Appendix C2

2015 Water Management Report and Plan

MEADOWBANK GOLD MINE

2015 WATER MANAGEMENT REPORT AND PLAN

MARCH 2016

VERSION 01

AGNICO EAGLE
MEADOWBANK

EXECUTIVE SUMMARY

Agnico-Eagle Mines Ltd. Meadowbank Division (AEM) is operating the Meadowbank Gold Mine (the Mine), located on Inuit-owned surface lands in the Kivalliq region approximately 70 km north of the Hamlet of Baker Lake, Nunavut. The mine is subject to the terms and conditions of both the Project Certificate issued in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on December 30, 2006, and the Nunavut Water Board Water Licence No. 2AM_MEA1525 issued on July 23, 2015.

This report presents an updated version of the Water Management Plan 2014 and provides a revised site-wide water balance. The revised water balance determines the demand and storage requirements of water over the life of the mine. The storage strategies and required transfers will be discussed at large. Certain concepts within the water balance, including pit flooding, remain at the conceptual stage for now and will be further detailed in the Final Mine Closure and Reclamation Plan to be submitted one year prior to final closure in accordance with the current Type A Water License.

The necessity of this particular water management update follows changes in the observed natural pit water inflows, updated tailings deposition parameters, mine and milling life schedule and production rate, tailings management and pit backfilling strategies.

The principal additions to this update are:

- The revision of runoff water management strategy that positively impacts the mill freshwater consumption;
- The addition of a year of production related to the new life of mine (LOM);
- The tailings deposition parameters used for the model following the results of the 2015 bathymetries analysis and the new tailings deposition guideline;
- The Central Dike seepage status update;
- The updated planning of the Phaser Lake dewatering (pending approval from the NWB – application has been submitted).

The 2015 Water Management Plan also includes the 2015 Water Quality Forecast Update (Appendix C), the 2015 Freshet Action Plan (Appendix D) and the 2015 Ammonia Management Plan (Appendix E).

The Water Management Plan will be updated on a yearly basis as required by the Nunavut Water Board Water License 2AM-MEA1525.

Recommendations obtained during the renewal process for of the Water License 2AM-MEA1525 and from the 2014 Meadowbank Annual Review have been included in the 2015 Water Management Plan, as well as new requirements Water License 2AM-MEA1525. These recommendations and requirements are outlined below:

- The 2015 Water Management Plan includes a yearly updated water balance according to the water management strategy.
- The Water Management Plan includes a pit reflooding strategy meeting the requirements outlined in the Water Licence 2AM-MEA1525. The updated pit reflooding strategy and yearly water usage are presented.
- As mentioned in the 2015 Water Management Plan, AEM will provide at least 30 day notice to the Nunavut Water Board and Inspector prior to starting the re-flooding of each pit.
- As per the Water License 2AM-MEA1525, AEM will conduct weekly inspections of all water management structures during periods of flow. This program will commence in 2016 however it should be noted that weekly inspections are already undertaken as per the Freshet Action Plan (Appendix D) at water conveyance structures during flow periods. Records of the inspections will be available for review by an Inspector upon request.
- As recommended, Portage Pits sectors are clearly identified in section 2.2.1 of the 2015 Water Management Plan.
- In the 2015 Water Management Plan, section 3.1.10.3 - East Dike Seepage Collection, explanations regarding the East Dike seepage flow to Second Portage Lake are included and Table 3.8 was corrected. Clarifications on East Dike seepage directed to the Portage Pit are also included in this section.
- The computations and presentation of the water balance tables presented in appendix were reviewed for better understanding and more clarity.
- Site wide runoffs have been reviewed in September 2015. This revision has been integrated to the water balance. Note that Goose runoffs are presented for every month of the year to better reflect the volume pumped during Goose operation in the previous years. As the pit is now inactive, those volumes are still present but form the ice cover on the pit walls. A validation of those volumes for winter time will be undertaken at the

end of summer once the ice melt, supported by the model combined with water survey elevation.

- The 2015 Water Management Plan includes an updated water quality model, available in Appendix C. The water quality model will be updated yearly or at a minimum every two year, as required by the Water Licence 2AM-MEA1525.

- As recommended, an action plan to be implemented if predicted re-flooded pit water quality indicates that treatment is necessary is included in the 2015 Water Quality Forecast Update (Appendix C). Details on the water treatment options are discussed in the report.

- For parameters that do not have Canadian Council of Ministers of the Environment (CCME) Guidelines, the pit water quality will meet site specific criteria (or background within the range of natural variability) developed through review of the final closure plan by regulatory agencies, before the dikes are breached. This applies for the Goose Pit and the Vault Pit that will both be reflooded at closure. This requirement is taken into consideration in the 2015 Water Quality Forecast Update.

- Discussions on total suspended solids and minewater inflows are included in the 2015 Water Quality Forecast Update.

- As recommended, areas of seepage and proposed mitigation measures are updated in the 2015 Freshet Action Plan (Appendix D).

- A map of the snow disposal locations is included in the 2015 Freshet Action Plan.

- Description of disposal methods to be implemented in the eventuality that water in the containment area does not meet discharge criteria for the Baker Lake Tank Farms and the Vault Tank Farm is included in the 2015 Freshet Action Plan (Appendix D).

- As recommended, the ST-16 Seepage Monitoring Program duration in operation and closure is discussed in the 2015 Freshet Action Plan.

- All Monitoring Program Stations in the licence are referenced in the 2015 Freshet Action Plan with the consideration to include a table of concordance and reiteration of monitoring requirements (parameters and monitoring frequency) included in the license.

- Sampling frequency during freshet is also discussed in the monitoring plan included in the 2015 Freshet Action Plan.

- Estimate of ammonia/nitrogen loading to all mining infrastructure designed to contain mine water and mine waste and to the receiving environment is included in the Ammonia Management Plan, presented in Appendix E.

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DOCUMENT CONTROL

Version	Date (YM)	Section	Page	Revision
1	March 2014	ALL	-	Revision for the 2012 Water Management Plan (by SNC) according to the updated Life of Mine and water management strategies
2	March 2015	ALL	-	Revision for the 2013 Water Management Plan (by AEM) according to the updated Life of Mine and water management strategies
3	October 2015	ALL	-	Update of sections according to Water License renewal conditions
4	March 2016	ALL	-	Revision of the 2014 Water Management Plan (by AEM) according to the updated Life of Mine and water management strategies

Approved by:

Engineering Department

Approved by:

Environmental Department

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Section 1.0 - INTRODUCTION

Agnico-Eagle Mines Ltd. (AEM) has been operating its Meadowbank Gold Mine since 2008, officially beginning production in 2010. The mine is located approximately 70km north of the Hamlet of Baker Lake, Nunavut. The mine is subject to the terms and conditions of both the Project Certificate issued in accordance with the Nunavut Land Claims Agreement Article 12.5.12 on December 30, 2006, and the Nunavut Water Board Water Licence No. 2AM-MEA1525 issued on July 23, 2015.

This report presents an updated version of the Water Management Plan 2014 and provides a revised site-wide water balance that determines the demand and storage requirements of water over the life of the mine (LOM). The storage strategies and required transfers will be discussed at large. Certain concepts within the water balance, including pit flooding, remain at the conceptual stage for now and will be further detailed in the Final Mine Closure and Reclamation Plan which is to be submitted one year prior to mine closure in accordance with the Type A Water License.

The necessity of this particular water management update follows changes in the observed natural pit water inflows, updated tailings deposition parameters, mine and milling life schedule and production rate, tailings management and pit backfilling strategies.

Runoff values and pit inflows for the Vault, Portage and Goose area were determined from the review completed by SNC Lavallin in September 2015. Those run off values will be verified and revised with field observations.

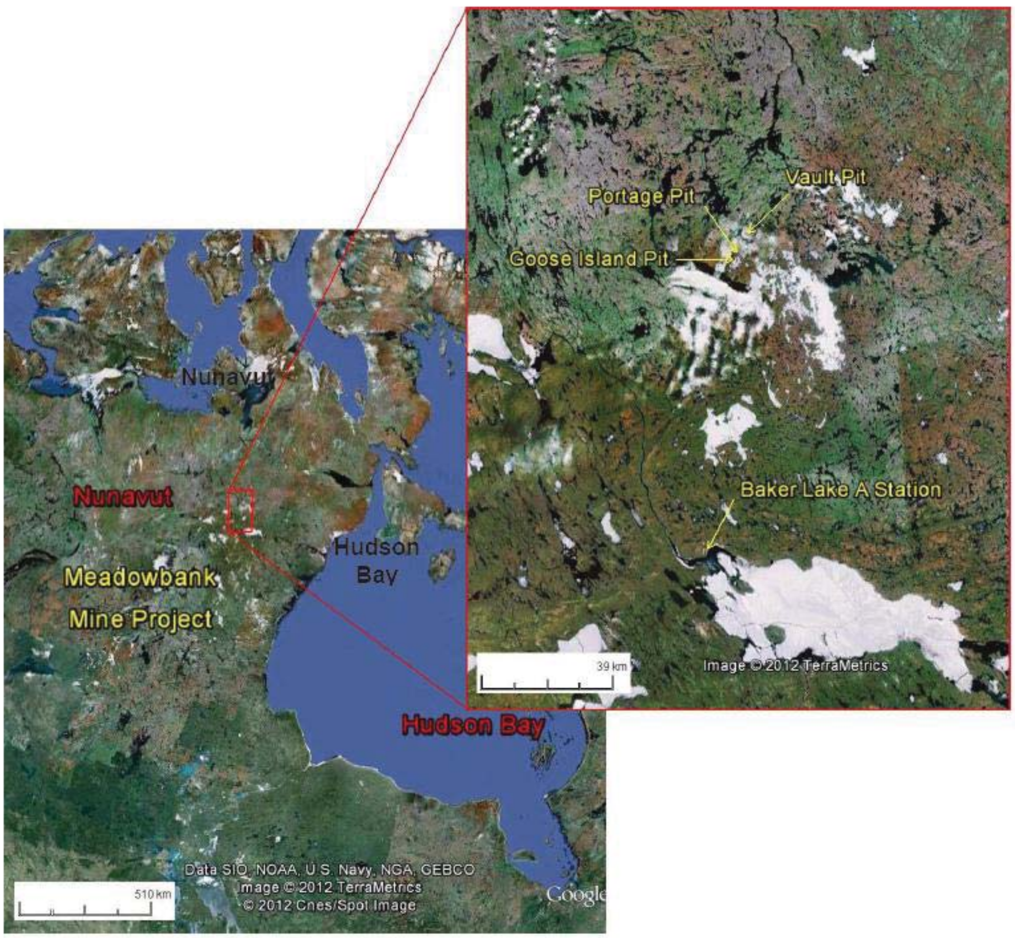
This report also addresses the recommendations from the NIRB following their review of the 2014 Annual report and recommendations obtained during the renewal process for of the Water License 2AM-MEA1525. Recommendations and requirements concerning the water use and management, the water balance and the water quality modelling are outlined in the *document Water License: 2AM-MEA1525 Reasons for Decision Including Record of Proceedings* from the Nunavut Water Board. These recommendations and requirements are included in this report; refer to the executive summary of this report for the specific list. The Water Management Plan will be updated on a yearly basis as required by the Nunavut Water Board Water License 2AM-MEA1525.

Section 2.0 - BACKGROUND INFORMATION

2.1 SITE CONDITIONS

The location of the Meadowbank mine site is shown below in Figure 2.1. A close-up is also provided to show the location of the Baker Lake A Station used to obtain meteorological data.

Figure 2.1: Portage Pit area map



Source: Google Earth Pro, 2012

2.1.1 Climate

The Meadowbank region is located within a low Arctic Eco climate described as one of the coldest and driest regions of Canada. Arctic winter conditions occur from October through May, with temperatures ranging from +5°C to -40°C. Summer temperatures range from -5°C to +25°C with isolated rainfall increasing through September (Table 2.1).

Table 2.1: Estimated average monthly climate data – Baker Lake

Month	Max. Air Temp. (°C)	Min. Air Temp. (°C)	Rainfall (mm)	Snowfall (mm)	Total Precip. (mm)	Lake Evap. (mm)	Min. Relative Humidity (%)	Max. Relative Humidity (%)	Wind Speed (km/h)	Soil Temp. (°C)
January	-29.1	-35.5	0	6.9	6.9	0	67.1	75.9	16.3	-25.5
February	-27.8	-35.2	0	6.0	6.1	0	66.6	76.5	16.0	-28.1
March	-22.3	-30.5	0.0	9.2	9.2	0	68.4	81.4	16.9	-24.9
April	-13.3	-22.5	0.4	13.6	14.0	0	71.3	90.1	17.3	-18.1
May	-3.1	-9.9	5.2	7.7	12.8	0	75.7	97.2	18.9	-8.0
June	7.6	0.0	18.6	3.1	21.7	8.8	62.6	97.2	16.4	2.0
July	16.8	7.2	38.6	0.0	38.6	99.2	47.5	94.3	15.1	10.5
August	13.3	6.4	42.8	0.6	43.4	100.4	59.2	97.7	18.4	9.3
September	5.7	0.9	35.2	6.7	41.9	39.5	70.8	98.6	19.3	3.6
October	-5.0	-10.6	6.5	22.6	29.1	0.1	83.1	97.4	21.4	-2.8
November	-14.8	-22.0	0.2	16.2	16.4	0	80.6	91.1	17.9	-11.7
December	-23.3	-29.9	0	9.4	9.5	0	73.3	82.7	17.7	-19.9

Note: Data from Baker Lake A station is available from 1946 to 2011. During this period, the data quality is good, with the exception of years 1946 to 1949, and 1993 which were removed from the compilation.

The long-term mean annual air temperature for Meadowbank is estimated to be approximately 11.1°C. Air temperatures in the Meadowbank area are, on average, about 0.6°C cooler than Baker Lake air temperatures, and extreme temperatures tend to be larger in magnitude. This climatic difference is thought to be the effect of a moderating maritime influence at Baker Lake.

