porcupine River is typical of boreal forested lowland within the clay belt region. In the local study area, the Porcupine River meanders generally northward through coniferous lowland forest. Channel gradients and flow velocities are typically low. Stream morphology is comprised of approximately 60% pool areas and 40% flat areas. Substrates consist of grey/black organic silt and fine sand with substantial amounts of woody/plant debris. The river banks are typically stable and well vegetated by grasses and alders, with upland spruce and poplar. Sparse emergent vegetation is present at the edges of the bank, whereas dense submergent macrophytes occur throughout most of the channel. The near shore areas are characterized by floating duckweed, aquatic plants, and fallen trees.

Water Survey of Canada streamflow data is available for the Porcupine River at Hoyle (Station 04MD004). Typical flow in the Porcupine River adjacent the Pamour Mine was determined by pro-rating Water Survey of Canada streamflow data by drainage area. The approximate drainage area of the Porcupine River at Hoyle is 408 square kilometres and approximate drainage area of the Porcupine River adjacent the Pamour Mine is 99 square kilometres. The reference location used for the Porcupine River adjacent the Pamour Mine is the node denoted as the T3 Outfall on Figure 2.2. This is the location where effluent from the Pamour Mine is currently discharged to the Porcupine River from the T3 Tailings Area.

Summarized in Table 2.3 are pro-rated mean monthly, minimum monthly, and maximum monthly flow in the Porcupine River at the T3 Outfall location. As shown in Table 2.3, the mean annual flow is 1.339 cubic metres per second (cms) and the mean monthly flow varies from 0.222 cms (March) to 4.301 cms (May).

Table 2.3: Summary of Porcupine River Streamflow Characteristics adjacent the Pamour Mine

Month	Mean Monthly Flow (cms)	Minimum Monthly Mean Flow (cms)	Maximum Monthly Mean Flow (cms)
January	0.294	0.179	0.586
February	0.222	0.105	0.445
March	0.486	0.100	4.228
April	3.645	0.634	6.294
May	4.301	0.872	8.724
June	1.256	0.306	2.843
July	0.807	0.090	2.406
August	0.700	0.080	2.503
September	0.904	0.120	2.389
October	1.514	0.442	3.961
November	1.346	0.566	3.378
December	0.595	0.330	1.616
Annual	1.339	-	-

Note:
1. Units: cms – cubic metres per second.

Three Nations Creek (Upper Branch)

Surface water from the Pamour Mine drains predominately to the Three Nations Creek watershed. Three Nations Creek has two main branches: one to the north of the Pamour Mine and one southeast of the Pamour Mine which includes Three Nations Lake. The north or upper branch of Three Nations Creek was the original outlet for Three Nations Lake. As a component of the approved 2005 Pamour Pit expansion, Three Nations Lake was modified, and the lake outlet realigned to the southeast to connect to a tributary of Three Nations Creek south of Highway 101.

The existing drainage area of the upper branch of Three Nations Creek at Highway 101 is 388.1 ha and at the confluence with the realigned branch of Three Nations Creek is 536.6 ha. The upper branch receives drainage from the Pamour Mine and also the Kidd Metallurgical Site of Glencore Canada Corporation to the north. Upstream of Highway 101 the watercourse has been modified by channelization, berm construction, and past and present beaver activity. Of specific note, two grade control structures were constructed in 2011 by Glencore Canada Corporation to maintain flooded conditions over several areas of the tributary and reduce the release of metals from creek sediments.

Under extreme dry weather conditions, it has been reported that intermittent flow conditions can occur in the upper branch of Three Nations Creek (Amec Foster Wheeler Environment & Infrastructure, 2015).

Three Nations Creek (Realigned Branch)

In the mid-2000, a major expansion occurred at the Pamour Mine which involved enlargement of the open pit, isolating and draining a portion of Three Nations Lake, and construction of a new drainage channel to convey flow from Three Nations Lake to an existing tributary of Three Nations Creek at a point approximately 5 kilometres downstream of the lake outlet. The realigned Three Nations Creek (denoted the realigned branch) contains redirected flow from Three Nations Lake and joins the upper branch of Three Nations Creek, approximately 1.3 kilometres upstream of the confluence with the Porcupine River.

The existing drainage area of the realigned branch of Three Nations Creek at Highway 101 is 309.9 ha and at the confluence with the upper branch of Three Nations Creek is 786.7 ha. Upstream of Highway 101, the lower branch of Three Nations Creek receives drainage from areas of the Pamour Mine, Three Nations Lake, and vegetated and forest areas. Downstream of Highway 101, the drainage area is predominately forested.

Newmont Porcupine has been monitoring flow in the realigned branch of Three Nations Creek since the Pit Expansion in mid-2000. A continuous streamflow gauging station was established on the realigned branch of Three Nations Creek in 2007 and is operational to-date. This streamflow gauging station is located immediately downstream of Highway 101.

Summarized in Table 2.4 are monthly streamflow characteristics for the realigned branch of Three Nations Creek at Highway 101 over the period 2013 to 2019. As shown in Table 2.4, the realigned branch of Three Nations Creek has intermittent flow conditions having experienced recorded zero flow conditions during each month of the year over the period 2013 to 2019.

Table 2.4: Summary of Monthly Streamflow Characteristics for Three Nations Creek (Realigned Branch) at Highway 101 (2013 to 2019)

Month	Mean Monthly Flow (cms)	Minimum Monthly Mean Flow (cms)	Maximum Monthly Mean Flow (cms)
January	0.029	0.000	0.122
February	0.013	0.000	0.079
March	0.015	0.000	0.108
April	0.226	0.000	1.416
May	0.313	0.000	1.623
June	0.160	0.000	1.574
July	0.031	0.000	0.575
August	0.038	0.000	0.327
September	0.033	0.000	0.304
October	0.098	0.000	0.861
November	0.075	0.000	0.188
December	0.076	0.000	0.211

Note:
1. Units: cms – cubic metres per second.

Three Nations Lake

Three Nations Lake is located on the Pamour Mine to the southeast of the Pamour Pit. The lake is located upstream of Highway 101 and has an existing drainage area of 238.6 ha. Three Nations Lake does not have any major tributaries and receives drainage from the low-grade ore stockpile pad immediately to the west, vegetated and forest areas surrounding the lake, and the lake itself.

The lake is generally oriented in a north to south direction and has a shallower and narrow basin extending from the south of the lake towards Highway 101. This basin was constructed as part of the Pit Expansion in mid 2000 to compensate for loss of portion of the original north part of the lake with the respective pit expansion.

The surveyed outlet elevation of the lake is 285.6 metres. Based on information from bathymetric surveys completed by Newmont Porcupine on the main portion of the lake and data on the compensation lake portion from the Porcupine Joint Venture (2005), at elevation 285.6 metres, the surface area of the lake is 62.1 ha and lake volume is in the order of 1,891,700 cubic metres. This equates to a mean lake depth of 3.05 metres.

Lake levels follow a typical pattern of high in the spring in conjunction with the spring melt followed by a gradual recession over the summer and slight increase in the fall. Review of data from Newmont Porcupine on lake water levels indicates lake water levels typically vary over an approximate 0.5 metre range, and have occasionally fallen below the lake outlet elevation of 285.6 metres.

CC Tributary

The CC Tributary is a constructed drainage channel upstream of the Ontario Northland Transportation Commission (ONTC) rail line. Downstream of the ONTC rail line, the tributary flows through a low-lying area to the Porcupine River. The existing drainage area of the CC Tributary at the Porcupine River is approximately 492.5 hectares.

The constructed channel sections are typically linear in plan form and of trapezoidal shape with a base width in the order of three to five metres. The channel typically has the presence of standing water, even under dry weather conditions, due to the low channel gradient and presence of beaver activity. A photograph of the CC Tributary is provided in Figure 2.3.

A temporary flow monitoring station was installed and maintained on the CC Tributary at the Hallnor Road crossing in the Summer of 2017. Summarized in Table 2.5 are monthly flow characteristics for August, September, and October of 2017. A description of the flow monitoring installation and collected data has been provided by Calder Engineering Ltd. (2018).

Table 2.5: Summary of CC Tributary Monthly Flow Characteristics

Month and Year	Minimum Recorded Flow (L/s)	Maximum Recorded Flow (L/s)	Mean Flow (L/s)
August 2017	7.88	498.89	119.09
September 2017	7.41	94.79	36.48
October 2017	7.02	447.74	63.50

Note:
1. Units: L/s – litres per second.
2. Information from flow monitoring completed by Calder Engineering Ltd. for Goldcorp Canada Ltd.
3. Minimum and maximum recorded flows are based on the 15-minute interval dataset. Monthly mean flow is based on the arithmetic mean of all recorded data points for a given month.

Figure 2.3: CC Tributary looking downstream (west) at the Hallnor Road Crossing (July 13, 2017)

2.3.2 Groundwater

The geology in the area of the Site consists of variable thicknesses of overburden overlying bedrock. Previous studies (Klohn Crippen, 1998) have characterized the Site into five hydrostratigraphic layers: these are summarized in Table 2.6.

Table 2.6: Summary of the Five Hydrostratigraphic Layers at the Pamour Mine (source: Klohn Crippen, 1998)

Hydrostratigraphic Layer	Approx. Thickness (m)	Formations	Estimated Hydraulic Conductivity (m/s)	Expected Rate of Groundwater Flow	Hydrogeological Classification
Layer 1 (Surficial Layer, unconfined aquifer)	0 - 17	Fill material, Peat, Sands	10^{-5}	Moderate (sand) to high (waste rock and peat)	Unconfined Unit
Layer 2 (Middle aquifer)	0 - 5	Silt, Clay, Clayey Silts	10^{-7} to 10^{-9}	Low	Confining Unit
Layer 3 (Lower overburden aquifer	0 - >30	Sands, Glacial Till	10^{-5} to 10^{-6}	Moderate	Confined Unit (potentially unconfined adjacent to outcrops where clay unit is not present)
Layer 4 (Shallow fractured bedrock aquifer)	0 – 5	Slates, Greywackes, Conglomerates and Volcanics	10^{-5} to 10^{-7}	Moderate to Low	Confined Unit or Confining Unit depending on K value
Layer 5 (Regional bedrock system)	Deeper than 6 m into bedrock	Slates, Greywackes, Conglomerates and Volcanics	10^{-7} to 10^{-9}	Typically Low (potentially higher K along fault & fracture zones)	Confining Unit

Note:
1. Units: m – metres; m/s – metres per second.
2. K – hydraulic conductivity.

Shallow groundwater flow occurs within the overburden, with some sub-horizontal flow in the shallow organics above the clay, some vertical flow through the clay and sub-horizontally through the shallow bedrock (up to 6 m into bedrock). Overburden tills and clays are of low permeability, and water in these layers is somewhat perched, preventing significant infiltration into the deeper groundwater system. Bedrock topography and local surface water features control groundwater flow in the shallow system. Deeper groundwater flow in the bedrock is reportedly toward the north. Faulting and shearing are the main structural features that control groundwater movement in the deep bedrock groundwater flow system.

Groundwater elevations in on-site wells are measured coincidentally with groundwater quality sampling and the level data used to infer groundwater flow paths. Groundwater flow at the Pamour Site is strongly influenced by the presence of open pits (main pit and satellite pits) and underground mine workings, as well as Three Nations Creek and Three Nations Lake. The main open pit in particular acts as a significant groundwater sink since the water elevation in the pit has not yet risen to the elevation of the local groundwater table. Mounding of the water table occurs within the fine-grained material within the T2 and T3 tailings areas resulting in the downward and outward flow of groundwater.

There is an extensive groundwater monitoring network at the site, both in terms of evaluating groundwater quality and groundwater elevations. During the development of the main open pit in the mid-2000s, many groundwater wells were installed around the property with the intention of monitoring water levels during pit dewatering. Groundwater wells were also installed in the T2

tailings to monitor the performance of the contained concentrate tailings relocated from T1 between 2005 and 2009 (i.e., the Leachate Contingency Plan). In early 2013, a data gap was identified, particularly within and surrounding the waste rock piles, with screens targeting the shallow groundwater table and managed the installation of several additional wells later that year to address this deficiency. Ten (10) standpipes were installed within the waste rock, overburden and low grade ore stockpiles to characterize the quality of drainage, or contact waters, immediately below the piles and above the natural ground surface.

Groundwater quality on the Pamour site is influenced by site aspects. Subsurface water in the tailings facilities comprises a mixture of process water and infiltration. Subsurface water associated with the waste rock piles is drainage that has developed its chemistry within the stockpile. Compared to the background groundwater quality in the area, subsurface water in the tailings facilities is typically characterized by elevated alkalinity, hardness, sulphate, chloride, dissolved organic carbon (DOC), phosphorus and several metals/metalloids (arsenic, cadmium, iron, manganese and zinc). Shallow subsurface waters at the waste rock piles exhibit neutral pH and generally elevated levels of sulphate and hardness when compared to background groundwater quality. Metal/metalloid concentrations in the shallow subsurface differ among the stockpiles, with arsenic concentrations associated with the West Waste Rock Pile being highest (~ 1 to 2 mg/L) and arsenic concentrations associated with the North Waste Rock Pile and former Low Grade Ore stockpile area being lowest (< 0.05 mg/L). The spatial pattern for nickel mirrors that of arsenic, with the highest concentrations measured at the West Waste Rock Pile (0.2 to 0.4 mg/L) and the lowest concentrations measured at the North Waste Rock Pile and Low Grade Ore stockpile area (< 0.02 mg/L). Generally, the concentrations of the other metals (e.g., copper, cobalt, and zinc) do not show a signature in the subsurface that is related to the waste rock.

2.3.3 Water Quality

Surface water quality monitoring on site includes the characterization of effluent, site drainage and receiving environment sampling. In this context, effluent includes water released (or within) the T3 Tailings Facility that comprises runoff that collects within this inactive facility, site drainage refers to surface runoff derived from and closely associated with Site aspects and the receiving environment includes natural surface water features such as the Porcupine River, Three Nations Creek and Three Nations Lake. The surface water monitoring network on the Pamour site is extensive. Most of the locations are sampled to fulfil commitments made in the Leachate Contingency Plan that was developed in consideration of the plan for open pit expansion and to confirm the success/adequacy of the T1 Tailings Relocation program. A lesser number of stations are sampled to better understand the quality of site drainage based on the current configuration of the Site, whereas the primary objective of others is to support development and refinement of the site-wide constituent loadings model. Surface waters are characterized upstream and downstream of proposed collection areas.

Over the last couple of years, effluent has been discharged from the site on between approximately 175 to 225 days, with the volume of effluent discharged ranging from approximately 75,000 m^3 to 170,000 m^3. Effluent quality met all discharge criteria at all times, no acute toxicity was measured in the effluent and a decreasing trend has been noted in key constituents (e.g., arsenic, nickel) in the last number of years.

The quality of drainage in the immediate vicinity of various on-site aspects reflects the nature and geochemical characteristics of the material that is stored within them. Site drainage in general is characterized by neutral pH and high hardness and sulphate levels, though cyanide leach tailings remain in localized, isolated pockets on the T1 tailings and runoff from these tails exhibit acidic

pH values. Hardness and sulphate levels range from on the order of 500 mg/L to 1,100 mg/L and from approximately 200 mg/L to greater than 800 mg/L, respectively, with the highest values of each constituent seen in areas where drainage is influenced more significantly by acid generation as the result of sulphide oxidation and the subsequent neutralization of the acid via the dissolution of carbonate minerals in the material. Site-wide the neutralization potential of waste rock and tailings well exceeds the acid generation potential. Sodium levels in Site drainage reflect the relative contribution of drainage from tailings areas. Higher levels of sodium are seen where drainage is dominated by tailings run-off. Sodium levels in the range of 75 mg/L measured in Site drainage represent areas of significant tailings run-off inputs, sodium levels in the range of 20 to 30 mg/L represent areas with moderate tailings run-off inputs and drainage that is free of tailings influence has sodium levels less than 10 mg/L. Elevated arsenic levels are ubiquitous in Site aspect drainage across the Site, though concentrations associated with the Site aspects differ. For example, arsenic concentrations associated with the West WRP (~ 0.23 to 3.3 mg/L) are generally higher than those associated with the East WRP (up to 1 mg/L) and North WRP (up to 0.53 mg/L). Arsenic concentrations associated with drainage from the tailings are similar and generally on the lower end of those associated with the waste rock stockpiles.

Water quality in the open pit is driven by its various inputs that include groundwater inflow, direct precipitation, surface runoff from Site aspects and the source terms associated with the pit itself, such as the pit walls and rubble on the pit floor and benches that would have leached soluble products prior to them being inundated as the pit filled with water. Pit water chemistry is measured regularly with samples taken from the surface and at depth. The water column has shown evidence of thermal stratification during late summer but no evidence of chemical stratification has been noted. As an example, water quality within the pit associated with a sample collected in July 2018 is discussed. Generally, the chemistry in the pit measured in that sample is consistent over time. At that time, conductivity in surface waters was 824 uS/cm and increased with increasing depth to 1,520 uS/cm at 90 m. Hardness and alkalinity at the surface were 361 mg/L as CaCO3 and 130 mg/L as CaCO3, respectively, and were 851 mg/L as CaCO3 and 276 mg/L as CaCO3, respectively, at a depth of 90 m. The concentrations of some other constituents, including for example boron, cobalt iron, manganese, nickel, potassium and strontium generally followed this same pattern and increased with depth. In contrast, concentrations of arsenic increased from surface water (0.210 mg/L) to 50 m depth (0.291 mg/L) and decreased thereafter to 90 m depth (0.056 mg/L).

The quality of water downstream of the Site in the receiving environment generally reflects the influence of drainage from Site aspects, but also reflects inputs from different source areas in the individual sub watersheds. For example, water quality in the Porcupine River reflects inputs associated with mining facilities upstream, as well as from the Whitney-Tisdale Sewage Treatment Plant. Arsenic monitoring data provide clear examples of the changes that have occurred in receiving water quality in the pre- and post-mining eras at Pamour. Arsenic regularly exceeds the IPWQO and PWQO at most on-site monitoring stations and therefore remains the primary constituent of concern. Cobalt and nickel concentrations at several on-site monitoring stations also exhibit exceedances of their respective PWQO values. Other constituents such as copper, boron, iron, zinc and ammonia also exceed their respective PWQO/IPWQO values but only infrequently.

2.3.4 Aquatic Resources

Aquatic biological community data are available as described below for the three surface water features into which site drainage reports, the Porcupine River, Three Nations Lake and Three

Nations Creek. The north and south constructed channels convey Site drainage to their respective receiving environments, Three Nations Creek North and the Porcupine River.

Aquatic biological community data come from routine aquatic biology monitoring that has been done as part of Environmental Effects Monitoring (EEM) program under the MMER of the Fisheries Act, as well as from performance monitoring that was completed to assess the success of measures implemented as part of the Fisheries Habitat Authorization Compensation program associated with the construction of the Three Nations Lake Dam. Selected data were also collected to support the development of and Environmental Risk Assessment (ERA) for the site. Areas from which biological community data have been collected in the last number of years are highlighted in Figure 2.4. Additional aquatic resource characterization relevant to the Pamour Site, including Collection Area 1 (CA1) and Collection Area 3 (CA3), was conducted in 2018 by Wood.

Porcupine River

The reach of the Porcupine River situated west of the Pamour mine site is low gradient (< 1%). The wetted channel width in areas where the river channel is clearly defined is in the range of 5 to 10 m, though it may be several tens of metres in areas where the margins of the river comprise flooded wetlands. Water depth ranges from 1 to 3 m. Bottom sediments are dominated by fine fractions (fine sand, silt, clay) and total organic carbon levels are relatively high ranging up to on the order of 10%. The river supports dense aquatic emergent and to a lesser extent submergent macrophytes, as well as pondweeds and algae. Riparian vegetation in the area consists of grasses, sedges, rushes, cattails, horsetails and shrubs (alder and dogwood), whereas upland vegetation consists of shrubs (alder and dogwood), horsetails, and a mixed forest community including black spruce.

The fish community in the vicinity of the Pamour site is dominated by forage fish species. The most abundant of these are Brook Stickleback, Brassy Minnow, Finescale Dace and Pearl Dace. Brook Stickleback have been used for further assessment, including the measurement of age distribution, growth (size at age), reproductive capacity (gonad weight at body weight) and energy storage (condition [ratio of length:weight] and relative liver weight). No differences have been measured in male and female brook stickleback upstream and downstream of the Site discharge in terms of age distribution, growth, reproductive capacity and relative liver weight. Condition of female fish has been lower downstream of the Pamour discharge in some surveys, but reduced condition in these fish has not been measured consistently. Generally, the results of the EEM surveys indicate no effects on fish health downstream of the Pamour discharge.

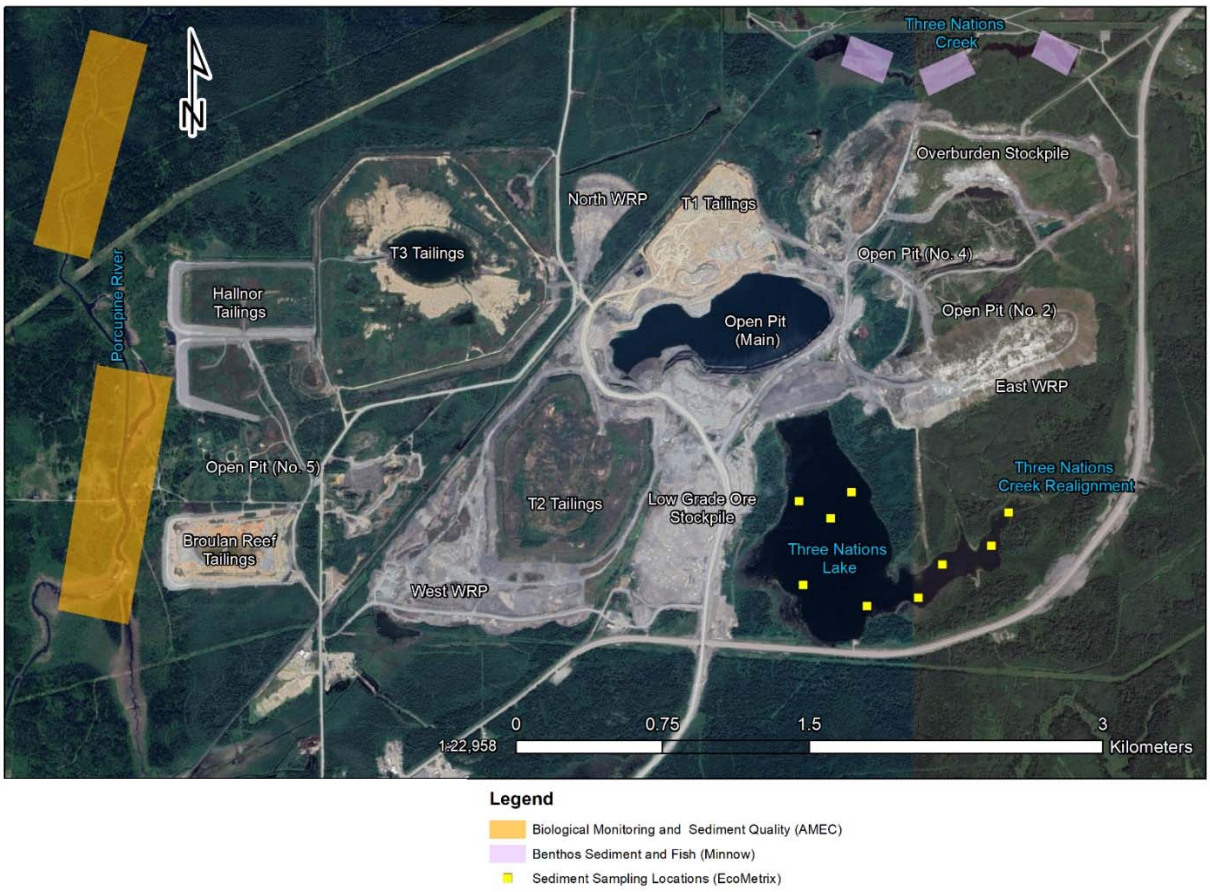

Figure 2.4: Biological Sampling Locations at the Pamour Site

Three Nations Lake and the Three Nations Creek Realignment

Following the open pit expansion in 2006, the northern portion of Three Nations Lake was infilled. As part of required habitat compensation, a replacement basin was created on the eastern portion of the Lake. Additionally, a new lake outlet was constructed with the outlet creek (Three Nations Creek Realignment) flowing back into the original Three Nations Creek channel to the northeast of the Site.

As noted in Section 2.3.1, Three Nations Lake occupies a surface area of approximately 62.1 ha within a relatively small watershed of 238.6 ha. The main (original) basin of the lake is oriented north-to-south and the new lake basin in oriented east-to-west. The maximum lake depth is on the order of 7 m, with this depth occurring in the main lake basin. The new lake basin is generally shallower (2 to 3 m) and has extensive shoreline areas that have been developed specifically to enhance walleye spawning.

Plants noted along the Three Nations Lake shoreline include: herbaceous plants, grasses, sedges, horsetails, strawberry, wintergreen, low shrubs, Labrador tea, raspberry, leatherleaf,

dogwood, dwarf birch, and tall shrubs/trees (balsam fir), willow, tamarack, speckled alder, white birch, trembling aspen and balsam poplar (Azimuth, 2015).

A wide variety of emergent, submergent, and floating aquatic vegetation are found at Three Nations Lake. The aquatic plant species observed are commonly found within aquatic environments in this region of Ontario and include: Cattail, Arrowhead, Burreed, Hard Stem Bulrush, Yellow Water Lilly, Tape Grass, Water Milfoil, Variable-Leaved Pondweed, Curly Leaf Pondweed, Common Waterweed, and Stonewort/Muskgrass (Azimuth, 2015).

Cattail stands along the shoreline provide erosion protection and spawning/nursery and feeding habitat for fish found within the lake. The aquatic vegetation at Three Nations Lake provides spawning habitat for Northern Pike and Yellow Perch, and provides nursery and feeding areas for gamefish such as Walleye, Northern Pike, and Yellow Perch (Azimuth, 2015).

Flooded shoreline areas and associated tree mortality have been observed at Three Nations Lake, with these flooded shorelines transitioning to wetland “marsh” habitat, which will provide key aquatic habitat features (Azimuth, 2015).

In the lake the following species have been collected: Walleye, Northern Pike, Yellow Perch, Iowa Darter, and White Sucker. The forage fish community in Three Nations Lake is reportedly limited and the adult sport fish population likely is sustained on young-of-year and juvenile Yellow Perch and White Sucker (Azimuth, 2015). The most recent and final assessment of fisheries habitat use in Three Nations Lake was conducted in 2014 (Azimuth, 2015). Based on observations made during this survey it was concluded that the spawning shoals created for the DFO compensation are functioning as intended, and are providing spawning opportunities for Walleye within Three Nations Lake. Similarly, based on the results and observations made during the four-year spawning assessment it was concluded that Three Nations Lake Northern Pike and Yellow Perch populations are making use and successfully spawning within the available habitat created for the DFO compensation during the creation of the new replacement basin.

Three Nations Creek Realignment comprises a relatively small (< 2 m wetted width) and shallow (< 1 m depth) low gradient channel. Bottom substrates comprise fine-grained organic muds. In general, riparian vegetation has successfully established along the length of the channel and includes grasses, sedges and reeds. Instream plant cover is afforded by emergent and submergent macrophytes (Azimuth, 2015). In the creek the following species have been collected: Northern Pike, Yellow Perch, Brook Stickleback, Northern Redbelly Dace, Brassy Minnow, Pearl Dace, Finescale Dace, Fathead Minnow, and Iowa Darter.

Three Nations Creek

Prior to open pit expansion, water from Three Nations Lake flowed northwards into Three Nations Creek. However, as the pit was expanded, the north part of Three Nations Lake was infilled and a new basin was created at the eastern portion of the Lake. Thus, Three Nations Creek no longer receives input from Three Nations Lake.

Extensive in-stream works were carried out by Glencore in 2011 as part of remedial activities associated with the Kidd Met Site (Jarosite Ponds). As part of these activities two large grade

control structures (rock fill dams) were installed within Three Nations Creek upstream of Hwy 101 that resulted in the flooding of large areas of the Three Nations Creek flood plain. The purpose of these works was to maintain continual flooded conditions in specific reaches of the creek and thereby reduce the release of metals from creek sediments.

Three Nations Creek is an intermittent riverine tributary flowing approximately 6 km in an easterly direction to the Porcupine River. Three Nations Creek is characteristic of a warm/cool water stream that supports a forage/baitfish community. Species present include: Brassy Minnnow, Brook Stickleback, Fathead Minnow, Finescale Dace, Northern Redbelly Dace, and Northern Pearl Dace (Wood, 2019). Larger bodied sport fish species have not been identified during previous studies. Influences from past and present beaver activities have resulted in a wide variation in channel configuration, including open water impoundments and areas of riverine wetland conditions. Segments of the creek exhibit low to no discernable flow velocity, generating depositional areas consisting of fine bed material and organics underlain by a layer of unconsolidated clay. The surrounding riparian vegetation consists of a combination of grass, sedge, cattail, bulrush and woody shrub species, while the table land vegetation is largely composed of mixed forest stands.

Three Nations Creek to the north of the Pamour site comprises a diverse and abundant forage community (AMEC, 2015). A total of eight fish species have been collected including Brassy Minnow, Brook Stickleback, Fathead Minnow, Finescale Dace, Iowa Darter, Northern Redbelly Dace, Pearl Dace and White Sucker. Fish population health is seemingly unaffected by current or historic releases associated with the Jarosite Ponds. Fish condition was as high or higher in several sentinel species at measured areas potentially impacted by the Jarosite Ponds than it was at non-impacted or reference areas.

CC Tributary

A fish community assessment was conducted in 2018 to document existing habitat within the North and South constructed channels (Wood, 2019). The South Constructed Channel conveys site drainage to the Porcupine River to the southwest of the Site. The North Constructed Channel conveys site drainage to the Three Nations Creek to the north of the Site.

Fish collections were made at three areas that are part of the South Constructed Channel drainage (Figure 2.6).

- Upstream of the ponded area to the south of the West WRP five fish species were captured: Brook Stickleback, Fathead Minnow, Finescale Dace, Northern Redbelly Dace and Northern Pearl Dace. A total of 187 individuals were captured with Fathead Minnow being the most abundant, followed by Northern Redbelly Dace, Finescale Dace, Northern Pearl Dace and Brook Stickleback.

- Within the ponded area a total of 187 individual fish were captured representing five species: Brook Stickleback, Fathead Minnow, Finescale Dace, Northern Redbelly Dace and Northern Pearl Dace. Fathead Minnow were the most abundant fish species captured, followed by Finescale Dace, Brook Stickleback, Northern Pearl Dace and Northern Redbelly Dace.

- Downstream of the ponded area in the stretch of the channel contiguous with the Porcupine River fourteen individual fish representing four fish species were captured: Brook Stickleback, Fathead Minnow, Finescale Dace and Northern Pearl Dace. Brook Stickleback were the most abundant fish species captured, followed by Fathead Minnow, Finescale Dace and Northern Pearl Dace.

A total of 331 individual fish were captured in the channel reach located approximately between routine water quality monitoring stations PM121A and PM121B representing six fish species: Brassy Minnow, Brook Stickleback, Fathead Minnow, Finescale Dace, Northern Redbelly Dace and Northern Pearl Dace. Northern Redbelly Dace were the most abundant fish species captured, followed by Brassy Minnow, Finescale Dace, Fathead Minnow, Northern Pearl Dace and Brook Stickleback.

2.4 Existing Permits and Review

Provided in this section is a summary of existing permits related to the Pamour Mine, and applications and review comments received to-date for the proposed water collection and pumping system.

The Site has two existing permits, including the Environmental Compliance Approval under No. 5135-82AMB4 and a Permit to Take Water under No. 7167-AQQRBW. Both the Environmental Compliance Approval and Permit to Take Water consider dewatering and discharge of the Open Pit to support mining operations. The existing permits do not consider collection and management of impacted surface water runoff from the Site.

A series of amendments and applications have been planned in collaboration with the local Ministry of Environment to facilitate construct water collection and discharge systems on the Pamour Mine property. Ultimately, the planned permit amendments will allow for construction and management of contaminated water on the Site in a timely manner.

The existing Pamour Mine Environmental Compliance Approval amendment has been under review since December 2017 and has been modified to include collection and storage of contaminated water within the Pamour Pit up to a water level of 279 masl. The modification was submitted to the Ministry of Environment Permits and Approvals branch on February 28th, 2020 under the Ministry of Environment Reference Number #1943-AUFR5D. The submission of the modification was completed to support Provincial Officers Orders, Order Number 6324-BKVRKD.

A subsequent future amendment to the Pamour Mine Environmental Compliance Approval will allow for discharge and treatment of contaminated water within the Pamour Pit.

The existing Permit to Take Water 7167-AQQRBW only contemplates dewatering of the Pamour Open Pit for the purposes of mining. The existing Permit to Take Water is not under amendment and will remain separate from the proposed taking within the report.

3.0 METHODOLOGY

The purpose of this section is to document, describe, and justify the selection of methods used to evaluate potential interference that could be caused by the proposed water taking.

3.1 Surface Water Assessment

3.1.1 Streams and Rivers

Based on review of the hydrologic regime, it was determined that use of a monthly flow statistic (i.e., monthly mean flow) would be suitable for evaluation of effects that could be caused by the proposed water taking. Under extreme low flow conditions, Three Nations Creek (both branches) and the CC Tributary can experience zero flow conditions. In addition, it is noted that watercourses in the study area are typically low gradient systems comprising pools, debris and beaver dams, and ponding areas interspersed with flat areas. During low flow periods, standing water remains in these systems.

Given that the basins under consideration are small in terms of drainage area and have predominately surface land use types specific to a mining industry, it was determined that application of a statistical evaluation approach by pro-rating by drainage area using streamflow data from the Water Survey of Canada streamflow gauge on the Porcupine River at Hoyle would not be applicable. For instance, the drainage areas of the basins under consideration are typically less than 10 square kilometres, whereas, the drainage area of the Porcupine River at Hoyle is 408 square kilometres.

Therefore, the surface water assessment of streams and rivers was conducted by application of a hydrologic model developed for the Pamour Mine and completion of hydraulic computations. The hydrologic model was set-up and applied to estimate mean monthly flow for existing conditions and the proposed condition (i.e., with the proposed water taking). The following three scenarios were evaluated:

- mean annual weather conditions
- dry weather conditions
- wet weather conditions

With respect to the scenarios, the key factors considered in the evaluation were as follows:

- effect on typical instream flow regime in terms of both monthly flows and monthly flow distribution
- effect on instream water levels
- effect on instream erosion
- effect on peak flows and flood risk

The focus of the evaluation was on effect of the proposed water taking on streams and rivers under mean weather conditions and dry weather conditions. Under wet weather conditions, there are not expected to be any increase in peak flows and flood risk in Three Nations Creek and the CC Tributary as drainage area is being diverted out of the respective basins.

The potential impact of the proposed water taking and peak flows and erosion in the Porcupine River was evaluated by review of hydraulic capacity of watercourse crossings in the study area and potential effect on water levels and instream flow velocities.

Monthly flows for the evaluated scenarios were computed using a hydrologic water balance model set-up for the Pamour Mine by Calder Engineering Ltd. in 2017 and updated for this study. With the model, inputs and outputs are computed on a monthly basis using data which represents current operations and hydrologic conditions. The model is spreadsheet based and set-up in Microsoft Excel. The contributing areas were discretized as natural ground, pit, pond/lake, tailings and waste rock/low grade ore, based on current site conditions.