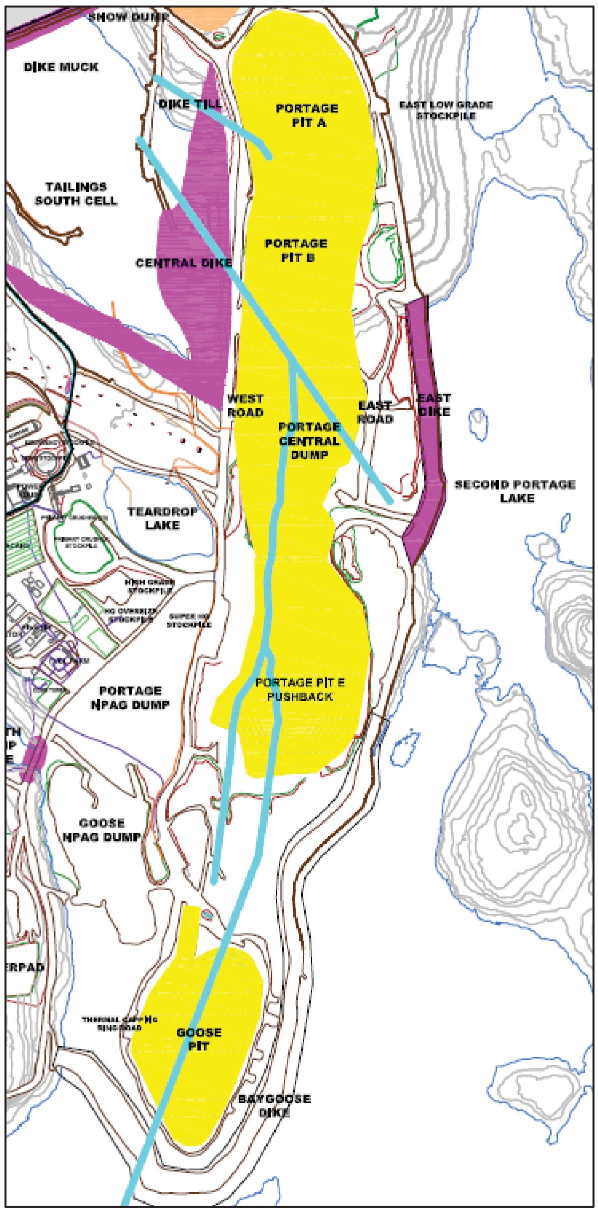
The prevailing winds at Meadowbank for both the winter and summer months are from the northwest. A maximum daily wind gust of 93 km/h was recorded on September 1, 2009. Light to moderate snowfall is accompanied by variable winds up to 70 km/h, creating large, deep drifts and occasional whiteout conditions. Skies tend to be more overcast in winter than in summer.

The Table 2.1 presents monthly rainfall, snowfall and total precipitation values for the mine site. August is the wettest month, with a total precipitation of 43.4 mm, and February is the driest month, with a total precipitation of 6.1 mm. During an average year the total precipitation is 249.6 mm, split between 147.5 mm of rainfall and 102.1 mm of snowfall precipitation.

2.1.2 Faults

As shown in Figure 2.2 by clear blue lines, two main faults are inferred in the Portage deposit area and included in the groundwater model (Golder, 2011) used to estimate groundwater inflows and brackish water upwelling to the pits during mine life. These are the Bay Zone Fault and the Second Portage Fault. The Second Portage fault trends to the northwest and is expected to be under the Central Dike and the Tailings Storage Facilities (TSF), roughly parallel to the orientation of Second Portage Lake. Analysis conducted during the design of the Central Dike showed seepage potential at the time. More details are available in section 3.1.10.4 regarding Central Dike seepage. To date Central Dike has been completed to elevation 137m.

Figure 2.2: Portage Pit area map



2.1.3 Permafrost

The Meadowbank Gold Mine is located in the area of continuous permafrost. Lake ice thicknesses of between 1.5 m and 2.5 m have been encountered during geotechnical investigations in mid to late spring. Taliks (areas of permanently unfrozen ground) could be expected where water depth is and/or has been greater than about 2 to 2.5 m. Based on thermal studies and measurements of ground temperatures (Golder, 2003), the depth of permafrost at site is estimated to be in the order of 450 to 550 m, depending on proximity to lakes. The depth of the active layer ranges based on depth of overburden, vegetation and organics, proximity to lakes, and aspect of about 1 to 1.5 m.

Based on ground conductivity surveys and compilation of regional data, the ground ice content is expected to be low. Locally on land, ice lenses and ice wedges are present, as indicated by ground conductivity, and by permafrost features such as frost mounds. These areas of local ground ice are generally associated with low-lying areas of poor drainage.

2.1.4 Hydrology

As shown above in Table 2.1, the Baker Lake A meteorological station was used to tabulate the monthly precipitation data. Using this data SNC-Lavalin completed a Log-Pearson 3 probability distribution to determine the annual precipitation for different return periods. The results of this statistical analysis can be seen in Table 2.2.

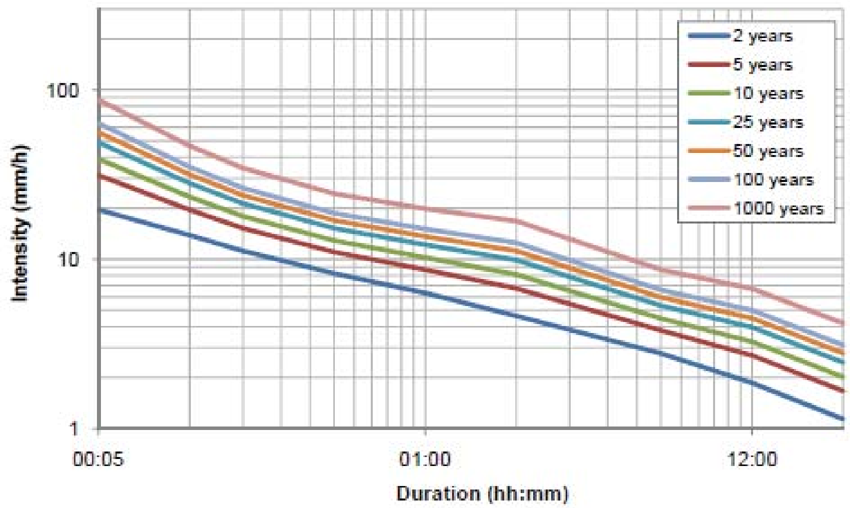
Table 2.2: Total annual precipitation for varying return periods

Return Period (years)	Precipitation (mm)
2	246
5	295
10	322
20	345
100	391

Source: SNC-Lavalin Water Management Plan 2012

Intensity duration frequency curves (IDF) previously presented by SNC in the Water Management Plan 2012 (SNC, 2013), are seen below in Figure 2.3. These curves prepared by Environment Canada from the Baker Lake A meteorological station, show the IDF curves for precipitations of short duration (5min-24hrs) based on data between 1987 and 2006.

Figure 2.3: Baker Lake A meteorological IDF curves



Source: SNC-Lavalin Water Management Plan 2012

The freshet (spring period) will vary from year to year however it has been observed that the winter snow accumulation (October to May) will begin to melt at the beginning June and continue throughout the month.

2.2 MINING OPERATION DESCRIPTION

The Meadowbank Gold Mine consists of several gold-bearing deposits within reasonably close proximity to one another. The three main deposits are: Vault (including the proposed Phaser and BB Phaser), Portage (South, Center and North Portage deposits), and Goose.

The South Portage deposit is located on a peninsula, and extends northward under Second Portage Lake (2PL) and southward under Third Portage Lake (3PL). The North Portage deposit is located on the northern shore of 2PL. The South, Center and North Portage deposits are mined as a single pit, termed the Portage Pit, which extends approximately 2 km in a north-south direction. The Goose deposit lies approximately 1 km to the south of the Portage deposit, and beneath 3PL. The Vault deposit is located adjacent to Vault Lake, approximately 6 km north of the Portage deposits. A series of dewatering dikes (East, West Channel, Bay-Goose, South Camp and Vault dikes) were required to isolate the mining activities from the lakes. Additional dikes (the Central Dike, Stormwater Dike and Saddle Dams) are required to manage tailings within the dewatered 2PL Arm. East Dike, West Channel, Bay-Goose, South Camp, Stormwater Dike, Saddle Dam 1, Saddle Dam 2 and the start of Central Dike were all constructed from 2009 - 2014. Regarding the Central Dike; the Coffer Dam was built in 2011, raised to 132masl in 2014 and brought to 137masl in 2015. Further target elevations are being evaluated by AEM at the moment. The dikes were and will be constructed primarily using materials produced on site.

2.2.1 Portage Pit Area

The Portage area located between the Third Portage Lake (3PL) and Second Portage Lake (2PL) contains most of the infrastructure of the Meadowbank mine site including but not limited to the Rock Storage Facility (RSF), North and South Tailings Storage Facilities (NC & SC TSF), mill and the Stormwater Management Pond. The East Dike was constructed to isolate the north portion of the Portage Pit from the 2PL. Subsequent renaming of the pits led to the new nomenclature for each pit (A, B, C, D and E). Mining in Pits B, C, D (representing the old Central Portage area) are now completed and are currently subject to pit infilling operations (which will form part of fish habitat compensation). Mining is still active in Pits A and E. Figure 2.4 below presents the evolution of the Portage pit terminology and Figure 2.5 shows the current Portage Pit and surrounding infrastructures.

Figure 2.4: Portage Pit terminology

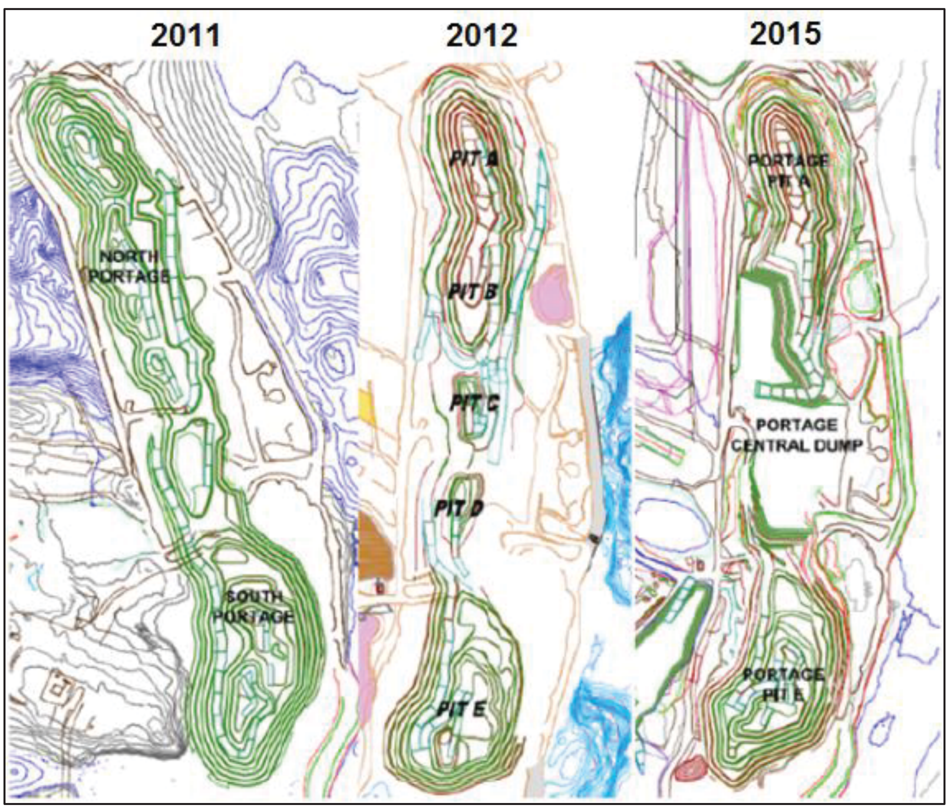
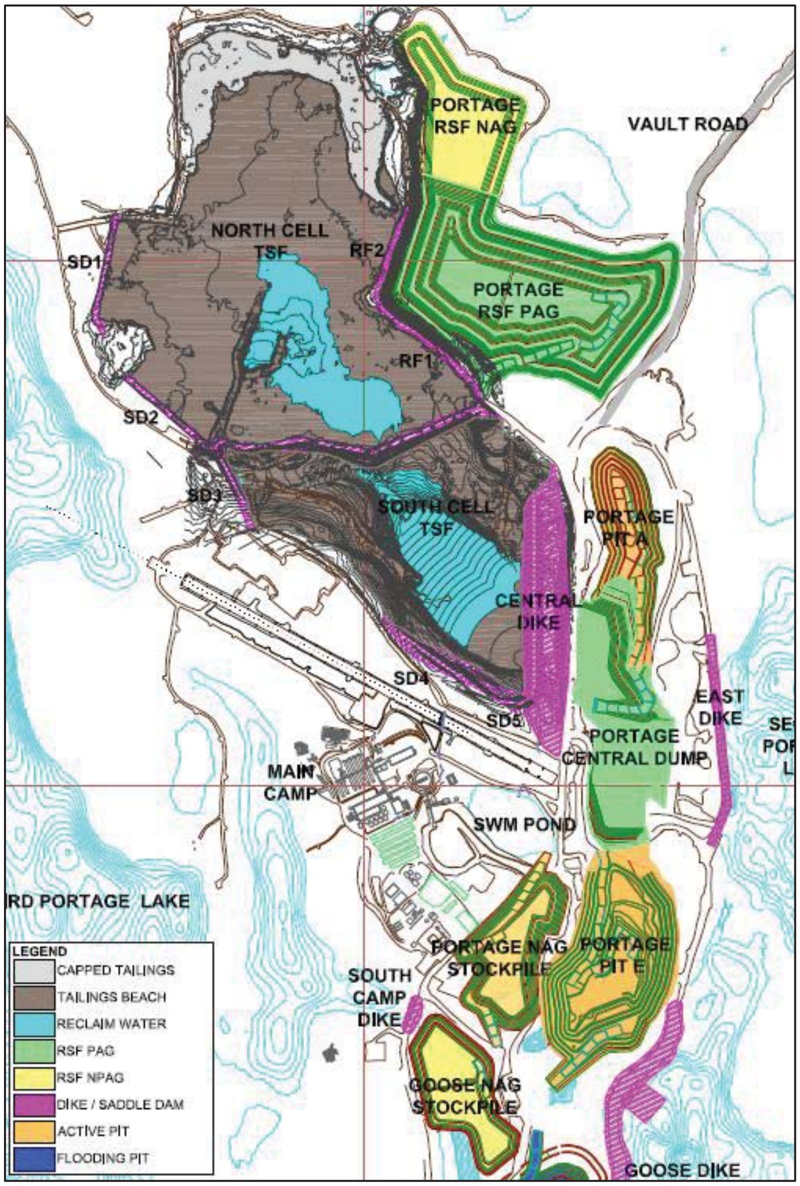


Figure 2.5: Portage Pit area map



In 2015 and likely continuing through 2016, water enters Portage Pit from the East Dike wall, due to observed seepage through the East Dike from Second Portage Lake (2PL). This seepage is controlled via two seepage collection points. From the collection points, the water is pumped to a common pipe and discharged back into 2PL. The discharge is subject to MMER and Water License effluent criteria. The water is discharged through a diffuser located in 2PL. If the seepage does not meet criteria (mainly related to TSS), the pumping is redirected toward the Portage Pit, specifically in the Portage Central Waste Rock area, where the water flows in the rock backfill porosity towards Pit B and Pit E in two sumps located at the northern and southern toe of the dump (sampling locations ST-17 and ST-19). If necessary, the water is pumped to the South Cell (SC) reclaim pond from those two sumps. Another source of pit water was observed in the bottom benches of Pit C and D. These two pits are located in an inferred talik area and also cross a regional fault (Golder, 2009). There are several areas in these pits which are not in permafrost which infers a talik. The water is likely a combination of ground and surface water. AEM is currently monitoring all water quality in sampling locations ST-17 and ST-19 in accordance with the Water License. Pits A and B are located in the permafrost and a minimal amount of water has been observed historically. Some water inflows were observed from the Pit E south wall during the year 2015. A major rock fall occurred in September 2015 which was related partially to the talik conditions and to the shear zone observed on this wall. All water pumped from this area of the Portage Pit is directed to the operational South Cell TSF and forms part of the reclaim system (formerly the Portage Attenuation Pond).