Illustrated in Figure 3.1 is the hydrologic model discretization. The primary input for the hydrologic model is precipitation. Monthly normal precipitation amounts were taken from available data from the Timmins Victor Power Airport weather station (Climate Station ID # 6078285) for the period 1981-2010. The mean annual precipitation from this data base is 834.7 millimeters. Further description of the hydrologic model, including set-up, assumptions, verification, and application is provided in Appendix B.

3.1.2 Lakes and Ponds

The surface water assessment of lakes and ponds was conducted similar to the assessment of stream and rivers (Section 3.1.1). As previously discussed, a hydrologic model was set-up and applied to estimate mean monthly flow for existing conditions and the proposed condition (i.e., with the proposed water taking). The focus of the evaluation was on the effect of the proposed water taking on water level in the lakes and ponds under mean weather conditions and dry weather conditions. Considered was the effect on the following:

- lake/pond water levels and littoral zone
- seasonal water fluctuations
- lake/pond function

3.2 Groundwater Assessment

Potential effects on the groundwater environment are expected to be negligible, given the nature of the proposed surface water taking. As indicated in Section 2.3.2, groundwater flow on the site is heavily influenced by site features, in particular the main open pit and connected satellite pits that are groundwater sinks, and any small incremental change in site conditions that may occur are likely masked by the influence of these features. The proposed system does not include groundwater collection and/or taking, nor is it designed to alter ground water flow and gradients. Surface water collection areas will be situated in in low-lying areas and the containment berms will be constructed with low-permeability cores to contain the water within the collection areas and prevent shallow groundwater from exiting the collection areas. In addition, the proposed water taking does not change groundwater drainage areas/divides, there are no proposed changes to topography, other than local changes in vicinity of the two containment ponds, there are no proposed changes to surface land use that would affect infiltration and recharge rates, and, finally the overall water balance associated with the Porcupine River watershed is unaffected. In consideration of the above, no formal impact assessment of the proposed water taking on groundwater is provided in Section 4.0.

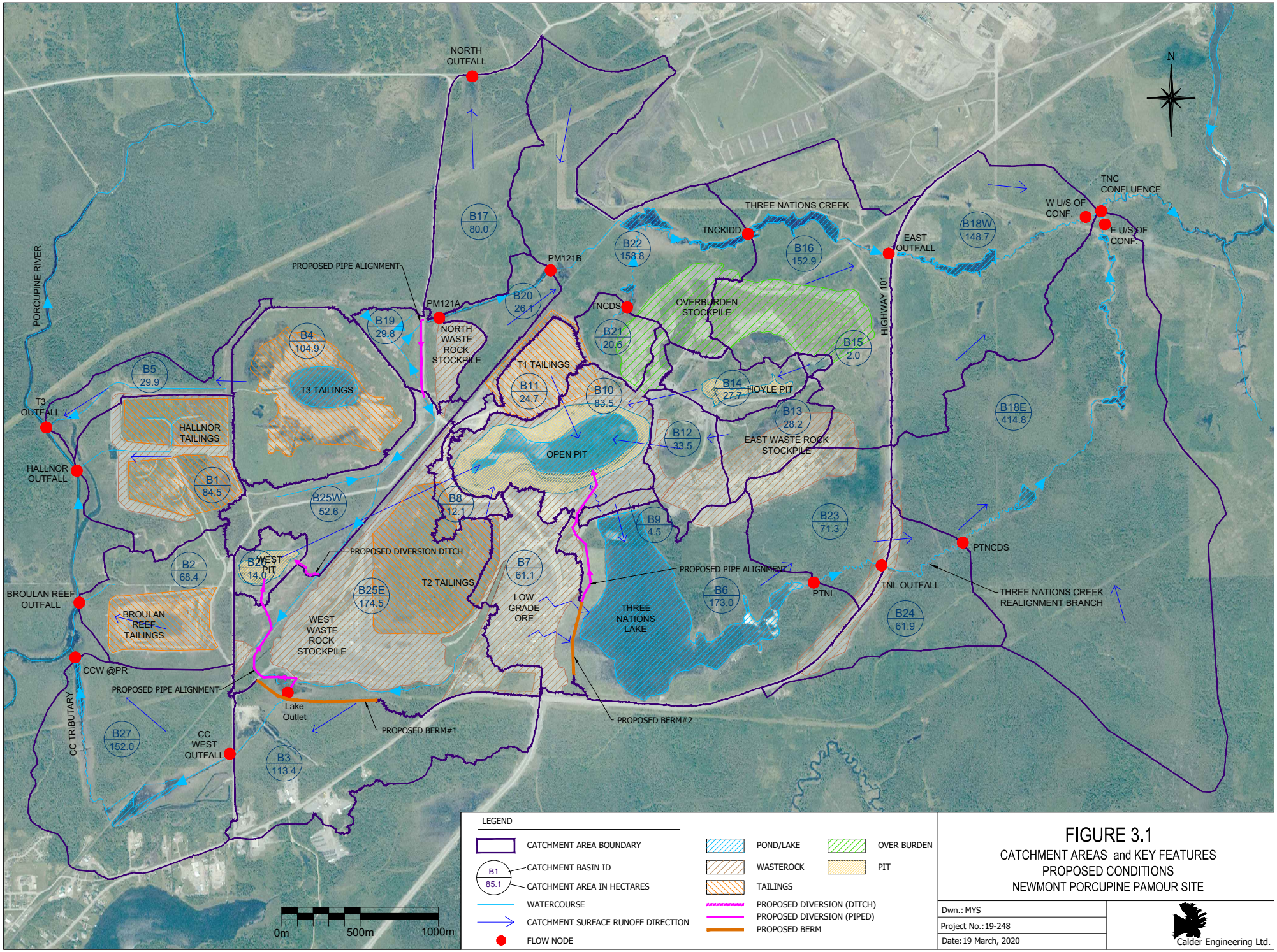

FIGURE 3.1

CATCHMENT AREAS and KEY FEATURES
PROPOSED CONDITIONS
NEWMONT PORCUPINE PAMOUR SITE

Dwn.: MYS	
Project No.: 19-248	
Date: 19 March, 2020	Calder Engineering Ltd.

3.3 Water Quality Assessment

Numerous investigations have been completed in recent years that have characterized the geochemical nature of site aspects at the Pamour Mine. The results of these investigations have been integrated in the development of a site-wide constituent loadings model. The Pamour Mine loadings model was generated in a geochemical modeling software tool called MineMod™. The model integrates loadings from potential source areas and the site water balance. The model represents a full mass and flow balance that includes chemical sources, surface water runoff, groundwater flow inputs, and releases from sources to the surface water receiving environment as seepage flows within watersheds. The model has been calibrated in consideration of existing site conditions, including routine surface water quality monitoring data collected at the site.

The Pamour Mine loadings model has been used in the context of this PTTW application to predict changes in site loadings and the associated changes in water chemistry in the three sub-drainages to which site-influenced drainage reports, Three Nations Creek, Three Nations Lake and the Porcupine River through the CC Tributary, that will result from the proposed water taking activities.

3.4 Aquatic Assessment

Potential changes to the aquatic environment are typically viewed within the context of water taking interactions with the physical aquatic habitat, water levels and flows and the chemical water quality. As collection of surface water is not expected to directly impact the physical aquatic environment from an overprinting perspective, this interaction is not further considered herein. Interactions that may result due to the collection of site surface water run-off in the proposed collection system include the following:

- changes in water quality due to collection of water prior to discharge to the natural environment; and,

- reduced flow/water levels in the CC Tributary, Three Nations Creek, and Three Nations Lake/Three Nations Creek realigned branch.

The assessment of potential interference of water taking on the aquatic environment is based on a qualitative to semi-quantitative approach which examines the results of estimates to flow/water level reductions at surface water features within the study area, as well as modelled results of changes to water quality. These are then considered within the context of the available fish habitat and fish communities it supports to identify the likelihood of an interference.

4.0 IMPACT ASSESSMENT

4.1 Surface Water - Stream and Rivers

As previously described in Section 3.2.1, a hydrologic model was set-up and applied to estimate mean monthly flow for existing conditions and the proposed condition (i.e., with the proposed water taking). Summarized in Table 4.1 and illustrated in Figure 4.1 and estimated decreases in mean annual flow for Three Nations Creek and the Hallnor Road Tributary. For reference purposes, the estimated decreases have been categorized in the following ranges:

- 0% to 10%
- 10% to 30%
- 30% to 50%
- >50%

Further to the above, typically, cumulative flow alterations less than 10% in a river system relative to a "natural flow regime" have a low probability of detectable impacts to ecosystems. Flow alterations greater than 10% will potentially result in detectable impacts. The effects of the proposed water taking on the various surface water features are discussed in the following sections.

Table 4.1: Summary of Study Area Mean Annual Flow Volume Changes

Node	Area (ha)		Area Difference		Mean Annual Volume (cu.m)		Mean Annual Volume Difference	
	Ex.	Prop.	(ha)	(%)	Ex.	Prop.	(cu.m)	%
CC Tributary								
CC West Outfall	340.5	113.4	-227.1	-66.7%	1,807,163	454,713	-1,352,450	-74.8%
CCW at PR	492.5	265.4	-227.1	-46.1%	2,397,219	1,044,769	-1,352,450	-56.4%
Three Nations Creek								
PM121A	29.8	0	-29.8	-100.0%	156,179	0	-156,179	-100.0%
PM121B	55.9	26.1	-29.8	-53.4%	257,086	100,907	-156,179	-60.7%
TNCDS	20.6	20.6	0.0	0.0%	81,259	81,259	0	0.0%
TNCKIDD	235.3	205.5	-29.8	-12.7%	960,278	804,099	-156,179	-16.3%
East Outfall	388.1	358.3	-29.8	-7.7%	1,571,803	1,415,625	-156,179	-9.9%
W u/s of TNC Conf.	536.8	507.0	-29.8	-5.6%	2,151,132	1,994,953	-156,179	-7.3%
Three Nations Creek Realigned Branch								
PTNL	238.6	177.5	-61.1	-25.6%	1,196,575	752,264	-444,311	-37.1%
TNL Outfall	309.9	248.8	-61.1	-19.7%	1,545,929	1,101,618	-444,311	-28.7%
PTNCDS	371.8	310.7	-61.1	-16.4%	1,815,199	1,370,888	-444,311	-24.5%
E u/s of TNC Conf.	786.7	725.5	-61.1	-7.8%	3,427,451	2,983,140	-444,311	-13.0%
W u/s of TNC Conf.	536.8	507.0	-29.8	-5.6%	2,151,132	1,994,953	-156,179	-7.3%

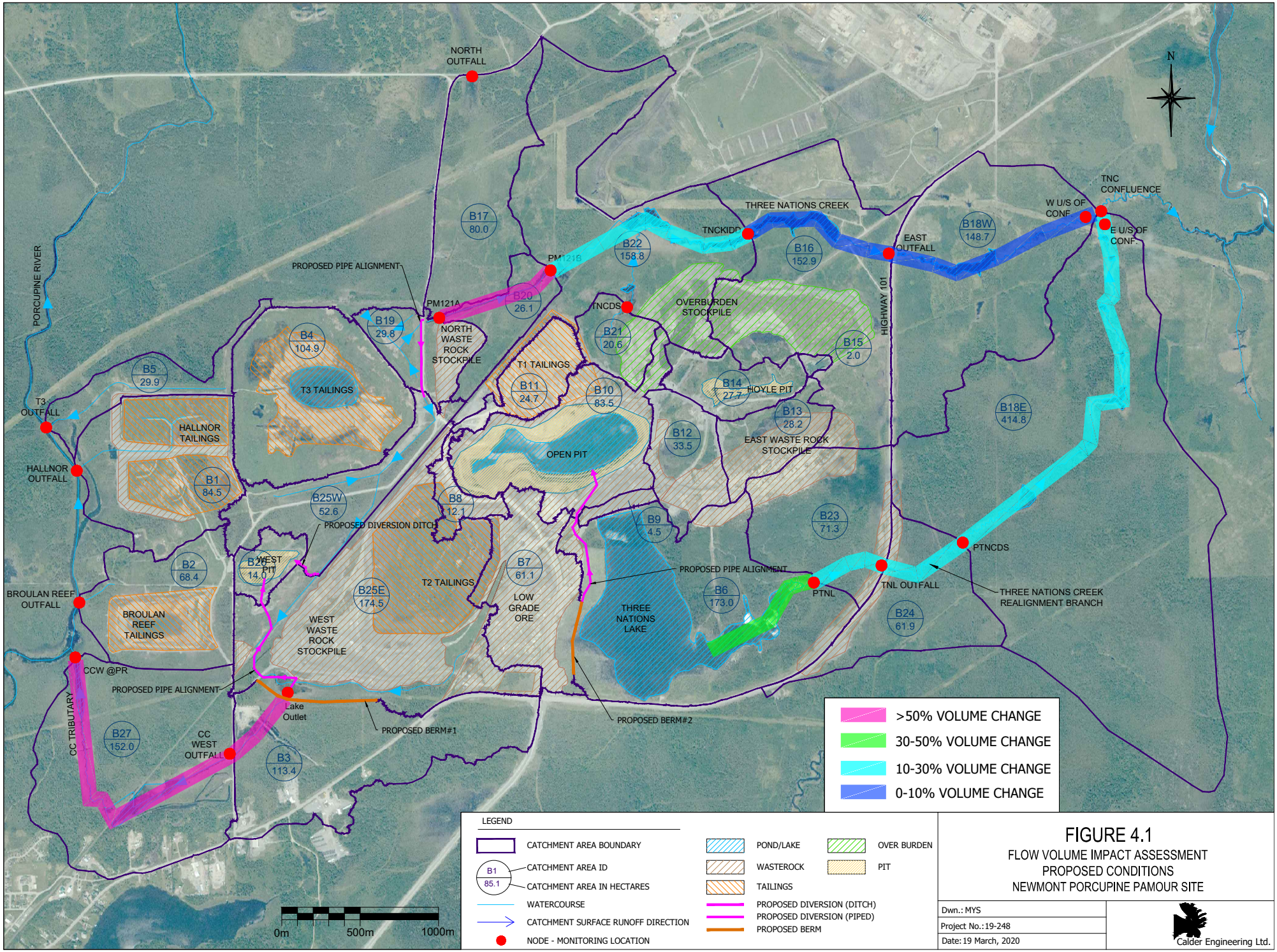

FIGURE 4.1

FLOW VOLUME IMPACT ASSESSMENT
PROPOSED CONDITIONS
NEWMONT PORCUPINE PAMOUR SITE

Dwn.: MYS	
Project No.: 19-248	
Date: 19 March, 2020	Calder Engineering Ltd.

TNC Confluence	1,323.5	1,232.6	-90.9	-6.9%	5,578,582	4,978,093	-600,490	-10.8%

Note:
1. Units: ha – hectares; cu.m – cubic metres; % - percent.
2. Abbreviations: Ex. – Existing; Prop. – Proposed.
3. Refer to Figure 4.1 for Node locations.

Provided in Appendix B are computed monthly flows for both existing and proposed conditions.

4.1.1 Three Nations Creek

With the proposed water taking a 29.8 ha area located in the upper branch of Three Nations Creek (Sub-basin B19) will be diverted out of the Three Nations Creek watershed. Approximately 100% of the diverted area comprises a waste rock stockpile, reclaimed tailings area, access roads, and ditch infrastructure With respect to the upper branch of Three Nations Creek, the diversion of 29.8 ha will result in a decrease in drainage area in the order of 7.7% at Highway 101 (East Outfall) and 5.6% upstream of the confluence with the Three Nations Creek realigned branch (W U/S of TNC Conf).

As shown in Table 4.1, the projected effect on mean annual flow in Three Nations Creek varies downstream from a decrease of approximately 60.7% in the reach immediately downstream of the diverted area to a decrease of 9.9% at Highway 101, and to a decrease of 7.3% upstream of the confluence with the Three Nations Creek realigned channel. The major effect of the drainage area diversion, in terms of flow reduction, is within the first kilometre of channel downstream.

With respect to the dry weather scenario the results are similar. In this case, the projected effect on annual flow in Three Nations Creek varies downstream from a decrease of approximately 61.0% in the reach immediately downstream of the diverted area to a decrease of 10.0% at Highway 101, and to a decrease of 7.3% upstream of the confluence with the Three Nations Creek realigned channel.

Hydraulic computations were completed for a reference channel section in Three Nations Creek downstream of Highway 101 (TNC-E). A detailed description of this reference channel section has been provided by Amec Foster Wheeler Environment & Infrastructure (2015). The projected water level decrease is estimated to be in the order of 8 millimetres to 10 millimetres under mean conditions and in the order of 5 to 6 millimetres under dry weather conditions. The estimates of water level decrease are conservative as the watercourse morphology typically comprises ponding, pool, and flat areas, and the computations are only representative of the “flat areas”. For the computations, normal uniform flow conditions were assumed with a 0.5% channel slope. It is anticipated the slope of the channel in most areas is lower than 0.5%.

Projected effects on water levels behind grade control structures in Three Nations Creek upstream of Highway 101 are discussed in Section 4.2.1.

4.1.2 Three Nations Creek (Realigned Branch)

With the proposed water taking an approximate 61.1 ha area located to the west of Three Nations Lake will be diverted out of the Three Nations Creek realigned branch (Sub-basin B7). The diverted area comprises predominately a low grade ore pad of waste rock and portions of the T2 tailings area (refer to Figure 3.1). With respect to this branch of Three Nations Creek, the diversion of 61.1 ha will result in a decrease in drainage area in the order of 25.6% at the outlet of Three

Nations Lake (PTNL), 19.7% at Highway 101 (TNL Outfall) and 7.8% upstream of the confluence with the upper branch of Three Nations Creek (E U/S of TNC Conf).

As shown in Table 4.1, the projected effect on mean annual flow in this branch of Three Nations Creek varies downstream from a decrease of approximately 37.17% at the outlet of Three Nations Lake (PTNL), to a decrease of 28.7% at Highway 101 (TNL Outfall), and a decrease of 13.0% upstream of the confluence with the upper branch of Three Nations Creek (E U/S of TNC Conf).

With respect to the dry weather scenario the results are similar. In this case, the projected effect on flow in this branch of Three Nations Creek varies downstream from a decrease of approximately 37.17% at the outlet of Three Nations Lake (PTNL), to a decrease of 28.7% at Highway 101 (TNL Outfall), and to a decrease of 13.0% upstream of the confluence with the upper branch of Three Nations Creek (E U/S of TNC Conf).

Hydraulic computations were completed for two reference channel sections in Three Nations Creek downstream of Highway 101 (PTNCDS and TNC-REF). A detailed description of the reference channel sections has been provided by Amec Foster Wheeler Environment & Infrastructure (2015). The projected water level decrease is estimated to be in the order of 20 millimetres to 40 millimetres under mean conditions and in the order of 20 to 30 millimetres under dry weather conditions. The estimates of water level decrease are conservative as the watercourse morphology typically comprises ponding, pool, and flat areas, and the computations are only representative of the “flat areas”. For the computations, normal uniform flow conditions were assumed with a 0.5% channel slope. It is anticipated the slope of the channel in most areas is lower than 0.5%.

4.1.3 CC Tributary

With the proposed water taking an approximate 227.1 ha area will be diverted out of the CC Tributary watershed (sub-basins B25E and B25W). The diverted area comprises a waste rock stockpile, tailings areas, and natural ground along the Hallnor Road. With respect to the CC Tributary watershed, the diversion of 227.1 ha will result in a decrease in drainage area in the order of 66.7% at the Hallnor Road (CC West Outfall) and 46.1% at the confluence with the Porcupine River (CCW at PR).

As shown in Table 4.1, the projected effect on mean annual flow in the CC Road Tributary varies downstream from a decrease of approximately 74.8% at the Hallnor Road to a decrease of 56.4% at the confluence with the Porcupine River.

With respect to the dry weather scenario the results are similar. In this case, the projected effect on flow in the CC Road Tributary varies downstream from a decrease of approximately 74.8% at the Hallnor Road to a decrease of 56.4% at the confluence with the Porcupine River.

With the large flow decreases, there is the potential for water levels to decrease in the order of 30% to 50%, particularly in the constructed/ditch sections of the tributary upstream of the ONTC rail line. It is expected that the lowlying channel section downstream of the ONTC rail line will be affected to a lesser degree as it is located in a backwater area associated with the Porcupine River. This area is also typically flooded due to presence of beaver dams.

4.2 Surface Water - Lakes and Ponds

4.2.1 Three Nations Creek Ponds

As noted in Table 4.1, in vicinity of the grade control structures of Three Nations Creek (i.e., at Node TNCKIDD), the decrease in mean annual flow is estimated to be approximately 16.3%. Hydraulic computations were completed for each of the two grade control structures using reference channel sections reported by Amec Foster Wheeler Environment & Infrastructure (2015).

It is estimated with the proposed water taking, under dry weather conditions, that water levels could decrease, greater than they would have without the water taking, in the order of 0.23 to 0.29 metres behind the TNC-B grade control structure and in the order of 0.26 metres to 0.33 metres behind the TNC-C grade control structure: The nominal pond depth is 0.9 metres for the TNC-B pond and 1.7 metres for the TNC-C pond.

4.2.2 Three Nations Lake

With the proposed water taking an approximate 61.1 ha area located to the west of Three Nations Lake will be diverted out of the Three Nations Creek watershed (Sub-basin B7) that drains directly to Three Nations Lake. The diverted area comprises predominately a low-grade ore pad of waste rock and portion of the T2 tailings area (refer to Figure 3.1). The diversion of 61.1 ha will result in a decrease in drainage area in the order of 25.6% at the outlet of Three Nations Lake (PTNL) from 238.6 ha to 177.5 ha.

As shown in Table 4.1, the projected effect on mean annual flow at the lake outlet is a decrease in the order of 37.1%. The timing of seasonal variation in lake levels will be unchanged with lake levels following a typical pattern of high in the spring in conjunction with the spring melt followed by a gradual recession over the summer and slight increase in the fall.

It is expected the water level increases in the lake will not be as great during wet weather periods due to reduced flow contributions and remain within the typical annual 0.5 metre water level fluctuation. Seasonally, the duration of flooding in the spring of riparian areas along the shoreline is expected to slightly decrease. Under typical conditions in the summer, fall, and winter, lake levels are anticipated to not be affected and lake normal water elevation will remain the same.

In terms of lake hydraulic retention time, the hydraulic retention is projected to increase from in the order of 1.6 years to 2.5 years. The seasonal vertical temperature profile of the lake is anticipated to be unaffected.

Under extended dry weather conditions, there is potential for lake levels to decrease in the order of 50 centimetres to 60 centimetres greater than they would have without the water taking. This represents an approximate 2 percent decrease in water level relative to the mean lake depth of 3.04 metres.

4.3 Water Quality

As previously indicated, the primary objective of the implementation of the proposed water collection/diversion system is to mitigate on site mine-related constituent loadings and improve downstream water quality.

The reductions in loadings within the three sub-drainages to which site-influenced drainage reports, Three Nations Creek, Three Nations Lake and the Porcupine River through the CC Tributary, associated with the proposed water taking are shown in Table 4.2. As indicated in the note provided with the table, the estimates account for the removal of loadings due to the collection of water only, and do not account for the contribution of loadings upstream of this collection. Predicted loadings reductions are shown for several key constituents that are known to be associated with site aspects, with arsenic being the primary constituent of concern. In each instance, the loadings captured by the proposed water collection system are significant. It is noted that 100% of the constituent loadings that report to the CC Tributary will be captured and that the values presented in Table 4.2 refer to the predicted loadings reductions in the Porcupine River at the confluence with the CC Tributary. The incremental reduction in loadings in the Porcupine River at that location will range from 10 kg/year (~8%) to 630 kg/year (~60%) for key constituents. It is predicted that construction of the water collection system will cumulatively divert a total of approximately 860 kg of arsenic, 32 kg of copper, 32 kg of cobalt and 176 kg of nickel from the Porcupine River on an annual basis.

Table 4.2: Summary of Predicted Loadings Reductions in Three Nations Creek, Three Nations Lake and the Porcupine River through the CC Tributary associated with the Proposed Water Taking

	Drainage Area		
Loadings Reduction (kg/year / % reduction)	**Three Nations Creek (at Hwy 101 Crossing)**	**Three Nations Lake (at lake outlet)**	**Porcupine River (at confluence with the CC Tributary)**
Arsenic	100 / 98%	130 / 95%	630 / 60%
Copper	16 / 30%	6.2 / 98%	10 / 8%
Cobalt	11 / 16%	4.1 / 64%	17 / 8%
Nickel	92 / 41%	24 / 93%	60 / 15%

Note: The estimates provided in this table account for the removal of loadings due to the collection of water only, and do not account for the contribution of loadings upstream of this collection.

4.4 Aquatic Resources

4.4.1 Water Quality

One of the purposes of collection of surface water run-off at the Pamour Site is to reduce loadings to the receiving water environment. As per results provided in Section 4.3, such collection will ensure the appreciable reduction in loadings to all waterbodies associated with the receiving water environment. Therefore, changes to water quality as a result of water taking (surface water collection) are expected to be beneficial to the aquatic environment and its resources.

4.4.2 Water Levels and Flow

Changes to flow volumes were discussed and presented in Sections 4.1 and 4.2, and are considered herein within the context of aquatic resources. A summary of estimated water levels at specified nodes in study area under current conditions and those with the collection system are shown in Table 4.3.

Porcupine River

Flow reductions to the Porcupine River as a result of redirect of surface flow at the Pamour site are considered negligible and no effects on aquatic resources are expected.

Three Nations Lake and Realigned Three Nations Creek

Flows and water levels downstream of TNL (PTNL node just downstream of the constructed TNL portion and TNL Outlet) are estimated to be reduced by up to 37% and 38%, respectively. The reduction in TNL water level (as measured here) of 38% was estimated for the late summer period (August). Estimates of flow reduction decrease along the realigned TNC drainage from 28% at the TNL Outfall location to 13% at E U/S of Confluence the most downstream node of the realigned TNC channel. Water level estimates for August at this location (also described as TNC-E in Table 4.3) were 8%. The overall change to TNC flows prior to its discharge to the Porcupine River was estimated at 10.8%.

The changes estimated to TNL and the realigned TNC are expected to be of low impact to the sportfish of TNL as their ability to access habitats needed for their life history requirements is expected to remain available. Forage fish habitats that are in come cases located within the margins of the flooded areas of TNL may see some change to habitats, however, these would be consistent with marginal habitats that are not limiting with respect to availability within the lake. The fish community present in the realigned TNC consists of species adapted to small tributaries consistently influenced by changes to flow patterns and beaver activity. These may include fragmentation, temperature fluctuation, changes to overwintering refugia. As such, impacts to the warm/cool baitfish community of TNL and the realigned TNC are expected to be minimal.

Three Nations Creek

Changes to the flow volumes in TNC were estimated for the following nodes in order of upstream to downstream; PM121A, PM121B, TNCKIDD, East outfall, W U/S of CONF (Table 4.2; Section 4.1). The reach between PM121A and PM121B is estimated to see a flow reduction of up to 60%, and is likely to see the greatest potential for impact. However, the cumulative flow reduction between PM121B and TNCKIDD is relatively minor (16%). Flow reductions along the remainder of TNC are estimated to remain below 10% and unlikely to pose a significant reduction in wetted habitat to impact fish communities in the creek. TNC and the realigned TNC are both U-shaped channels which provide a limited amount of fish habitat in the form of cover or substrates at its bank margins. As such, a reduction in flow or water level will not greatly impact fish species interaction with the clay banks, yet in general will continue to provide access to bottom substrates and movement corridors.

Estimates of water level change associated with the grade control structures and ponded areas of TNC at the Kidd Complex were undertaken. Consistent ponding of these reaches is imperative within the context of remedial actions taken to reduce sediment releases of metals to the aquatic environment of TNC. Reductions in water level at TNC-B and TNC-C ponds created by grade control are estimated to be up to 34% (or 25 cm) during the August low flow period. Water levels in the ponded areas are maintained by the grade control structures and the flow of water out of the ponds downstream in TNC would only further increase resident time of water within the system, therefore reducing the risk of metals loading. Estimates of water level do not currently indicate exposure of TNC sediments during drought condition.

CC Tributary

Changes to the flow volumes in CC Tributary were estimated for the following nodes in order of upstream to downstream; CC West Outfall and CCW at PR. Reductions in flow here are expected to be as great as 60 to 75%; though given the low relief of the area and low gradient between the site and the Porcupine River it is expected that the area will develop as a backwater of the river and continue to be wetted. Under drought conditions, the fish community here may experience some reduction in habitat. As it is directly connected to the Porcupine River, it is expected that direct movement of the low sensitivity, warm/cool water fish community to the Porcupine River may occur during periods of drought and to over winter in available refugia.

Table 4.3: Estimated water levels at specified nodes in Study Area

Node	Description	Month	Existing	Proposed		
			WL	WL	diff	diff
			m	m	%	m
TNC-REF	Realigned TNC just upstream of confluence with TNC	Jun.	0.217	0.197	-9.22%	-0.020
		Jul.	0.126	0.100	-20.63%	-0.026
		Aug.	0.117	0.091	-22.22%	-0.026
		Sept.	0.165	0.143	-13.33%	-0.022
PTNCDS	Just downstream of flow node TNL Outfall	Jun.	0.157	0.133	-15.29%	-0.024
		Jul.	0.116	0.080	-31.03%	-0.036
		Aug.	0.108	0.075	-30.56%	-0.033
		Sept.	0.141	0.112	-20.57%	-0.029
TNL Outfall	At TNL Outfall	Jun.	0.130	0.115	-11.54%	-0.015
		Jul.	0.108	0.070	-35.19%	-0.038
		Aug.	0.100	0.062	-38.00%	-0.038
		Sept.	0.131	0.100	-23.66%	-0.031
TNC-E	TNC downstream of Kidd Complex and just upstream of confluence with Realigned TNC	Jun.	0.238	0.230	-3.36%	-0.008
		Jul.	0.131	0.122	-6.87%	-0.009
		Aug.	0.125	0.115	-8.00%	-0.010
		Sept.	0.175	0.165	-5.71%	-0.010
TNC-B	TNC at Kidd Complex - Water Behind TNC-B grade control structure	Jun	2.35	1.97	-16.4%	-0.39
		Jul	0.77	0.51	-33.8%	-0.26
		Aug	0.68	0.45	-33.8%	-0.23
		Sep	1.24	0.95	-23.5%	-0.29
TNC-C	TNC at Kidd Complex - Water Behind TNC-C grade control structure	Jun	2.63	2.20	-16.4%	-0.43
		Jul	0.86	0.57	-33.8%	-0.29
		Aug	0.76	0.51	-33.8%	-0.26
		Sep	1.38	1.06	-23.5%	-0.33

5.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary and Conclusions

1. A water collection and pumping system is being proposed by Newmont Porcupine to manage impacted surface water on the Pamour Mine and improve downstream receiving water quality. The permitting and associated collection of impacted surface water directly fulfils the requirements under Provincial Officer's Order #6324-BKVRKD, Item No.4.

2. The proposed water collection and pumping system will result in diversion of water from the upper areas of three local tributaries to the Pamour Pit. The three local tributaries drain to the Porcupine River and include two branches of Three Nations Creek and a constructed watercourse denoted as the CC Tributary. Ultimately, the water diverted to the Pamour Pit from the three tributaries will be returned to the Porcupine River. Storage of impacted surface water runoff will be within the Pamour Pit under an existing Environmental Compliance Approval Amendment, reference number 1943-AUFR5D. Treatment and discharge from the Pamour Pit will be considered in a subsequent amendment to the existing Environmental Compliance Approval.

3. A feasibility level study for the proposed water collection and pumping system design was completed by Amec Foster Wheeler Environment & Infrastructure (2017) and is provided in Appendix A of this study. The catchment areas to be diverted have been labelled as CATCH 1W, CATCH 1E, CATCH 2, and CATCH 3. The total area diverted from the respective tributaries to the Pamour Pit is 318.0 hectares (ha).

4. The Pamour Mine is situated in the Porcupine River Watershed which drains to Night Hawk Lake and subsequently drains to the Frederick House Lake via the Frederick House River. Surface water from the Pamour Mine drains predominately to the Three Nations Creek watershed. Three Nations Creek has two main branches: one to the north of the Pamour Mine denoted as the upper branch and one to the southeast of the Pamour Mine denoted as the realigned branch. The realigned branch of Three Nations Creek is the outlet channel for Three Nations Lake. The key surface water features in the study area include the Porcupine River, Three Nations Creek (upper branch), Three Nations Lake, Three Nations Creek (realigned branch), and the CC Tributary.

5. Assessment of the effect of the proposed water taking was conducted using available hydrologic and water quality models developed for the study area by Newmont Porcupine.

6. With the proposed water taking an approximate 29.8 ha area located in the upper branch of Three Nations Creek will be diverted out of the Three Nations Creek watershed. The diversion of 29.8 ha will result in a decrease in drainage area in the order of 7.7% at Highway 101 and 5.6% upstream of the confluence with the Three Nations Creek realigned branch. The projected effect on mean annual flow in Three Nations Creek varies downstream from a decrease of approximately 60.7% in the reach immediately downstream of the diverted area to a decrease of 9.9% at Highway 101, and to a decrease of 7.3% upstream of the confluence with the Three Nations Creek realigned channel. The major effect of the drainage area diversion, in terms of flow reduction, is within the first kilometre of channel downstream.

7. With the proposed water taking an approximate 61.1 ha area located to the west of Three Nations Lake will be diverted out of the Three Nations Creek realigned branch. The diversion of 61.1 ha will result in a decrease in drainage area in the order of 25.6% at the outlet of Three Nations Lake, 19.7% at Highway 101, and 7.8% upstream of the confluence with the upper branch of Three Nations Creek. The projected effect on mean annual flow in this branch of Three Nations Creek varies downstream from a decrease of approximately 37.17% at the outlet of Three Nations Lake, to a decrease of 28.7% at Highway 101, and to a decrease of 13.0% upstream of the confluence with the upper branch of Three Nations Creek.

8. With the proposed water taking an approximate 61.1 ha area located to the west of Three Nations Lake will be diverted out of the Three Nations Creek watershed that drains directly to Three Nations Lake. The diversion of 61.1 ha will result in a decrease in drainage area in the order of 25.6% at the outlet of Three Nations Lake from 238.6 ha to 177.5 ha. The projected effect on mean annual flow at the lake outlet is a decrease in the order of 28.7%. The potential effects of the proposed water taking on Three Nations Lake are as follows:

    - the timing of seasonal variation in lake levels will be unchanged with lake levels following a typical pattern of high in the spring in conjunction with the spring melt followed by a gradual recession over the summer and slight increase in the fall;

    - water level increases in the lake will not be as great during wet weather periods due to reduced flow contributions and remain within the typical annual 0.5 metre water level fluctuation;

    - seasonally, the duration of flooding in the spring of riparian areas along the shoreline is expected to slightly decrease, and under typical conditions in the summer, fall, and winter, lake levels are anticipated to not be affected and lake normal water elevation will remain the same;

    - the lake hydraulic retention is projected to increase from in the order of 1.6 years to 2.5 years;

    - the seasonal vertical temperature profile of the lake is anticipated to be unaffected; and

    - under extended dry weather conditions, there is potential for lake levels to decrease in the order of 50 centimetres to 60 centimetres greater than they would have without the water taking.

9. With the proposed water taking an approximate 227.1 ha area will be diverted out of the CC Tributary watershed. The diversion of 227.1 ha will result in a decrease in drainage area in the order of 66.7% at the Hallnor Road and 46.1% at the confluence with the Porcupine River. The projected effect on mean annual flow in the CC Road Tributary varies downstream from a decrease of approximately 74.8% at the Hallnor Road to a decrease of 56.4% at the confluence with the Porcupine River.

10. The proposed water taking will result in meaningful reductions in constituent loadings to Three Nations Creek, Three Nations and the Porcupine River through the South Constructed Channel and associated improvements in surface water quality therein. For example, for

arsenic, which is a key constituent of concern for the site, loadings reduction to Three Nations Creek and Three Nations Lake are predicted to be on the order of 98% and 95%, respectively. One-hundred percent of the loadings that currently report to the South Constructed Channel will be captured resulting in a predicted loadings reduction of 60% in the Porcupine River at that location.

11. Despite potential seasonal reductions in the flow and water levels associated with receivers in the study area, the expected improvement in water quality must be considered as the highest priority with respect to the fish community and aquatic environment.

12. In each instance, the loadings captured by the proposed water collection system are significant. It is noted that 100% of the constituent loadings that report to the CC Tributary will be captured.

13. In general, Newmont Porcupine has extensive surface water, groundwater, and biological monitoring programs in place for all potentially affected surface water features. The majority of programs are associated with Federal and Provincial regulations related to metal mining and conditions of existing Provincial permits under the Environmental Protection Act and Water Resources Act. The spatial and temporal aspect of these monitoring programs is considered adequate to provide information for assessment of effects of the proposed water taking.

14. The potential for adverse effects due to the proposed water taking can be mitigated by monitoring and contingency planning.

5.2 Recommendations

1. An adaptive water management plan be adopted to monitor, document, and evaluate performance of the proposed water taking, and if required, implement mitigation measures. An outline of the recommended water management plan is provided in Section 6.0.

2. A Site-Specific Contingency Plan be prepared to monitor and manage water levels behind the existing grade control structures on the upper branch of Three Nations Creek.

6.0 PROPOSED ADAPTIVE WATER MANAGEMENT PLAN

An adaptive water management approach is recommended which includes monitoring to collect on-going information on surface water natural features, groundwater conditions, and aquatic resources, assessment of performance of the proposed water taking, documentation, notification, and contingency planning.

6.1 Monitoring

Newmont Porcupine has extensive surface water, groundwater, and biological monitoring programs in place for all potentially affected surface water features. The majority of programs are associated with Federal and Provincial regulations related to metal mining and conditions of existing Provincial permits under the Environmental Protection Act and Water Resources Act. The spatial and temporal aspect of these monitoring programs is considered adequate to provide information for assessment of effects of the proposed water taking.

The programs provide adequate spatial and temporal resolution to assess the performance of the proposed collection system, in terms of both water quality (surface and groundwater) and groundwater elevations. For example, surface water is, and will continue to be measured both upstream and downstream of proposed collection areas, as well as in the open pit to where water will be diverted, so that magnitude of the loadings captured can be assessed relative to those predicted by the site loadings model. Similarly, existing groundwater wells in the vicinity of the collection areas, as well as site-wide, will provide information that can be used to confirm that groundwater will not be affected by the proposed surface water taking activities.

Notwithstanding, as required, it is anticipated that the monitoring program would be refined and updated as part of the adaptive water management approach. Monitoring program data will be reviewed at regular intervals and these data will provide the basis on which to revise monitoring program structure.

6.2 Indicators and Triggers

The indicators identified below are proposed to assess the effectiveness of the proposed water management strategy. It is expected that these indicators (triggers) would be reviewed annually and updated or augmented accordingly as part of the adaptive water management plan. With respect to the triggers, unless otherwise noted below, information from the monitoring program would be reviewed annually to identify change in water quality from baseline levels, and change in trends of surface water and groundwater conditions. Identified changes would trigger an action plan comprising notification, review, and follow-up additional monitoring/assessment, and implementation of adaptive management measures, as required.

Flow

- extended “zero” flow conditions in the order of one week or more in the realigned branch Three Nations Creek as determined by review of streamflow data recorded at the existing streamflow gauging station downstream of Highway 101

- difference between projections and actual monitoring of diverted flows from collection areas by a factor of two

Water Quality

- decrease in water quality in Three Nations Creek, Three Nations Lake, Three Nations Creek (realigned branch), and the CC Tributary downstream of the diversions as determined by change from baseline levels

Lake and Pond Water Levels

- Three Nations Lake – drop in water level elevation below the outlet elevation of 285.6 metres

- Three Nations Creek Pond upstream of Highway 101 – drop in water level elevation below the pond outlet elevations

Groundwater

- change in groundwater levels in vicinity of the collection areas and affected tributaries as determined by change from baseline levels

- change in groundwater quality in vicinity of the collection areas and affected tributaries as determined by change from baseline levels

6.3 Management Framework

As part of the adaptive water management plan, an administration and contingency planning framework is proposed to be established. This framework would include:

- notification
- performance reporting
- contingency planning process

Notification would comprise informing the Ministry of the Environment, Conservation and Parks of any identified change in surface water or groundwater quality from baseline levels or change in trends of pond/lake and groundwater levels. The Mattagami Region Conservation Authority, City of Timmins, and Ministry of Natural Resources and Forestry should be included in the notification process if surface water resources in the Porcupine River are affected or potentially could be affected.

Performance reporting would comprise provision of a report on annual basis containing the following information:

- a summary and interpretation of monitoring data and the performance of the proposed water taking based on established design criteria and performance objectives;

- an evaluation of the proposed water takings performance and ability to meet established design criteria and performance objectives, and its effect (if any) on the site surface water features;

- a description of any operating problems encountered and corrective actions taken during the reporting period and the need for further investigations in the following reporting period

for water management plan refinements or ways of improving to meet established design criteria and performance objectives;

- any need for modifications of the monitoring program and/or the water management plan;
- a summary of any complaints received during the reporting period and any steps taken to address the complaints; and
- any other information that is deemed to have been obtained and is relevant for inclusion in the reports from time to time.

The contingency planning process is discussed in Section 6.4.

6.4 Contingency Planning Process

6.4.1 General

The Contingency Plan identifies procedures and processes that Newmont Porcupine should follow in the event critical flow conditions occur, critical water levels are exceeded, or a change in surface water or groundwater quality from baseline levels or change in trends of pond/lake and groundwater levels is identified during the course of routine monitoring.

6.4.2 Process

In the event critical flow conditions occur, critical water levels are exceeded, or a change in surface water or groundwater quality from baseline levels or change in trends of pond/lake and groundwater levels is identified during the course of routine monitoring, the following process would be initiated:

- Step 1 – Screening Level Study
- Step 2 – Detailed Investigation
- Step 3 – Implementation of Mitigation Measures

Step 1 - Screening Level Study

The first step in the event critical flow conditions occur, critical water levels are exceeded, or a change in surface water or groundwater quality from baseline levels or change in trends of pond/lake and groundwater levels would be to conduct a screening level study to determine if the respective changes are attributable to factors other than the proposed water taking. For instance, this would involve review of the following:

- monitoring data reliability
- magnitude and persistence of the low flow or low water level condition
- presence of extreme dry weather conditions
- presence of other factors or unanticipated events which may have influenced water quality or low flow or low water level conditions

Mitigation measures may be identified at this stage. If it is determined from the screening level study that the change in surface water or groundwater quality from baseline levels or change in trends of pond/lake and groundwater levels are not attributable to the proposed water taking, then

routine monitoring would be continued and a re-assessment undertaken every thirty (30) days until the specific condition no longer exists.

If it is determined from the screening level study that the changes in baseline conditions are potentially attributable to the proposed water taking then a recommendation would be provided to proceed to Step 2.

Step 2 - Detailed Investigation

This step will involve a detailed inspection and review of surface water and groundwater conditions specific to the identified issue(s) of concern. At this stage, there would be two primary components, the first component would be associated with review of the local surface water and groundwater regime and include, but not be limited to the following:

- detailed review of monitoring records to ascertain the presence of any increase or trend in flow or water quality that was not anticipated
- detailed assessment of the potential cause for the identified issue(s) of concern
- if required, preparation of an updated water balance and flow projections for study area tributaries
- if required, preparation of updated water quality predictions for study area tributaries
- if required, implementation of a temporary monitoring program focusing on the issue(s) of concern

The second component of Step 2 would be assessment of results from review of the detailed assessments, review of additional monitoring data, and identification, prioritization, and scheduling of mitigation measures, as applicable. The mitigation measures may include further detailed investigation, monitoring and surveillance, and study.

Step 3 - Implementation of Mitigation Measures

This step would involve the implementation of mitigation measures according to Step 2.

6.5 Three Nations Creek Site-Specific Contingency Plan

As part of the Surface Water Study, a recommendation was made for development of a Site-Specific Contingency Plan to monitor water levels behind the existing grade control structures on the upper branch of Three Nations Creek and identify trigger levels for implementation of contingency planning. This recommendation has been made due to the identified concern related to maintaining flooded conditions over sediments behind the respective grade control structures. It is anticipated that a contingency plan and or routine monitoring of water levels and flow at this location may already be in-place with the adjacent property owner.

Notwithstanding, a Site-Specific Contingency Plan is recommended to address potential adverse impacts due to potential decrease in water levels behind the Three Nations Creek grade control structures during dry weather conditions. The Site-Specific Contingency Plan would comprise the following:

- an assessment of critical water levels and stream flow in this branch of tree Nation Creek
- a description of how water levels would be monitored and assessed
- identification of mitigation measures
- identification of trigger levels for implementation of mitigation measures

At this stage, for discussion purposes only, potential mitigation measures could include the following:

- review of grade control structure design
- review of grade control structure outlet operation
- review of opportunities for flow augmentation
- inclusion of culverts with gates in the diversion berm at the upstream diversion location for re-direction of flow subject to water quality considerations

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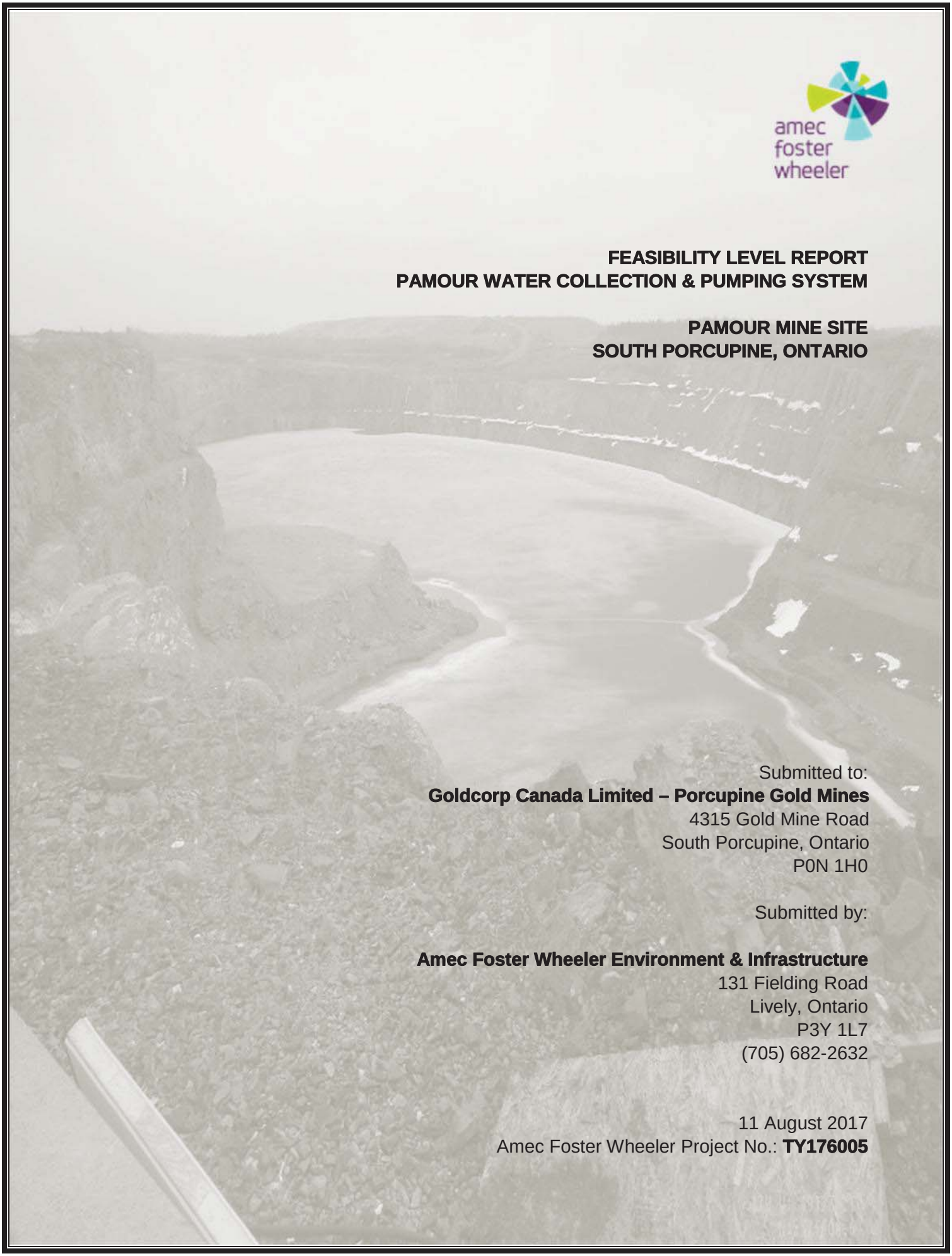
APPENDIX A

Feasibility Level Report, Pamour Water Collection & Pumping System



FEASIBILITY LEVEL REPORT
PAMOUR WATER COLLECTION & PUMPING SYSTEM

PAMOUR MINE SITE
SOUTH PORCUPINE, ONTARIO

Submitted to:
Goldcorp Canada Limited – Porcupine Gold Mines
4315 Gold Mine Road
South Porcupine, Ontario
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11 August 2017
Amec Foster Wheeler Project No.: **TY176005**

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1.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure (Amec Foster Wheeler) has been retained by Goldcorp Canada Ltd., Porcupine Gold Mine (Goldcorp PGM) to conduct a feasibility level study for a water collection and pumping system design at the Pamour Mine Site near Timmins, Ontario. This feasibility design and report is in support of permit applications (Phase 1) and it will form the basis for the Phase 2 work related to the detailed design in the following year.

This report summarizes a comprehensive conceptual design of the collection system, including figures and anticipated baseline costs for the construction stage.

2.0 BACKGROUND AND SITE DESCRIPTION

The Pamour Mine Site (the site) is located in Whitney Township of Timmins, Ontario; see Figure 1. The site was originally an underground mine opened in 1936, with open pit mining beginning in 1976. Under the ownership of Goldcorp PGM, a new open pit was developed and operated from 2005 to 2008, when ore was hauled via access roads to the Dome Mine Mill Complex. Waste rock from this mining process was stored in three areas of the site, used to construct an ore stockpile pad, and was utilized throughout the site as construction aggregate.

In 2012, Goldcorp PGM identified that the water quality downstream of the site had a noted rise in contaminants (specifically arsenic). Through an extensive review, it has been determined that the waste rock leachate on the site is the main source of these contaminant loadings.

A previously developed geochemical loading model identified three (3) key areas for water collection that will improve the management of site runoff. In an attempt to improve the water quality, Goldcorp PGM has committed to the implementation of a system to collect surface water and route it to the Pamour Open Pit (report cover photo), where it will be stored and eventually treated. The collection system is expected to consist of three catchment areas named Collection Areas 1, 2 and 3 (CA-1, CA-2 and CA-3); see Figure 2.

3.0 PRELIMINARY CONCEPTUAL DESIGN

During the 50% completion review meeting, important points for the conceptual design of the system were confirmed and are summarized below and presented schematically on Figure 2:

1. Pit No. 5, also called the West Pit, has been confirmed by Goldcorp PGM to be hydraulically connected to the main Pamour Pit, by underground workings at Levels 4 and 6 (Review of Pamour #5 Pit Connectivity, Mirarco 2017, Ref. No. MPM003-170714).
2. CA-1 has been subdivided into two catchment areas, west and east of the ONTC train tracks. The runoff collected from the west area will be diverted to the West Pit by a small berm and connected to the pit by a gravity ditch and a culvert. The east portion will continue to drain south to the current CA-1 outflow, towards the two 813 mm culverts under Hallnor Road; however, runoff will be captured by a containment berm and pumped to the West Pit through the pipe crossing the ONTC train tracks; see Appendix A.
3. CA-2 will continue to drain east towards Three Nations Creek; however, runoff will be captured by a containment berm and pumped to the Main Pamour Pit.
4. Due to the low flows reporting to CA-3, and the close proximity of its boundary with the CA-1 subcatchment, it has been proposed that a berm would be constructed at the west end (upstream end) of the North Channel to capture any potential seepage from the North Waste Rock Stockpile and Northeast Extension of T3 Tailings Area. In order to drain this collection area, a portable pump has been proposed to be located on site to pump out any collected water to the well-defined ditch adjacent to Hallnor Road, approximately 400 m south of CA-3, which after the breakpoint will discharge south to the proposed outflow of CA-1 West portion to the West Pit.

4.0 HYDROLOGY ASSESSMENT

Based on the conceptual design, a hydrological assessment and flood routing analysis were completed for the east portion of CA-1, which will just be called CA-1 going forward, CA-2 and CA-3.

Short duration rainfall intensity-duration-frequency (IDF) data was obtained from Environment Canada (EC) for Timmins Victor Power A (Station 6078285), database: 1952 to 2006. Rainfall depths for available durations and return periods are provided in Table 1.

Table 1: Rainfall Depths for Timmins Victor Power A (ON 6078285)

Duration (min)	Duration (h)	2 Year (mm)	5 Year (mm)	10 Year (mm)	25 Year (mm)	50 Year (mm)	100 Year (mm)
5	0.08	6.8	9.0	10.5	12.3	13.7	15.1
10	0.17	9.8	13.4	15.8	18.8	21.1	23.3
15	0.25	11.6	15.9	18.7	22.3	25.0	27.6
30	0.50	14.7	21.2	25.4	30.8	34.8	38.8

Duration (min)	Duration (h)	2 Year (mm)	5 Year (mm)	10 Year (mm)	25 Year (mm)	50 Year (mm)	100 Year (mm)
60	1	17.9	25.0	29.7	35.7	40.1	44.5
120	2	21.7	29.0	33.8	39.9	44.4	48.9
360	6	29.1	38.4	44.6	52.5	58.3	64.1
720	12	35.2	48.0	56.5	67.3	75.3	83.2
1440	24	43.8	62.6	75.0	90.7	102.3	113.9

4.1 Site Hydrologic Characterization

Hydrologic data to represent site runoff were determined based on available LiDAR data plus information from reconnaissance conducted during the recent Amec Foster Wheeler site visit; see Figure 3. Important hydrologic parameters are summarized in Table 2 and the catchment area by land use type are presented in Table 3.

Table 2: Subcatchment Hydrologic Parameters

Parameter	Catchment Area 1	Catchment Area 2	Catchment Area 3
Drainage Area (ha)	173.6	61.1	29.8
Max. Length (m)	2,000	1,400	750
Max. Length Slope (%)	0.5	1.5	1.0
Average Watershed Slope (%)	8.7	10.3	5.6
Impervious Area (%)	7.9	13.4	4.5

Notes:

1. The impervious area includes ponded water, pavement and compacted gravel roads, buildings and bedrock.
2. The area of Catchment Area 1 is based on the proposed construction of a ditch and culvert to divert the northwest portion of the watershed to the West Pit.

Table 3: Catchment Area by Land Use Type

Parameter	Ponded Water	Impervious	Waste Rock	Tailings	Natural Ground	Total
Catchment Area 1						
Area (ha)	5.2	8.5	76.6	50.3	33.0	173.6
Weighed Runoff Coefficient (%)	5%	80%	30%	60%	25%	40%
Pervious Weighted SCS Curve Number	100	98	58	88	65	69.0
Catchment Area 2						
Area (ha)	3.1	5.1	46.2	3.7	3.1	61.1
Weighed Runoff Coefficient	5%	80%	30%	60%	25%	35%
Pervious Weighted SCS Curve Number	100	98	58	88	65	60.5
Catchment Area 3						
Area (ha)	0.0	1.3	12	12.7	3.8	29.8
Weighed Runoff Coefficient	5%	80%	30%	60%	25%	44%
Pervious Weighted SCS Curve Number	100	98	58	88	65	72.3

Notes:

1. 10 % of the waste rock portion has been considered impervious (pavement and compacted gravel roads, buildings and bedrock).
2. Pervious land uses of the watershed consist of waste rock (random fill), tailings and natural ground

4.2 Preliminary Hydrologic Assessment

Using the above site hydrologic characterization, and based on the conceptual design presented above, a preliminary analysis was carried out to estimate the critical duration and the pumping capacity that would be required to handle a range of storm events with the estimated storage capacity available at catchment areas 1 and 2. These results are summarized in the following

Table 4 and graphically presented on Graphs 1 and 2 below for the 25 year storm event on both catchment areas respectively as an example.

This same preliminary assessment has shown that for the same 25 year storm event the estimated critical duration and required pump capacity for CA-3 are 24 hours (1 day event) and 0.03 m³/s, respectively.

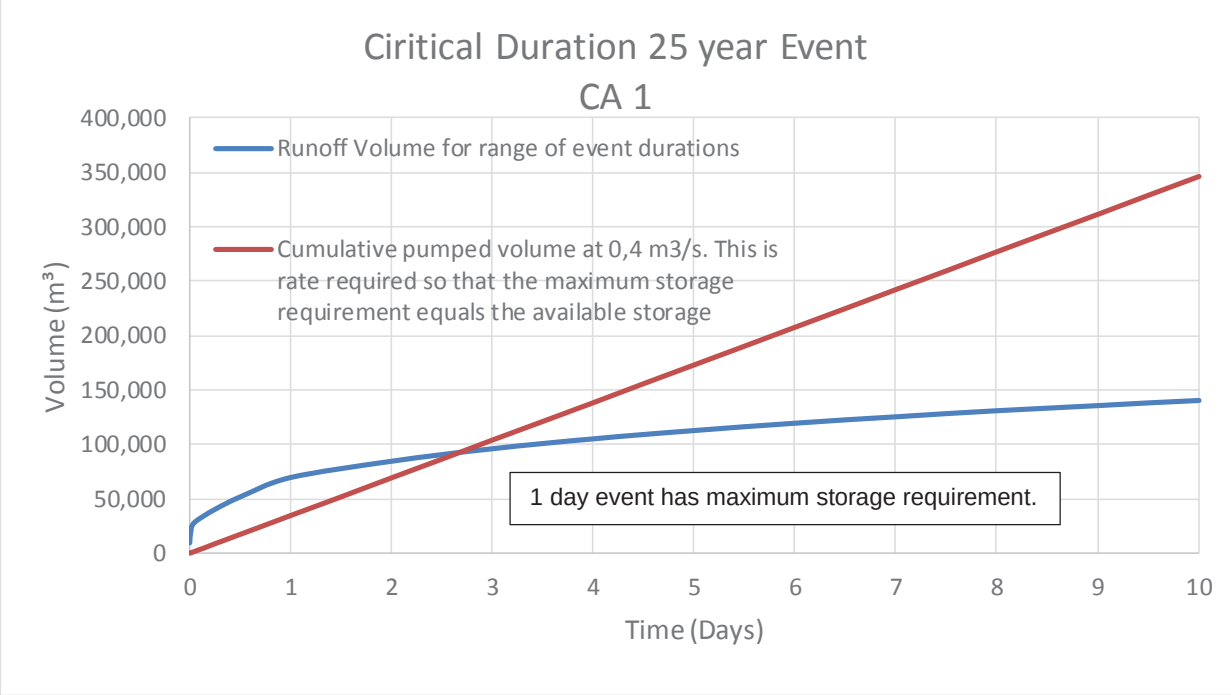
Table 4: Approximate Pumping Capacity versus Return Period

Magnitude of Rainfall /Runoff Event (return period, years)	Catchment Area 1		Catchment Area 2	
	Approximate Pumping Capacity Needed (m^3/s)	Critical Duration (hours)	Approximate Pumping Capacity Needed (m^3/s)	Critical Duration (hours)
2	0.05	96	0.01	144
5	0.10	48	0.02	72
10	0.20	24	0.03	48
25	0.40	24	0.08	24
50	0.65	12	0.13	24
100	0.90	6	0.18	24

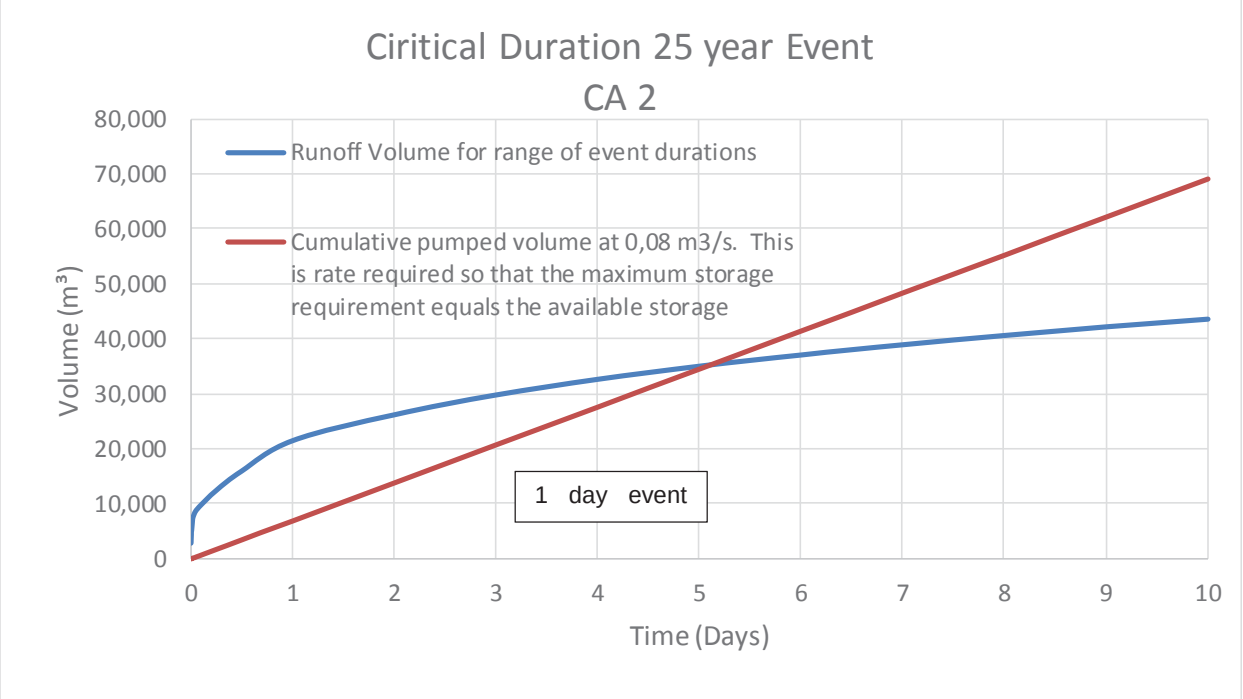
Notes:

1. Based on preliminary analysis
2. Using currently available storage

Graph 1: Preliminary Hydrologic Analysis for 25 year Event CA-1



Graph 2: Preliminary Hydrologic Analysis for 25 year Event CA-2



As shown on the above graphs, for CA-1 and CA-2 the critical duration storm event also resulted as the 24 hours (1 day event). This is using the existing available storage; providing significant additional storage capacity may not be practical due to the topography constraint of the site. The pump-out time would be between 2 to 3 days for CA-1 and around 5 days for CA-2, as shown on Graph 1 and Graph 2, respectively.

In summary, this preliminary hydrologic analysis shows that pump rates of 0.40, 0.08 and 0.03 m^3/s would be needed for a 25 year storm event at CA-1, CA-2 and CA-3, respectively.

4.3 Detailed Hydrologic Assessment for CA-1 and CA-2

Based on the preliminary results, and the 10 year design life for the collection system, it is recommended to design the system to handle the 1 in 25 year storm event. For larger storm events, some portion of the runoff would be released to the environment. This design approach was accepted by Goldcorp PGM.

A detailed hydrologic assessment was done to determine more precisely the pumping capacity required to handle a 1 in 25 year, 24 hour duration storm event using a SCS Type II rainfall distribution and the available storage capacity at CA-1 and CA-2. The PCSWMM dynamic hydrologic-hydraulic simulation model was used for the hydrologic modeling analysis. PCSWMM is a fully dynamic hydrologic and hydraulic analysis software package based on the EPA algorithm and numerical engine. Runoff results for the 25 year storm event are summarized in Table 5 below. The 2 and 100 year storm events have also been included as a reference and comparison.

Table 5: Summary of Hydrologic Results Reporting to the Site

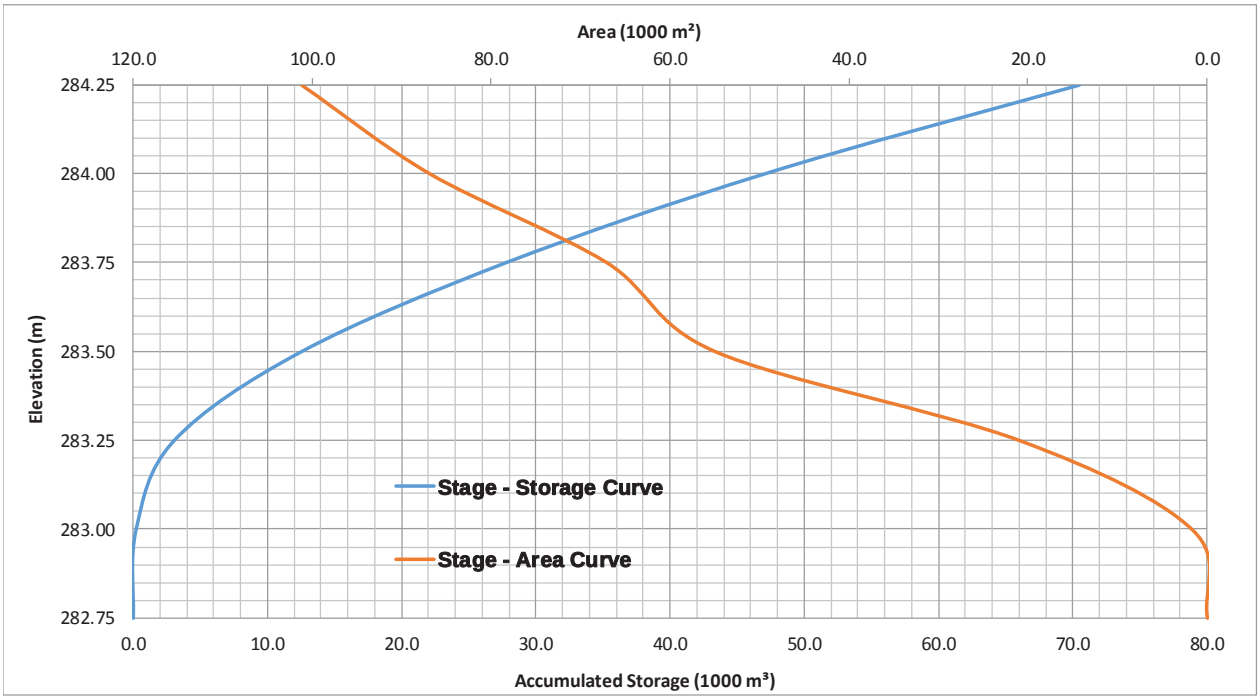
Storm event	Duration	Area	Rainfall Depth (mm)	Total Infiltration (mm)	Runoff Coeff.	Total Runoff (mm)	Runoff Volume (1000m³)	Peak Runoff (m³/s)
2 year	24 hour	CA-1	43.8	36.17	0.15	6.39	11.09	2.06
		CA-2	43.8	35.97	0.15	6.61	4.04	1.22
25 year	24 hour	CA-1	90.7	54.55	0.39	34.92	60.62	5.48
		CA-2	90.7	57.66	0.35	31.83	19.45	2.86
100 year	24 hour	CA-1	113.9	60.73	0.46	51.97	90.22	8.58
		CA-2	113.9	65.59	0.41	47.12	28.79	4.12

5.0 RESULTS OF HYDROLOGICAL DESIGN

5.1 Collection Area 1

The stage storage curve for CA-1 is graphically presented in the following Graph 3 with details of hydrologic and hydraulic results presented on Graph 4.

Graph 3: Stage-Storage-Area Curve for Collection Area 1



As shown in Graph 4 below, in order to manage the runoff volume generated from a 25 year storm event (peak runoff 5.48 m³/s) within the available storage (i.e., below elevation 284 m), a pump with a 0.30 m³/s flow rate would be required at Collection Area No. 1. Note that the duration to pump out and recover normal conditions is estimated to be between 2 to 3 days, similar to the findings of the preliminary hydrologic analysis. The 2 and 100 year storm events have also been included as a reference and comparison. Table 6 presents a summary of these results.