During closure, the East Dike seepage and any water inflow originating from Pit C and D will contribute to the pit reflooding process. According to the mine plan, some inflows will not be pumped and will remain in the pit in some inactive portions of the Portage pit from January 2018 as outlined in the Water Balance (refer to Appendix A).

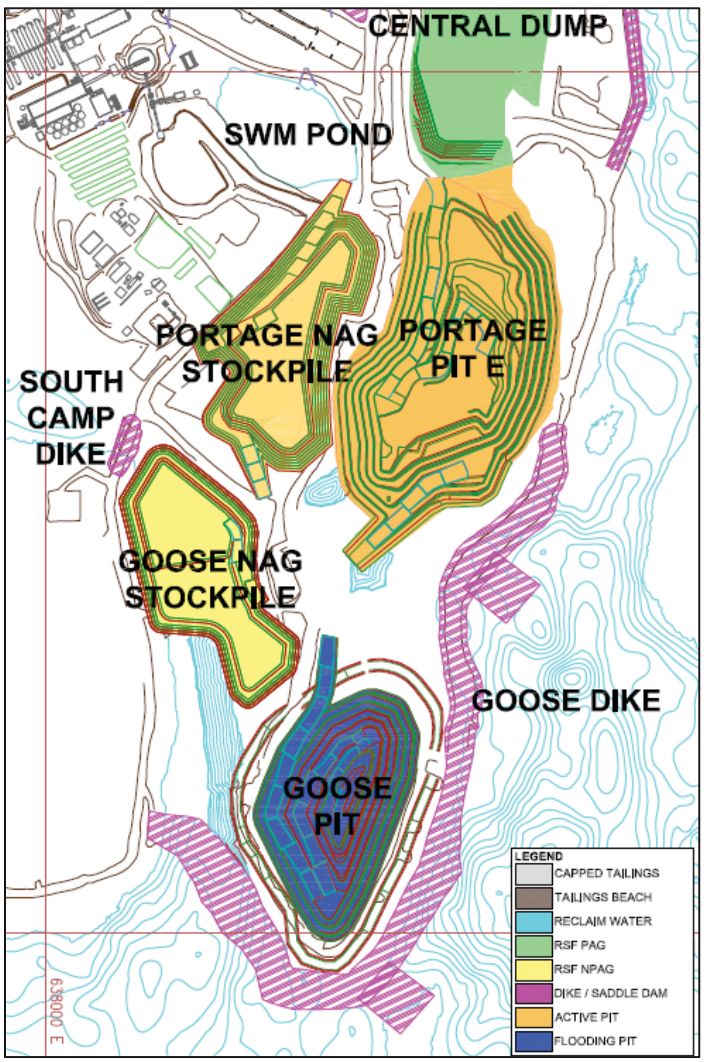
2.2.2 Goose Pit Area

The Goose Pit is under 3PL which required the construction of the Goose Dike to isolate the lake from the mining area. Mining in Goose pit commenced in 2012 and was completed by the end of April 2015. After mining was completed, Goose Pit is being passively re-flooded (only natural runoff and inflow) as part of the closure (refer to the flooding section 3.2 for further details). The Goose Pit area and surrounding infrastructure are illustrated in Figure 2.6.

The majority of the water entering Goose Pit has been observed coming from the South and West wall due to natural inflow from the fractured quartzite rock formation. No major water inflow is observed on the eastern wall associated with iron formation type rock with small volcanic lenses. Between the quartzite and iron formation, there is a large band of ultramafic rock (soapstone). Most of this pit is located in a talik zone which can explain the water inflow. Some areas of the lower part of the pit are not in permafrost which infers a talik zone. Until mining was completed in April 2015, the water was managed with a system of sumps and trenches along the pit ramp, on the 5109 catch bench and on the working elevation. All water pumped from the Goose Pit was directed to the South Cell Reclaim pond. Since mining has been completed, the inflows are collected in the pit as part of the natural flooding process. The beginning of the active flooding (water transferred from Third Portage Lake) of the Goose pit is planned in 2016 but could be delayed. Section 3.2.1 discusses the Goose Pit reflooding.

In 2014, seepage from Central Dike was observed. The seepage was contained at the downstream toe of the dike and a permanent pumping system was installed in 2015. In September 2015, 50,431m³ of water from the Central Dike D/S Pond were transferred to the Goose pit. This transfer was part of a steady state pumping test performed at that time to understand the nature of the seepage flows. This test was recommended by the Meadowbank Dike Review Board #17 (MDRB) and was in accordance to a specific recommendation by SNC-Lavalin to validate that the seepage water transferred to Goose would not compromise water quality at closure. The impacts of the transfer on the pit water quality at closure are addressed in the 2015 SNC Water Quality Forecasting Update (Appendix C). More details about the Central Dike seepage are presented in the section 3.1.10.4.

Figure 2.6: Goose Pit area map



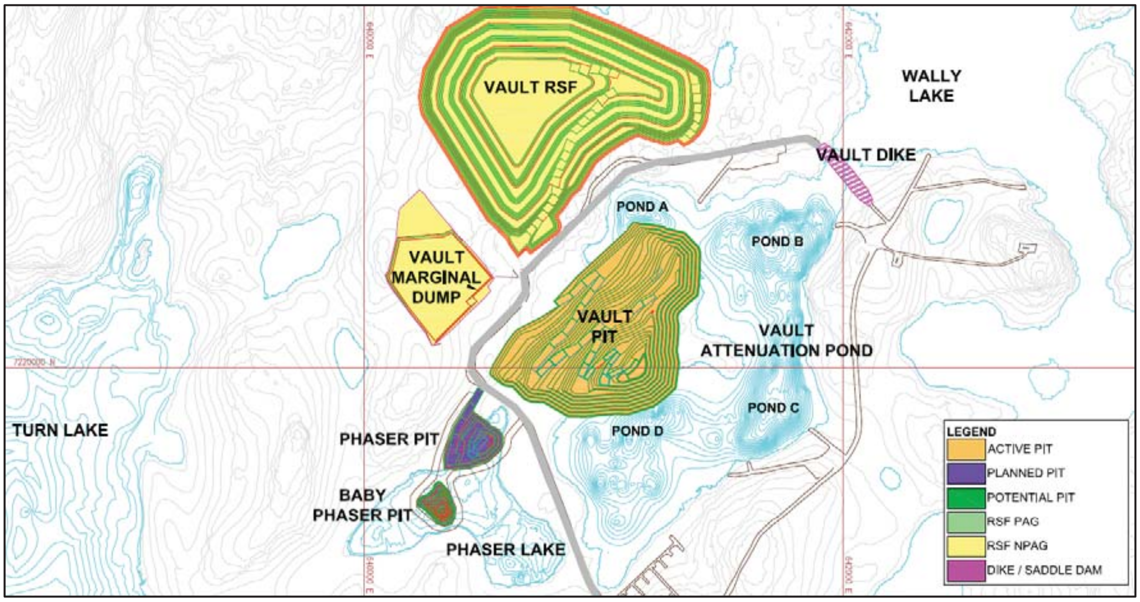
2.2.3 Vault Pit Area

The Vault Pit area contains its own independent infrastructure including but not limited to the Vault RSF, ore and marginal pads, Vault dike, Vault pit, Vault attenuation pond, service building and emergency shelter. The Vault Pit, which is located under the former Vault Lake required the construction of Vault dike in order to isolate the mining area from Wally Lake. Dewatering was undertaken in 2013 and 2014. This allowed for mining of Vault Pit and the creation of the Vault Attenuation Pond (ATP). The Vault pit began pre-mining operations in 2013 with active mining starting in 2014. Mining is expected to be completed by the end of third quarter of 2018. Figure 2.7 illustrates the Vault Pit area and surrounding infrastructure.

The majority of the water migrating into Vault Pit has been observed to be runoff from the surrounding area during the freshet period. No major water inflow has been observed to date originating from the pit walls. However, occurrences of small, pressurized, isolated pockets of water are sometimes found while drilling. Furthermore, preliminary observations show that the rare water venues seem to be located in a specific area close to one of the attenuations pond's low points (pond D) adjacent to the pit. The water is managed with a system of sumps and trenches along the pit crest, the main ramp and on the working bench. All water pumped from the Vault Pit is directed to the Vault Attenuation Pond (ATP). The water is subsequently treated for total suspended solids removal (TSS) during summer months (if necessary) and discharged into Wally Lake in accordance with the Water License and the MMER. It is worth mentioning that as of 2016, no water treatment for TSS has been required prior to discharging in Wally Lake as the water met the MMER and Water license criteria.

In 2015, the footprint of the Vault pit was extended following the new LOM. This footprint extension required AEM to review the water management of the Vault Attenuation Pond and change the maximum operation elevation of the different ponds – specifically pond D. The configuration of the Vault Attenuation Pond is presented on Figure 2.7. There are four internal ponds named Pond A, B C & D respectively, which promote natural settling of the suspended solids and contribute to the low TSS levels confirmed by effluent sampling in accordance with MMER and the Water License. The new LOM presented in this document also includes the proposed mining of Phaser Pit in 2017-2018. Pending approval from the Nunavut Water Board (NWB) this will require the dewatering of the Phaser Lake during summer 2016 in order to start mining operations by 2017. Baby (BB) Phaser Pit is not included in the present LOM as it is still conceptual; but was identified as an opportunity for the next revision of the LOM.

Figure 2.7: Vault Pit area map



2.3 LIFE OF MINE DESCRIPTION

The current life-of-mine (LOM) has been updated with the current mining surfaces, operational fleet, stockpile situation and milling forecasts. An update to the pit designs has caused an expansion of Phaser and Vault Pits. The specifics of the expected monthly milling tonnage are summarized in Table 2.3 seen below.

Table 2.3: Current official LOM figures – Processed ore tonnages

	2016	2017	2018
January	356,345	-	-
February	332,688	-	-
March	315,735	-	-
Q1	***1,004,768***	***973,440***	***810,000***
April	331,560	-	-
May	348,719	-	-
June	315,480	-	-
Q2	***995,759***	***1,013,922***	***819,000***
July	342,922	-	-
August	336,288	-	-
September	296,010	-	-
Q3	***975,220***	***988,816***	***675,251***
October	344,162	-	-
November	334,800	-	-
December	349,897	-	-
Q4	***1,028,859***	***1,034,724***	***-***
Total	4,004,606	4,010,902	2,304,251

2.3.1 Changes from the Water Management Plan 2014

As previously stated, updates to the LOM will lead to additional adjustments of the water management plan. Changes in the LOM plan that affect water management include but are not limited to:

- Phaser and Vault Pit modifications;
- Updated truck mining fleet;
- Updated stockpile status;
- Modification to the Central waste rock storage (Portage Pit) design and overall volume;
- South Cell (SC) and North Cell (NC) TSF NAG capping volumes (progressive reclamation) and timeframe.

In 2015, the above mentioned modifications added one year to the tailings storage requirements as well as slightly affecting the pit flooding curves. In addition to the changes in the LOM, many other revisions/modifications were made to the water balance in 2015-2016 that lead to this update. These include:

- Fresh water consumption revision;
- Total daily mill water requirements;
- Updated tailings deposition plan affecting the North Cell and South Cell deposition calendar;
- Pit water inflow revision based on observed flowmeter data as well as a revision of the pits and TSF run off inflows related to their underlying watersheds (performed by SNC, 2013);
- Flooding sequence and volumes update to take into account the updated run off inflows;
- Updating dewatering of Phaser Lake – will occur when approved by regulatory agencies;
- Updating the seepage section;
- Changes in tailings dry density as observed through bathymetric analysis.

Further details of the modifications/revisions and their effects on the overall water management strategy will be provided in subsequent sections of the Plan.

Section 3.0 - WATER MANAGEMENT PLAN AND WATER BALANCE

3.1 GENERAL WATER MANAGEMENT STRATEGY

At Meadowbank, five major sources of inflow water are considered in the site water management system: freshwater pumped from Third Portage Lake, natural run off, natural pit groundwater inflow, seepage inflow from the East Dike and freshet water. This water is either utilized or removed from the inflow by the following means: water treatment plant (if treatment necessary) effluent or non-treated effluent from the Vault attenuation pond, water trapped in the capillary voids of the tailings fraction (including ice entrapment for winter months) at the TSF's, East Dike seepage discharge into Second Portage Lake and water trapped within the in-pit rock storage facilities area voids.