Graph 4: Hydrologic and Hydraulic Results for CA-1

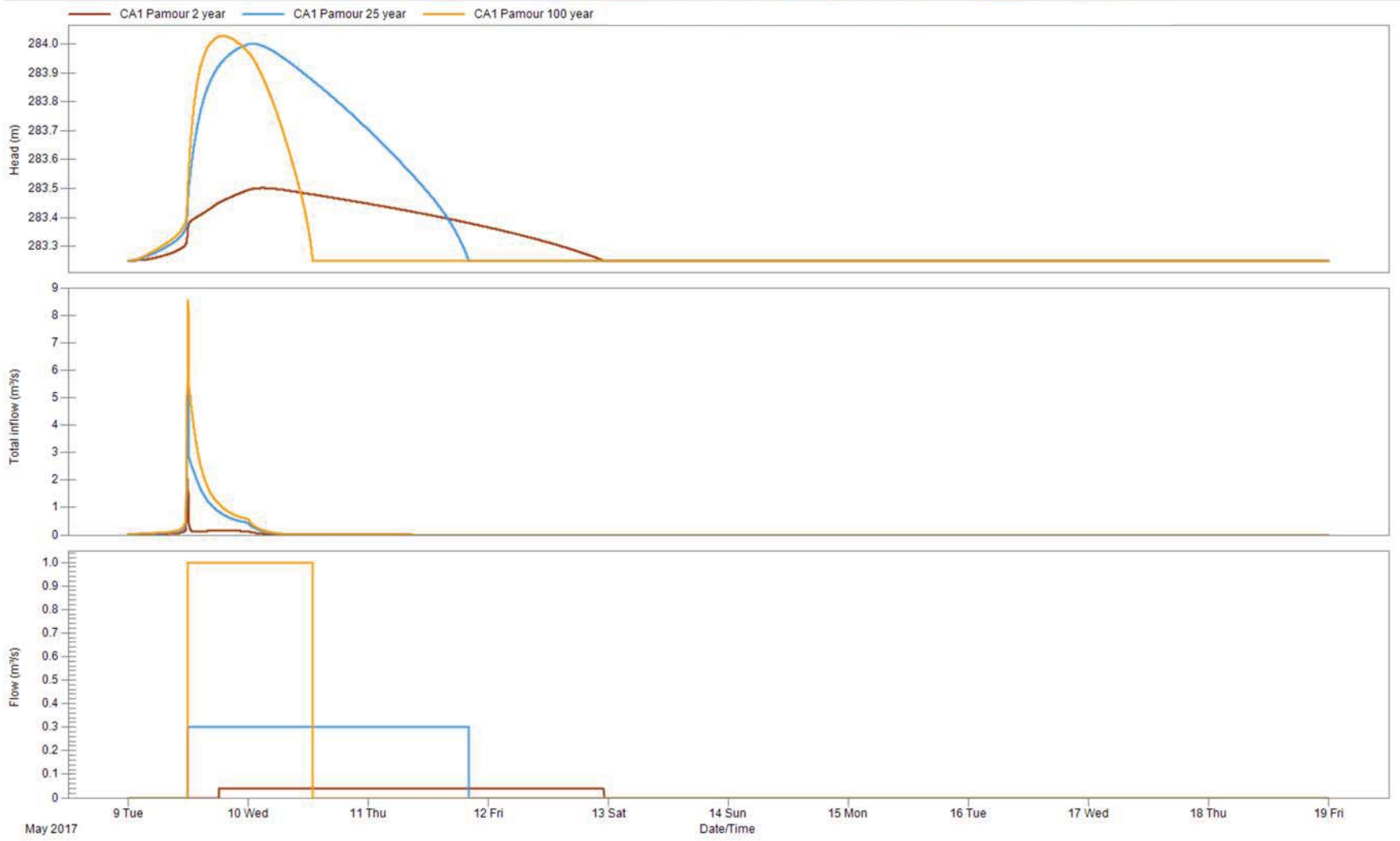


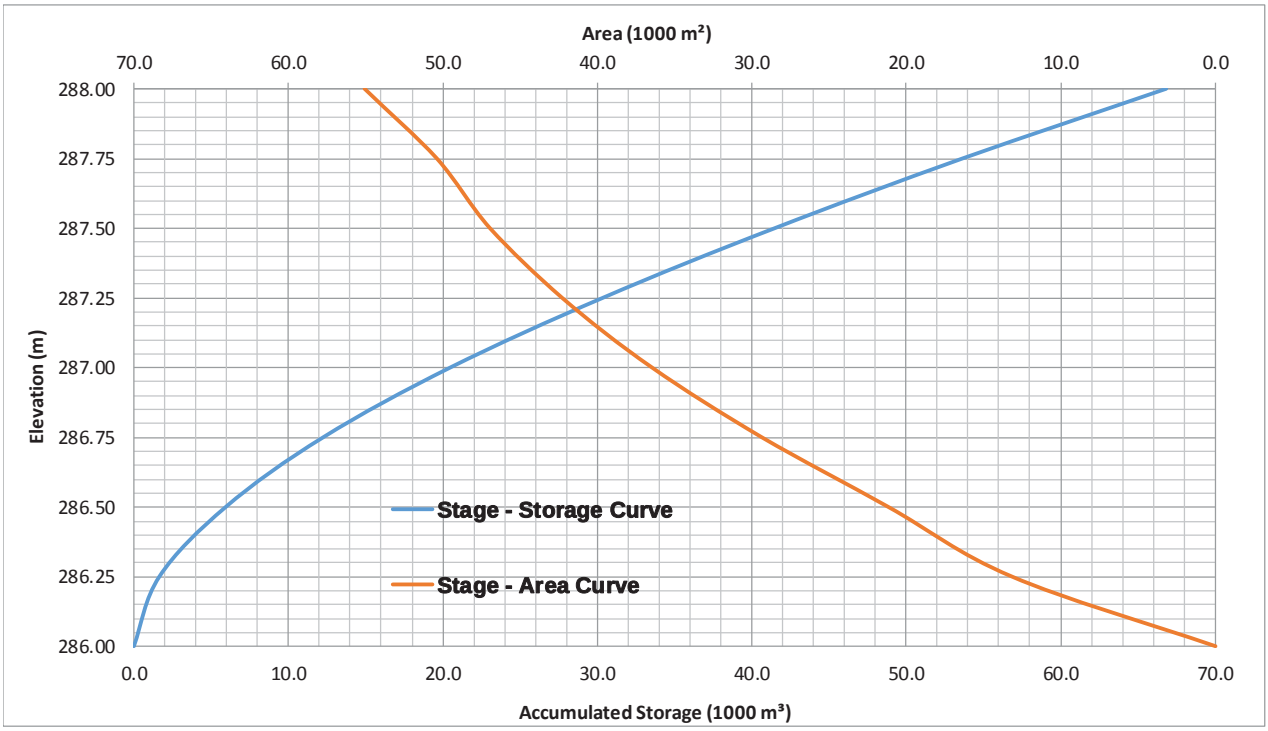
Table 6: Summary of Results for CA-1

Storm Event	Pump Rate Required (m³/s)
2 year	0.04
25 year	0.30
100 year	1.00

5.2 Collection Area 2

The stage storage curve for CA-2 is graphically presented in the following Graph 5 with details presented on Graph 6.

Graph 5: Stage-Storage-Area Curve for Collection Area 2



As shown in Graph 6 below, in order to manage the volume generated from a 25 year storm event (peak runoff 2.86 m³/s) within the available storage (i.e., below elevation 287 m), a pump with a 0.05 m³/s flow rate would be required at Collection Area No. 2. Note that the duration to pump out and recover normal conditions is estimated to be around 5 days, similar to the findings of the preliminary hydrologic analysis. The 2 and 100 year storm events have also been included as a reference and comparison. Table 7 presents a summary of these results.

Graph 6: Hydrologic and Hydraulic Results for CA-2

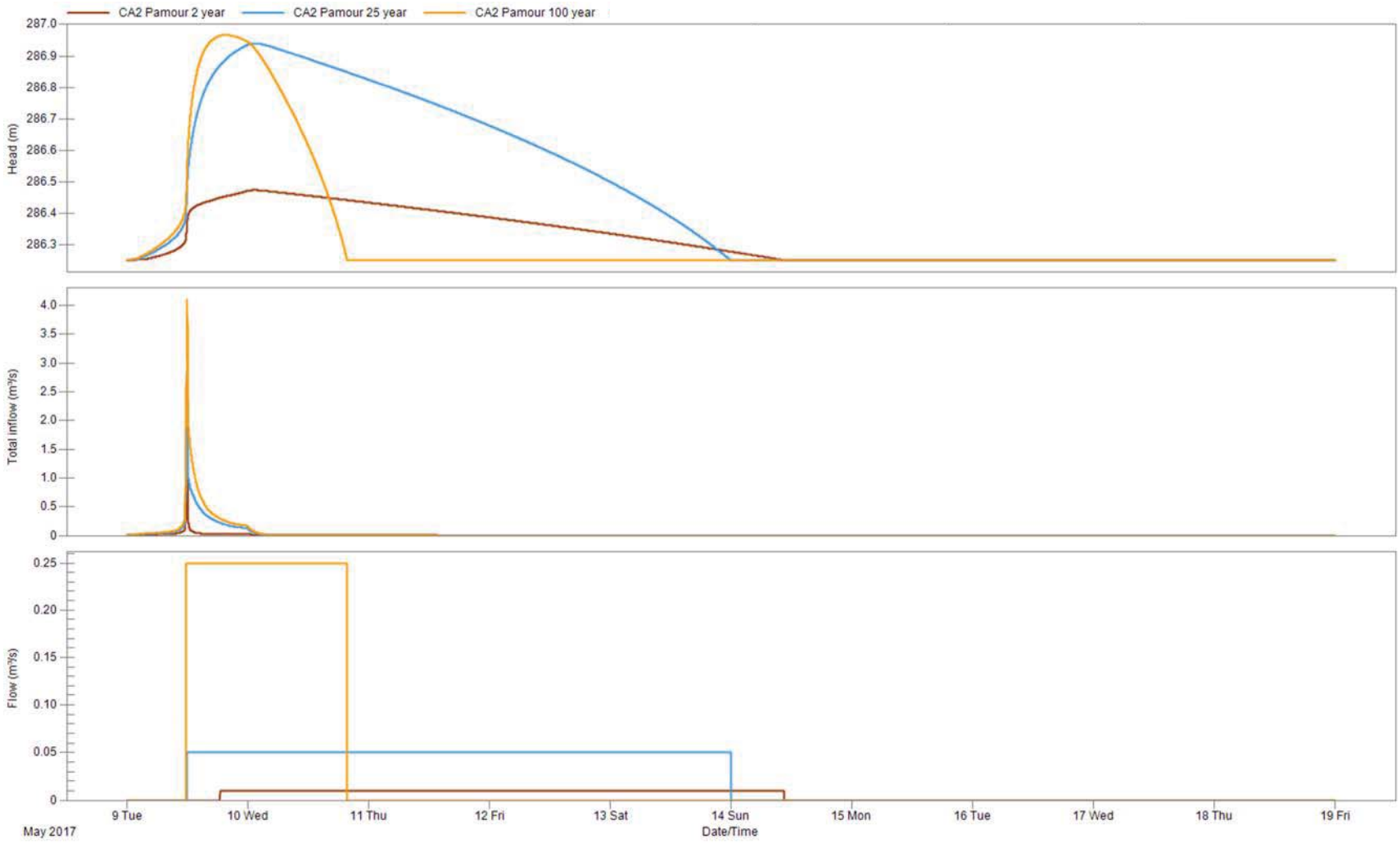


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Table 7: Summary of Results for CA-2

Storm Event	Pump Rate Required (m^3/s)
2 year	0.01
25 year	0.05
100 year	0.25

5.3 Summary of Results

Taking into consideration a considerable reduction in the CA-1 due to the proposed diversion ditch and a more detailed land use analysis, a pump rate of 0.30 m^3/s (4,755 usgpm) would be required at CA-1, and a pump rate of 0.05 m^3/s (792 usgpm) would be required at CA-2 in order to manage a 25 year storm event with no discharge to the environment. In similar way, a pump rate of 0.03 m^3/s (475 usgpm) is estimated to be required at CA-3 to manage the same event.

As mentioned, with a 10 year design life for the collection system, a 25 year storm event has been selected as the design event to be handled with the proposed pump systems. For larger storm events, some portion of the runoff would be safely released to the environment, which is considered acceptable by Goldcorp PGM.

6.0 BERM DESIGN

In order to collect runoff inside the boundaries of the mine site and potentially treat it before it discharges to the environment, low permeability containment berms have been proposed at the end of the two collection areas. In an effort to limit the berm height such that it would not be classified as a “dam”, nominal storage capacity has been attempted at this feasibility study stage.

Based on limited geotechnical information available around the berm locations, as reported on borehole logs in Appendix A, very soft, varved lacustrine silty clay with “0” blow-count is present in the area. Therefore, a preliminary design for the berms has been proposed, taking into consideration of the presence of the very soft silty clay. As shown on Figures 4 and 5, these berms have been proposed to have 3H:1V slopes with a 1 m width crest. As mentioned in Section 5, these berms have been proposed to collect runoff from a 25 year storm event. In case of higher storm events, these berms have been proposed with emergency spillways to have a controlled release to the environment to safeguard the berm. Details of the geometry for each berm are presented in the following Table 8.

Table 8: Containment Berm Details

Berm	Dead Storage (1000 m³)	Normal Water Level (m)	Live Storage (1000 m³)	Spillway Elevation (m)	Peak Water Elevation (m)	Crest Elevation (m)	Aprox. Height (m)	Berm Fill Volume (m³)	Length (m)
CA-1 – Berm 1	3.1	283.3	44.0	284.0	284.2	284.5	1.75	3,820	825
CA-2 – Berm 2	1.7	286.3	19.0	287.1	287.2	287.5	1.5	1,800	450

Note:

1. Both emergency spillways have been preliminarily designed to be a 5 m wide overflow channel with 4H:1V side slopes covered with clean riprap.

Due to the absence of location specific geotechnical information, stability analysis on the containment berms needs to be done during the detailed design stage, followed by possible revisions. Available historical borehole logs around the location of these berms have been included in Appendix A.

7.0 PUMPING STATION DESIGN

As mentioned in Section 5, the collection pump stations have been designed to pump at 0.30 m^3/s (4,755 usgpm) for CA-1, at 0.05 m^3/s (792 usgpm) for CA-2, and 0.03 m^3/s (475 usgpm) for CA-3. Details of the proposed pump stations and pipe lines developed by Porcupine Engineering Services Inc. (PES) are provided in Appendix B. These pumping rates and pump sizes may be optimized at the next stage of the design, taking into account a possible increase in pond storage capacity to the “maximum” allowed volume before it becomes a “dam” and longer buffering / retention time and hence lower pumping rates required.

Regarding CA-3, details of the proposed pump have been included in Appendix B with a system curve and the product cut sheet of a quoted pump. These costs, together with estimated fittings, hoses and pipes, have been included in the estimated total cost presented in Section 9.

It is also possible to optimize the currently proposed two identical pump arrangement with a low flow and high flow pump system such that the low flow pump operates most of time and the high flow pump kicks in during storms and high freshet seasons, to save on cost.

Relevant geotechnical information has been referenced for the design of the pump house foundation. The historical borehole logs around the location of these pump stations have been included in Appendix A. However, confirmatory test-pitting is required to confirm subsurface condition at the next stage of design.

8.0 SEDIMENT AND EROSION CONTROL

During the construction period, it will be necessary to provide sediment and erosion control until the berms have been constructed. This will be done by implementing the following temporary measures:

- Light duty silt fence barrier as per OPSD 219.100 or 219.110 will be installed in the downstream side of the perimeter containment berm.
- Straw bale barriers will be installed in all defined watercourses leaving the site until construction is completed and the final grading is finished.

Copies of the Ontario Provincial Standards Drawings (OPSD) are attached in Appendix C. The above sediment control devices will be left in place until the seepage collection system and the site final grading are completed.

9.0 PRELIMINARY ESTIMATED COSTS

Table 9 below presents the estimated total cost for the water collection and pumping system at the Pamour Mine Site, including the cost of the two proposed pump stations.

10.0 PROPOSED WORK FOR DETAIL DESIGN

The following work is proposed to be completed prior to or during the detail design stage:

1. Optimize the pumping rates and pump sizes, taking into account possible increase in pond storage capacity to the "maximum" allowed volume before it becomes a "dam" with longer buffering / retention time and hence lower pumping rates are required with savings on pumps.
2. Consider the possibility of optimizing the currently proposed two identical pump arrangement with a low flow and high flow pump system such that the low flow pump operates most of time and the high flow pump kicks in during storms and high freshet seasons, to save on cost (variable speed pumping)
3. It would be prudent to check with Hydro One Networks Inc (HONI) to see if suitable capacity is available on their 27.6kV line (within a km of CA-1), as this may be a cheaper option.
4. Detailed design to set operation levels – dead storage, normal OL , etc.
5. Freeboard required
6. Flow measurements at Hallnor Road (downstream of CA-1) so flows can be confirmed during the detail design stage.
7. Expose of end of culvert at CA-3.
8. Complete some test pits around the potential location of the proposed pump stations and berm alignments.
9. Confirm potential pits for borrow materials for berm construction. A few test pits should be dug within the collection pond to determine if the overburden material can be used for the berm construction. If so, it will create additional storage and lower the berm height.
10. Investigate access to the diversion area to the West Pit (a couple of crowns, one raise, and high walls).
11. Detailed survey of the No. 5 pit area for topography.

11.0 CLOSING REMARKS

This report is for the exclusive use of Goldcorp PGM, for specific application to the area within this report. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibility of such third parties. Amec Foster Wheeler accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report. It has been prepared in accordance with generally accepted hydraulic and geotechnical engineering practices. No other warranty, expressed or implied, is made.

It is recommended practice that the design engineer be retained during construction to confirm that the conditions throughout the site do not deviate materially from those analyzed in the design process. Since all details of the design may not be known, we recommend that we be retained during the construction stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid. This design does not include any long term treatment plans associated with the seepage collection system, or any plan for decommissioning of the system at the time of site closure as those items are outside the scope of this project.

The design given in this report is based on available information for this site, the site visit, and accepted engineering assumptions. This work has been undertaken in accordance with normally accepted engineering practices.

We trust that the information presented in this report is complete within our terms of reference. If you have any questions, please do not hesitate to contact our office.

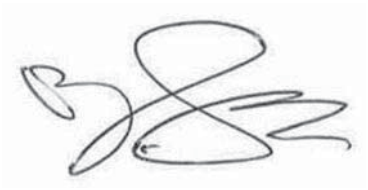
Respectfully submitted,

Amec Foster Wheeler Environment & Infrastructure
a Division of Amec Foster Wheeler Americas Limited

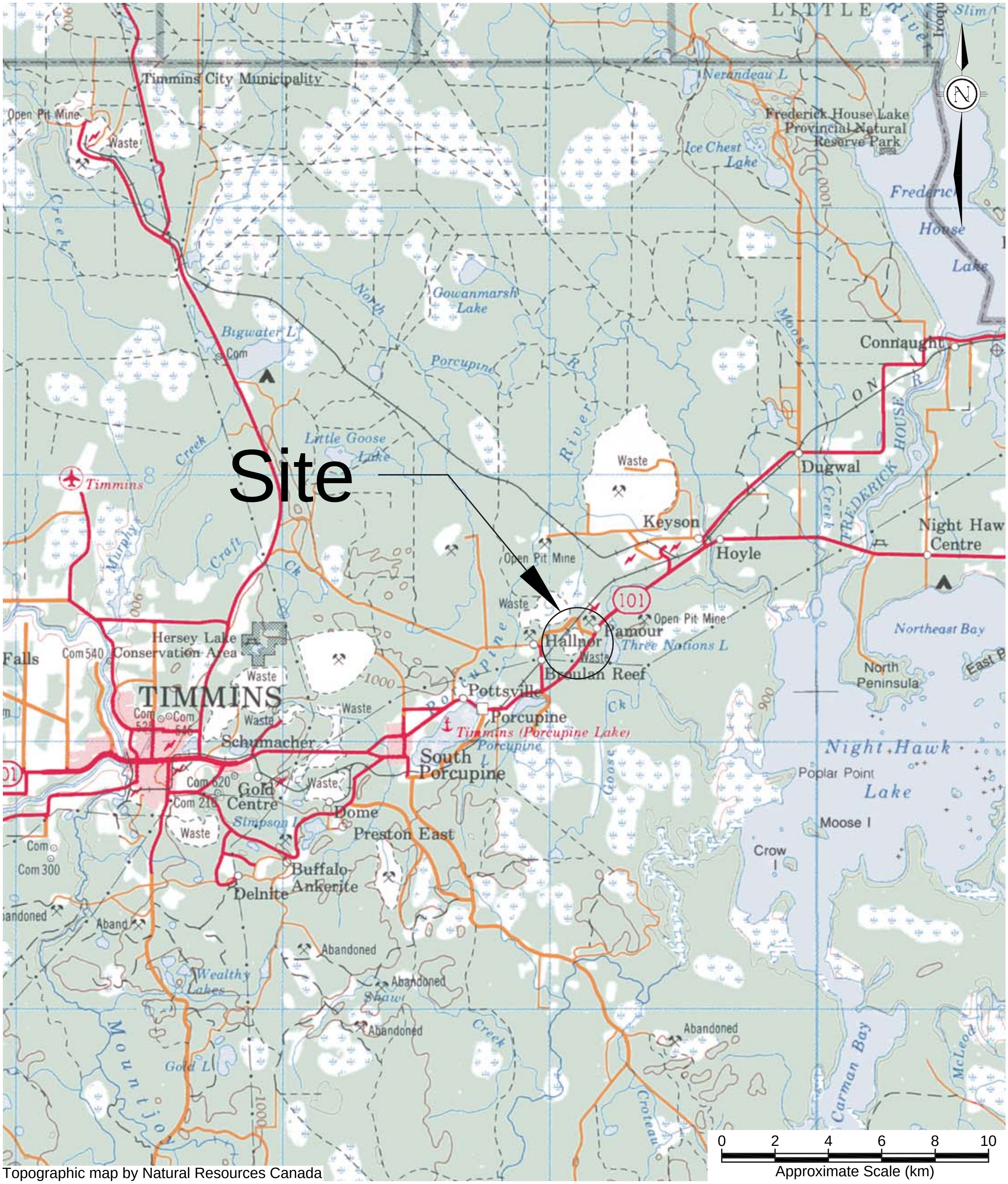
Prepared by:

Mauricio Del Olmo Gil, M.Eng., P.Eng.
Water Resources and Dam Engineer

Reviewed by:

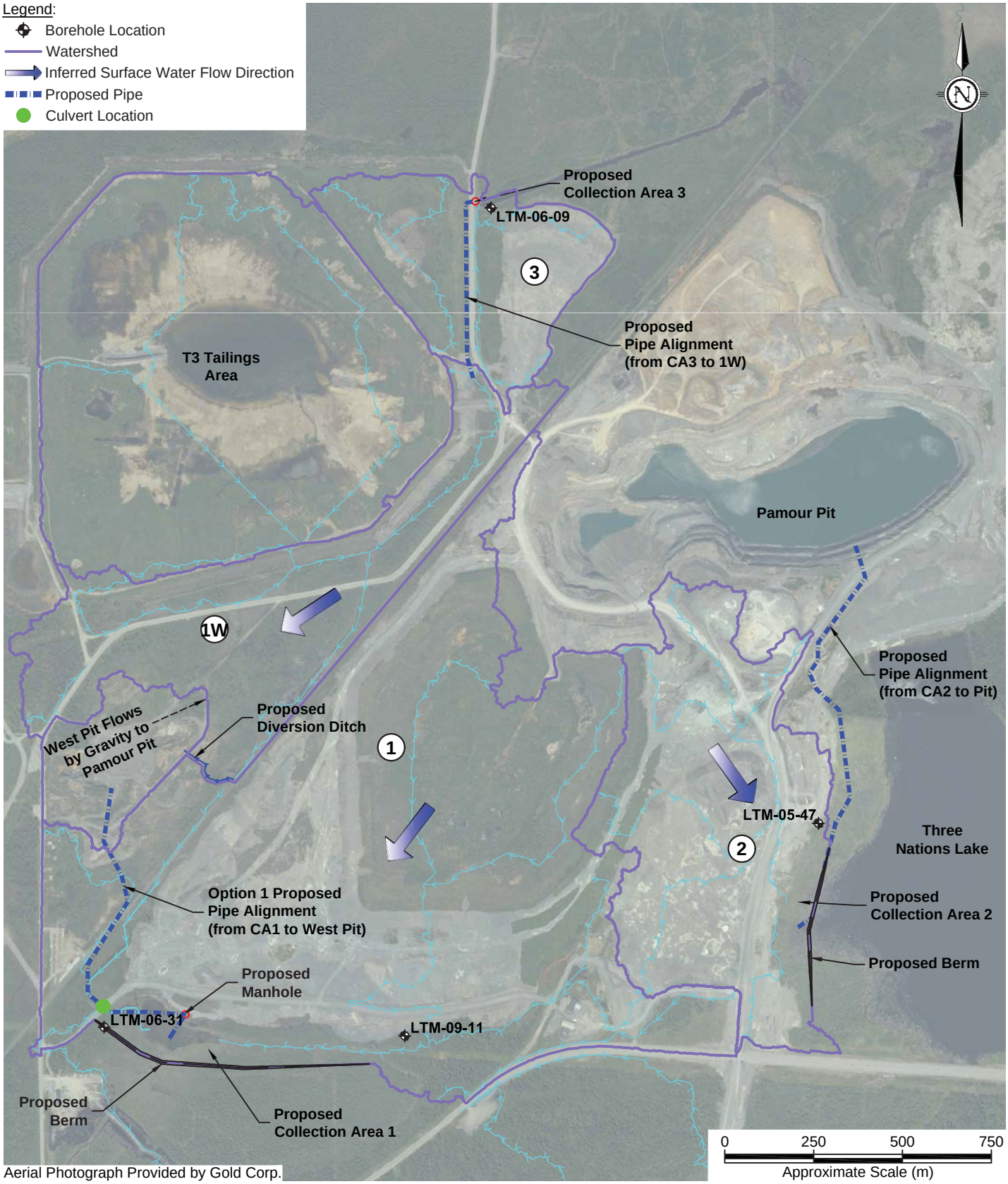


Bing Wang, Ph.D., P.Eng.
Senior Reviewer



Amec Foster Wheeler Environment & Infrastructure 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632	amec foster wheeler	GOLDCORP PORCUPINE GOLD MINES	Gold Corp

PROJECT	DWN BY:	CHK'D BY:	DATE: / PROJECT NO:
Draft Feasibility Level Report Pamour Water Collection & Pumping System Pamour Mine Site, South Porcupine, Ontario	KKJ	MDOG	August 2017 TY176005
TITLE	**REV. NO.:**	**SCALE:**	**FIGURE NO:**
Site Location Map	1	as shown	1



Aerial Photograph Provided by Gold Corp.

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Lively, Ontario
P3Y 1L7
705-682-2632

amec foster wheeler

GOLDCORP PORCUPINE GOLD MINES

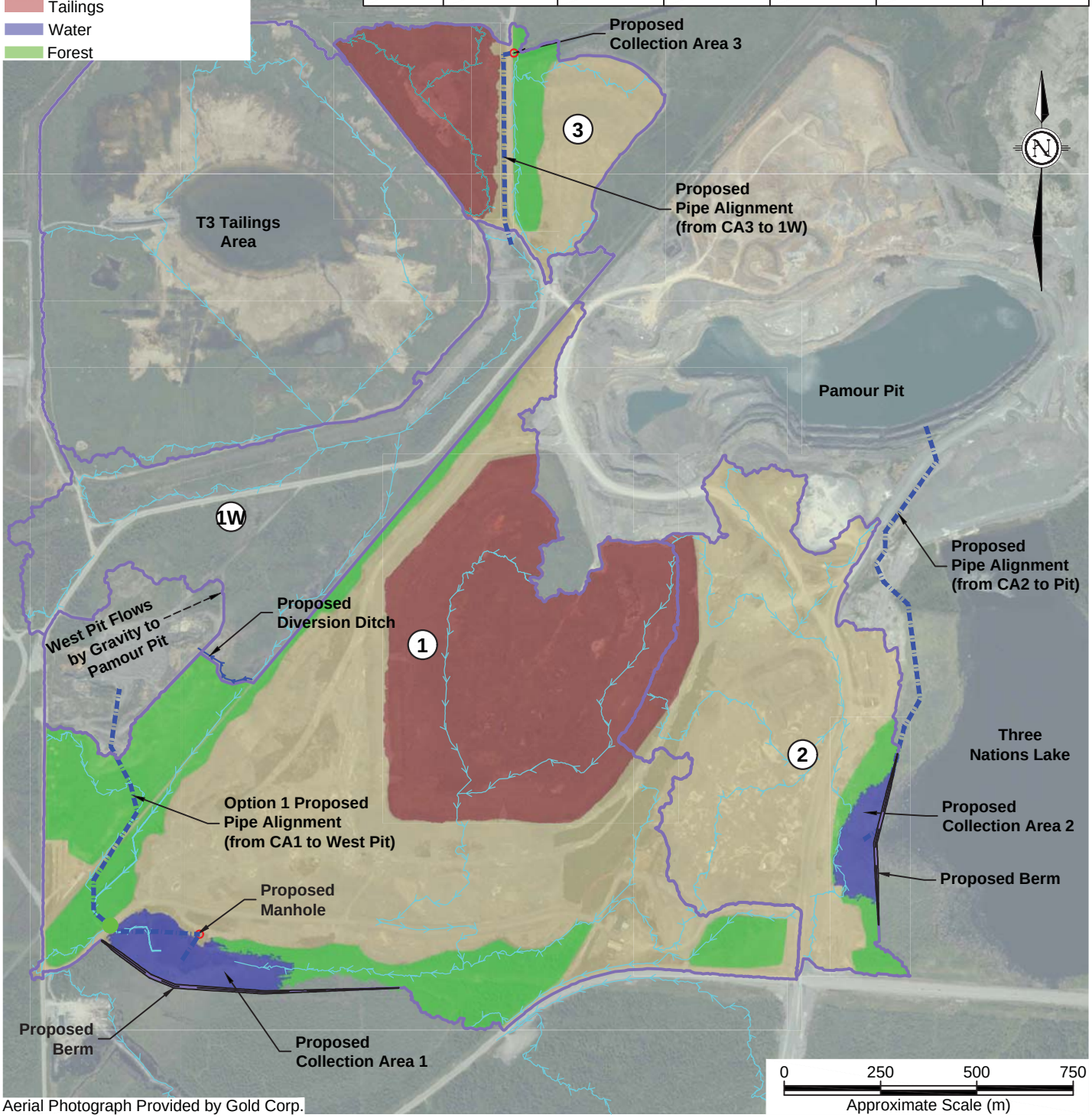
Gold Corp

PROJECT: Draft Feasibility Level Report Pamour Water Collection & Pumping System Pamour Mine Site, South Porcupine, Ontario		DWN BY: KKJ	CHK'D BY: MDOG	DATE: August 2017 PROJECT NO: TY176005
TITLE: Conceptual Design		REV. NO.: 1	SCALE: as shown	FIGURE NO: 2

Legend:
- Watershed
- Surface Water Flow Paths
- Proposed Pipe
- Culvert Location

Landuse:
- Waste Rock
- Tailings
- Water
- Forest

Watershed Data			Landuse			
Number	Area	Slope	Waste Rock	Tailings	Water	Natural
1	173.6 ha	8.7%	49%	29%	3%	19%
2	61.1 ha	10.3%	84%	6%	5%	5%
3	29.8 ha	5.6%	44%	43%	0%	13%



Aerial Photograph Provided by Gold Corp.

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Lively, Ontario
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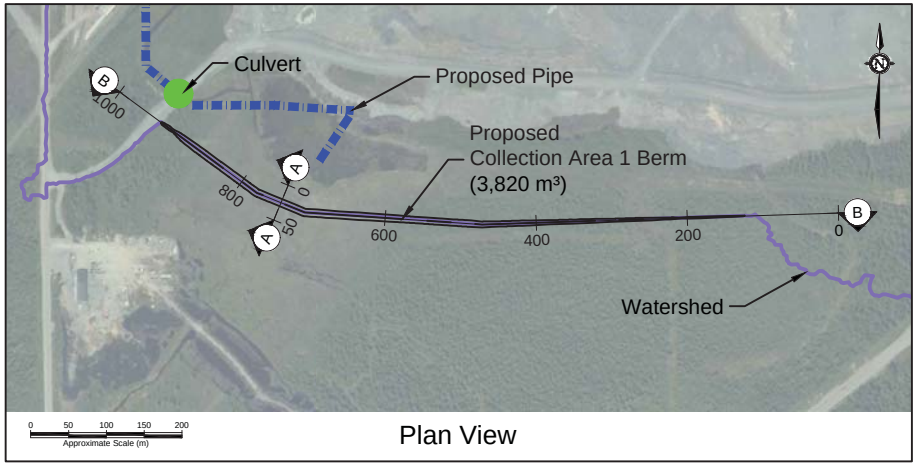
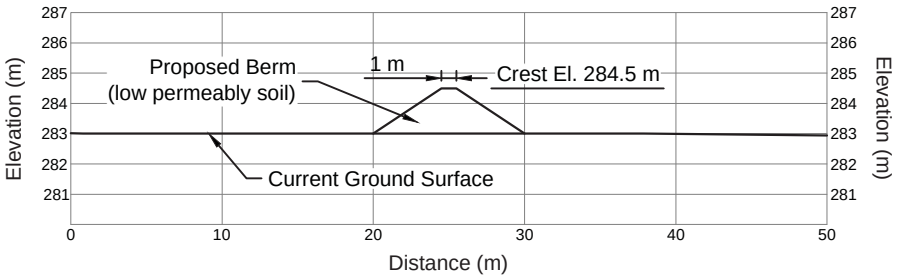
GOLDCORP PORCUPINE GOLD MINES

Gold Corp

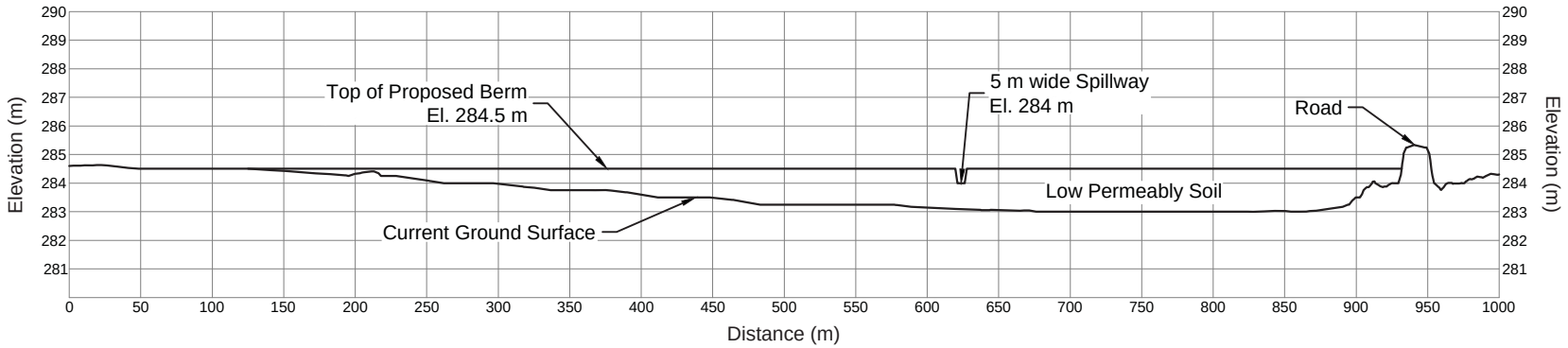
PROJECT: Draft Feasibility Level Report Pamour Water Collection & Pumping System Pamour Mine Site, South Porcupine, Ontario	DWN BY: KKJ	CHK'D BY: MDOG	DATE: August 2017	PROJECT NO: TY176005
TITLE: Catchment Characterization	REV. NO.: 1	SCALE: as shown	FIGURE NO: 3	



Plan View



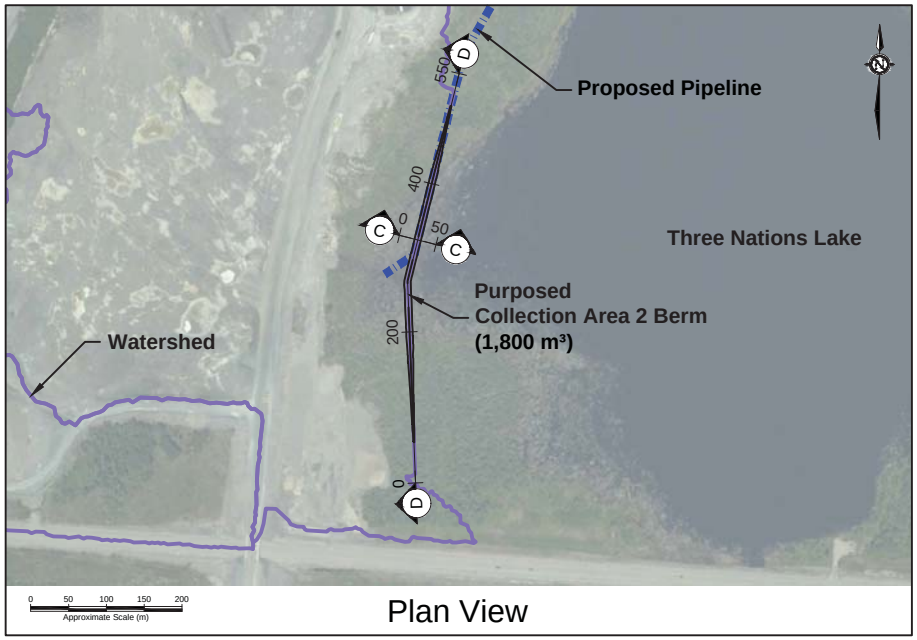
Collection Area 1 Berm Cross Section A-A



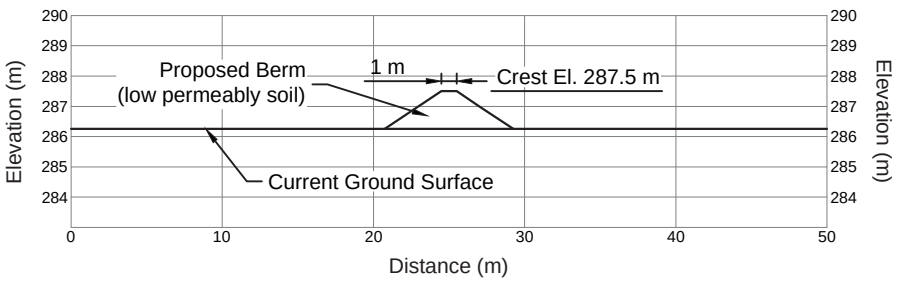
Collection Area 1 Berm Profile B-B

Aerial Photograph and LiDAR Provided by Gold Corp.