The water balance is subdivided into the following sections: Fresh Water from Third Portage, Reclaim Tailings Water, Mill Water, North and South Cell TSF's, Portage Pit, Goose Water Transfers, Model Parameters, East Dike Seepage, Vault Pit, Phaser Pit and Lake (once approved), Vault ATP and Vault water transfers. The following sections will discuss each item and their inherent parameters.

The Water Balance is presented in Appendix A of this report.

As per the requirements concerning the water balance in the Water License 2AM-MEA1525 (Part E, condition 7), the Water Management Plan will be updated on an annual basis. The Water Management Plan will include a yearly updated water balance according to the water management strategy.

3.1.1 Fresh Water from Third Portage Lake

Fresh water from Third Portage Lake is pumped, utilizing a fresh water barge, in order to service the camp, mill, maintenance shop and all other fresh water users at Meadowbank. The amount pumped from the barge is tracked and reported in the water balance and as a requirement of the Type A Water License. The two main consumers of fresh water are the mill with an average of 64,801 m^3/month in 2015 (expected average 44,723m^3/month in 2016) and the camp that averaged 2,890m^3/month in 2015.

The freshwater going to the mill is used in the milling process and will be discharged with the tailings as slurry. Once in the TSF, the total water volume is generally comprised of 40-70% (depending of time in the season due to presence of ice) free reclaim water (recycled back to the mill as process water), 30% entrapped water within the capillary void space of the tailings and 30% is entrapped within the TSF as ice (60% total entrapped in tailings during winter months). The water entrapment within the TSF represents the annual average as the ice entrapment during the summer months would fall to zero, while in winter months it could reach close to 80% (according to the July 2014 bathymetric analysis of the North Cell TSF). However, the 2015 bathymetry analysis of the South Cell revealed that the annual ice entrapment reduced to 36%. According to AEM, these results are the consequence of the tailings deposition strategy itself as deposition occurring in the South Cell was only in sub-aqueous conditions which reduced the impact of the climate, eased the consolidation of the tailings in the pond and resulted in less water trapped into the capillary void space of the tailings. Following this conclusion, AEM changed the average ice entrapment for the year to 42% for 2016, 50% for 2017 and 60% for 2018 which evolves as the changing geometry promotes sub-aerial deposition which is more prone to ice entrapment. The average ice entrapment is based on the North Cell historical data and from assumptions regarding the evolution of ice entrapment in the South Cell as a function of tailings beach length.

The fresh water used in the camp includes laundry facilities, cleaning, cooking and drinking water consumption. The majority of the camp fresh water is returned as sewage treatment effluent to the Stormwater Management Pond which ultimately gets transferred to the active TSF (currently the South Cell) and later in the mine closure period to the Portage Pit from 2019 to 2024 as part of the flooding process at closure.

The total expected fresh water utilization planned for 2016 to mine closure varies from 90-200m^3/hr during mill operation, and drops gradually during closure to 4m^3/hr once the mill has closed (represents water used by the camp only and does not include pit flooding). The variation seen in the fresh water consumption during the mill operation is optimized to prevent a water deficit in the TSF and allows for adequate reclaim volumes while minimizing the reclaim water transfers from the TSF to the pits at closure. The higher freshwater consumption flows are planned at the end of the South Cell operation and occur mainly during winter time. The objective is to increase reclaim pond free water volume during winter to reduce the ice entrapment ratio and secure reclaim pond operation. Table 3.1 shows the water consumption through time. The ice cover during the winter months on the reclaim pond will vary between 0.0-1.8m in thickness which may represent up to 55% of the total reclaim water volume compared to the 80% ratio planned in the 2014 Water Management Plan. This is the result of the new freshwater flow planned until the end of the mine and of the increase of reclaim water volume in the South Cell TSF at closure. For this reason, the water balance is completed hand in hand with the tailings deposition plan.

In 2015, AEM used 812,285 m^3 of freshwater. Tables 3.1 and 3.2 present, respectively, the targeted water consumption for 2016 and the average yearly water consumption summary until the end of the mine life. More details are included in the water balance presented in Appendix A.

Adjustments at the mill and in the water management strategies have led to a revision in fresh water consumption. As of 2018, when the mill is scheduled to cease production, freshwater use will be limited to pit flooding and camp use. Figure 3.1 presents the 2016 mill water consumption per month and yearly values are summarized in Table 3.2. Refer to Section 3.3 for the pit flooding activities description and freshwater needs.

It is important to take note that 2017's freshwater consumption at the mill are higher than prior years which is part of a strategy to have sufficient free water volume in the reclaim pond to put less pressure on the reclaim system during winter 2017/2018, and avoid having the reclaim barge operating within the tailings (which occurred in 2013 at the North Cell).

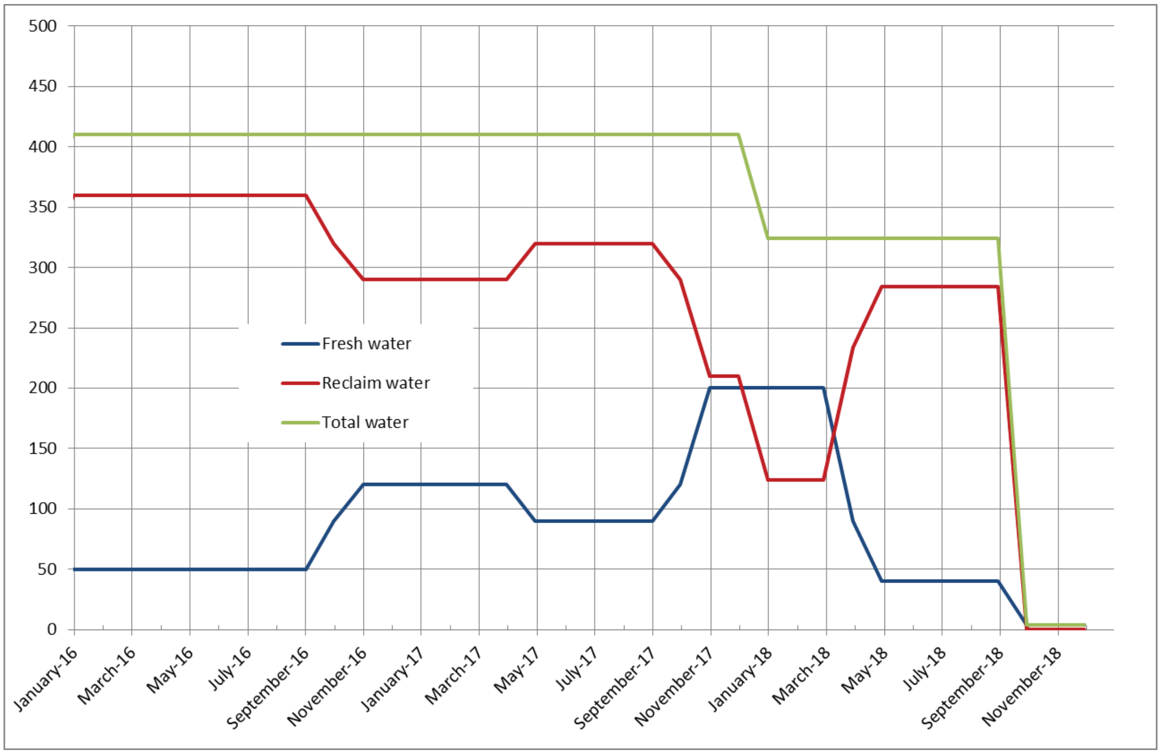
Table 3.1: 2016 Targeted water hourly consumption per month

Month	Fresh Water Flow (m^3/h)	Reclaim Water Flow (m^3/h)	Total Water Flow (m^3/h)
January	50	360	410
February	50	360	410
March	50	360	410
April	50	360	410
May	50	360	410
June	50	360	410
July	50	360	410
August	50	360	410
September	50	360	410
October	90	320	410
November	120	290	410
December	120	290	410
Average	**65**	**345**	**410**

Table 3.2: Yearly water consumption summary

Year	Average Fresh Water Flow (m^3/h)	Total Fresh Water (m^3)	Average Reclaim Water Flow (m^3/h)	Total Reclaim Water (m^3)
2015	93	812,285	313	2,743,821
2016	65	571,440	345	3,030,000
2017	121	1,058,160	289	2,533,440
2018	75	652,420	169	1,478,218
2019-2025	4	34,675	-	-

Figure 3.1: Flow to the mill



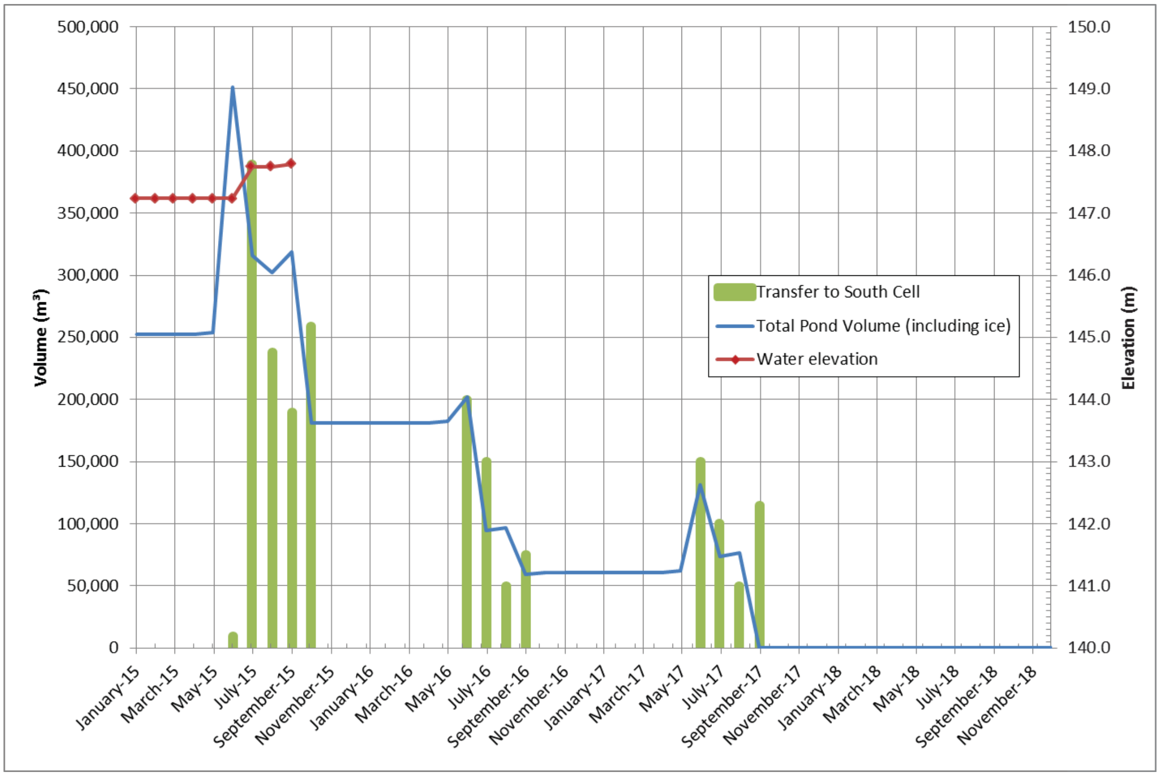
3.1.2 Reclaim Tailings Water

Reclaim tailings water represents the water reclaimed from the TSF during mill operation (North and South Cell reclaim ponds). Currently, the pumping system utilizes a mobile pumphouse on skids which retreats on a road as the water level rises in the South Cell TSF. The suction line is placed at the bottom of the pond and extended as needed according to the pump moves. A summary of the reclaim water sent to the mill on an annual basis can be seen in Table 3.2.

Figure 3.2 represents the water management in the North Cell TSF until the end of its operation. As seen in the water balance spreadsheet presented in Appendix A, at this time, the reclaim pumping system now installed in the South Cell will continue to supply the mill with reclaim water until end of operation. North Cell TSF runoff water inflow will be transferred yearly during summer months into the South Cell to maintain a 2m freeboard in the North Cell TSF as required by the TSF designer, the OMS manual and the Water License. This action will be performed yearly (even after the North Cell is capped during closure operations) until 2029 (planned dike breaching if CCME criteria/site specific criteria are met). It should be understood that run off water from the surrounding North Cell TSF watershed area is captured in the diversion ditches and conveyed to the Interception Sump. From there, it is planned to be transferred into the

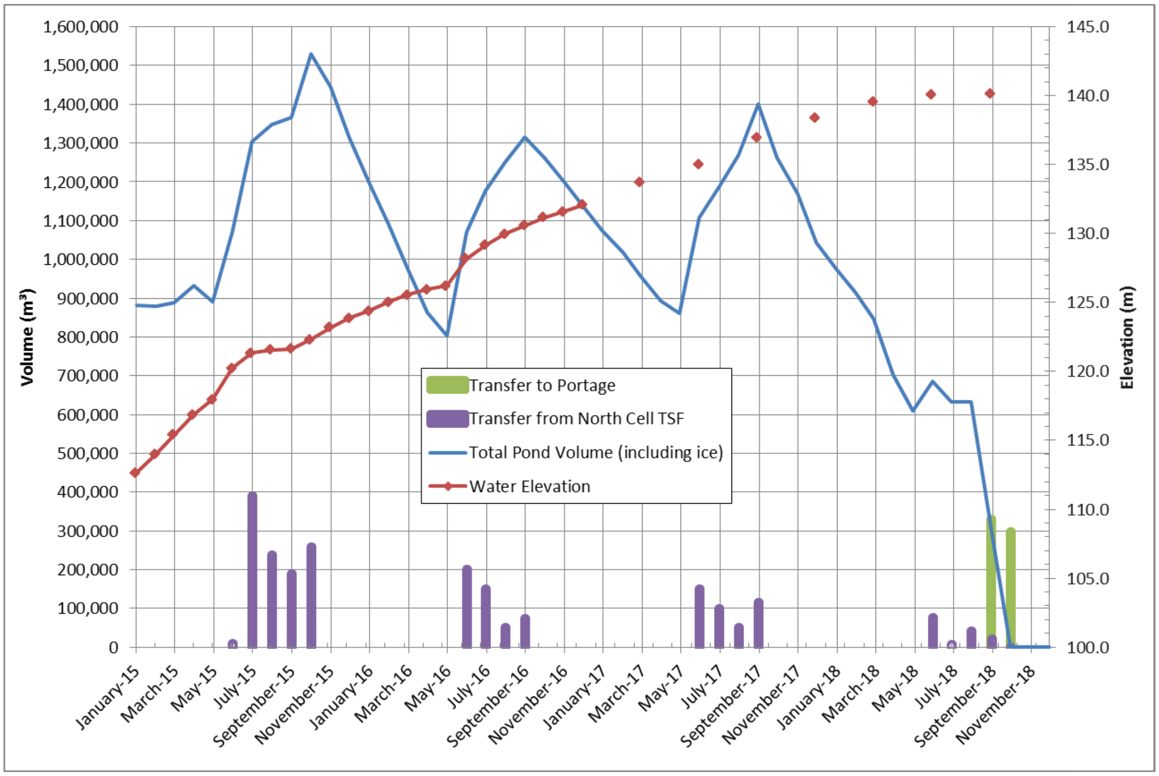
North Cell. Remediation on the North Cell ditches was completed last year to prevent any elevated TSS from reaching Third Portage Lake.

Figure 3.2: North Cell TSF – Reclaim water volume, elevation and transfer



The South Cell TSF water management is based on same principles as the North Cell. Figure 3.3 shows the projected water elevation and volume from 2015 through to mine closure in Q3, 2018. The freshet periods of 2016 and 2017 are represented by two peaks on the volume curve. After the summer of 2017, the reclaim water volume will decrease slowly until the tailings deposition is completed. All water transfers as per the water management plan and water balance are also included in the graph. Some water will need to be transferred to the Portage Pit at the end of the deposition (cessation of mine and mill operation) to properly dewater the tailings pond for closure capping. Those reclaim water transfers are included in the pit flooding process. The impact on final pit water quality is considered in the yearly water quality forecast model prepared by SNC (Appendix C).

Figure 3.3: South TSF - Reclaim water volume, elevation and transfers



3.1.3 <u>Mill</u>

The LOM figures depicted in Table 2.3 were used to calculate the monthly mill throughput. Based on this, AEM has determined the historical average ore moisture content associated with the mill feed which represents this source of water within the water balance. Table 3.3 illustrates the average moisture content over time until closure. The forecasted average moisture content for 2016-2018 is the average of the measured volume of 2013 to 2015. The moisture content calculation is also an important factor used to calculate tailings storage capacities. Note that the moisture content is established as a percentage of mill throughputs. This means, for example, that for the total 2016 planned mill feed of 4,008,134t with an average 0.99% of moisture, 41,891m^3 of water content in the ore is considered.

Table 3.3: Monthly average moisture content at the mill

Month	Observed Average Moisture Content (%)
January	0.98%
February	1.53%
March	1.04%
April	1.09%
May	1.08%
June	0.99%
July	1.30%
August	0.98%
September	0.89%
October	0.99%
November	0.72%
December	0.93%
Average	0.99%

3.1.4 North Cell

The North Cell TSF has been in operation since January 2010. Deposition ceased temporarily in the North Cell in November 2014 as the South Cell TSF became operational. Tailings deposition resumed in the North Cell from June to October 2015 to accomplish summer deposition as part of the closure of the North Cell (fill to final design elevation). Progressive closure and capping of the North Cell TSF started in winter 2015 (January to April) with the placement of 592,258 tonnes of NPAG and will continue to occur progressively during operations depending on material availability. As per the design specifications and regulatory requirements, the level of the North Cell reclaim pond must be maintained with a two meter freeboard, with the peripheral structures which are at 150.0masl elevation. For the North Cell the reclaim water must respect a maximum elevation of 148.0masl. 1,085,614m^3 of water from the North Cell was transferred to the South Cell reclaim pond during the final deposition period from June to October 2015.

3.1.5 South Cell

The South Cell area was, prior to the November 2014 commencement of tailings deposition, the mine site attenuation pond (known as the Portage Attenuation Pond). The attenuation pond was designed to contain mine contact water as well as freshet runoff and was discharged to Third Portage Lake via the Water Treatment Plant (WTP) in accordance with the Water License and MMER. In May 2015, AEM proceeded with the dismantlement of the Portage WTP as no more additional water is planned to be discharged into 3rd Portage Lake through the mine life. As presented earlier, AEM adapted its water management strategy to reduce freshwater consumption by directing runoff water into the South Cell for reclaiming. At closure, runoff water will be collected in the Goose and Portage Pits as part of the pit flooding process. The South Cell TSF commenced operation in November 2014 and will be receiving tailings from the mill until end of production in October 2018. Closure and capping will be finalized during the closure process.

No tailings were deposited in the South Cell during the summer 2015 (June 2015 – October 2015) in order, as mentioned, to finalize deposition in the North Cell. The water transfers, that will be discussed later, and water management strategies within the water balance reflect the tailings deposition plan presented in the 2015 Mine Waste and Tailings management plan (AEM, 2015).

3.1.6 Portage Pit

The Portage pit incorporates all sub-pits (A, B, C, D & E) and their associated pushback areas. Currently, Portage Pit contains a central waste rock storage area which extends from Pit C to D with a second section located in Pit B. The Portage Pit natural inflow has been revised from the 2012 SNC Water Management Plan (SNC, 2013) with measured on site data from 2013 to 2015. This inflow includes runoff water, groundwater and the part of the East Dike seepage water which is now mainly pumped back to Second Portage Lake. Field observations revealed an inflow observed originating from the bottom benches of Pit C and D. Since these areas are completed and backfilled with rockfill, water can accumulate in the rockfill porosity voids thus leading to a reduction in Portage Pit water outflow. AEM believes that the water inflow is filling up the porosity voids of the Portage Central Dump to some extent. It is anticipated that additional inflow could occur at the bottom of Pit A and E as there will be an increased hydraulic gradient compared to the surrounding water (from possible GW and surface water from Second Portage Lake). Furthermore, water inflows were observed from the Pit E south wall during the year 2015. A major rockfall occurred in September 2015 which was related in part to the talik conditions and to the shear zone observed on this wall. Until pit flooding operations commence in 2018, all water pumped from the Portage Pit area will be pumped to the South Cell to supplement reclaim water. Once pit flooding starts, the pumping systems will be decommissioned and replaced by the infrastructure required for the pit flooding process. Refer to Section 3.3 for the pit flooding activities description.

3.1.7 Goose Pit

Mining in the Goose Pit was completed in April 2015. The inflow values have been revised from the 2012 SNC Water Management Plan (SNC, 2013). Namely, it was observed that the pit inflow diminishes during the winter due to the freezing of the pit walls. The volume cannot be measured but is reconciled in the water level once melting occurs during the summer. The values for the 2016 Goose pit inflow have been adjusted based on SNC revised run off inflows (SNC 2013) which are within an acceptable range compared to the measured pit inflows of 2014 and 2015. A further revision of SNC's inflows will occur when AEM completes the 2016 Goose pit water elevation survey. When referring back to the initial estimates originating from the 2012 SNC Water Management Plan (SNC 2013), an increase was observed in the water inflow during the mining of the bottom benches of Goose which could be attributable to an increased hydraulic head as vertical mining progresses. No more water is pumped from Goose to the South Cell as the mining of this pit is completed and the inflows (runoff and groundwater) will be collected in the pit as part of the pit flooding process. Global changes in the TSF management have resulted in a slight increase of total water volume to be transferred to the pits at closure which is the reason for no additional Goose water transfers to the TSF during operations. As mentioned previously, AEM has monitored (and will continue to do so) the flooding rate since Goose Pit mining was completed.

A total of 330,526 m³ of runoff and groundwater inflows were stored in the pit in 2015 and, as mentioned, another 50,431 m³ from the Central Dike seepage was transferred in September 2015 (due to the South Cell steady state pumping test approved by the Meadowbank Dike Review Board - MDRB). The Central Dike Downstream Investigation – High level water quality assessment memorandum (SNC, 2015) presents the impact study performed by SNC-Lavalin prior to performing the transfer. The objective of the test was to determine the ratio of South Cell water flowing into the Central Dike seepage collection area at the downstream toe of the dike. Refer to Section 3.3 for the pit flooding activities description and to 3.1.10.4 for Central Dike seepage.

3.1.8 Vault Pit & Phaser Pit

In 2015, the footprint of the Vault pit was extended following the new LOM. This footprint extension required AEM to review the water management of the Vault Attenuation Pond and change the maximum operation elevation of the different ponds. As mentioned, the Vault Attenuation pond is divided in four different ponds as show on Figure 2.7. Specifically, it was observed that the elevation of water in Pond D rising above 134.3masl would overflow through the pit ring road and into the pit. During the winter 2016, AEM plans to construct a new sump in the Vault Pond D to increase storage capacity to prevent any overflow.

For the past three years, the discharge of the Attenuation Pond water to the Wally Lake has been undertaken without treatment as the water quality has met Water License and MMER criteria. In 2015, 1,065,433 m^3 was discharged from the Vault attenuation (Pond B and C) to Wally Lake.

During the summer 2016, AEM plans to dewater Phaser Lake, once approved by regulatory agencies. A total of 939,136m^3 of water will be discharged to Wally Lake in 2016. This amount includes the Phaser Lake water (558,511m^3), which will be transferred to the Vault Attenuation (Pond C) and then pumped from the Attenuation Pond to the Wally Lake. The Water Treatment Plant will be utilized, if necessary. By doing so, AEM will reduce fuel consumption required for Phaser Lake dewatering.

3.1.9 Water Transfers

Water transfers from various locations around the site are required to reduce freshwater consumption, optimize basin storage, optimize the water balance in general and maintain the good working order of the different facilities around the mine site. They are also required to prevent off site environmental impacts.

3.1.9.1 TSF Water Transfers

In order to optimize the tailings deposition sequence, maintain an adequate reclaim pond (operating volume, dike structure protection and water quality), minimize freshwater consumption and perform closure of each cell, water transfers within the tailing storage facilities and pits are required throughout their operating life. As seen in Table 3.4, water transfers from the North Cell to the South Cell TSF were required during the last phase of deposition in the North Cell due to the reclaim system being located in the SC. Also, additional water from the Stormwater Management Pond (SMP) was transferred to the South Cell TSF in 2015. The 2015 Water Management Plan included Central Dike seepage, Interception Sump, WEP and ST-16 water as inflows into the TSF. All these transfers were recorded in order to improve accuracy of the water balance and maintain adequate reclaim pond levels. These transfers are now planned through time until end of operation. Regular transfers from SMP take place twice yearly from 2016 and ending in 2018. These transfers ensure there is always capacity in the pond to contain freshet water as well as the onsite Sewage Treatment Plant effluent. Once both TSF's are closed, the transfers from SMP will be directed to the Portage Pit until camp closure in 2024 to play part in the pit flooding process. In 2016 and 2017, water transfers from the North Cell towards the South Cell are required for adequate operation and closure of the North Cell. In 2018, water transfers from the South Cell to the pit (Portage) are undertaken to close this TSF.

The diversion ditches (East and West), located around the perimeter of the North Cell TSF and the Portage RSF, are designed to collect the non-contact water runoff from the surrounding water shed. The ditches are divided in two sections – the west and east sections, to divert non-contact water respectively to Third Portage Lake and to NP1 Lake. On the west end of the diversion ditches, an interception sump was constructed in March 2014 and was completed in 2015. The interception sump has been put in place mainly to control the water quality, in terms of total suspended solids. The interception sump aims to collect runoff water from the west section of the diversion ditches and to retain it until the total suspended solids have reached the criteria allowing discharge to the environment. In 2015, some of the water in the interception sump needed to be transferred to the North Cell TSF as the discharge criteria was not met and water level in the sump was too high. AEM plans, as per the water balance to pump until end of mine life the entire water accumulation from the Interception Sump into the North Cell. This was done in order to plan the maximum transfers required from North to South Cell and to properly design the required pumping station. However, AEM will promote natural drainage into 3rd Portage Lake as much as possible to reduce the overall pumping activities on site.

The Central Dike seepage is included in the water balance in accordance with the 1:1 ratio (South Cell reclaim water on seep water) based on the conclusion of the steady flow test performed during the 50,431m^3 water transfer to Goose Pit in October 2015. However, at the end of each month, the volumes pumped back from the D/S seep location to the SC are accounted for and it is compared to the seep volumes leaking out of the South Cell. The seep volumes are calculated through a mass balance and since it is the only unknown element of the SC system, the volume is derived from the actual SC surveyed water elevation. The actual real ratio is monitored through time and will be used to validate or change the 1:1 ratio currently used if deemed significantly different. Furthermore, the seepage flow is expected to diminish as the buildup of the beach will allow for diminished flows.

Table 3.4: TSF water transfers

Year	TSF Water Transfers - During Operations									
	North Cell to South Cell (m^3)	SMP to South Cell (m^3)	SMP to Portage (m^3)	South Cell to Portage (m^3)	South Cell to Goose (m^3)	Interception sump to NC (m^3)	WEP to NC (m^3)	ST-16 to NC (m^3)	CD D/S pond to SC (m^3)	SC to CD D/S pond (m^3)
2015	1,085,614	53,394			50,431	171,214	15,569	19,236	2,904,219	2,572,663
2016	475,000	34,770				171,214	15,569	19,236	**1:1 *ratio assumed***	
2017	415,053	34,675				171,214	15,569	19,236	**1:1 *ratio assumed***	
2018	148,451	34,675	34,675	626,978					**1:1 *ratio assumed***	
Total	**2,124,118**	**157,514**	**34,675**	**626,978**	**50,431**	**513,642**	**46,707**	**57,708**		

3.1.9.2 Portage Water Treatment Plant

In May 2015, the Portage water treatment plant (WTP) was dismantled as no more transfers from the former Portage Attenuation Pond will need to be treated and discharged into 3rd Portage Lake.

3.1.9.3 Vault Treatment Plant

In 2015, the Vault WTP was not required to remove TSS as the water met discharge criteria stated in the Water License as well as MMER criteria. The Vault Lake is divided into 4 different zones, see figure 3.4, and has now become the Vault Attenuation Pond as Vault Pit contact water and runoff from the Vault RSF area is pumped to the pond. AEM does not expect to utilize the Vault Treatment Plant for the dewatering of Phaser Lake and Vault pit contact water prior to discharge in 2016 as water quality and management experience of the two previous years indicate that suspended solids settlement occurs in the Vault Attenuation Pond prior to discharge. As mentioned, Vault WTP will be ready to use if necessary.