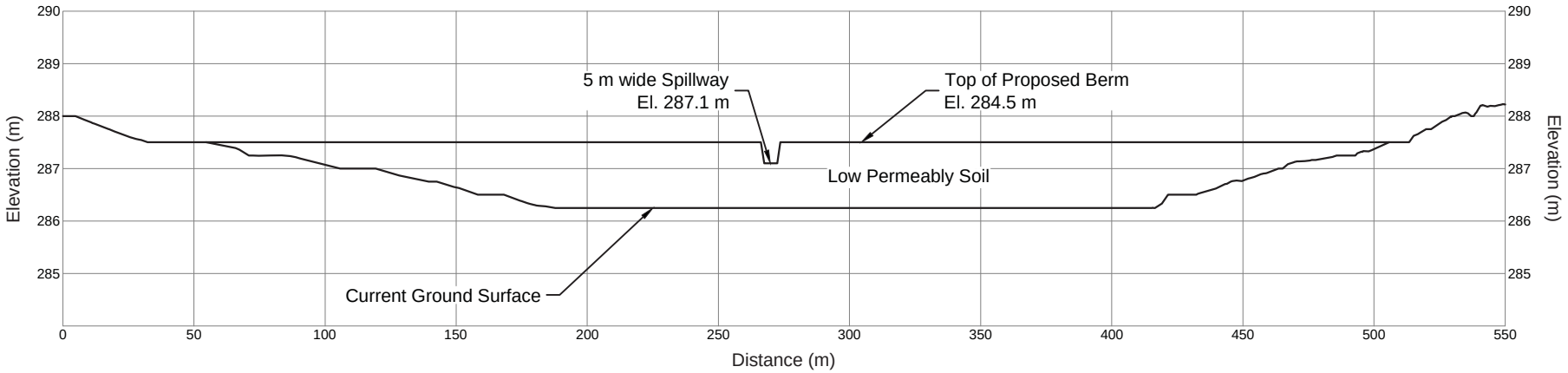
GOLDCORP Porcupine Gold Mines	Goldcorp Canada Limited	DWN BY: KKJ	PROJECT: Draft Feasibility Level Report Pamour Water Collection & Pumping System Pamour Mine Site, South Porcupine, Ontario	REV. NO.: 1
		CHK'D BY: MDOG		DATE: August 2017
Amec Foster Wheeler Environment & Infrastructure 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632	amec foster wheeler	SCALE: as shown	TITLE: CA-1 Detail	PROJECT NO: TY176005
				FIGURE NO: 4



Plan View



Collection Area 2 Berm Cross Section C-C



Collection Area 2 Berm Profile D-D

Aerial Photograph and LiDAR Provided by Gold Corp.

GOLDCORP Porcupine Gold Mines	Goldcorp Canada Limited	DWN BY: KKJ	PROJECT: Draft Feasibility Level Report Pamour Water Collection & Pumping System Pamour Mine Site, South Porcupine, Ontario	REV. NO.: 1
		CHK'D BY: MDOG		DATE: August 2017
Amec Foster Wheeler Environment & Infrastructure 131 Fielding Road Lively, Ontario P3Y 1L7 705-682-2632	amec foster wheeler	SCALE: as shown	TITLE: CA-2 Detail	PROJECT NO: TY176005
				FIGURE NO: 5

APPENDIX A

BACKGROUND INFORMATION

ONTC AGREEMENTS - PAMOUR

Legend

- ONTC_Agreements

Surface Rights

- Others
- Goldcorp

0 0.25 0.5 1 1.5 2 Kilometers

N

RECORD OF MONITORING WELL No. LTM-05-47

Project Number:	TY56004 task 3000	Drilling Location:	Three Nations Lake	Logged by:	SGL
Project Client:	Porcupine Joint Venture	Drilling Method:	200 mm Hollow Stem Augers	Compiled by:	DMB
Project Name:	Aquifer Instrumentation	Drilling Machine:	Track Mounted Drill	Reviewed by:	TIM
Project Location:	Timmins, Ontario	Date Started:	18 Feb 05	Date Completed: 18 Feb 05	Revision No.: 1, 29/03/05

Elev (m) / Depth (m)	Lithology Plot	DESCRIPTION (Local Ground Surface Elevation:)	Sample Type	Sample Number	Recovery (%) Coring RQD (%)	SPT/DCPT 'N' Value Field Vane (kPa)	DEPTH (m)	ELEVATION (m)
0.0		100 mm black ORGANICS over						
		brown SAND with some gravel observed to 3.1 m depth	SS	1	92	53		
							1	
			SS	2	25	4	2	
			SS	3	41	6	3	
							4	
			SS	4	41	18	5	
							6	
-6.4								
6.4		gravel with trace sand observed at 6.4 m depth	SS	5	67	23		
-7.0							7	
7.0		END OF BOREHOLE DUE TO AUGER REFUSAL ON POSSIBLE BOULDERS OR BEDROCK						

FIELD TESTING

× Pocket Penetrometer (kg/cm²) 1 2 3 4

Standard Penetration Testing 'N': ○ Standard Test ● Dynamic Cone

Field Vane*: △ Intact ▲ Remould

Nilcon Vane*: ◇ Intact ◆ Remould

* Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING

★ Rinse pH Values 2 4 6 8 10 12

Soil Vapour Reading: △ parts per million (ppm) 100 200 300 400

▲ Lower Explosive Limit

✳ Passing 75 um (%)

○ Moisture Content (%) 20 40 60 80

INSTALLATION LEGEND

MONITORING WELL INSTALLATION

1 upright casing in concrete
1 riser pipe in backfill
1 riser pipe in bentonite
1 slotted pipe in backfill
no installation, only backfill

Format: AMEC-SUDBURY ENV METRIC File: TY56004 TASK 3000 PJV - AQUIFER PLAN, BH LOGS REV 0.GPJ Date: 03/29/2005 11:18:21 AM

RECORD OF BOREHOLE No. LTM-06-09 Co-Ord. 0490873E, 5375059N

Project Number: TY66034 | Drilling Location: | Logged by: SGL

Project Client: Gold Corp | Drilling Method: 200 mm Hollow Stem Augers | Compiled by: KKJ

Project Name: Well Replacement | Drilling Machine: Track Mounted Drill | Reviewed by: TIM

Project Location: Porcupine Joint Venture | Date Started: 07 Sep 06 | Date Completed: 07 Sep 06 | Revision No.: 1, 20/09/06

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION Local Ground Surface Elevation:	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Atterberg Limits W_P W W_L Plastic Liquid; ✳ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	grass over moist FILL mostly sand, clay and organics increasing with depth	SS	1	51	3					1m Metal Stick-up Riser in Bentonite	
						1					
		SS	2	0	0						
						2					
	brown, soft, wet 2.6 PEAT										
		SS	3	8	1	3					
						4					
	grey, soft to compact, wet 4.1 SILTY CLAY										Riser in Grout
		SS	4	100	0	5					
						6					
		SS	5	100	0						
						7					
		SS	6	100	0	8					
						9					
		SS	7	100	0						

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www.amec.com

▽ No freestanding groundwater measured in open borehole on completion of drilling.

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 50

Continued on Next Page

RECORD OF BOREHOLE No. LTM-06-09 Co-Ord. 0490873E, 5375059N

Project Number: TY66034 Drilling Location: Logged by: SGL

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	Atterberg Limits W_P W W_L Plastic Liquid; ✳ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	COMMENTS
	grey, soft to compact, wet SILTY CLAY					10					Riser in Grout
		SS	8	100	0	11		○			Riser in Bentonite
						12					Riser in Sand
		SS	9	51	3			○			
						13					2" Screen in Sand
		SS	10	75	3	14		○			
	END OF BOREHOLE 14.9 DUE TO AUGER REFUSAL ON POSSIBLE BOULDERS OR BEDROCK										

Borehole details as presented, do not constitute a thorough understanding of all potential conditions present and requires interpretative assistance from a qualified Geotechnical Engineer. Also, borehole information should be read in conjunction with the geotechnical report for which it was commisioned and the accompanying'Explanation of Borehole Log'.

Scale: 1 : 50

RECORD OF MONITORING WELL No. LTM0911 Co-Ord. 0490666 E, 5372967 N

Project Number:	TY96008	Drilling Location:	TMA T2	Logged by:	AJS
Project Client:	Goldcorp	Drilling Method:	200 mm Hollow Stem Augers	Compiled by:	KKJ
Project Name:	Pamour Well Installations	Drilling Machine:	Track Mounted Drill	Reviewed by:	TIM
Project Location:	Timmins, Ontario	Date Started:	27 May 09	Date Completed: 27 May 09	Revision No.: 1, 24/6/09

LITHOLOGY PROFILE | **SOIL SAMPLING** | **FIELD TESTING** | **LAB TESTING** | **INSTRUMENTATION INSTALLATION** | **COMMENTS**

Local Ground Surface Elevation: 285.29 m

Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)
	grey MINE ROCK FILL 283.8					0	285
	brown 1.5 PEAT / ORGANICS moist to wet	AU	1			1	284
		AU	2			2	283
		AU	3			3	282
		AU	4			4	281
		AU	5			5	280
	276.1					6	279
	grey 9.2 SILT some clay, wet					7	278
						8	277
						9	276

FIELD TESTING: PenetrationTesting — SPT, DCPT; MTO Vane* Intact, Remould; Nilcon Vane* Intact, Remould; * Undrained Shear Strength (kPa) 20 40 60 80

LAB TESTING: Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading, parts per million (ppm) 100 200 300 400; Lower Explosive Limit; Passing 75 um (%); Moisture Content (%) 20 40 60 80

INSTRUMENTATION INSTALLATION

COMMENTS
1 riser pipe in bentonite
1 riser pipe in bentonite silt / clay mixture
1 riser pipe in sand
1 slotted pipe in sand

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Scale: 1 : 50

Continued on Next Page

RECORD OF MONITORING WELL No. LTM0911 Co-Ord. 0490666 E, 5372967 N

Project Number: **TY96008** Drilling Location: **TMA T2** Logged by: **AJS**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	PenetrationTesting ○ SPT ● DCPT; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit ✱ Passing 75 um (%) ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in bentonite silt / clay mixture 1 riser pipe in sand 1 slotted pipe in sand
	grey SILT some clay, wet	AU	6			10	275				
		AU	7			11	274				
		AU	8			12	273				
		AU	9			13	272				
	270.1					14	271				
	grey SILT and CLAY wet 15.2	AU	10			15	270				
		AU	11			16	269				
		AU	12			17	268				
	265.5					18	267				
	grey CLAY some silt, wet 19.8	AU	13			19	266				
						20	265				

Continued on Next Page

RECORD OF MONITORING WELL No. LTM0911 Co-Ord. 0490666 E, 5372967 N

Project Number: **TY96008** Drilling Location: **TMA T2** Logged by: **AJS**

LITHOLOGY PROFILE		SOIL SAMPLING						FIELD TESTING	LAB TESTING		COMMENTS
Lithology Plot	DESCRIPTION	Sample Type	Sample Number	Recovery (%)	SPT 'N' Value	DEPTH (m)	ELEVATION (m)	Penetration Testing: SPT ○ DCPT ●; MTO Vane* △ Intact ▲ Remould; Nilcon Vane* ◇ Intact ◆ Remould; * Undrained Shear Strength (kPa) 20 40 60 80	★ Rinse pH Values 2 4 6 8 10 12; Soil Vapour Reading △ parts per million (ppm) 100 200 300 400; ▲ Lower Explosive Limit; ✱ Passing 75 um (%); ○ Moisture Content (%) 20 40 60 80	INSTRUMENTATION INSTALLATION	1 riser pipe in bentonite 1 riser pipe in bentonite silt / clay mixture 1 riser pipe in sand 1 slotted pipe in sand
	grey CLAY some silt, wet					21	264				
		AU	14			22	263				
		AU	15			23	262				
		AU	16			24	261				
		AU	17			25	260				
	257.9					26	259				
	grey 27.4 SAND some silt, trace gravel, wet	AU	18			27	258				
		AU	19			28	257				Auger Chatter (27 to 30 m)
	254.8					29	256				
	END OF BOREHOLE 30.5 (no refusal)					30	255				

Knight Piésold CONSULTING

DRILLHOLE AND INSTALLATION LOG

DRILLHOLE NO. DH-04

PROJECT: PJV Pamour Mine Expansion
PROJECT NO.: NB101-00053/6
DRILLHOLE LOCATION: East of Hallnor Rd, south of railway tracks
LOGGED BY: CG
NORTHING: m 5372769.1
DATE DRILLHOLE STARTED: Oct.24, 2002
EASTING: m 489817.1
DATE DRILLHOLE FINISHED: Oct.25, 2002
GROUND ELEVATION: m 282.82
DATE INSTRUMENTATION COMPLETED: Oct.26, 2002

Depth (m)	Elevation	Sample Recovery (%)	Sample Type	Sample Number	SPT N-Value
0	282.8				
1	282.0	100		1	4
2	281.0	100		2	4
3	280.0	100		3	4
4	279.0	100		4	
5	278.0	56		5	6
6	277.0				
7	276.0				
8	275.0	67		6	69
9	274.0				
10	273.0				

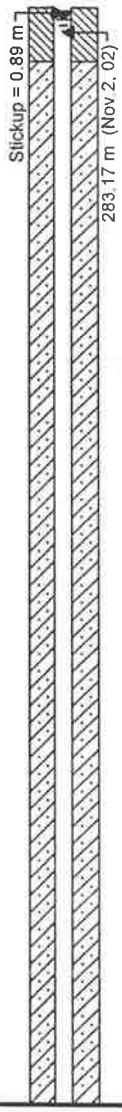
SPT N-Value (blows per foot): 12.5 25 37.5

Atterberg Limits (%): PL M/C LL; 25 50 75

Field Vane Shear Strength: Remould 25 75 125 (kPa) Peak 25 75 125

Graphic Log	STRATIGRAPHY Description
	Ground Surface
	Muskeg (0.0 to 0.75 m) Moist, soft, black muskeg; some wood fragments
	Brown Varved Clay and Silt (0.75 to 1.6 m) Moist to dry, firm to stiff, brown, varved clay and silt
	Grey Silt and Clay (1.6 to 6.2 m) Moist to wet, firm to soft, grey, varved silt and clay. Becoming softer with depth
	Till (6.2 to 13.75 m) Moist to dry, very dense, grey silty sand; some gravel, occasional cobbles and boulders
	Note: Auger refusal at 6.7 m.

Drill Comments and Instrumentation Details



SAMPLE TYPE
- Shelby Tube
- Split Spoon (SPT)
- Rock Core

GRAPHIC LOG SYMBOL
Tailings, Gravel, Clay, Bedrock, Sand, Organics, Silt

INSTALLATION SYMBOL
Bentonite Seal, Native Fill, Filter Sand, Grout

Figure. A.4

Knight Piésold CONSULTING

DRILLHOLE AND INSTALLATION LOG

DRILLHOLE NO. DH-04

PROJECT: PJV Pamour Mine Expansion
PROJECT NO.: NB101-00053/6
DRILLHOLE LOCATION: East of Hallnor Rd, south of railway tracks
LOGGED BY: CG
NORTHING: m 5372769.1
DATE DRILLHOLE STARTED: Oct.24, 2002
EASTING: m 489817.1
DATE DRILLHOLE FINISHED: Oct.25, 2002
GROUND ELEVATION: m 282.82
DATE INSTRUMENTATION COMPLETED: Oct.26, 2002

Depth (m)	Elevation	Sample Recovery (%)	Sample Type	Sample Number	SPT N-Value	SPT N-Value (blows per foot) 12.5 25 37.5	Atterberg Limits (%) PL M/C LL 25 50 75	Field Vane Shear Strength (kPa) Remould 25 75 125 / Peak 25 75 125	Graphic Log	STRATIGRAPHY Description	Drill Comments and Instrumentation Details
11	272.0	12								**Till**	
12	271.0										
13	270.0										
14	269.0									**Till** (13.75 to 24.0 m) Grey silt and fine sand; no cobbles or boulders recovered	14.2 m
15	268.0										15.3 m
16	267.0										15.6 m
17	266.0										
18	265.0										
19	264.0	0									18.6 m
20	263.0										

SAMPLE TYPE
- Shelby Tube
- Split Spoon (SPT)
- Rock Core

GRAPHIC LOG SYMBOL
- Tailings
- Bedrock
- Gravel
- Sand
- Silt
- Clay
- Organics

INSTALLATION SYMBOL
- Bentonite Seal
- Filter Sand
- Grout
- Native Fill

Figure. A.4

Knight Piésold CONSULTING

DRILLHOLE AND INSTALLATION LOG

DRILLHOLE NO. DH-04

PROJECT: PJV Pamour Mine Expansion
PROJECT NO.: NB101-00053/6
DRILLHOLE LOCATION: East of Hallnor Rd, south of railway tracks
LOGGED BY: CG
NORTHING: m 5372769.1
DATE DRILLHOLE STARTED: Oct.24, 2002
EASTING: m 489817.1
DATE DRILLHOLE FINISHED: Oct.25, 2002
GROUND ELEVATION: m 282.82
DATE INSTRUMENTATION COMPLETED: Oct.26, 2002

Depth (m)	Elevation	Sample Recovery (%)	Sample Type	Sample Number	SPT N-Value	SPT N-Value (blows per foot) 12.5 25 37.5	Atterberg Limits (%) PL M/C LL 25 50 75	Field Vane Shear Strength (kPa) Remould 25 75 125 / Peak 25 75 125	Graphic Log	Description	Drill Comments and Instrumentation Details
21	262.0									Till	
22	261.0										
23	260.0										
24	259.0	15								Till (24.0 m to EOH) Grey silt and fine sand; occasional cobbles and boulders	
25	258.0									End of drillhole: 24.7 m	50 mm dia. PVC Monitoring Well
26	257.0										
27	256.0										
28	255.0										
29	254.0										
30	253.0										

SAMPLE TYPE
- Shelby Tube
- Split Spoon (SPT)
- Rock Core

GRAPHIC LOG SYMBOL
- Tailings
- Bedrock
- Gravel
- Sand
- Silt
- Clay
- Organics

INSTALLATION SYMBOL
- Bentonite Seal
- Filter Sand
- Grout
- Native Fill

Figure. A.4

APPENDIX B

PUMP STATION MEMO

PORCUPINE ENGINEERING SERVICES INC.

MEMO

To	**Mauricio Del Olmo Gil, M.Eng., P.Eng.** Water Resources & Dam Engineer, Amec Foster Wheeler	**File no**	144677
From	Brian Emblin	**Cc**	M. Colantonio F. O'Donnell
Tel	(705) 235-2110		
Fax	(705) 235-3316		
Date	July 21, 2017		

Subject **Goldcorp Pamour Mine Site Water Management Pumping Stations**

The Goldcorp Pamour mine site water pumping stations consists of two stations. Collection Area 1 (CA-1) will be located at the south west corner of the site. CA-1 will pump to the north, known as the west pit. Collection Area 2 (CA-2) will be located on the lower east side of the mine site area, near Three Nations Lake and it will pump to the Pamour Pit.

Mechanical

CA-1

Based on a pumping rate of 0.3m³/s (4,755usgpm) we recommend a 24 inch diameter HDPE DR26 pipe line (vel: 3.59ft/sec, delta P: 0.065psi/100ft) and a pair of vertical turbine 40hp pumps (one running one standby).

CA-2

Based on a pumping rate of 0.05m³/s (792usgpm) we recommend a 10 inch diameter HDPE DR26 pipe line (vel: 3.52ft/min, delta P: 0.143psi/100ft) and a pair of vertical turbine 20hp pumps, one running and one standby)

Civil/Structural

The pumphouse consists of a wet well composed of reinforced concrete large enough to house the two vertical turbine pumps. The pumphouses floor slab around the wet well is a reinforced concrete mat on grade. The mat will also incorporate the foundation for the pumphouse enclosure which will be a prefabricated metal structure with roof access hatches at the pump locations to allow for removal/reinstallation of the pumps by a mobile crane.

The pipeline corridor carried in the cost estimate consists of a built-up pipe bed composed in large part with mine waste rock. The corridor will provide containment to the pipeline complete

with a liner system. In addition, the pipeline corridor will be sloped from a high point back to either the pumphouse or the final discharge point at the main or west pits. Wet well inlet will consist of a French drain reporting to the wet well.

Electrical

CA-1

Based on the anticipated load of the pumps in this area (40HP each), the conceptual estimate has carried a 150kVA service (from the Hoyle Pond 27.6kV system ~2.2km away) to the small building. The building will be equipped with heat, lights, and maintenance/convenience receptacles as well as a small Programmable Logic Controller (PLC) to control and monitor the station. Should this project go into the detailed engineering stage, it would be prudent at that time to check with Hydro One Networks Inc (HONI) to see if suitable capacity is available on their 27.6kV line (within a km of CA-1), as this may be a cheaper option. During 'study' work, HONI does not guarantee or reserve any line capacity.

CA-2

The electrical configuration carried for CA-2 is very similar to CA-1, expect the 27.6kV line from Hoyle is ~1.2km away and the pump starters will be a size smaller for the anticipated pumps at this location (20HP each). The HONI line pass near CA-2 as well, and it can be explored during the next stage of project approval.

Automation and Control (CA-1 & CA-2)

Each pumping station will be equipped with a PLC that controls the pumps and monitors water level and pump flow using field instrumentation devices; the system also monitors the temperature within the building. An allowance has also been carried for third-party equipment to 'talk' to the PLC and broadcast chosen pieces of data (level, pump running, flow) wirelessly to a pre-existing Goldcorp monitoring dashboard.

We trust the above information summarizes the items carried in the capital estimate for this stage/phase of the work; should you have any questions, please do not hesitate to call anytime.

Yours truly,

Brian Emblin, P. Eng.
Mechanical Engineer
Porcupine Engineering Services Inc.

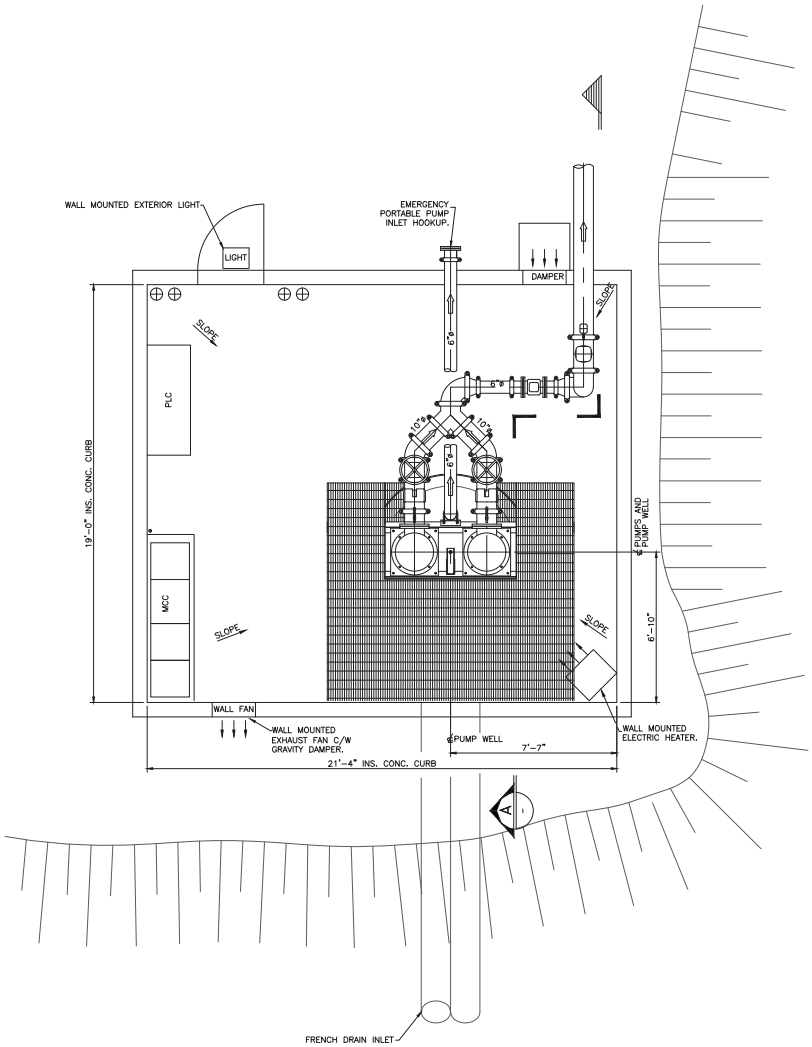
DETAILED PROJECT COST ESTIMATE (CIVIL/STRUCTURAL)

Item Nº.	Description	MATERIAL Qty.	U.O.M.	Unit Cost	Taxes (%)	Frgt. (%)	Eng EF (%)	*Total*	LABOUR Total Hours	Hourly Rate	Eng EF (%)	Total	**Total**
1	Mobilization	1	Lot	$1,500			20.00	$1,800	20	$105	20.00	$2,520	$4,320
2	Demobilization	1	Lot	$1,500			20.00	$1,800	20	$105	20.00	$2,520	$4,320
													$8,640
A	**Pump Station**												
1	Excavation and Backfill	5000	m^3	$10			50.00	$75,000	480	$105	50.00	$75,600	$150,600
2	Reinforced Concrete Wet Well/Foundations	130	m^3	$850			20.00	$132,600	1260	$105	20.00	$158,760	$291,360
3	Pumphouse Enclosure	65	m^2	$1,250			20.00	$97,500	240	$105	20.00	$30,240	$127,740
B	**Pipeline Corridor**												
1	Pipe Bedding	29000	m^3	$5			20.00	$174,000	300	$175	20.00	$63,000	$237,000
2	Liner	7000	m^2	$5			20.00	$42,000	350	$105	20.00	$44,100	$86,100
	TOTAL:							**$524,700**	**2670**			**$376,740**	**$901,440**

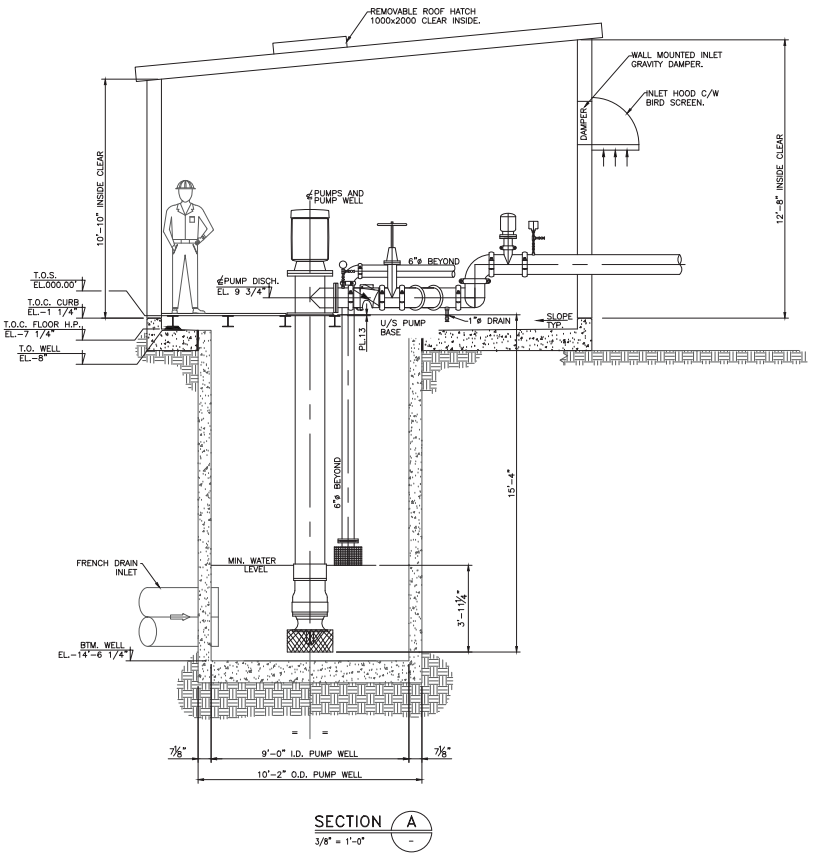
PORCUPINE ENGINEERING SERVICES INC.
TIMMINS, ONTARIO

TITLE: Goldcorp Pamour Mine
144677 - Pamour Pump Station - CA#1 to West Pit

Prepared By: M. Colantonio | Appv'd. (Eng): | Date: 21-Jul-17 | Rev.: 0



PLAN VIEW



SECTION A
3/8" = 1'-0"

PORCUPINE ENGINEERING SERVICES INC.
PROJECT No. 144677

goldcorp CANADA LTD.

PORCUPINE GOLD MINES
DOME MILL

GOLDCORP
PAMOUR PUMP STATIONS
GENERAL ARRANGEMENT

DRAWN BY: M.MCKELVEY	CHECKED BY: –	DESIGNED BY: B.EMBLIN	APPROVED BY:
SCALE: 3/8"=1'-0"	GRIND SMOOTH ALL BURRS AND ROUGH EDGES		
	DEPARTMENT – MINE ☐ MILL ☐ PLANT ☐ PIT ☐		
DATE: 2017/07/06	EQUIPMENT No.: –	FILENAME:	PLOT SCALE: 1:1
DRAWER No.:	DRAWING No.: 144677-SK1		REV: A

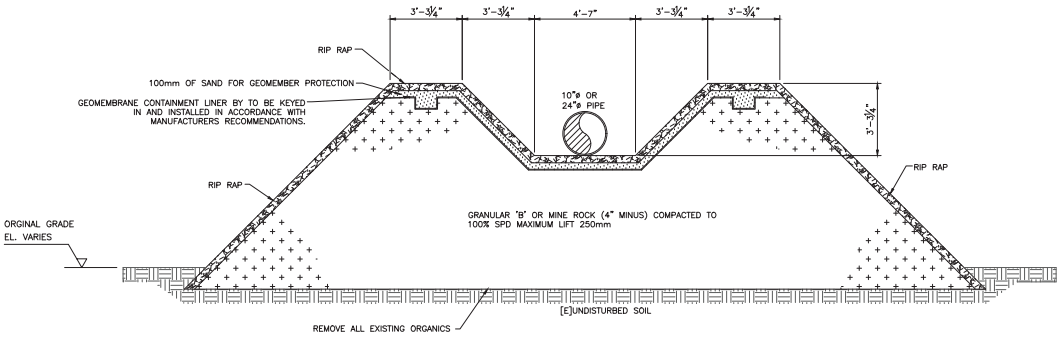
DWG No.	DESCRIPTION
REFERENCE DWGS	

DWG No.	DESCRIPTION
REFERENCE DWGS	

NO.	DESCRIPTION	DATE	BY
REVISIONS			

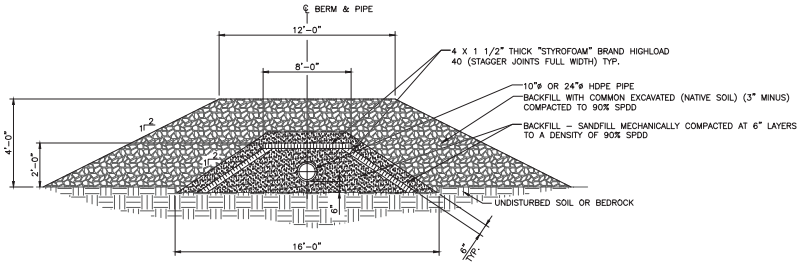
NO.	DESCRIPTION	DATE	BY
REVISIONS			

NO.	DESCRIPTION	DATE	BY
REVISIONS			



TYPICAL SECTION THROUGH PIPE CORRIDOR OPTION #1

[E] – DENOTES EXISTING



TYPICAL SECTION THROUGH PIPE CORRIDOR OPTION #2

PORCUPINE ENGINEERING SERVICES INC.
PROJECT No. 144677

goldcorp CANADA LTD. PORCUPINE GOLD MINES
DOME MILL

GOLDCORP
PAMOUR TAILINGS PIPE CORRIDOR
GENERAL ARRANGEMENT

DRAWN BY	CHECKED BY	DESIGNED BY	APPROVED BY
M.MCKELVEY	–	B.EMBLIN	

SCALE: 3/8"=1'-0" — GRIND SMOOTH ALL BURRS AND ROUGH EDGES
DEPARTMENT – MINE ☐ MILL ☐ PLANT ☐ PIT ☐

DATE	EQUIPMENT No.	FILENAME	PLOT SCALE
2017/07/06	–		1:1

DRAWER No. — DRAWING No. 144677-SK2 — REV A

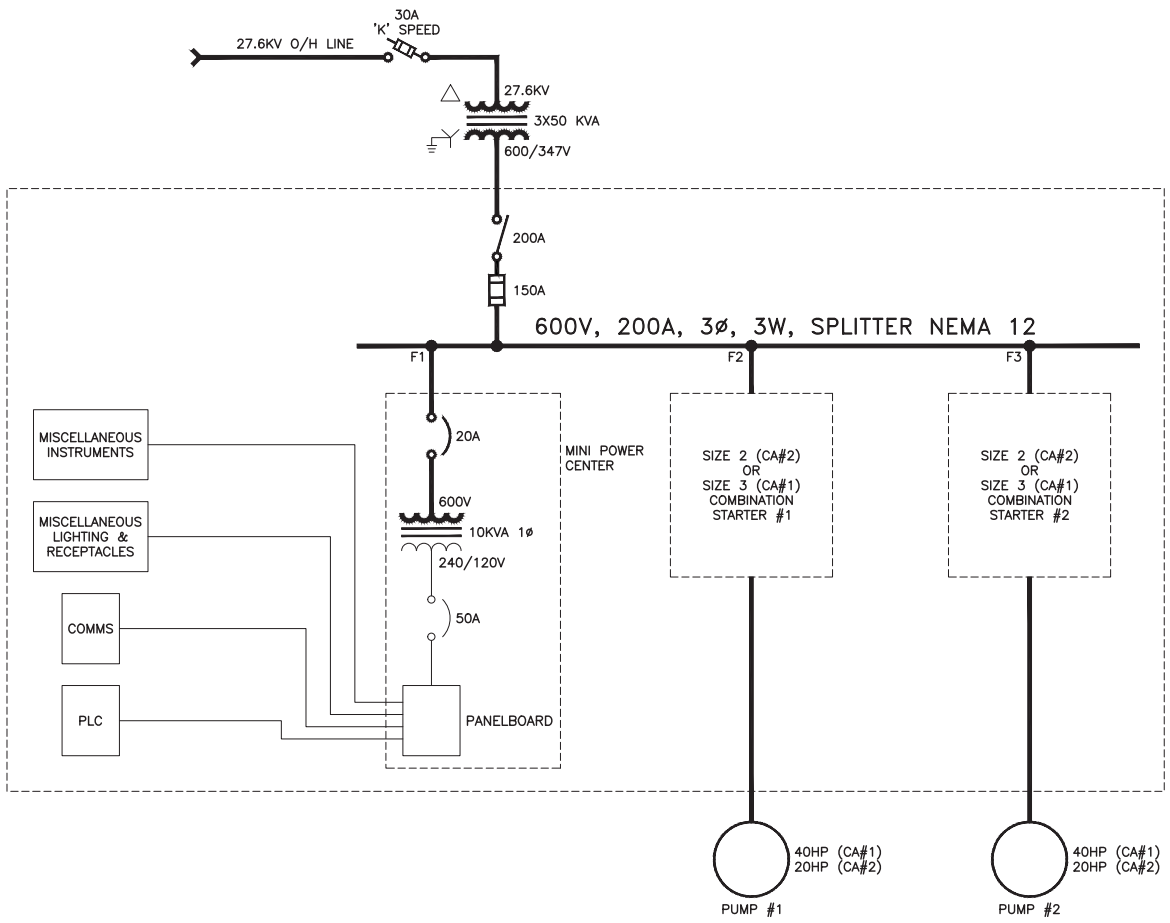
DWG No.	DESCRIPTION
	REFERENCE DWGS

DWG No.	DESCRIPTION
	REFERENCE DWGS

NO.	DESCRIPTION	DATE	BY
	REVISIONS		

NO.	DESCRIPTION	DATE	BY
	REVISIONS		

NO.	DESCRIPTION	DATE	BY
	REVISIONS		



PRELIMINARY

PORCUPINE ENGINEERING SERVICES INC.