AEM has applied to the Nunavut Water Board (NWB) for a modification Type A Water License for the dewatering of Phaser Lake. Phaser Pit mining is planned to start during winter 2017-2018. A supplementary pit known as BB Phaser Pit is not yet included in the LOM however AEM expects it to be added in the next LOM. AEM has included estimated water volumes associated with the dewatering of Phaser Lake in this plan. See Table 3.5 and section 3.1.8.3 below for details of the proposed Phaser Lake dewatering. The Wally Lake Annual Discharge column presented in the table 3.5 shows the potential maximum volume of water that could be treated with the Vault treatment plant (if necessary) until end of operations.

Figure 3.4: Vault Attenuation Pond

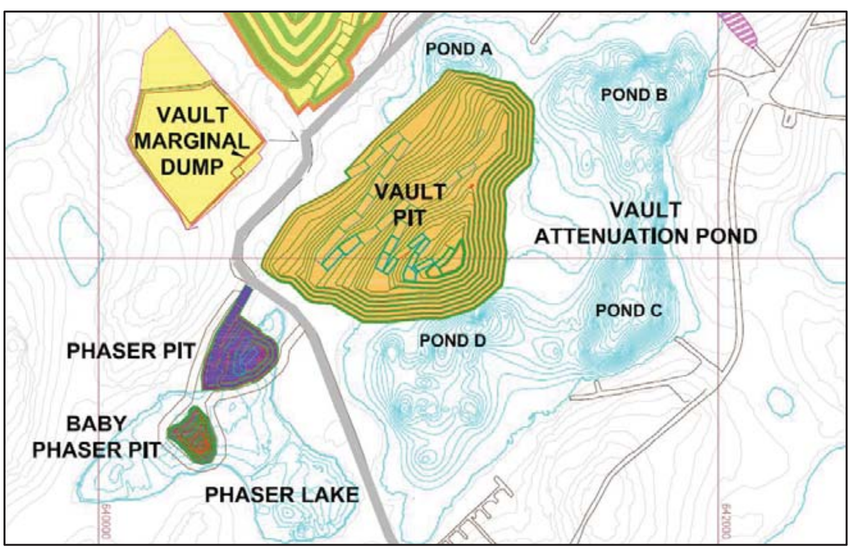


Table 3.5: Wally Lake annual discharge

Year	Wally Lake Annual Discharge (m^3)
2015	1,065,433
2016	939,136
2017	552,094
2018	380,625
Total	**2,937,288**

3.1.9.4 Phaser Lake dewatering (Proposed)

Phaser Lake is a small, shallow lake located south of Vault Lake beside the Vault haul road, as shown on figure 3.4. In the current version of the Life of Mine (LOM), Phaser Pit is proposed to be mined during the period from 2017Q3 to 2018Q3. Upon receiving approval from the NWB and other regulators (NIRB, DFO) AEM will proceed to dewater Phaser Lake to allow mining the Phaser Pit. Fish out procedures would occur prior to dewatering in accordance with DFO requirements. A volume of 558,511m^3 of water will be pumped to the adjacent Vault Lake ATP. This will then be discharged from the Vault ATP to Wally Lake via the WTP, if required, in accordance with the Water License and the MMER.

General dewatering schedule of Phaser Lake is divided in three phases presented below:

Dewatering Phase 1 – July to August 2016
- Fishout begins early July 2016;
- First phase of dewatering will start by pumping 325,000m^3 of water from Phaser Lake to the Vault ATP in August 2016.

Dewatering Phase 2 – September 2016
- Fishout is completed within three small basins at the end of August 2016;
- Water level is dropped to elevation 137.4masl by removing 120,00m^3 of water.

Dewatering Phase 3 and 4 – September to October 2016
- Complete the dewatering by pumping an additional 113,511m^3.

3.1.9.5 Stormwater Management Pond

The Stormwater Management Pond is a small shallow and fishless, water body that can be seen in Figure 2.2 adjacent to Portage Pit. Treated sewage effluent is discharged to this lake before being transferred to the active TSF (South Cell). The pond also collects freshet flows within its catchment area. The pond water is transferred two times per year during the warmer months – once in the spring and once in the fall with the total flow volume forecasted as being 34,675m^3. This represents less than 1% of the total inflow to the TSF. It should be noted that in 2015, a larger volume of 53,394m^3 was pumped to the SC TSF as runoff inflows were greater than planned during freshet.

3.1.1 Seepage Collection Systems

3.1.10.1 Mill Seepage Collection system

In November 2013, AEM observed seepage discharging west of the access road in front of the Assay lab shown on figure 3.5. After an investigation, which included initial sampling, drilling of wells and monitoring, contaminants, namely cyanide and copper were identified. The source was determined to be leaking from internal containment structures within the mill. Third Portage Lake (3PL), approximately 200 m to the west, was identified as a possible sensitive receptor. Remedial measures were undertaken immediately and this included construction of an impermeable interception/collection trench downstream of the seepage flow path. A comprehensive monitoring network and plan was implemented which included installation of monitoring wells, a recovery well (MW 203) and a sampling program (including Third Portage Lake). To date no contaminants have been detected in 3PL. Repairs (sealing) were completed within the mill (containment structures) in 2014 to eliminate the source of contaminants. Seepage collected in the trench and recovery well is pumped back to the mill to be used as process water (much the same as reclaim water from the TSF's). The pumping occurs in the warmer months beginning when freshet commences. The recovery well is pumped year round. No flow of water has been detected during winter months in the trench. (See Freshet Action Plan – Appendix D) Table 3.6 shows the pumped volumes for 2015. AEM observed that the flow to the trench increased in 2015. This volume is related to the high precipitation received during summer 2015 and a higher freshet volume (snow). In December 2015, no seepage was observed or pumped from the recovery well (MW-203 frozen/dry) which supports the assumptions (seepage volumes will diminish and concentrations of contaminants will decrease) of the seepage source and the efficiency of the remediation completed in 2014.

Figure 3.5: Mill Seepage Area

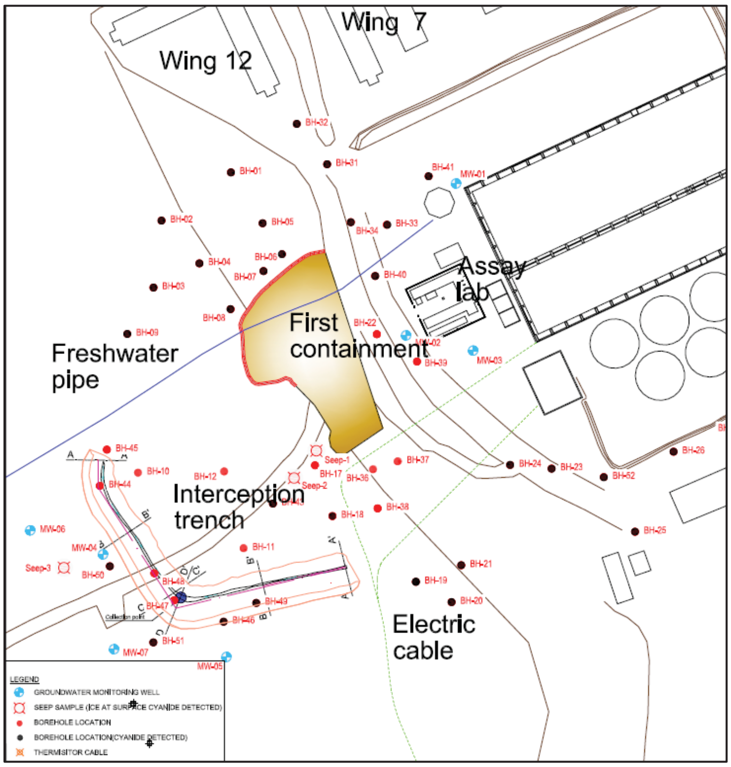


Table 3.6: Mill Seepage 2015 pumped volumes

Month	2015 Mill seepage pumped volumes back to the mill (m^3)
January	871
February	306
March	500
April	680
May	347
June	10,803
July	6,633
August	4,467
September	4,584
October	1,188
November	164
December	0
Total	**30,543**

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3.1.10.2 ST-16 RSF Seepage management

Refer to the Freshet Action Plan (Appendix D) for the history, long term monitoring plan and remedial actions for this seepage location. A pumping system installed in 2014 is still in operation. Contaminated seepage was monitored in accordance with the Freshet Action Plan and 19,236m³ was pumped back to the North Cell TSF in 2015. Table 3.7 presents the volume of water pumped back to the North Cell TSF from the ST-16 location. There was a lower volume observed in 2015 (19,236m³), compared to 2014 (32,169m³), even with high precipitation observed through summer, which supports the assumption that the seepage flow reduced due to the sealing of the RF-1 perimeter road by placement of the tailings beach in front of RF1 and RF2. This assumption is also supported by the low contaminants levels observed by the sampling program (refer to Appendix D - 2015 Freshet management plan for more details).

Table 3.7: ST-16 RFS Seepage 2014 pumped volumes

Month	2015 RSF seepage pumped volumes back to NC TSF (m³)
January	0
February	0
March	0
April	0
May	1,625
June	10,832
July	3,414
August	1,365
September	2,000
October	0
November	0
December	0
Total	**19,236**

3.1.10.3 East Dike Seepage Collection

As previously stated, the East Dike Seepage Collection system collects seepage originating from Second Portage Lake (2PL). Seepage from 2PL traverses through the East Dike in two discrete locations and is collected and discharged back, as a combined flow, through a diffuser, to 2PL (in accordance with the Water License and the MMER). Once mining of South Portage Pit area is completed, the East Dike seepage will remain in the Portage Pit as part of the pit flooding operations (closure plan). The monthly flow observed in Table 3.8 indicates the 2015 monthly volume discharged to 2PL. If water quality does not meet license or MMER criteria, due to increased TSS during freshet period and large precipitation events in summer, the seepage water is pumped to the mined out areas of the Portage Pit. This explains the low flow values to Second Portage during summer time. The total volume returned to Second Portage Lake in 2015 was 169,585m^3. During summer, lower transfer volumes are regularly observed.

As stated in section 2.2.1 and above, if the seepage does not meet criteria, the discharge is redirected toward the Portage Pit, specifically in the Portage Central Waste Rock area, where the water flows through the deposited rock of the Portage Central Dump. The "voids" in the rock store some of this water; any remaining flows to the two sumps located at the toe of the Portage Central Dump (which are respectively named sampling locations ST-17 and ST19). From this point, the water is considered Portage Pit inflow regardless of the proportion coming from East Dike Seepage as it is mixed with contact and groundwater –if any. Any water collected in these sumps is pumped to the South Cell. Those volumes are recorded.

Table 3.8: East Dike Seepage 2015 pumped volumes

Month	2015 East Dike seepage pumped volumes back to 2PL (m^3)
January	15,270
February	14,119
March	16,918
April	16,918
May	12,755
June	10,367
July	0
August	15,359
September	18,792
October	17,959
November	15,917
December	15,211
Total	**169,585**

3.1.10.4 Central Dike Seepage

Once tailings deposition started in the South Cell – November, 2014 – daily inspections of the downstream toe of Central Dike were undertaken as part of the geotechnical inspection program. A small volume of water located against the downstream toe of Central Dike was noticed at that time. This water was contained between the West road and the Central Dike downstream toe. AEM utilized piezometers, thermistors and a ground water well to monitor the dike integrity, the foundation temperatures and the piezometric levels within the structures and its foundation.

On April 14th 2015, AEM started pumping at the D/S toe of the dike to lower the water level. The water was pumped back to the South Cell TSF. Water quality was closely monitored to foresee any changes from initial conditions in terms of turbidity and clarity. A flowmeter was also installed to monitor the volume of water pumped. By of July 7th, pumping was still on going with a larger pump. The water quality (clarity/turbidity) at the D/S toe is also visually assessed by the Engineering technical personnel during their daily inspection.

Monthly samples are collected as per the Water license and include analysis for metals, cyanide and major anions. The concentration of some parameters, namely copper, cyanide, sulfates, to name a few, confirms a link between the water ponding at the D/S and the SC reclaim water. Additional to the steady flow test, SNC performed two specific chemical mass balances to evaluate the ratio of reclaim water, ground water and runoff in the water pumped from the Central Dike D/S pond back into the South Cell TSF (SNC, 2015). A transfer to Goose Pit was also done to evaluate the same ratio by monitoring the drawdown in the South Cell during the transfer. SNC identified that 50,000 m^3 of seepage transfer from the downstream toe to Goose Pit was possible without compromising water quality at closure (using CCME guidelines for the protection of aquatic life). Appendix F presents the memo from SNC. The 1:1 ratio was confirmed by this test which meant that the seepage water source was the South Cell reclaim water.

A series of pumping tests were also performed by AEM during the summer 2015 to measure the seepage flow according to the head pressure difference between the South Cell and the Central Dike downstream pond (sampling location STS-5) where seepage water is collected and pumping infrastructure redirects this seepage water back to the cell. This information has been used by Golder to review the Central Dike seepage model and for a report issued in November 2015, presented in the Appendix G. In September 2015, mitigation measures were defined with the support of Golder and it was confirmed that the Central Dike could be operated safely under certain conditions. The MDRB also agreed to recommence the operations of the South Cell deposition and that no short term mitigation was required to be implemented. In early November, the downstream pond operational level was to be set at 115masl until summer 2016 following Golder’s recommendations (Golder, 2015). At the same time, a permanent and winterized pumping system was put in place to manage and track the water volumes through the winter. The deposition in South Cell TSF restarted on October 28th, 2015. Within two weeks the seepage flow dropped from 800m^3/h to 400m^3/h and has been stable since that time.

Table 3.9 presents the water pumped from the Central Dike D/S pond to the South Cell TSF in 2015. Golder seepage analysis suggests that the flow should drop lower in time as a result of the buildup of the tailings beach. Seepage flow should vary between 120 and 850 m^3/h until the end of the operation in the South Cell.

Table 3.9: Central Dike Seepage 2015 pumped volumes

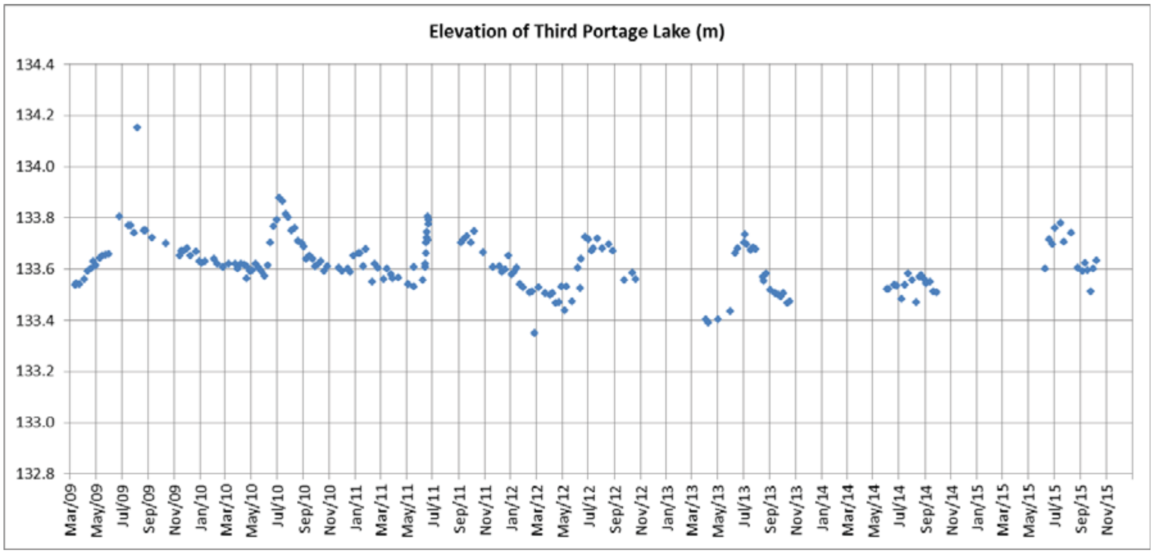
Month	2015 Central Dike seepage pumped volumes back to SC TSF (m^3)
January	0
February	0
March	0
April	22,185
May	66,794
June	251,541
July	498,141
August	589,190
September	392,244
October	458,572
November	337,878
December	287,674
Total	**2,904,219**

It should be noted that the assumed 1:1 ratio has been verified since the total pumped volumes are close to 3Mm^3 which is considerably higher than the 2015 total cell volume of 1,311,842m^3. If the ratio was not 1:1 there would have been a considerable variation in the South Cell TSF volume. The volume was stable and accounted for in the water Balance.

3.2 PIT FLOODING

The volumes of water needed for pit flooding, which is part of the overall closure plan, is dependent on the water elevation of 3PL. The Goose dike can only be breached when the level of the flooded pits reaches the same elevation as 3PL and pit water quality meets CCME/site specific criteria concentrations. According to 3PL elevation data from 2013-2015 this elevation would be 133.6masl. Figures 3.6 shows the elevation data recorded since 2009.

Figure 3.6: Distribution of TPL elevation surveyed data



The current flooding technique proposed for Portage and Goose Pits is to use a combination of pumps and siphons to achieve the pumping rates prescribed by the water balance which conforms to the approved volume stipulated in the Water License. Details of the complete flooding system will be available in the Final Reclamation and Closure Plan to be issued one year prior to closure. A total of 33.2Mm^3 will need to be transferred form 3rd Portage Lake to accomplish the required pit flooding for Portage and Goose Pits. As Goose Pit mining is completed, flooding of Goose Pit is planned to commence in 2016 with a transfer of 1.35Mm^3. Mining will cease in the Portage Pit around the summer of 2018. Pit flooding of the Portage Pit will then commence during that same summer. At water elevation 131.0masl both Portage and Goose Pits will join to become one waterbody. Reflooding will continue to the natural Third Portage Lake water elevation at approximately 133.6masl. At this level the dikes can be breached; however this is dependent on pit water quality. The current objective is to ensure the water meets CCME Guidelines for the Protection of Aquatic Life and/or site specific criteria for for parameters not listed in the CCME guidelines before the dike is breached. The first phase of the flooding sequence should be completed by the end of summer 2024. Four years of monitoring is planned at that point to evaluate the water quality in the pits. During this time, water runoff will be diverting into the pits to finish the flooding to the 3PL elevation. Breach of the dike is planned for 2029.

Prior to completing the capping of the TSF's, residual reclaim water in the South Cell (626,978m^3) will be transferred into the pits. The 2012 Water Management Plan (SNC, 2012) suggested to pump it in equal volumes to Goose and Portage Pits. Due to capping of the South Cell TSF planned to take place right after the end of mine operations in 2018 as well as the requirement to meet water quality criteria early in the reflooding process the current water management plan is to transfer the total amount of reclaim water to the Portage Pit in 2018. The treatment requirements of the reclaim water will be determined as per Meadowbank Water Quality Forecasting Update Technical Note rev. 00 completed by SNC (Feb, 2015 – See Appendix C) (a summary of the findings is also the subject of Section 4 of this report). This document predicts that copper, silver and total nitrogen may require treatment to reach CCME criteria based on the completely mixed assumption. Furthermore, Selenium needs close monitoring as it exceeds the CCME limits for Portage Pit but is slightly less than the CCME guideline in the completely mixed pits. Treatment may be conducted either as the water is discharged, by a water treatment unit, to Portage Pit or after (batch treatment). In 2016 a study as part of the closure plan is planned to be conducted to evaluate a 3rd option. The third option is to determine if the mill infrastructure could be modified to treat the effluent directly at the mill prior to discharge of the tailings to the South Cell. A final decision has not been made at this time but options are being evaluated; however AEM is committed to update the Water Quality Forecast Model, using up to date, year over year data, on a yearly basis until, and possibly after, the cessation of mine operations. The water split between Portage and Goose could also be revised in the future depending on mining plan updates and water balance changes.

To obtain a water elevation of 133.6m a total of 45Mm^3 of water will be required. As previously stated, 33.2Mm^3 originates from 3rd Portage Lake, and the 19.8Mm^3 balance will be made up from the natural pit water inflows including runoff and precipitation combined with reclaim water. The difference from the 2014 Water management plan is related to the capped TSF runoff water that will be transferred to the pits from 2019 until dike breaching in 2029. Note that AEM feels that this approach is conservative, with respect to TSF runoff, as water quality of the runoff should be able to be re-directed to Third Portage Lake five years after capping (2024) which is consistent with the initial function of the diversion ditch system (however please note that the runoff from the capped TSF’s will be directed to the pits until the water quality meets closure criteria). Please refer to Table 3.9 for the reflooding sequence per year for all pits.

Table 3.10: Pit flooding profile

Pit Flooding profile								
Year	Volumes pumped from 3rd Portage lake			Volumes pumped from Wally lake				Total flooding water (m^3)
	To Portage pit (m^3)	To Goose pit (m^3)	From 3PL (m^3)	To Vault pit (m^3)	To Vault Attenuation Pond (m^3)	To Phaser pit (m^3)	From Wally Lake (m^2)	
2016	0	1,350,000	1,350,000	0	0	0	0	1,350,000
2017	0	900,000	1,350,000	0	0	0	0	1,350,000
2018	3,000,000	941,614	4,350,000	0	0	0	0	4,350,000
2019	4,520,000	0	4,350,000	4,182,604	0	0	4,182,604	8,532,604
2020	4,520,000	0	4,520,000	4,182,604	0	0	4,182,604	8,702,604
2021	4,520,000	0	4,520,000	4,182,604	0	0	4,182,604	8,702,604
2022	4,520,000	0	4,520,000	4,182,604	0	0	4,182,604	8,702,604
2023	4,520,000	0	4,520,000	4,182,604	0	0	4,182,604	8,702,604
2024	4,374,649	0	3,686,264	4,182,604	0	0	4,182,604	7,868,868
2025	0	0	0	2,955,472	314,194	0	3,269,666	3,269,666
Total	**29,974,649**	**3,191,614**	**33,166,264**	**28,051,096**	**314,194**	**0**	**28,365,290**	**61,531,554**

As mentioned in the *document Water License: 2AM-MEA1525 Reasons for Decision Including Record of Proceedings* from the Nunavut Water Board and as prescribed in the Nunavut Water Board Water License No. 2AM-MEA1525 issued on July 23, 2015 (Part E, Conditions 1 and 2), the use of water from Third Portage Lake, for all purposes, including flooding of the pits, shall not exceed a total 2,350,000 m^3 per year from the License approval date to December 31 2017, followed by a maximum 4,935,000 m^3 starting in 2018 through to the expiry of the License 2AM-MEA1525. The use of water from Wally Lake shall not exceed a total 4,185,000 m^3 per year starting in 2018 through the expiry of the License 2AM-MEA1525. As per the recommendations and requirements concerning the water use, the Meadowbank Water Management Plan will be updated on an annual basis. The Water Management Plan includes a pit flooding strategy meeting the requirements outlined in the Nunavut Water Board Water License No. 2AM-MEA1525.

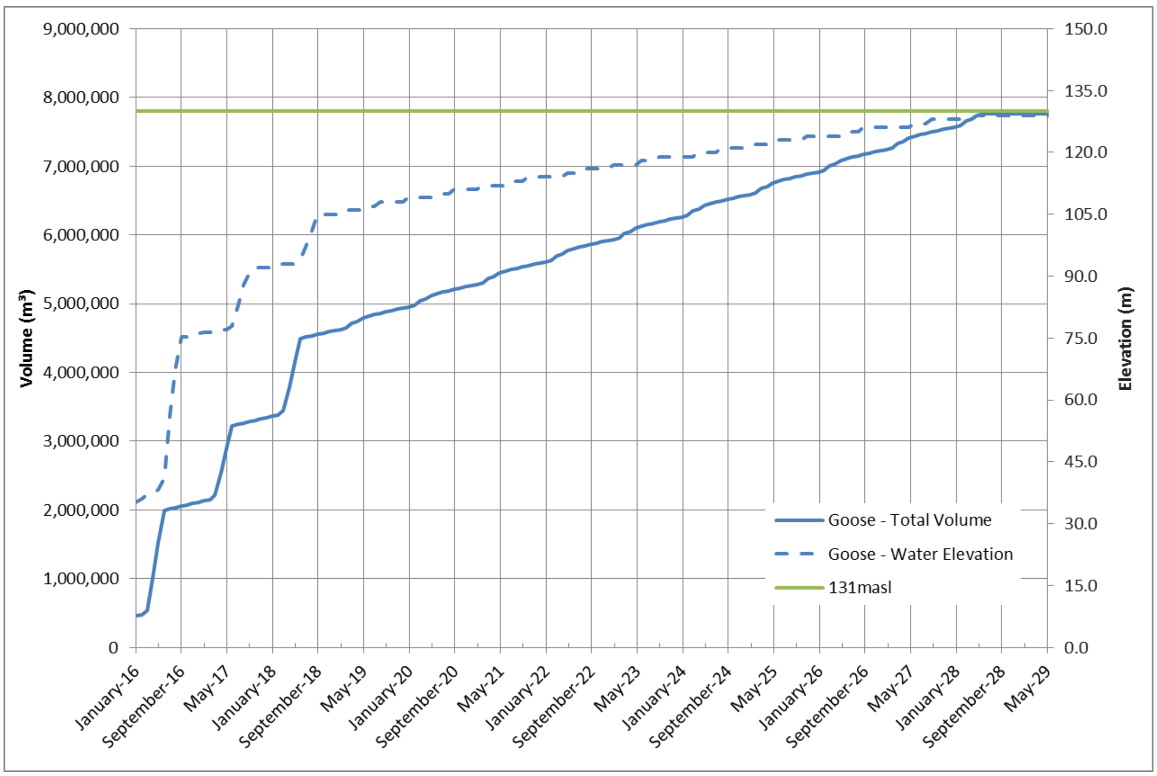
AEM will provide at least 30 days notice to the Nunavut Water Board and Inspector prior to starting the flooding of each pit from water obtained from Third Portage Lake and Wally Lake.

3.2.1 Goose pit flooding

Goose pit flooding started in 2015 by allowing the annual inflow volume (runoff, groundwater, precipitation and possible Bay Goose dike seepage) of 383,800m^3 to remain within the pit. In the summer 2016, transfers from 3PL to Goose Pit are planned to commence. Once elevation 131.0masl is reached, the Goose water will join the Portage Pit water to form one water body. This is planned by September 2024 according to figure 3.8. Figure 3.7 depicts the Goose Pit flooding curve. Artificial flooding – From 3PL – will end in September 2018 after which natural pit inflow as well as Portage flooding over 131masl (when two pits join) will allow for the level to reach the 3PL lake elevation in 2029. If water quality meets all closure criteria including CCME guidelines and site specific criteria, the Goose dike will then be breached. Refer to Section 4 for the pit water quality forecast model.

When interpreting figure 3.7, it should be noted that it appears that Goose Pit never reaches 133.6masl, however, Goose Pit volumes between 131masl and 133.6masl are included as part of Portage flooding volumes.