DATE: JULY 19, 2017

ISSUED BY: T. CROUSSETTE

Last Drawing Revision: A

PORCUPINE ENGINEERING SERVICES INC.

PROJECT No. 144677

goldcorp CANADA LTD. PORCUPINE GOLD MINES
PAMOUR SITE
Div. of Goldcorp Canada LTD.

											DESIGN FOD	JULY 19, 2017	PAMOUR CLOSED SITE	
											DRAWN TC	JULY 19, 2017	COLLECTION AREAS CA#1 & CA#2	
											CHECK		PUMP HOUSE STATIONS	
A	PRELIMINARY	CONCEPTUAL SLD	TC	FOD			JUL 19, 17				APPROVED		CONCEPTUAL SINGLE LINE DIAGRAM (TYPICAL)	
REV. No.	ISSUED FOR	REVISION DESCRIPTION	DWN	DES	CHK	APR	DATE	REF. No.	DWG. No.	REFERENCE DRAWING	INITIAL	DATE	DRAWING No.	144677-SLD CONCEPT A

144677-SLD CONCEPT

PROJECT COST ESTIMATE SUMMARY SHEET

PROVINCIAL TAXES ALLOWED (YES/NO):	Mech.	Civ/Struc	Elec./Inst.
	N	N	N

ESCALATION ALLOWED (%): 0

COMMENTS

1) No G.S.T. Allowance in Project.
2) Eng. EF = Engineering Estimating Factor (Ranges from 0% to 30% Depending on Clarity of Project Scope).
3) Construction Labour Based on Regular Time Hourly Rate, Rentals and Construction Consumables.
4) Contingency (%) to be Negotiated with Client and is Used to Cover Project Scope Additions.
5) Estimating Accuracy Reflected by Engineering Estimating Factor (Eng. EF) on Pages 2 and 3.
6)
7)

ITEM	DESCRIPTION	MATERIAL	LABOUR	TOTAL
001	MECHANICAL	$317,456	$107,180	$424,636
002	CIVIL/STRUCTURAL	$524,700	$376,740	$901,440
003	ELECTRICAL/INSTRUMENTATION	$335,305	$65,760	$401,065
004	SPARE PARTS	$0	$0	$0
SUBTOTAL:		**$1,177,461**	**$549,680**	**$1,727,141**

NOTE:

1) For E.P.C.M. Costs on Projects > $200 000, Use Percentage of Subtotal. E.P.C.M. (%): 12.00 $207,257
2) For E.P.C.M. Costs on Projects < $200 000, See Detailed Engineering Cost Sheet.
3) **EXCLUSION** LICENSES AND PERMITS:

TOTAL: **$1,934,398**

CONTINGENCY (%): 30.00 $580,319

GRAND TOTAL: **$2,514,717**

PORCUPINE ENGINEERING SERVICES INC.

TITLE: **Goldcorp Pamour Mine**
144677 - Pamour Pump Station - CA#1 to West Pit

Rev.: 0

Prepared By: M. Colantonio	Client Review:	Appv'd. (Eng.):	Date: 18-Jul-17

DETAILED PROJECT COST ESTIMATE (MECHANICAL)

Item Nº.	Description	MATERIAL Qty.	U.O.M.	Unit Cost	Taxes (%)	Frgt. (%)	Eng EF (%)	*Total*	LABOUR Total Hours	Hourly Rate	Eng EF (%)	Total	**Total**
001	24 Inch Diameter Pipe	2460	ft.	$34			15.00	$96,186	812	$100	15.00	$93,380	$189,566
002	Mobilization/Demobilization	1		$3,500			15.00	$4,025					$4,025
003	Turbine Pump	2	ea	$93,150			15.00	$214,245	120	$100	15.00	$13,800	$228,045
004	Boom Truck	2	days	$1,500				$3,000					$3,000
	TOTAL:							**$317,456**	**932**			**$107,180**	**$424,636**

PORCUPINE ENGINEERING SERVICES INC.
TIMMINS, ONTARIO

TITLE: Goldcorp Pamour Mine
144677 - Pamour Pump Station - CA#1 to West Pit

Prepared By: Brian Emblin | Appv'd. (Eng): | Date: 21-Jul-17 | Rev.: 0

DETAILED PROJECT COST ESTIMATE (ELECTRICAL/INSTRUMENTATION)

Item Nº.	Description	MATERIAL Qty.	U.O.M.	Unit Cost	Taxes (%)	Frgt. (%)	Eng EF (%)	*Total*	LABOUR Total Hours	Hourly Rate	Eng EF (%)	Total	**Total**
001	27.6kV Aerial Poleline Ext. to CA#1 PH	2.2	km	$100,000			15.00	$253,000	20	$100	20.00	$2,400	$255,400
002	Dead-End Pole c/w Switch/Transformers	1	lot	$20,000			20.00	$24,000	68	$100	20.00	$8,160	$32,160
003	Indoor Fused Switch & Splitter Rack	1	lot	$1,500			20.00	$1,800	30	$100	20.00	$3,600	$5,400
004	Size 3 FVNR Combination Starters	2	ea	$3,500			20.00	$8,400	30	$100	20.00	$3,600	$12,000
005	Fused Switch/10kVA/Panelboard	1	lot	$2,000			20.00	$2,400	36	$100	20.00	$4,320	$6,720
006	Allowance for Lights/Receptacles/Heat	1	lot	$1,000			20.00	$1,200	20	$100	20.00	$2,400	$3,600
007	Allowance for Grounding	1	lot	$500			20.00	$600	24	$100	20.00	$2,880	$3,480
008	PLC c/w processor, I/O, PS & Cabinet	1	lot	$6,500			15.00	$7,475	40	$100	20.00	$4,800	$12,275
009	PLC programming / configuration	1	lot	$1,000			15.00	$1,150	40	$130	20.00	$6,240	$7,390
010	Wireless Communications Allowance	1	lot	$5,000			20.00	$6,000	20	$150	20.00	$3,600	$9,600
011	Level Transmitter	1	ea	$1,600			20.00	$1,920	8	$100	20.00	$960	$2,880
012	Level Switch L-L & H-H Alarms	2	ea	$300			20.00	$720	8	$100	20.00	$960	$1,680
013	Flowmeter local to Pumphouse	1	ea	$15,000			20.00	$18,000	24	$100	20.00	$2,880	$20,880
014	Temperature Transmitter	1	ea	$1,450			20.00	$1,740	6	$100	20.00	$720	$2,460
015	Miscellaneous Brackets/Suppports	1	lot	$1,500			20.00	$1,800	20	$100	20.00	$2,400	$4,200
016	Power Cabling Allowance	1	lot	$1,000			20.00	$1,200	28	$100	20.00	$3,360	$4,560
017	Control Cabling Allowance	1	lot	$500			20.00	$600	32	$100	20.00	$3,840	$4,440
018	Instrumentation Cabling Allowance	1	lot	$250			20.00	$300	16	$100	20.00	$1,920	
	Mobilization / Demobilization	1	lot	$1,500			20.00	$1,800	12	$100	20.00	$1,440	$3,240
	Rentals	1	lot	$500			20.00	$600	4	$100	20.00	$480	$1,080
	Construction QA/QC Checks	1	lot	$250			20.00	$300	16	$100	20.00	$1,920	$2,220
	Start-up / Commissioning Allowance	1	lot	$250			20.00	$300	24	$100	20.00	$2,880	$3,180
	TOTAL:							**$335,305**	**526**			**$65,760**	**$401,065**

PORCUPINE ENGINEERING SERVICES INC.
TIMMINS, ONTARIO

TITLE: Goldcorp Pamour Mine
144677 - Pamour Pump Station - CA#1 to West Pit

Page: 4 of 4

Prepared By: F. O'Donnell / T. Croussette | Appv'd. (Eng): | Date: 21-Jul-17 | Rev.: 0

PROJECT COST ESTIMATE SUMMARY SHEET

PROVINCIAL TAXES ALLOWED (YES/NO):	Mech.	Civ/Struc	Elec./Inst.
	N	N	N

ESCALATION ALLOWED (%): 0

COMMENTS

1) No G.S.T. Allowance in Project.
2) Eng. EF = Engineering Estimating Factor (Ranges from 0% to 30% Depending on Clarity of Project Scope).
3) Construction Labour Based on Regular Time Hourly Rate, Rentals and Construction Consumables.
4) Contingency (%) to be Negotiated with Client and is Used to Cover Project Scope Additions.
5) Estimating Accuracy Reflected by Engineering Estimating Factor (Eng. EF) on Pages 2 and 3.
6)
7)

ITEM	DESCRIPTION	MATERIAL	LABOUR	TOTAL
001	MECHANICAL	$179,262	$47,725	$226,987
002	CIVIL/STRUCTURAL	$567,900	$395,640	$963,540
003	ELECTRICAL/INSTRUMENTATION	$210,105	$64,200	$274,305
004	SPARE PARTS	$0	$0	$0
SUBTOTAL:		**$957,267**	**$507,565**	**$1,464,832**

NOTE:

1) For E.P.C.M. Costs on Projects > $200 000, Use Percentage of Subtotal. E.P.C.M. (%): 12.00 $175,780
2) For E.P.C.M. Costs on Projects < $200 000, See Detailed Engineering Cost Sheet.
3) **EXCLUSION** LICENSES AND PERMITS:

TOTAL: **$1,640,612**

CONTINGENCY (%): 30.00 $492,184

GRAND TOTAL: **$2,132,795**

PORCUPINE ENGINEERING SERVICES INC.

TITLE: **Goldcorp Pamour Mine**
144677 - Pamour Pump Station - CA#2 to Main Pit

Page 1 of 4
Rev.: 0

Prepared By: M. Colantonio	Client Review:	Appv'd. (Eng.):	Date: 18-Jul-17

DETAILED PROJECT COST ESTIMATE (MECHANICAL)

Item Nº.	Description	MATERIAL Qty.	U.O.M.	Unit Cost	Taxes (%)	Frgt. (%)	Eng EF (%)	*Total*	LABOUR Total Hours	Hourly Rate	Eng EF (%)	Total	**Total**
001	10 Inch Diameter Pipe	1640	ft.	$17			15.00	$32,062	295	$100	15.00	$33,925	$65,987
002	Mobilization/Demobilization	1		$3,500			15.00	$4,025					$4,025
003	Turbine Pump	2	ea	$60,750			15.00	$139,725	120	$100	15.00	$13,800	$153,525
004	Boom Truck	2	days	$1,500			15.00	$3,450					$3,450
	TOTAL:							**$179,262**	**415**			**$47,725**	**$226,987**

PORCUPINE ENGINEERING SERVICES INC.
TIMMINS, ONTARIO

TITLE: Goldcorp Pamour Mine
144677 - Pamour Pump Station - CA#2 to Main Pit

Prepared By: Brian Emblin | Appv'd. (Eng): | Date: 21-Jul-17 | Rev.: 0

DETAILED PROJECT COST ESTIMATE (CIVIL/STRUCTURAL)

Item Nº.	Description	MATERIAL Qty.	U.O.M.	Unit Cost	Taxes (%)	Frgt. (%)	Eng EF (%)	*Total*	LABOUR Total Hours	Hourly Rate	Eng EF (%)	Total	**Total**
1	Mobilization	1	Lot	$1,500			20.00	$1,800	20	$105	20.00	$2,520	$4,320
2	Demobilization	1	Lot	$1,500			20.00	$1,800	20	$105	20.00	$2,520	$4,320
													$8,640
A	**Pump Station**												
1	Excavation and Backfill	5000	m^3	$10			50.00	$75,000	480	$105	50.00	$75,600	$150,600
2	Reinforced Concrete Wet Well/Foundations	130	m^3	$850			20.00	$132,600	1260	$105	20.00	$158,760	$291,360
3	Pumphouse Enclosure	65	m^2	$1,250			20.00	$97,500	240	$105	20.00	$30,240	$127,740
B	**Pipeline Corridor**												
1	Pipe Bedding	34800	m^3	$5			20.00	$208,800	360	$175	20.00	$75,600	$284,400
2	Liner	8400	m^2	$5			20.00	$50,400	400	$105	20.00	$50,400	$100,800
	TOTAL:							**$567,900**	**2780**			**$395,640**	**$963,540**

PORCUPINE ENGINEERING SERVICES INC.
TIMMINS, ONTARIO

TITLE: Goldcorp Pamour Mine
144677 - Pamour Pump Station - CA#2 to Main Pit

Prepared By: M. Colantonio | Appv'd. (Eng): | Date: 21-Jul-17 | Rev.: 0

DETAILED PROJECT COST ESTIMATE (ELECTRICAL/INSTRUMENTATION)

Item Nº.	Description	MATERIAL Qty.	U.O.M.	Unit Cost	Taxes (%)	Frgt. (%)	Eng EF (%)	*Total*	LABOUR Total Hours	Hourly Rate	Eng EF (%)	Total	**Total**
001	27.6kV Aerial Poleline Ext. to CA#2 PH	1.2	km	$100,000			15.00	$138,000	15	$100	20.00	$1,800	$139,800
002	Dead-End Pole c/w Switch/Transformers	1	lot	$20,000			20.00	$24,000	68	$100	20.00	$8,160	$32,160
003	Indoor Fused Switch & Splitter Rack	1	lot	$1,500			20.00	$1,800	30	$100	20.00	$3,600	$5,400
004	Size 2 FVNR Combination Starters	2	ea	$3,000			20.00	$7,200	30	$100	20.00	$3,600	$10,800
005	Fused Switch/10kVA/Panelboard	1	lot	$2,000			20.00	$2,400	36	$100	20.00	$4,320	$6,720
006	Allowance for Lights/Receptacles/Heat	1	lot	$1,000			20.00	$1,200	20	$100	20.00	$2,400	$3,600
007	Allowance for Grounding	1	lot	$500			20.00	$600	24	$100	20.00	$2,880	$3,480
008	PLC c/w processor, I/O, PS & Cabinet	1	lot	$6,500			15.00	$7,475	40	$100	20.00	$4,800	$12,275
009	PLC programming / configuration	1	lot	$1,000			15.00	$1,150	40	$130	20.00	$6,240	$7,390
010	Wireless Communications Allowance	1	lot	$5,000			20.00	$6,000	20	$150	20.00	$3,600	$9,600
011	Level Transmitter	1	ea	$1,600			20.00	$1,920	8	$100	20.00	$960	$2,880
012	Level Switch L-L & H-H Alarms	2	ea	$300			20.00	$720	8	$100	20.00	$960	$1,680
013	Flowmeter local to Pumphouse	1	ea	$7,500			20.00	$9,000	16	$100	20.00	$1,920	$10,920
014	Temperature Transmitter	1	ea	$1,450			20.00	$1,740	6	$100	20.00	$720	$2,460
015	Miscellaneous Brackets/Suppports	1	lot	$1,500			20.00	$1,800	20	$100	20.00	$2,400	$4,200
016	Power Cabling Allowance	1	lot	$1,000			20.00	$1,200	28	$100	20.00	$3,360	$4,560
017	Control Cabling Allowance	1	lot	$500			20.00	$600	32	$100	20.00	$3,840	$4,440
018	Instrumentation Cabling Allowance	1	lot	$250			20.00	$300	16	$100	20.00	$1,920	
	Mobilization / Demobilization	1	lot	$1,500			20.00	$1,800	12	$100	20.00	$1,440	$3,240
	Rentals	1	lot	$500			20.00	$600	4	$100	20.00	$480	$1,080
	Construction QA/QC Checks	1	lot	$250			20.00	$300	16	$100	20.00	$1,920	$2,220
	Start-up / Commissioning Allowance	1	lot	$250			20.00	$300	24	$100	20.00	$2,880	$3,180
	TOTAL:							**$210,105**	**513**			**$64,200**	**$274,305**

PORCUPINE ENGINEERING SERVICES INC.
TIMMINS, ONTARIO

TITLE: Goldcorp Pamour Mine
144677 - Pamour Pump Station - CA#2 to Main Pit

Prepared By: F. O'Donnell / T. Croussette | Appv'd. (Eng): | Date: 21-Jul-17 | Rev.: 0

GLOBAL 4GSTAP

VARIABLE RPM PUMP | SYSTEM CURVE

Customer: Brian Emblin

Company: PES

Project: Goldcorp Dome diesel pump study

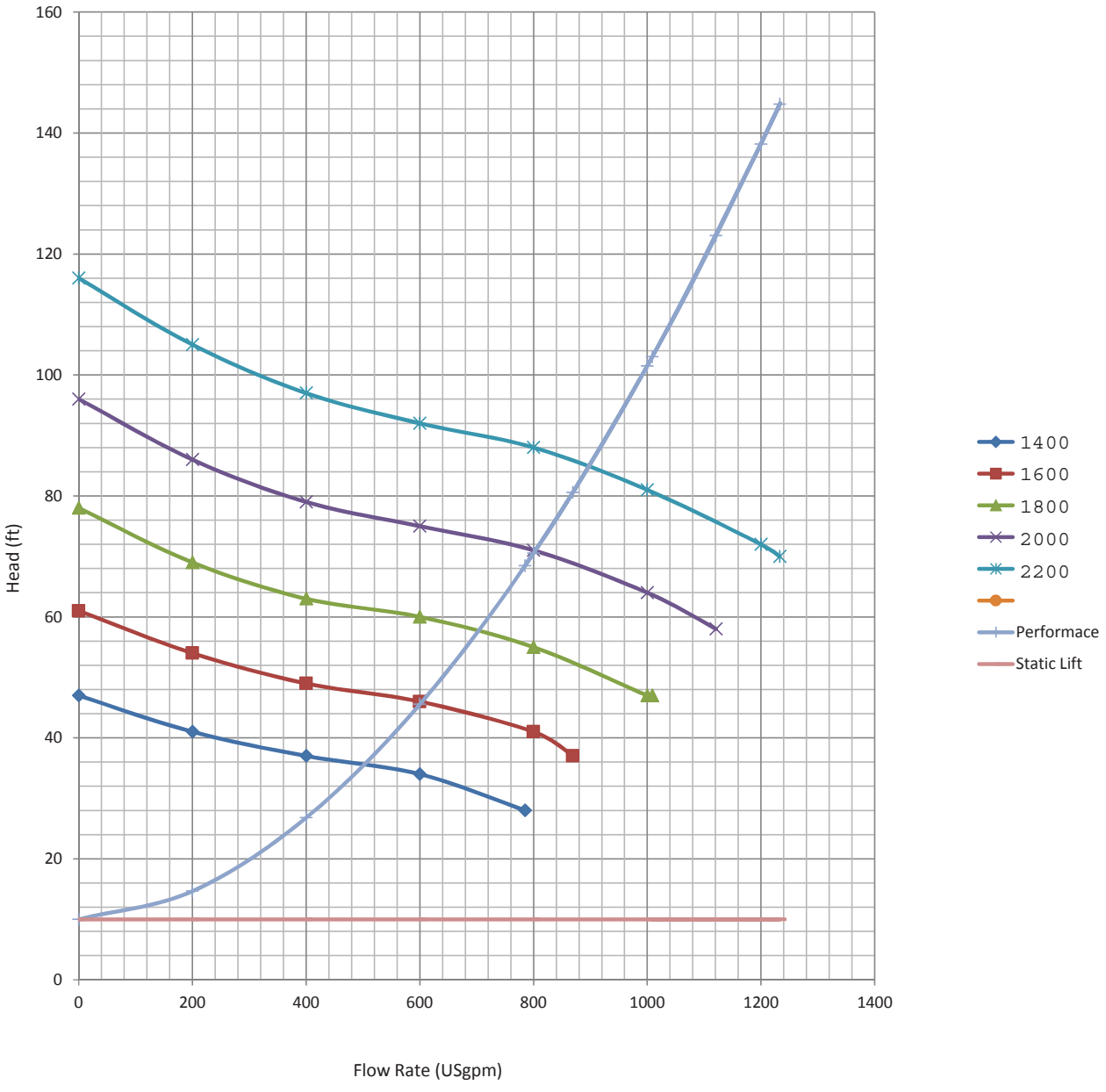
Date: Aug 10/17

10' suction lift with 6" x 30' suction line

level discharge lift with 6" x 1300' layflat hose discharge

Depending on final setup, performance will vary. If more TDH is required, may need to increase line ID or go to higher head pump; if less TDH required, may be able use throttling valve to correct.

Per below, recommend operate at 1400rpm= 600USgpm; estimated fuel consumption at 1400rpm= 1 gal/hr



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GLOBAL PUMP®
A MERSINO COMPANY

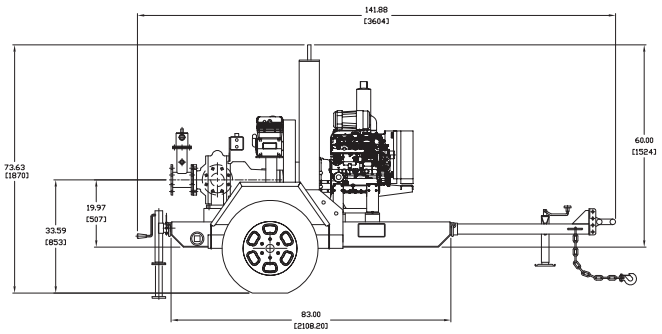
4GST
STANDARD TRASH

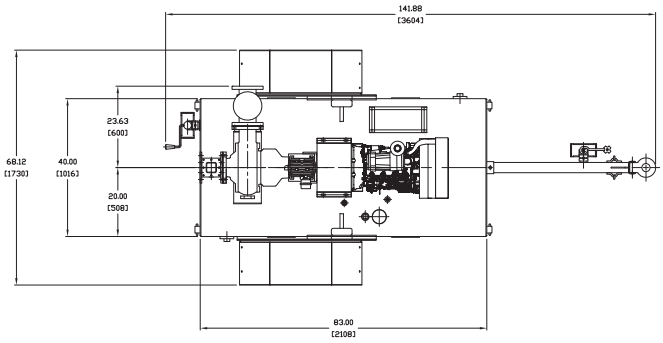
Global Pump® Standard Trash pumps are specifically designed to effectively handle a wide range of liquids from water to sewage and sludge that can contain solids and other material.

Global Pump Standard Trash pumps provide a dependable, highly efficient solution. The model 4GST is capable of achieving maximum flows of 1,250 gpm (284 m^3/h) and maximum total head of 116' (35.4 m) while handling solids up to 3" (76.2 mm) in diameter.

The standard 4GST is powered by a water-cooled, 4-cylinder diesel engine. Alternative drives are available, including other diesel engines or electric motor options.

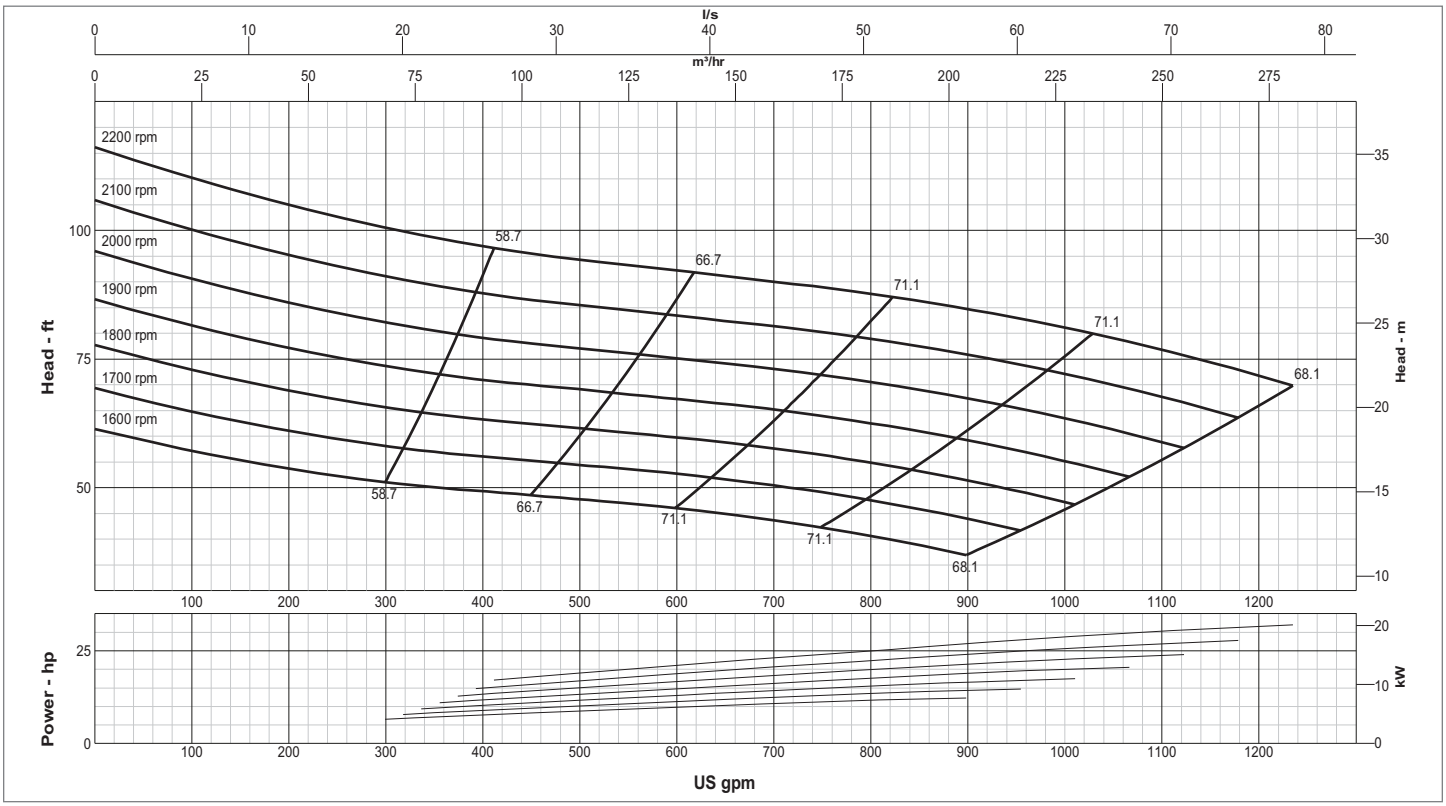
FEATURES	OPTIONS
Global Pump's rugged, heavy duty pumps are engineered specifically for portable application	Available with a variety of priming systems, including Global's Auto Prime® automatic priming system (compressor-fed venturi priming) or a diaphragm priming system
Non-return valve uses only a single moving part to allow with minimal restriction	Mechanical seal with biodegradable (optional) glycol quench allows the pump to start and run dry
Standard engine control panel provides preset emergency shutdown protection and allows the addition of automatic level control	Global Pump's Environmental Box separates and silences air exhaust and returns liquid to the pump suction.
Fully guarded coupling	Fuel cubes for extended run times and/or remote location as required
Pump casings are hydrostatically tested to 50 psig (345 kPa) above the peak casing design pressure	Sound attenuated enclosure options
Highway trailer with integral fuel cell/chassis, lights, fenders, tie downs, lifting bail, front and rear jacks. Trailer brakes can be offered as required	Skid-mounted formats with tie downs, lifting bail, and fork pockets
	Hose racks, accessory containers and other custom features available as required
	Wide range of suction and discharge fittings including Global Pump's own "QD" Quick Disconnect fittings and accessories





SPECIFICATIONS	
Connections	4" (100 mm) ANSI Flanges
Max Pump Speed	2,200 rpm
Max Flow	1,250 gpm (284 m^3/h)
Max Head	116' (35.4 m)
Max Static Priming Lift	28' (8.5 m)
Temperature Limit	160° F (70° C)
Solids Handling Capability	3" (76.2 mm)
Max Casing Pressure	125 psig (862 kPa)
Fuel Cell	85 gallons (320 liters)
Dry Weight	3,100 lbs

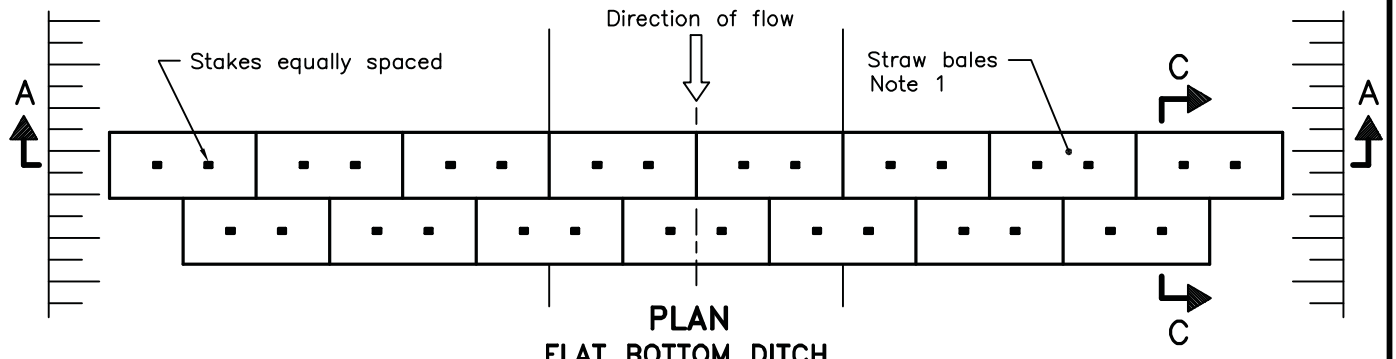
PUMP MATERIAL	
Casing	Cast Iron (CD4MCu is an option)
Impeller	Cast Iron (CD4MCu is an option)
Bearing Housing	Cast Iron
Bearing Lubrication	Grease
Shaft	Stainless Steel
Seal	Silicon Carbide on Silicon Carbide
Chassis/Fuel Cell	Steel
Non-Return Valve	Nitrile Fitted Cast Iron



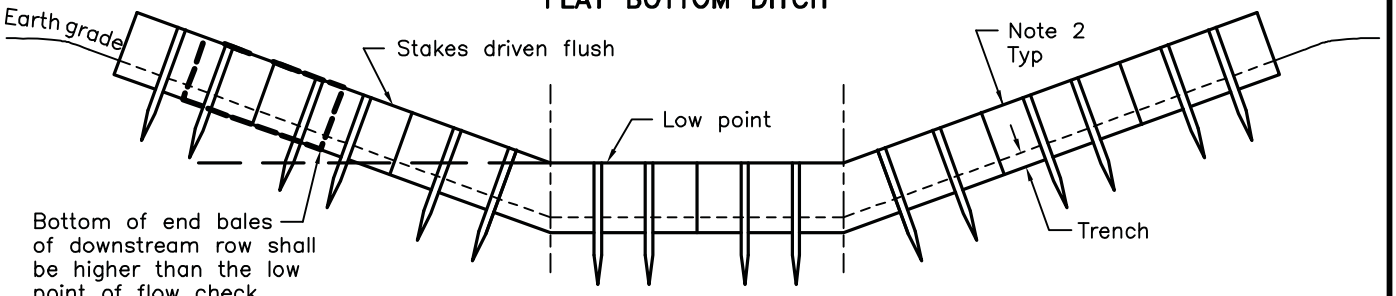
GLOBAL PUMP
10162 East Coldwater Road, Davison, MI 48423
Tel: 810.653.4828 Fax: 810.658.0632
1.866.360.PUMP www.globalpump.com

APPENDIX C

ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD)

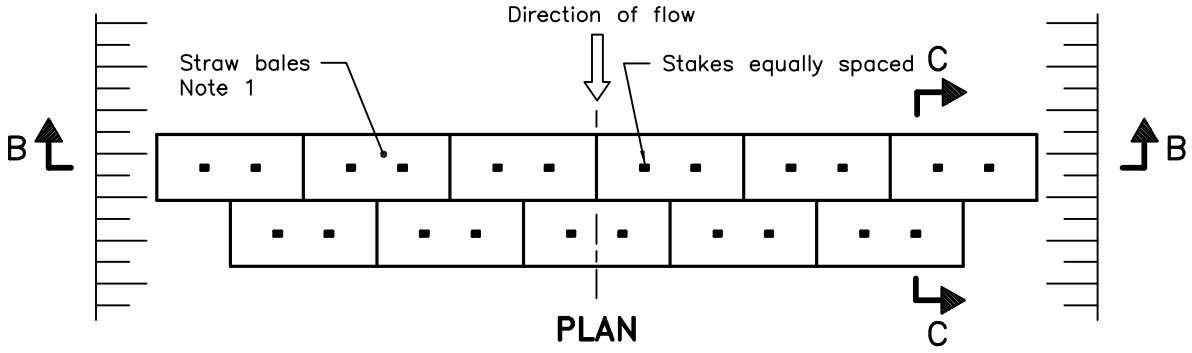


PLAN
FLAT BOTTOM DITCH

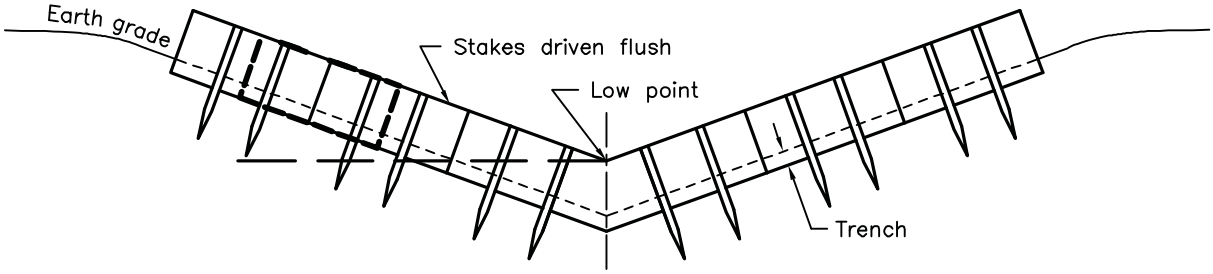


Bottom of end bales of downstream row shall be higher than the low point of flow check. Downstream bale position outlined. Typ

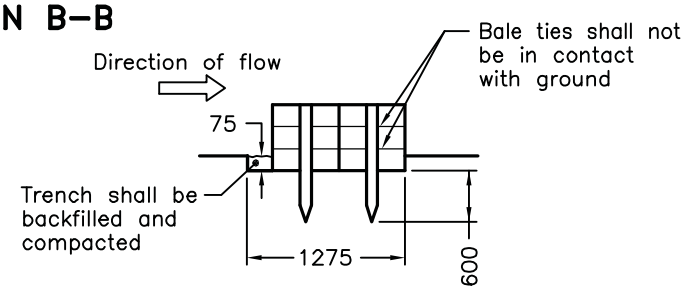
SECTION A–A



PLAN
V–DITCH



SECTION B–B



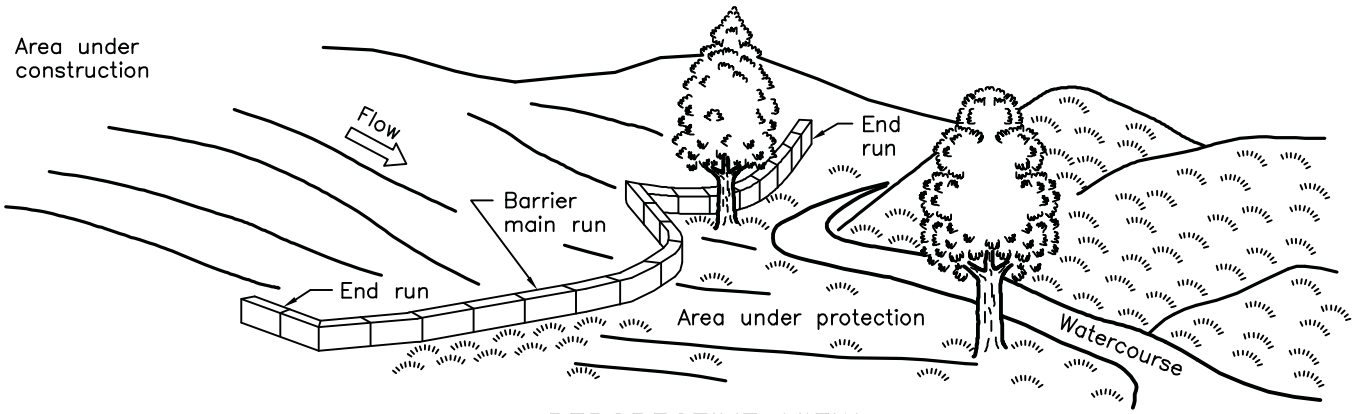
SECTION C–C

NOTES:

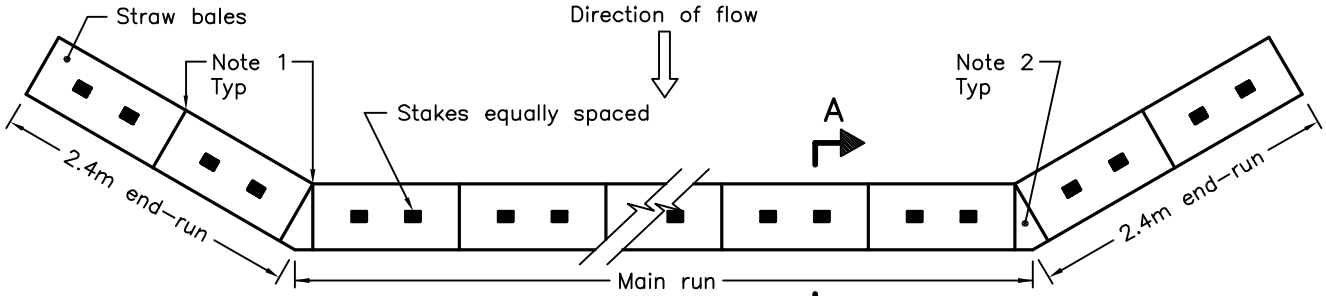
1 Number of bales varies and shall suit ditch.
2 Straw bales shall be butted tightly against adjoining bales and shaped to conform to the sides of the ditch to prevent water flow through barrier.

A All dimensions are in millimetres unless otherwise shown.

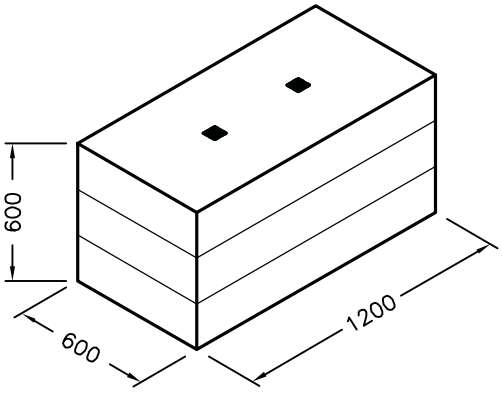
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
STRAW BALE FLOW CHECK DAM			
	OPSD 219.180		



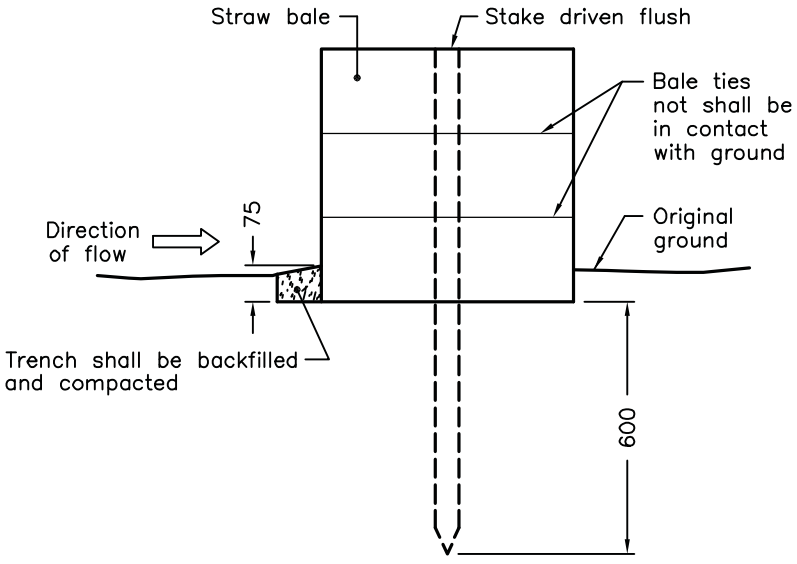
PERSPECTIVE VIEW



PLAN A



ISOMETRIC VIEW



SECTION A–A

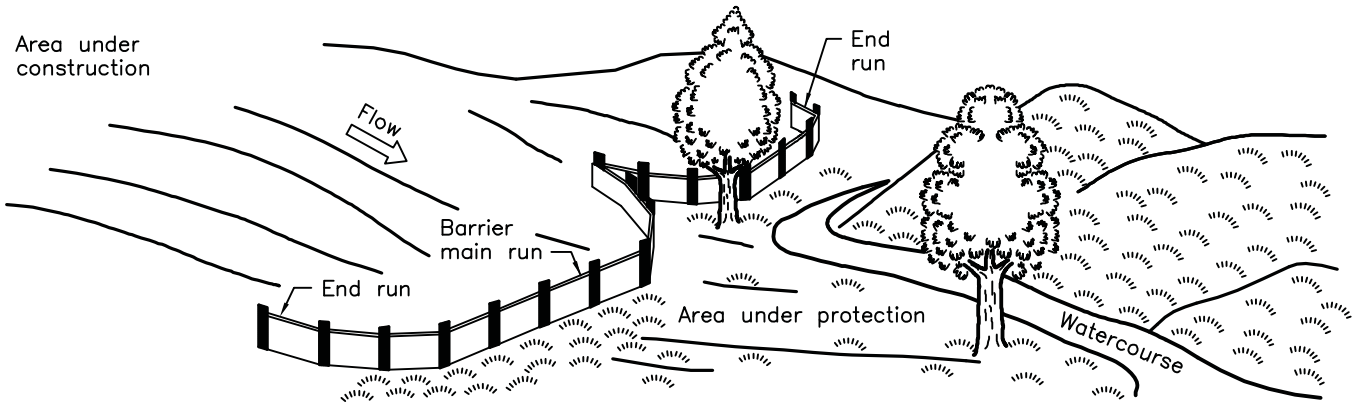
NOTES:

1 Straw bales shall be butted tightly against adjoining bales to prevent sediment flow through barrier.

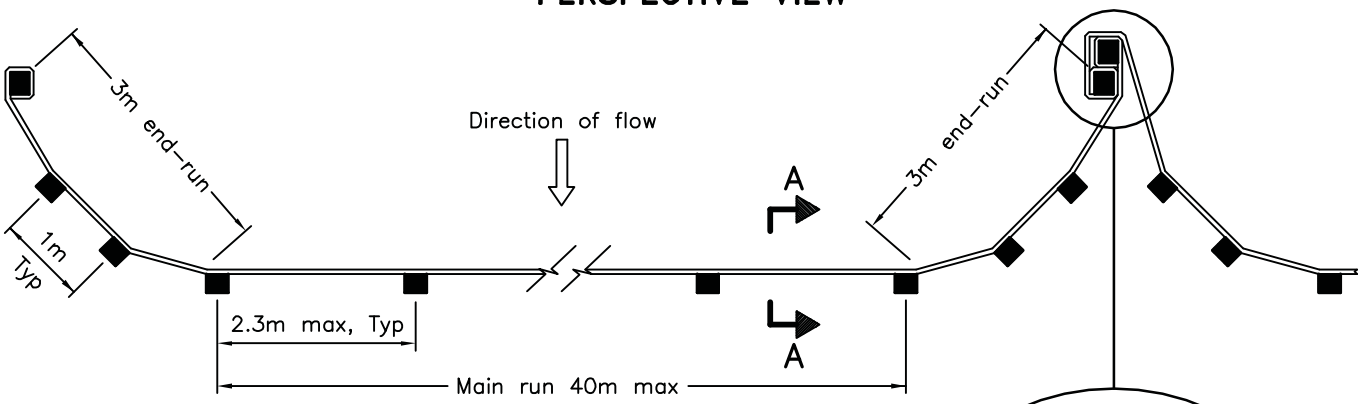
2 Caulk and compact gaps with loose straw.

A All dimensions are in millimetres unless otherwise shown.

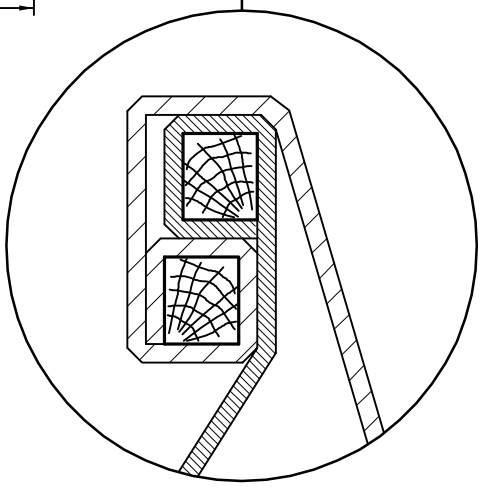
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
LIGHT–DUTY STRAW BALE BARRIER			
	OPSD 219.100		



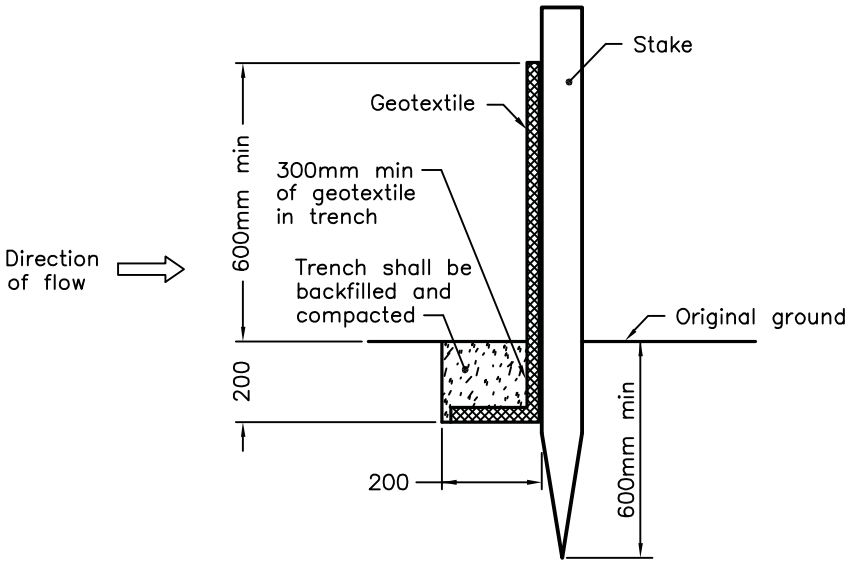
PERSPECTIVE VIEW



PLAN



JOINT DETAIL

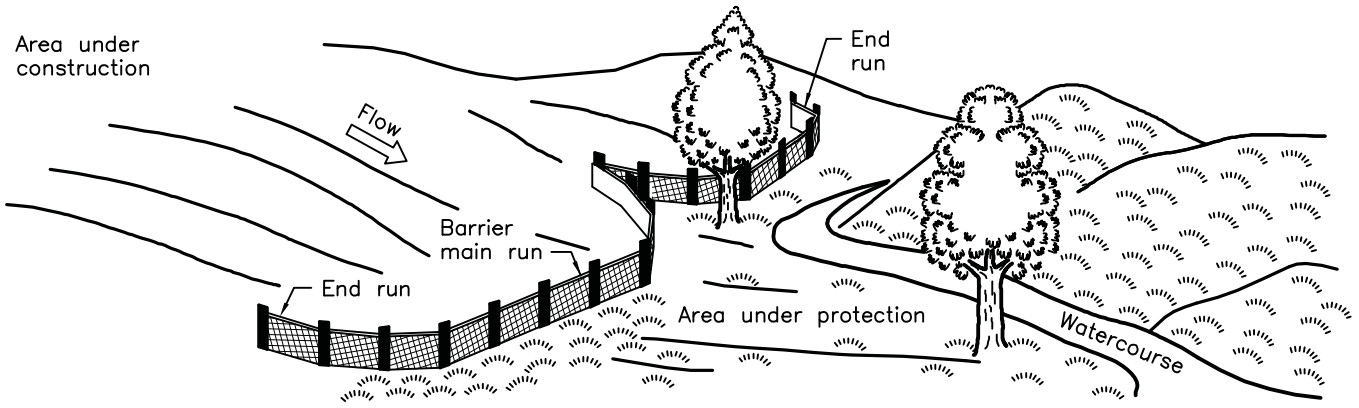


SECTION A–A

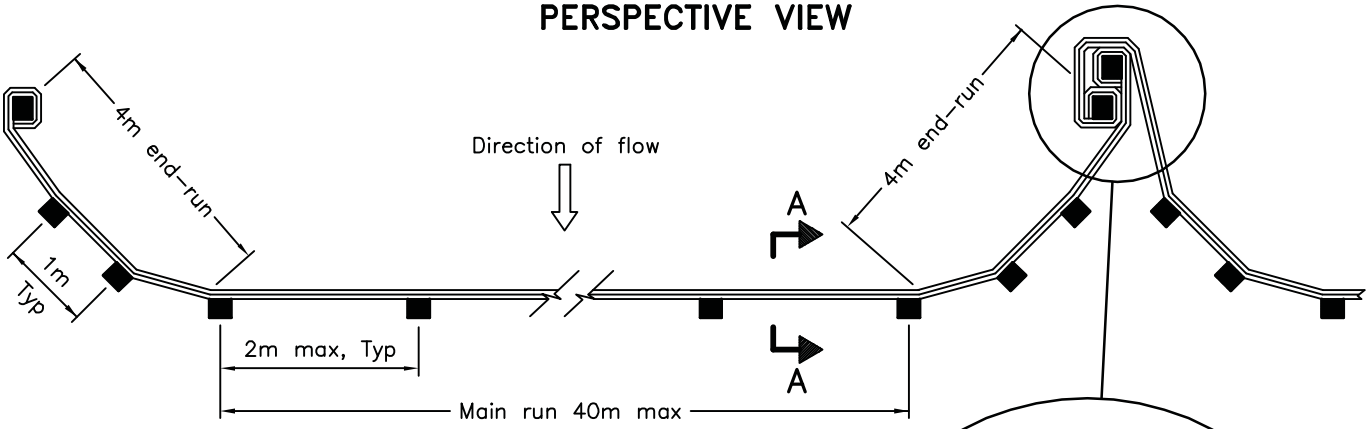
NOTE:

A All dimensions are in millimetres unless otherwise shown.

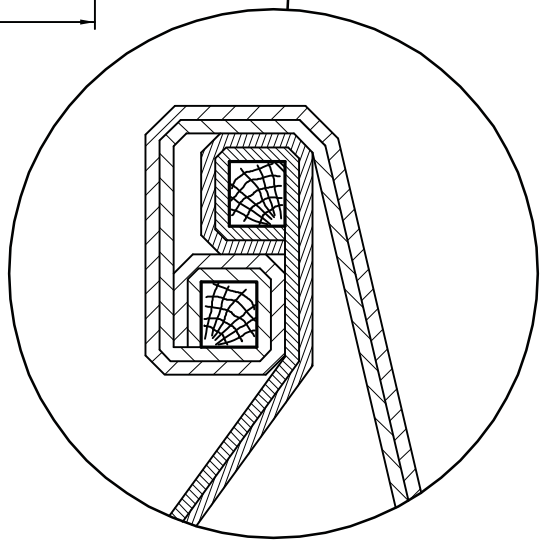
ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
LIGHT–DUTY SILT FENCE BARRIER			
	OPSD 219.110		



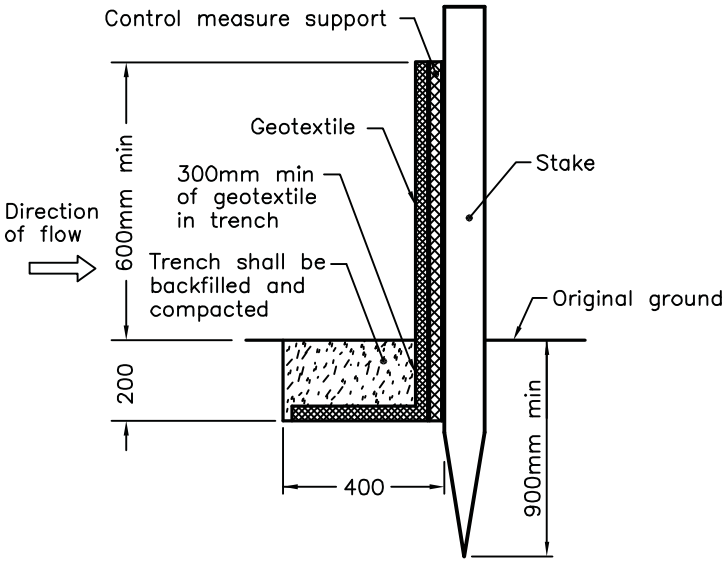
PERSPECTIVE VIEW



PLAN



JOINT DETAIL



SECTION A–A

NOTE:

A All dimensions are in millimetres unless otherwise shown.

ONTARIO PROVINCIAL STANDARD DRAWING	Nov 2015	Rev	2
HEAVY–DUTY SILT FENCE BARRIER			
	OPSD 219.130		

APPENDIX B

Hydrologic Model for the Pamour Mine Site

TECHNICAL MEMORANDUM

To: **Tyler Provencal, Newmont Porcupine**

Project: **Site Water Balance for Pamour Mine, Newmont Porcupine**

Location: **Newmont Porcupine, Pamour Mine, Timmins, Ontario**

Date: **March 19, 2020**

From: **Robert Whyte, P.Eng., Calder Engineering Ltd.**
Maria Yun Sang, P.Eng., Calder Engineering Ltd.

GENERAL

Provided in this Technical Memorandum is supporting documentation for the Newmont Porcupine Pamour Mine site water balance model set-up and applied by Calder Engineering Ltd. The main objective of the model was to provide estimated monthly and annual flow volumes for key points in the study area and to provide supporting technical documentation for the Pamour Site PTTW application.

SITE DRAINAGE PATTERNS

For preparation of the site water balance model, the following works were completed:

- determining points of interest (i.e., flow node locations);
- delineation of surface drainage areas;
- delineation surface areas types (tailings, waste rock, Pit, water bodies);
- delineation of areas for seepage calculations.

The surface drainage areas were discretized for the Pamour Mine site into 29 basins (labelled as A1 to A27 for existing conditions, and B1 to B27 for proposed conditions). Delineation of areas was determined from:

- topographic contours from lidar information (2006, and 2015);
- aerial image of the site provided by Goldcorp Canada Inc. in November 2015;
- report “Development of a Site-Wide Quantitative Loadings Model for the Pamour Mine”, prepared by EcoMetrix Incorporated, for Goldcorp Canada Inc., September 2014;
- site visit by Calder staff on November 25th, 2015 with Goldcorp staff; and

- report “Feasibility Level Report, Pamour Water Collection & Pumping System, Pamour Mine Site”, prepared by Amec Foster Wheeler Environment & Infrastructure, for Goldcorp Canada Limited, August 11, 2017 for collections areas CA-1, CA-2, and CA-3.

The general drainage patterns associated with the Pamour Mine under current conditions (as of December 2019) and proposed conditions are shown in Figure 1 and Figure 2 respectively to key points of interest (i.e., the flow nodes shown on Figure 1 and Figure 2). A summary of the site drainage areas under existing and proposed conditions are provided below in Table 1 and Table 2 respectively.

In order to model potential seepage associated with tailings, waste rock and pit, the site was then further discretized to represent areas characterized as tailings, waste rock, and low grade ore.

TABLE 1
SUMMARY OF SITE DRAINAGE BASINS – EXISTING CONDITIONS

Flow Node/ Points of Interest	**Basin-Surface**	**Drainage Area (hectares)**
CC West Outfall	A3+A25E+A25W	340.5
CCW at PR	Cc West Outfall+A27	492.5
PM121A	A19	29.8
PM121B	PM121A+A20	55.9
TNCDS	A21	20.6
TNCKIDD	PM121B+TNCDS+A22	235.3
East Outfall	TNCKIDD+A16	388.1
PTNL	A6+A7+A9	238.6
TNL Outfall	PNTL+A23	309.9
PTNCDS	TNL Outfall+A24	371.8
E u/s of TNC Confluence	East Outfall+A18W	536.8
W u/s of TNC Confluence	PTNCDS+A18E	786.7
TNC Confluence	East Outfall+PTNCDS+A18E+A18W	1,323.5
Open Pit	A8+A10+A11+A12+A13+A14+A15+A26	225.7

TABLE 2
SUMMARY OF SITE DRAINAGE BASINS – PROPOSED CONDITIONS

Flow Node/ Points of Interest	Basin-Surface	Drainage Area (hectares)
CC West Outfall	A3	113.4
CCW at PR	Cc West Outfall+A27	265.4
PM121B	A20	26.1
TNCDS	A21	20.6
TNCKIDD	PM121B+TNCDS+A22	205.5
East Outfall	TNCKIDD+A16	358.3
PTNL	A6+A9	177.5
TNL Outfall	PNTL+A23	248.8
PTNCDS	TNL Outfall+A24	310.7
E u/s of TNC Confluence	East Outfall+A18W	507.0
W u/s of TNC Confluence	PTNCDS+A18E	725.5
TNC Confluence	East Outfall+PTNCDS+A18E+A18W	1,232.6
Open Pit	A8+A10+A11+A12+A13+A14+A15+A26	543.7

A schematic of the site water balance under existing and proposed conditions is shown in Figure 3 and 4 respectively.

WATER BALANCE COMPUTATIONS

Water Balance Model

Water balance computations were completed using a water balance model set-up for the Newmont Porcupine Pamour Mine site by Calder Engineering Ltd. With the model, inputs and outputs are computed on a monthly basis using data which represents current operations and hydrologic conditions as well as proposed conditions. The model is spreadsheet based and set-up in Microsoft Excel. The contributing areas were discretized as natural ground, pit, pond/lake, tailings and waste rock/low grade ore, based on site conditions as of December 2019.

The primary input for the water balance model is precipitation. Monthly normal precipitation amounts were taken from available data from the Timmins Victor Power Airport weather station (Climate Station ID # 6078285) for the period 1981-2010. The mean annual precipitation from this data base is 834.7 millimeters. Table 3 below provides summary of effective precipitation used in the site water balance.

Calder Engineering Ltd.

TABLE 3
SUMMARY OF MONTHLY EFFECTIVE PRECIPITATION AMOUNTS UNDER NORMAL WEATHER CONDITIONS

Month	Normal
January	0
February	0
March	0
April	306.3
May	67.4
June	83.4
July	90.9
August	81.6
September	84.7
October	82.5
November	38.0
December	0
Total Annual	834.7

Notes:
1. Precipitation values are in millimeters.
2. Effective precipitation assumes that snowpack accumulates from mid-November through March, and Spring melt starts and is completed in April.

Water Balance Assumptions

Water balance computations were completed based on the following assumptions for the Pamour Site under current operations as of December 2019:

- assumed groundwater loss is 0.0036 mm/hr;
- assumed seepage through the isolation dam (between Three Nations Lake and the Open Pit) is 605 cubic meters per day;
- assumed groundwater seepage into Open Pit is 2,180 cubic meters per day (400 USGM);
- assumed input to the Open Pit is from:
    - surface runoff from sub-basins A8, A10, A12, A13, A14, A15, A26; and
    - seepage from S9 (Three Nations Lake Berm).
- winter snowfall accumulates, without melting, from mid-November to the end of March;

- losses in the accumulated snow pack due to sublimation are assumed to be zero;
- the accumulated snow pack melts over a 30 day period in April;
- water balance computations completed based on a year with 365 days; and
- Proposed conditions based on proposed collection areas and diversions in the Amec 2017 report mentioned above.

Model Runoff Coefficients

Summarized in Table 4 are monthly runoff coefficients applied in the Water Balance model to simulate different land use types.

TABLE 3.0
SUMMARY OF WATER BALANCE MODEL MONTHLY RUNOFF COEFFICIENTS

Month	Natural Ground	Tailings	Waste Rock/ Low Grade ore	Paved Road, Highway	Pond/Lake	Pit Wall
January	1.00	1.00	1.00	1.00	1.00	1.00
February	1.00	1.00	1.00	1.00	1.00	1.00
March	1.00	1.00	1.00	1.00	1.00	1.00
April	0.70	0.80	0.80	1.00	1.00	0.80
May	0.55	0.65	0.65	1.00	1.00	0.75
June	0.45	0.55	0.55	1.00	1.00	0.75
July	0.10	0.50	0.50	1.00	1.00	0.75
August	0.10	0.50	0.50	1.00	1.00	0.75
September	0.20	0.65	0.75	1.00	1.00	0.75
October	0.50	0.70	0.80	1.00	1.00	0.80
November	0.60	1.00	1.00	1.00	1.00	1.00
December	1.00	1.00	1.00	1.00	1.00	1.00

SUMMARY OF RESULTS

The water balance results for current site conditions are provided in Table A1 attached. The summary provides estimated monthly volumes at various points of interest:

- CC West Outfall;
- CCW at Porcupine River
- PM121A;

- PM121B;
- East Outfall;
- (Three Nations Creek) TNC Confluence;
- PTNL (Three Nations Lake);
- (Three Nations Lake) TNL Outfall; and
- PTNCDS.

With respect to the information contained herein, any errors or omissions made are not reflected and may be adjusted for accordingly.

Respectively Submitted,

CALDER ENGINEERING LTD.

Robert Whyte, P.Eng.
Project Manager

CALDER ENGINEERING LTD.

Maria Yun Sang, P.Eng.
Project Engineer

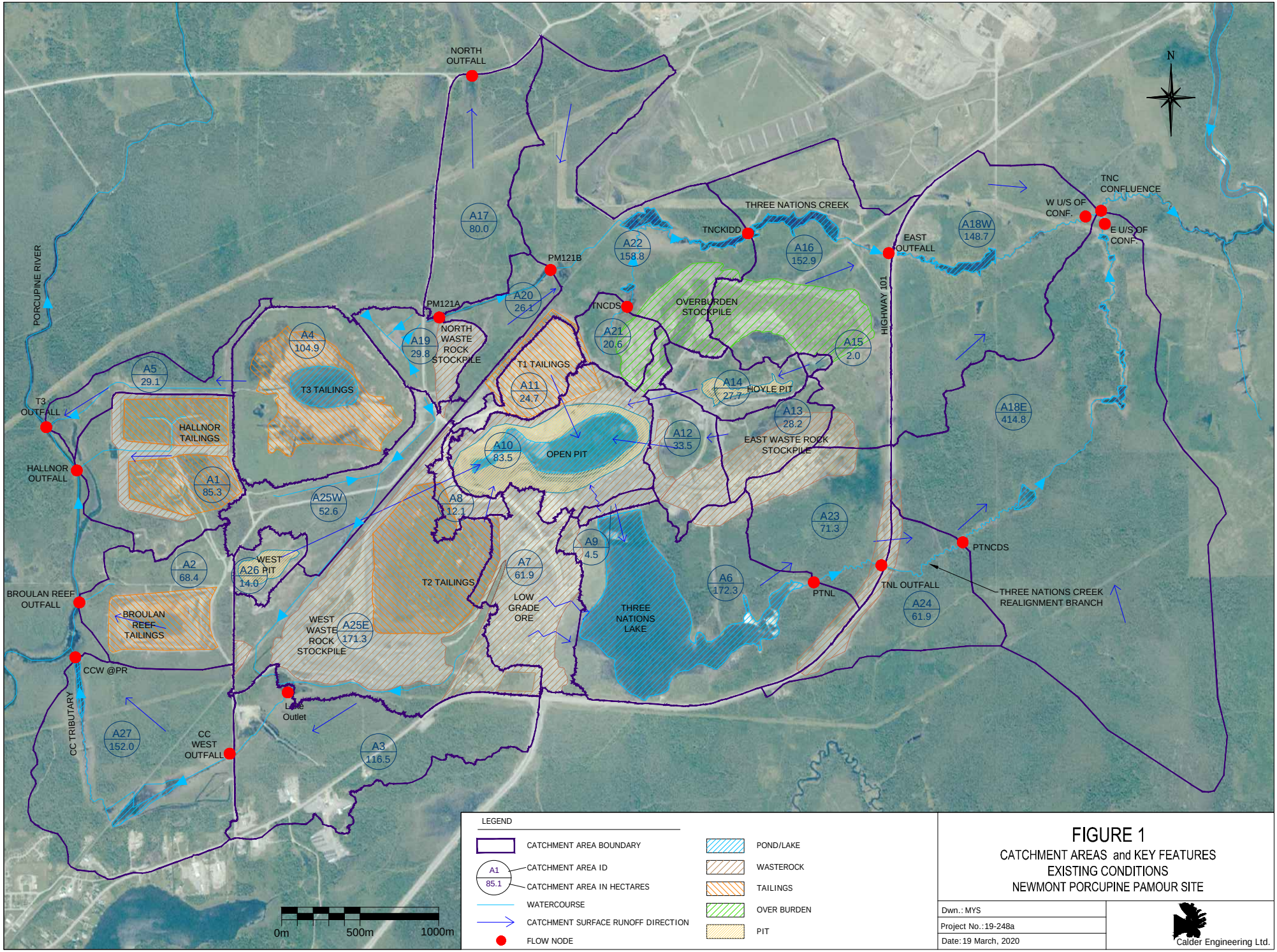


FIGURE 1

CATCHMENT AREAS and KEY FEATURES
EXISTING CONDITIONS
NEWMONT PORCUPINE PAMOUR SITE

Dwn.: MYS	
Project No.: 19-248a	
Date: 19 March, 2020	Calder Engineering Ltd.

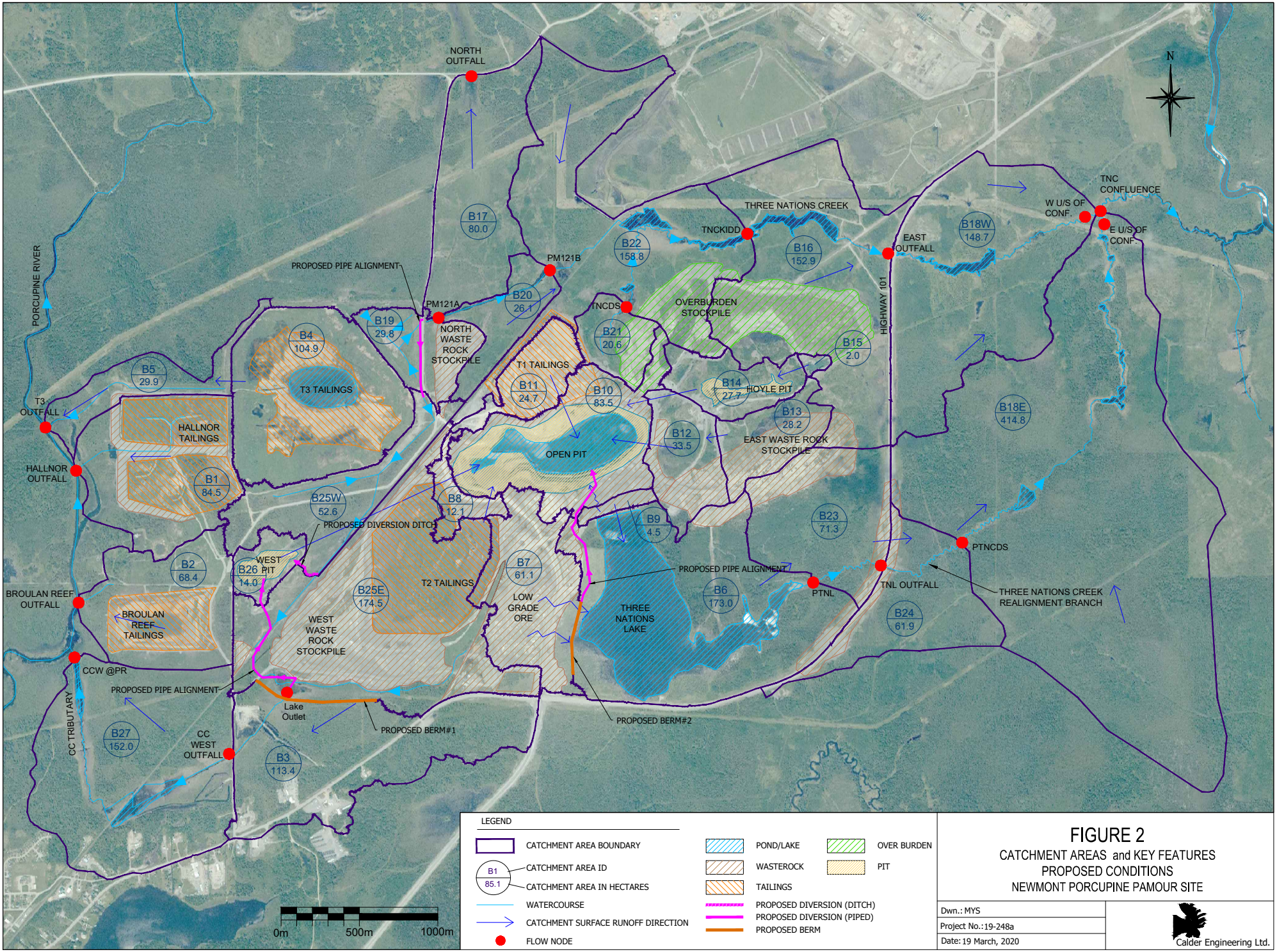


FIGURE 2

CATCHMENT AREAS and KEY FEATURES
PROPOSED CONDITIONS
NEWMONT PORCUPINE PAMOUR SITE

Dwn.: MYS	
Project No.:19-248a	
Date: 19 March, 2020	Calder Engineering Ltd.

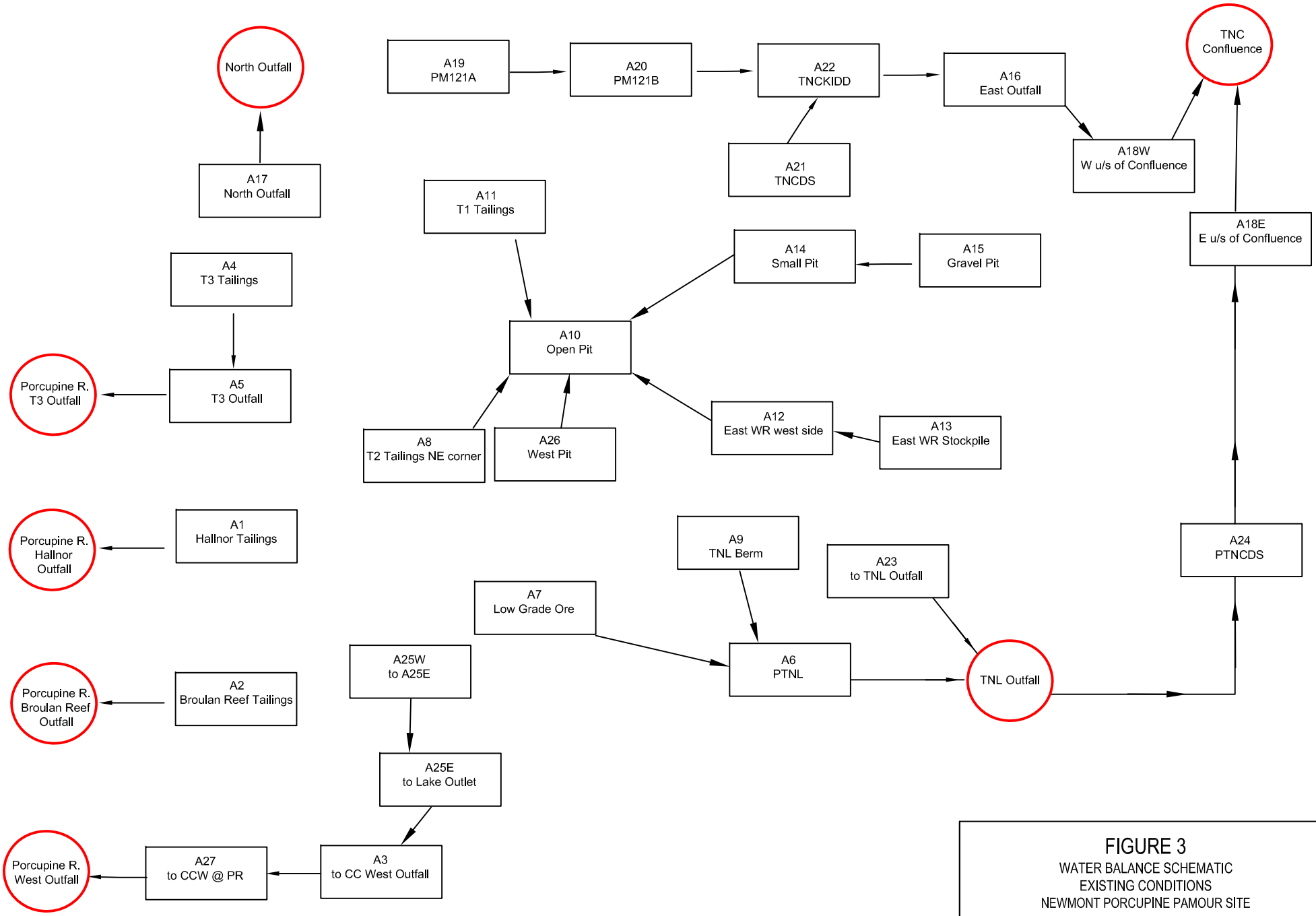


FIGURE 3

WATER BALANCE SCHEMATIC
EXISTING CONDITIONS
NEWMONT PORCUPINE PAMOUR SITE

Dwn.: MYS	
Project No.: 19-248a	
Date: 19 March, 2020	Calder Engineering Ltd.

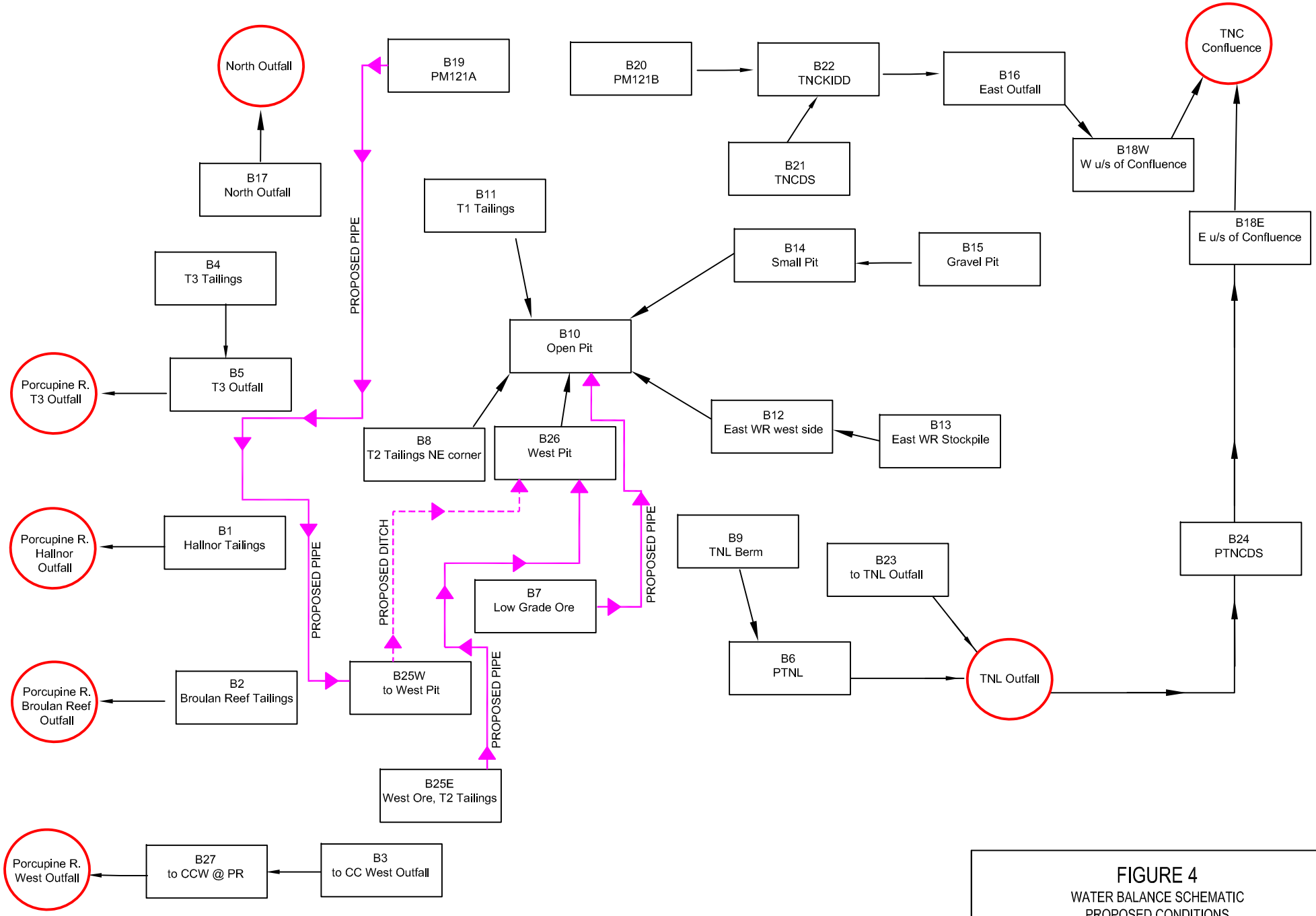


FIGURE 4

WATER BALANCE SCHEMATIC
PROPOSED CONDITIONS
NEWMONT PORCUPINE PAMOUR SITE

Dwn.: MYS	
Project No.: 19-248a	
Date: 19 March, 2020	Calder Engineering Ltd.

Table A1
Newmont Porcupine, Pamour Mine Site
Site Water Balance Model
Flow Node Summary - Current Conditions (as of December 2019 info): (cu.m./mt

Month	Precip.	CC West Outfall A3+A25W+ A25E	CCW at PR A3+A25W+ A25E+ A27	PM121A A19	PM121B A19+A20	TNCDS A21	TNCKIDD PM121B+ TNCDS+A22	East Outfall TNCKIDD+ A16	PTNL A6+A7+A9	TNL Outfall PTNL+A23	PTNCDS TNL Outfall+A24	E u/s of TNC Conf PTNCDS + A18E	W u/s of TNC Conf. East Outfall + A18W	TNC Confluence East Outfall + PTNCDS+ A18E+A18W	Open Pit A8+A10+A11+ A12+A14+ A15+A26
Jan	Mean	0	0	0	0	0	0	0	0	0	0	0	0	0	86,329
Feb.	Mean	0	0	0	0	0	0	0	0	0	0	0	0	0	77,974
Mar.	Mean	0	0	0	0	0	0	0	0	0	0	0	0	0	86,329
Apr.	Mean	847,116	1,177,365	73,198	129,068	44,444	518,046	852,895	621,079	790,632	930,045	1,822,731	1,174,292	2,997,023	719,090
May	Mean	151,890	206,869	13,376	23,038	7,696	88,818	145,632	86,220	116,833	141,471	294,866	200,314	495,180	199,316
Jun.	Mean	169,336	224,536	14,902	24,683	7,804	91,007	148,837	90,057	123,494	149,428	304,672	204,081	508,753	219,790
Jul.	Mean	117,351	130,411	10,031	12,400	2,153	29,648	46,398	58,572	78,221	89,178	127,471	60,093	187,564	212,632
Aug.	Mean	104,500	116,092	8,951	11,077	1,933	26,466	41,392	50,681	68,223	78,020	112,323	53,625	165,949	198,268
Sept.	Mean	132,492	158,580	11,263	15,678	3,785	47,873	76,852	84,191	107,444	122,450	193,712	102,638	296,350	204,121
Oct.	Mean	186,592	250,040	16,069	26,820	8,633	102,031	167,320	131,200	167,394	195,667	367,656	229,270	596,927	232,791
Nov.	Mean	97,885	133,324	8,388	14,322	4,812	56,389	92,477	74,575	93,687	108,940	204,019	126,818	330,837	158,667
Dec.	Mean	0	0	0	0	0	0	0	0	0	0	0	0	0	86,329
	Flow (cu.m/a)=	1,807,163	2,397,219	156,179	257,086	81,259	960,278	1,571,803	1,196,575	1,545,929	1,815,199	3,427,451	2,151,132	5,578,582	2,481,636

Flow Node Summary - Proposed Conditions (as of December 2019 info): (cu.m./mt

Month	Precip.	CC West Outfall B3	CCW at PR B3+B27	PM121A (diverted to B25W) B19	PM121B B20	TNCDS B21	TNCKIDD PM121B+ TNCDS+ B22	East Outfall TNCKIDD+ B16	PTNL B6+B9	TNL Outfall PTNL+B23	PTNCDS TNL Outfall+B24	E u/s of TNC Conf PTNCDS + B18E	W u/s of TNC Conf. East Outfall + B18W	TNC Confluence East Outfall + PTNCDS+ B18	Open Pit B8+B10+B11+ B12+B14+ B15+B26+ (B19+B25E+ B25W+B7)
Jan	Mean	0	0	0	0	0	0	0	0	0	0	0	0	0	86,329
Feb.	Mean	0	0	0	0	0	0	0	0	0	0	0	0	0	77,974
Mar.	Mean	0	0	0	0	0	0	0	0	0	0	0	0	0	86,329
Apr.	Mean	246,301	576,550	73,198	55,870	44,444	444,848	779,698	442,291	611,843	751,257	1,643,943	1,101,094	2,745,037	1,571,892
May	Mean	43,097	98,076	13,376	9,661	7,696	75,442	132,256	51,895	82,507	107,145	260,541	186,937	447,479	355,811
Jun.	Mean	44,163	99,363	14,902	9,781	7,804	76,106	133,935	48,428	81,866	107,799	263,043	189,179	452,223	401,494
Jul.	Mean	13,174	26,233	10,031	2,369	2,153	19,616	36,367	15,801	35,450	46,407	84,700	50,062	134,762	369,612
Aug.	Mean	11,826	23,419	8,951	2,127	1,933	17,515	32,441	12,579	30,121	39,918	74,221	44,675	118,896	337,995
Sept.	Mean	21,583	47,671	11,263	4,415	3,785	36,610	65,588	42,148	65,401	80,407	151,669	91,374	243,044	368,336
Oct.	Mean	48,219	111,667	16,069	10,750	8,633	85,961	151,251	86,705	122,900	151,173	323,162	213,201	536,363	431,728
Nov.	Mean	26,351	61,790	8,388	5,934	4,812	48,001	84,090	52,417	71,529	86,782	181,860	118,430	300,291	260,747
Dec.	Mean	0	0	0	0	0	0	0	0	0	0	0	0	0	86,329
	Flow (cu.m/a)=	454,713	1,044,769	156,179	100,907	81,259	804,099	1,415,625	752,264	1,101,618	1,370,888	2,983,140	1,994,953	4,978,093	4,434,575

Newmont CANADA

PORCUPINE
4315 Gold Mine Road
South Porcupine, ON P0N 1H0

P 705.235.6505
F 705.235.2343
newmont.com

Attachment 4
Permit to Take Water Application Form

Ontario

Ministry of the Environment and Climate Change

Application for Permit to Take Water

General Information and Instructions

General:

Information requested in this form is collected under the authority of the *Ontario Water Resources Act*, R.S.O. 1990 (OWRA) and the *Environmental Bill of Rights*, C. 28, Statutes of Ontario, 1993, (EBR) and will be used to evaluate applications for a Permit to Take Water as required by Section 34 (OWRA).

Instructions:

1. Applicants are responsible for ensuring that they complete the most recent application form. When completing this form, please refer to the "Guide to Permit to Take Water Application Form" (referred to as the Guide). Application forms and supporting documentation are available from your local Regional or District Office of the Ministry of the Environment and Climate Change, and on the Permit to Take Water program page at https://www.ontario.ca/page/permits-take-water.
2. Questions regarding completion and submission of this application should be directed to local Regional Office of the Ministry of the Environment and Climate Change. Contact information for these offices is available in the Guide or on the Ministry of the Environment and Climate Change website at http://www.infogo.gov.on.ca/infogo/#orgProfile/-181/en.
3. This form must be completed with respect to all the requirements of the Guide for it to be considered an application for approval. **Incomplete applications will be returned to the applicant.**
4. A complete application consists of:

   (1) a completed, signed application form

   (2) all required supporting information identified in this form and the Guide, and

   (3) a certified cheque or money order, in Canadian funds, made payable to the **Ontario Minister of Finance** for the application fee when required. Payment may also be made by Visa or MasterCard.

   The Ministry may require additional information during the technical review of any application initially accepted as complete.
5. The original application, along with supporting information and the application fee should be sent to:

   Ministry of the Environment and Climate Change,
   Attention: Permit to Take Water Director
   Director, Environmental Approvals Access and Service Integration Branch,
   135 St. Clair Avenue West
   1st Floor
   Toronto, Ontario M4V 1P5
6. Information contained in this application form is not considered confidential and will be made available to the public upon request. Information submitted as supporting information may be claimed as confidential but will be subject to the *Freedom of Information and Protection of Privacy Act* (FOIPPA) and the EBR. If you do not claim confidentiality at the time of submitting the information, the Ministry of the Environment and Climate Change may make the information available to the public without further notice to you. If you are identifying confidential material, please indicate why you believe the information is confidential.

Fields marked with an asterisk (*) are mandatory.

1. Permit Administration

Please indicate if this is an application for a:

- [x] New Permit
- [ ] Amendment to Permit (attach a photocopy of permit)
- [ ] Renewal of Permit (attach a photocopy of permit)

2. Classification

Classification	Fee Required	No Fee Required		Water Taking Source(s)
[ ] Category 1	[ ] $750	[ ] Reason		[x] Surface Water
[ ] Category 2	[ ] $750	[ ] Reason		[ ] Groundwater
[x] Category 3	[ ] $3,000	[x] Reason	Divert Impacted Runoff	[ ] Combined (surface and ground)

3. Applicant Information

Applicant Name (legal name of individual or organization as evidenced by legal documents such as a copy of Driver's Licence or Master Business Licence)	Business Identification Number
Goldcorp Canada Ltd.	887718682

Business Name
(the name under which the entity is operating or trading if different from the Applicant Name - also referred to as trade name)
Newmont Corporation

Applicant Type

- [x] Corporation
- [ ] Individual
- [ ] Partnership
- [ ] Sole Proprietor
- [ ] Federal Government
- [ ] Municipal Government
- [ ] Provincial Government
- [ ] Other (describe):

North American Industry Classification System (NAICS) Code
212220

4. Applicant Physical Address

Civic Address - Street information (street number/name/type/direction/unit/suite/emergency 911 location number and street)

Unit Number	Street Number	Street Name	City/Town
	4315	Goldmine Road	South Porcupine

County/District	Province/State	Country	Postal Code/Zip Code
	Ontario	Canada	P0N 1H0

Telephone Number (including area code)	Fax Number (including area code)
705-235-6505	

Email Address
Bryan.Neeley@newmont.com

5. Applicant Mailing Address

Same as Applicant Physical Address ? [x] Yes [ ] No (If no, complete below)

Civic Address - Street information (street number/name/type/direction/unit/suite/emergency 911 location number and street/ P.O.Box/Rural Route Number)

Unit Number	Street Number	Street Name	PO Box	Rural Route

City/Town	County/District

Province/State	Country	Postal Code/Zip Code

6. Project Technical Information Contact

Same as Applicant ? ☐ Yes ☑ No (If no, complete below)

Name	Company
Desmond O'Connor	Newmont

Address Information

Same as Applicant Mailing Address ? ☐ Yes ☑ No (If no, please provide technical information contact mailing address below)

Civic Address - Street information (street number/name/type/direction/unit/suite/emergency 911 location number and street/ P.O.Box/Rural Route Number)

Unit Number	Street Number	Street Name	PO Box	Rural Route
	4315	Goldmine Rd.		

City/Town	County/District	
South Porcupine		
Province/State	**Country**	**Postal Code/Zip Code**
Ontario	Canada	P0N 1H0

Telephone Number (including area code)	Fax Number (including area code)
705-235-6660 ext.	

Email Address
Desmond.OConnor@newmont.com

7. Source Information

Note: Source Information must be provided separately for each source. Please complete and submit multiple copies of this Source Information section if your application includes more than one source.

Number of Water Taking Sources Included in this Application (do not include domestic uses that do not require a permit)

Total Number of Wells	Total Number of Lake Intakes	Total Number of Ponds	Total Number of Watercourse Intakes
0	0	0	4

Watercourse 1

Watercourse Name	Tributary to
CC Tributary (Catchment 1 East)	Porcupine River

Does flow in the watercourse stop at any time during the year? ☐ Yes ☑ No

Do you move/relocate the water intake (pump)? ☐ Yes ☑ No

Source Location Information

Civic Address - Street information (street number/name/type/direction/unit/suite/emergency 911 location number and street)

Unit Number	Street Number	Street Name	PO Box

Lot	Concession	Part	Reference Plan

City/Town	County/District	Original Geographic Township
South Porcupine		Whitney Township

Province	Postal Code
Ontario	P0N 1C0

Geographic (GPS) Coordinates (to be provided in Datum NAD83)

Method of Collection	Accuracy Estimate
Map	10 - 30 metres

UTM Zone	Easting	Northing
17N	490028	5373045

Is the Applicant the owner of the site where water taking will occur? ☑ Yes ☐ No

Is the site where water taking will occur located in an area of development control as defined by the *Niagara Escarpment Planning & Development Act*?

☐ Yes ☑ No

Is the site where water taking will occur located on the Oak Ridges Moraine Conservation Area as defined by the Oak Ridges Moraine Conservation Plan (a regulation made under the *Oak Ridges Moraine Conservation Act*)?

☐ Yes ☑ No

Are you aware of any complaints or impacts resulting from water takings at the site? ☐ Yes ☑ No

Will water from the site be packaged in a container (bottled water, tanks)? ☐ Yes ☑ No

Are wells located within 500 m of the site where water taking will occur? ☑ Yes ☐ No

Is municipal water available to all dwellings within 500m of the site where water taking will occur?

☑ Yes ☐ No ☐ Unknown

Estimated start date of water taking (yyyy/mm/dd)
2020/09/01

Water taking to extend for a period of: _____ ☐ days ☐ weeks ☐ months ☐ years ☑ indefinite

Watercourse 2

Watercourse Name	Tributary to
CC Tributary (Catchment 1 West)	Porcupine River

Does flow in the watercourse stop at any time during the year? ☐ Yes ☑ No

Do you move/relocate the water intake (pump)? ☐ Yes ☑ No

Source Location Information

Civic Address - Street information (street number/name/type/direction/unit/suite/emergency 911 location number and street)

Unit Number	Street Number	Street Name	PO Box

Lot	Concession	Part	Reference Plan

City/Town	County/District	Original Geographic Township
South Porcupine		Whitney Township

Province	Postal Code
Ontario	P0N 1C0

Geographic (GPS) Coordinates (to be provided in Datum NAD83)

Method of Collection	Accuracy Estimate
Map	10 - 30 metres

UTM Zone	Easting	Northing
17N	490089	5373732

Is the Applicant the owner of the site where water taking will occur? ☑ Yes ☐ No

Is the site where water taking will occur located in an area of development control as defined by the *Niagara Escarpment Planning & Development Act*?

☐ Yes ☑ No

Is the site where water taking will occur located on the Oak Ridges Moraine Conservation Area as defined by the Oak Ridges Moraine Conservation Plan (a regulation made under the *Oak Ridges Moraine Conservation Act*)?

☐ Yes ☑ No

Are you aware of any complaints or impacts resulting from water takings at the site? ☐ Yes ☑ No

Will water from the site be packaged in a container (bottled water, tanks)? ☐ Yes ☑ No

Are wells located within 500 m of the site where water taking will occur? ☐ Yes ☑ No

If no, what is the distance to nearest well?
550m

Is municipal water available to all dwellings within 500m of the site where water taking will occur?

☑ Yes ☐ No ☐ Unknown

Estimated start date of water taking (yyyy/mm/dd)
2020/09/01

Water taking to extend for a period of: _____ ☐ days ☐ weeks ☐ months ☐ years ☑ indefinite

Watercourse 3

Watercourse Name	Tributary to
Three Nations Lake (Catchment 2)	Three Nations Lake and Lower Three Nations Creek

Does flow in the watercourse stop at any time during the year? ☐ Yes ☑ No

Do you move/relocate the water intake (pump)? ☐ Yes ☑ No

Source Location Information

Civic Address - Street information (street number/name/type/direction/unit/suite/emergency 911 location number and street)

Unit Number	Street Number	Street Name	PO Box

Lot	Concession	Part	Reference Plan

City/Town	County/District	Original Geographic Township
South Porcupine		Whitney Township

Province	Postal Code
Ontario	P0N 1C0

Geographic (GPS) Coordinates (to be provided in Datum NAD83)

Method of Collection	Accuracy Estimate
Map	10 - 30 metres

UTM Zone	Easting	Northing
17N	491765	5373289

Is the Applicant the owner of the site where water taking will occur? ☑ Yes ☐ No

Is the site where water taking will occur located in an area of development control as defined by the *Niagara Escarpment Planning & Development Act*?

☐ Yes ☑ No

Is the site where water taking will occur located on the Oak Ridges Moraine Conservation Area as defined by the Oak Ridges Moraine Conservation Plan (a regulation made under the *Oak Ridges Moraine Conservation Act*)?

☐ Yes ☑ No

Are you aware of any complaints or impacts resulting from water takings at the site? ☐ Yes ☑ No

Will water from the site be packaged in a container (bottled water, tanks)? ☐ Yes ☑ No

Are wells located within 500 m of the site where water taking will occur? ☐ Yes ☑ No

If no, what is the distance to nearest well?
600m

Is municipal water available to all dwellings within 500m of the site where water taking will occur?

☑ Yes ☐ No ☐ Unknown

Estimated start date of water taking (yyyy/mm/dd)
2020/09/01

Water taking to extend for a period of: _____ ☐ days ☐ weeks ☐ months ☐ years ☑ indefinite

Watercourse 4

Watercourse Name	Tributary to
Three Nations Creek (Catchment 3)	Three Nations Creek (Upper Branch)

Does flow in the watercourse stop at any time during the year? ☐ Yes ☑ No

Do you move/relocate the water intake (pump)? ☐ Yes ☑ No

Source Location Information

Civic Address - Street information (street number/name/type/direction/unit/suite/emergency 911 location number and street)

Unit Number	Street Number	Street Name	PO Box

Lot	Concession	Part	Reference Plan

City/Town	County/District	Original Geographic Township
South Porcupine		Whitney Township

Province	Postal Code
Ontario	P0N 1C0

Geographic (GPS) Coordinates (to be provided in Datum NAD83)

Method of Collection	Accuracy Estimate	
Map	10 - 30 metres	
UTM Zone	Easting	Northing
17N	490875	5375293

Is the Applicant the owner of the site where water taking will occur? ☑ Yes ☐ No

Is the site where water taking will occur located in an area of development control as defined by the *Niagara Escarpment Planning & Development Act*?

☐ Yes ☑ No

Is the site where water taking will occur located on the Oak Ridges Moraine Conservation Area as defined by the Oak Ridges Moraine Conservation Plan (a regulation made under the *Oak Ridges Moraine Conservation Act*)?

☐ Yes ☑ No

Are you aware of any complaints or impacts resulting from water takings at the site? ☐ Yes ☑ No

Will water from the site be packaged in a container (bottled water, tanks)? ☐ Yes ☑ No

Are wells located within 500 m of the site where water taking will occur? ☐ Yes ☑ No

If no, what is the distance to nearest well?
2,330m

Is municipal water available to all dwellings within 500m of the site where water taking will occur?

☑ Yes ☐ No ☐ Unknown

Estimated start date of water taking (yyyy/mm/dd)
2020/09/01

Water taking to extend for a period of: _____ ☐ days ☐ weeks ☐ months ☐ years ☑ indefinite

Is activity subject to the *Environmental Assessment Act*? ☐ Yes ☑ No

List any public consultation/notification that has occurred related to the proposed water taking (i.e., public hearings, notification of First Nations, etc.)
Newmont Porcupine has existing agreements in place with First Nation communities, including Wahgoshing First Nation, Flying Post First Nation, Matachewan First Nation and Mattagami First Nation. Monthly meetings are held to discuss upcoming projects and permits. The collection and diversion of water on Pamour Mine has been previously discussed with the First Nation communities.

8. Public Consultation / Environmental Bill of Rights (EBR) Requirements

Is this application for water taking to extend for a period of less than one year? ☐ Yes ☑ No

► If no, this application may be subject to posting and/or public consultation requirements under the Environmental Bill of Rights. For more information, please refer to the Guide.

Is this application for agricultural use or aquaculture? ☐ Yes ☑ No

► If no, this application may be subject to posting and/or public consultation requirements under the Environmental Bill of Rights. For more information, please refer to the Guide.

9. Water Taking Volumes

Purpose options for Water Taking

Purpose Category	Specific Purpose
Agriculture	irrigation of (includes frost protection): field and pasture crops; fruit orchard; market garden/flowers; nursery; sod farm; tender fruits; tobacco, other (must specify)
Commercial	aquaculture, bottled water, golf course irrigation, mall/business; snowmaking, other (must specify)
Construction	Dredging, road building, other (must specify)
Dewatering	pits and quarries; construction; other (must specify)
Industrial	aggregate washing, brewing/soft drinks, cooling water, food processing, manufacturing; pipeline testing; power generation; other (must specify)
Institutional	school, hospital, other (must specify)
Recreation	aesthetic, fish pond, other (must specify)
Remediation	groundwater; other (must specify)
Water Supply	campground, communal, municipal, other (must specify)
Miscellaneous	dam/reservoir, heat pump, pumping test, other (must specify)

Water Source Information – Table A (Units in Litres)

Source Name	Purpose Category (select from “purpose category" column in table above)	Specific Purpose (select from “specific purpose” column in table above)	Maximum rate per minute	Maximum number of hours of taking a day	Maximum volume per day	Typical volume per day	Maximum number of days of taking in a year	Earliest calendar date of taking (mm/dd)	Latest calendar date of taking (mm/dd)
Catchment Area 1 West	Miscellaneous	other - collect and divert surface water dr		24	146,880,000.00	593,000.00	365	01/01	12/31
Catchment Area 1 East	Miscellaneous	other - collect and divert surface water dr		24	25,920,000.00	3,112,000.00	365	01/01	12/31
Catchment Area 2	Miscellaneous	other - collect and divert surface water dr	3000	24	4,320,000.00	1,217,000.00	365	01/01	12/31
Catchment Area 3	Miscellaneous	other - collect and divert surface water dr	1800	24	2,592,000.00	428,000.00	365	01/01	12/31

10. Attachments

The following must be attached for all applications (Category 1, 2 and 3) to be complete:

☑ Map Requirements

On a 1:10 000 OBM (Ontario Base Map) (1:50 000 only acceptable in locations where 1:10 000 is not obtainable), mark and label:

- All existing and proposed water taking locations with sources corresponding with source name (refer to page 6 of the current application form).
- All of the following features within 500m of each source: existing wells (indicate use of existing well, springs, watercourses, wetlands, water bodies, property lines, locations and name of property owners, nearest road intersections, dwellings.

Browse... Remove

☑ Describe in detail how, where and when all water is obtained, stored, transferred, used and returned to the environment (if applicable). Details must include the source of all water takings (and corresponding source name if applicable), purpose of the water taking, period of water taking, and maximum quantity requested (see Guide for further instruction).

Note: If your application is subject to posting on the Environmental Bill of Rights (EBR) Registry, this description will be used to create the Proposal Notice. The ministry may change the wording as required, to meet the EBR posting requirements.

Browse... Remove

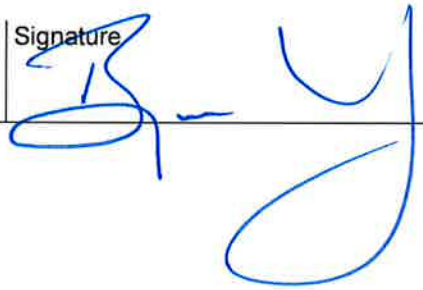
☑ Describe how water taking needs (rates, amounts and time periods) were determined. Provide all relevant information and calculations to demonstrate the water takings requested are warranted.

Browse... Remove

11. Statement/Signature of Applicant

I, the undersigned, hereby declare that to the best of my knowledge:

- The information contained herein and the information submitted in support of this application is complete and accurate in every way and I am aware of the penalties against providing false information.
- The Project Technical Information Contact identified in Section 6 if this form is authorized to act on my behalf for the purpose of obtaining this approval.

Print Name	Signature	Date (yyyy/mm/dd)
Bryan Neeley		2020/03/27

For Office Use Only			
Reference Number	Payment Record $	Date (yyyy/mm/dd)	Initials

12. Payment Information

The Ministry of the Environment and Climate Change does not accept applications containing Credit Card information for Permit To Take Water via email. If an application containing credit card information is received via email, it will not be processed and will be destroyed.

Method of Payment *		Amount Enclosed
☐ Certified Cheque ☐ Money Order ☐ VISA ☐ MasterCard		
Name on Credit Card (please print)	Credit Card Number	Expiry Date (mm/yy)
Credit Card Holder's Company Name		
Card Holder's Signature		Date (yyyy/mm/dd)

Schedule for Water Conservation Measures

Schedule 1 – Implementation of Water Conservation in accordance with Best Management Practices and Standards for the Relevant Sector

Section 1: General Information

Information on this Schedule is collected under the authority of the *Ontario Water Resources Act*, R.S.O. 1990 (OWRA), and the new *Environmental Bill of Rights*, C. 28. Statutes of Ontario, 1993, and will be used to evaluate applications for a Permit to Take Water as required by Section 34 (OWRA).

Instructions:

1. This Schedule forms part of the Permit to Take Water application form and is subject to all provisions and instructions where applicable.
2. All questions of Section 2 of this Schedule must be answered for this Schedule to be considered complete.

Purpose:

The purpose of this Schedule is to allow persons applying for a permit required by the Ministry to document in the application all water conservation measures and practices that are currently being undertaken or that is anticipated to be undertaken for the duration of the permit.

Persons applying for a permit are encouraged to take all reasonable and practical measures to conserve water and to be up to date with sector-specific best management practices and standards for water conservation (i.e. whether you are currently implementing or anticipate implementing water conservation best water management standards and practices relevant to your sector).

Various sector associations publish information on best practices that may be useful in determining practices and standards for water conservation. Examples of these sector-specifc assocations include the following:

- **Municipal Sector** – Ontario Water Works Association
- **Agricultural Sector** – Ontario Ministry of Agriculture (Fact Sheets and Guides on Best Management Practices containing information on efficient irrigation systems, staggering irrigation schedules and preparing Environmental Farm Plans)
- **Other Sectors** – For information on up-to-date best management practices and measures for water conservation, contact your relevant sector association.

Please note that this schedule may not be directly applicable to certain takings, such as pumping tests, instream uses, site dewatering and certain industrial processes. In these cases, consideration must be given to the fate of the water or system design requirements.

Section 2: Water Conservation Best Management Practices and Standards

Use this section of the Schedule to indicate what conservation measures and practices you are currently implementing or anticipate implementing. Where relevant, additional information can be attached as an appendix to this Schedule.

State your goals for reducing the use, loss or waste of water or for increasing the efficiency of water use (e.g., litres per day per unit of production or litres per day per capita for the residential sector).

Check off which of the following water conservation best management measures and practices that you have implemented or will implement for the duration of the permit:

Water conservation best management measures and practices	Implemented	To be Implemented
Water Use Audit	☐	☐
Universal metering of all users (municipalities)	☐	☑
Water Efficient Fixtures/Equipment/Technology	☐	☐
Develop and Implement an Overall Water Conservation and Efficiency Program	☐	☑
Leak Detection/Loss Prevention/Control Program	☐	☑
Public/Employee Information/Education/Outreach	☐	☐
Landscaping techniques/Site and Urban Design Principles	☐	☐
Water Efficient production processes/practices (e.g. re-use of water)	☐	☐
Economic Incentives/Cost-Share/Full Costing recovery/tax credits/rebate programs	☐	☐

Other (please specify) ► _____

Of the measures and practices checked off above, provide specific details of the best management practices applied or to be applied including equipment (e.g. pump specification), processes, such as water used for industrial production and/or irrigation system(s), current and proposed technology, approach, processes and procedures:

The collection areas have been designed to minimize the catchment areas to impacted footprints, thereby reducing unnecessary takings. Monitoring of water level, flows and quality in the downstream environment already occurs on site and will continue. Trigger and response plans have been provided in the attached Surface Water Study Document.

For the above measures and practices, list information relevant for your sector and/or other sources of information used in determining water conservation and efficiency management practices and measures:

Included Surface Water Study and suggested Water Management Plan.

List dates of when the best management measures and practices were or will be applied for the duration of the permit:

The best management practices will be applied when the collection areas are constructed and will continue during operation of the system.

Identify any approval or certification that you have received for implementing water conservation and efficiency best management practices, e.g. Environmental Farm Plan, Audubon Cooperative Sanctuary Program for Golf Courses:

Porcupine has an existing Environmental Compliance Approval under amendment (reference number 1943-AUFR5D) which proposes an amendment to the existing compliance monitoring of the downstream environment, ground water quality and levels. The best management plan will either be incorporated within the existing site monitoring plan (document) or be provided separately.