Figure 3.7: Goose pit flooding

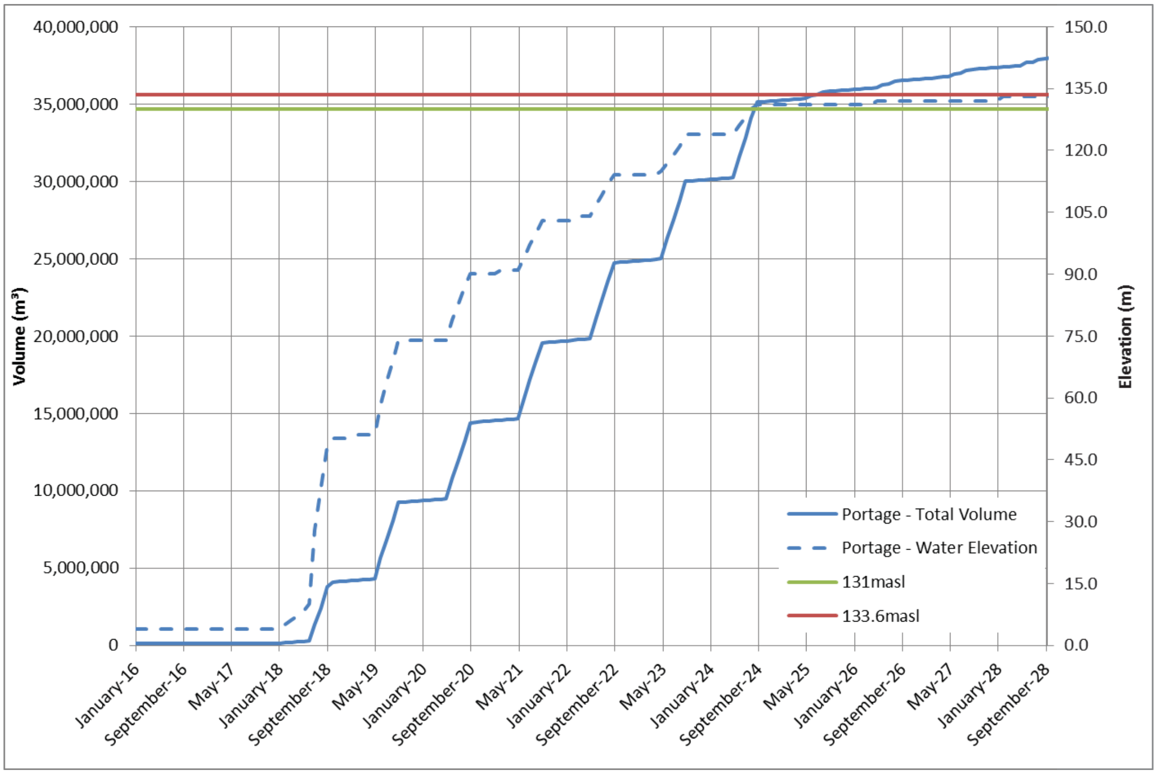


3.2.2 Portage pit flooding

Portage Pit reflooding will begin in 2018 with a 3Mm³ transfer from 3rd Portage Lake to the Portage Pit. From 2019 to 2023 inclusively, 4,5Mm³ will be transferred each year. In 2024, an additional 4.4Mm^3 will be required to complete the total artificial flooding to elevation 131masl. From this point, runoff water and other pit inflows will be used to complete flooding of both pits until elevation 133.6masl is reached at the end of 2028. See Figure 3.8 to view the pit reflooding curve. Refer to Section 4 for the pit water quality forecast model.

Again, as mentionned in the above section 3.2.1, for model simplification purposes the portion of Goose between 131masl and 133.6masl is included in the Portage Pit volumes.

Figure 3.8: Portage pit flooding

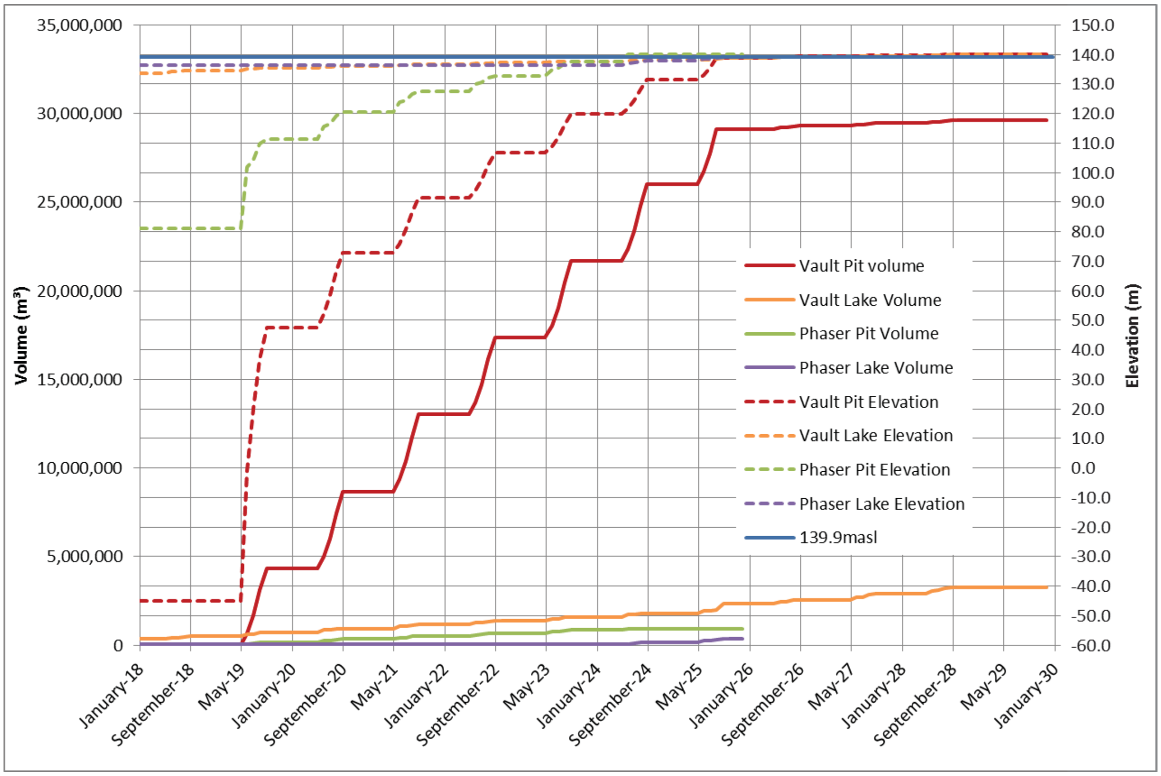


3.2.3 Vault pit flooding

The Vault pit area is composed of many basins in the former lake and different pit elevations that are all linked togheter. The flooding of Vault and Phaser (once approved) is more complex and requires water transfers from basin to basin. Reflooding from Wally Lake of the Vault area will commence in 2019 and will continue until the end of summer 2024 at an annual rate of 4,182,604m^3 and finally 2,955,472m^3 in 2025. Like Portage and Goose, from 2025 – 2029 the natural inflow will then allow Vault pit to reach 139.9masl (natural Wally Lake water level). The reflooding of Vault area with with natural inflow consists of approximatively 500,000m^3 yearly from freshet, precipitation, groundwater inflow. The flooding curves for the Vault area are represented in figure 3.9. The final elevation of the reflooding will be 139.9masl for Phaser and Vault Lake. At this point the Vault dike will be breached provided the water meets CCME criteria and/or site specific criteria for parameters not included in the CCME Guidelines. Refer to table 3.9 for the yearly cumulative volumes required to complete the flooding process as well as the resulting pit elevation. Refer to section 4 of this present report for the pit water quality forecast model.

Unlike Vault Pit, Phaser Pit and Lake are planned to be flooded exclusively from their watershed run off inflows until the target elevation of Wally is reached in summer 2027. From there, those same inflows will be used conjointly with the Vault ATP inflows to flood to the same target elevation as the Vault ATP area – 139.9masl (Wally Lake level).

Figure 3.9: Vault and Phase pits flooding



It should be noted on figure 3.9 that Vault Lake area is equivalent to the Vault ATP referring to ponds A,B,C and D in terms of appellation.

3.3 WATER MANAGEMENT STRUCTURES

As per the recommendations and requirements outlined in the document *Water License: 2AM-MEA1525 Reasons for Decision Including Record of Proceedings* from the Nunavut Water Board and as per the Water License 2AM-MEA1525 (Part E, Condition 10) AEM will conduct weekly inspections of all water management structures during periods of flow. This program will commence in 2016 however it should be noted that weekly inspections are already undertaken as per the Freshet Action Plan (Appendix D) at water conveyance structures during flow periods. Records of the inspections will be available for review by an Inspector upon request.

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Section 4.0 - MEADOWBANK WATER QUALITY FORECASTING UPDATE

The water quality forecast report was prepared by SNC Lavalin (SNC, 2016) and is a continuation of a series of yearly water quality modelling forecast reports that commenced in 2012 and will continue until mine closure as per the Water License part E item 7. The purpose is to identify through a mass balance approach the contaminants of concern during the pit flooding process and determine if water treatment will be required on site for closure activities when comparing the final contaminant levels to the CCME guidelines and/or site specific criteria for parameters that are not included in the CCME Guidelines. Each yearly update builds on the previous year as new monitoring data is added at the site. Forecasted model values of the prior years are compared with the actual sample results from the following years for model calibration purposes. SNC identified 3 contaminants in their 2016 report: copper, silver and total nitrogen as parameters of concern that may require treatment. In addition selenium is slightly elevated above the CCME guideline in Portage Pit but below when Portage and Goose are combined as a mixed system. For this reason, selenium will be monitored closely. As the aforementioned parameters may be of concern prior to dike breaching, treatment options for their removal during or after the pit flooding process will need to be examined and will be assessed in greater detail during the preparation of the final closure and reclamation plan which will be submitted one year prior to the end of operation. These contaminants originate from the TSF reclaim water when transferred to the pits in 2018 as outlined section 3.2. AEM is committed to implementing the recommendations provided in the SNC Water Modelling Report in 2016 and beyond. These are:

- In addition to the current set of chemical analyses, regular (at least monthly) monitoring of all inflows and outflows of the North and South Cells TSF Reclaim Pond for cyanide, total and dissolved copper, total and dissolved iron, ammonia, nitrate, chloride, total and dissolved silver, total and dissolved selenium, sulfates and total dissolved solids (TDS) should be undertaken.

- Regular monitoring of pit water quality (Portage and Goose) should also be undertaken, when the site can be safely accessed and analyzed for Total Suspended Solids, Total Dissolved Solids, chloride, sulfates, sodium, as well as a total and dissolved metal scans. This information will be useful in developing a water quality forecast model of the pit water quality based on loadings from surface runoff and possible underground water infiltration.

- Once transfer of South Cell Reclaim water begins to the Portage Pit (September 2018), regular (at least monthly) monitoring of all outflows of the TSF Reclaim Pond for all parameters should be undertaken.

- Sample and analyze the North and South Cell TSF Reclaim Pond at different depths and locations to determine if there is a concentration gradient in the Reclaim Pond.

- Continued monitoring of the water in the South Cell TSF Reclaim Pond in 2016 on a regular basis to monitor the evolution of the parameters of concern listed in section 2.2.1. It is understood that this recommendation is required as per the water license.

This version of the Meadowbank Water Management Plan Report as part of the Meadowbank Annual Report 2015 includes the updated water quality model and the comparison of predicted and measured water quantity and quality.

The 2015 Water Management Report, Appendix C, SNC Water Quality Modeling Report contains a section on water treatment options. Over the next year AEM will assess these options, including the 2016 forecast model to determine an appropriate path forward. This information will be included in the Final Closure and Reclamation Plan which will be submitted to the NWB one year prior to closure as required.

Section 5.0 - 2015 INTEGRATED DEPOSITION PLAN

A Tailings Deposition Plan prepared by AEM has been used to update last year's model. As stated in the water management strategies, the important milestone for 2015 was the addition of one year of deposition following the new LOM and also the implementation of new targets regarding the free water availability during winter in order to reduce the impact of the climate on the ice entrapment. The 2015 bathymetry was compared to the 2013 and 2014 bathymetries. The findings revealed that deposition in the South Cell during the winter 2015-2016 was much more efficient than expected. Average tailings dry density measured was up to 1.45t/m³ instead of the average of 1.28t/m³ observed in the North Cell during previous years. Based on this new information AEM reviewed the tailing deposition strategy and implemented a new guideline in order to improve the efficiency of the tailings deposition and reduce the operational risk. During the past winter, AEM has observed slurry channeling over the frozen tailings beach instead of beaching in front of the discharge point which is due to the beach geometry now protecting the upstream embankment of the Central Dike structure. It will be followed closely to make sure this poses no future constraint as far as reclamation of the mill process water within the cell. The new guideline consists of maintaining a free water volume at least two times larger than the sub-aerial tailings volume in the new deposition plan to ensure there is sufficient reclaim water volume until end of operations. With this new free water target, AEM expects that South Cell parameters of 2015 can be used to plan deposition for 2016-2017. North Cell parameters will be used for 2018 as they were considered representative of the tailings deposition occurring in a TSF pond at closure. A similar analysis will be conducted during the summer of 2016 in both cells to confirm this assumption. Closure water management for

TSF was updated as well to optimize the pit flooding process. Reclaim water transfers will be required yearly from the North Cell to the South Cell and then to the Portage pit (in 2018). This will occur until capping of the North Cell is completed to maintain the proper freeboard elevation in the reclaim pond. Once capping completion occurs, the same transfers will be done until dike breaching, however those transfers will originate from the capped TSF's run off which will differ in terms of quality (likely only TSS concerns) from the previous reclaim water transfers before the capping is finished. This deposition plan is presented in the Updated Mine Waste Rock and Tailings Management Plan 2015.

Section 6.0 - CONCLUSION

This report presents an updated/revised water management plan for the Meadowbank mine based on the AEM 2014 Water Management Plan submitted to the NWB as part of the AEM 2014 Annual Report. Validation and updates of the site parameters (i.e. runoff and pit inflows) was conducted in 2015. In addition further updates/modifications/revisions to the mine plan (LOM), site wide water management, tailings deposition plans and operating schedule were evaluated in preparing this report.

The water balance presented has been optimized to reduce freshwater consumption as much as possible and to minimize water treatment requirements at closure. The 2015 TSF bathymetries analysis reveal great performance regarding tailings dry density and beach angle in the South Cell. AEM adjusted the deposition strategy by implementing a guideline to improve the capacity of the Tailings Storage Facilities. Runoff water management was reassessed in a way to reduce the global freshwater consumption of the mill.

Phaser Lake dewatering (once approved by the NIRB and NWB) is planned in 2016 to allow mining of Phaser Pit from 2017Q3 to 2018Q3. Approximately 558,511m^3 of water will need to be dewatered after fishout has been undertaken. The current strategy is to transfer this water from Phaser to Vault ATP and then discharge to Wally with the current dewatering infrastructure already in place. Sequencing of the fishout and dewatering activities was presented and should occur from July to October 2016 pending approval.

Central Dike seepage was better understood and quantified during 2015. An equivalent of 2.9Mm^3 was pumped from the Central Dike D/S pond back to the South Cell reclaim pond. No water was released to the environment as no trace of the seepage water was found in the groundwater well located in this area and in water contained in the Portage Pit sumps. The source of water was confirmed by the following: mass balance analysis performed by SNC and a transfer of water from the D/S pond to Goose Pit which indicated a drawdown in the South Cell corresponding to the 50,431m^3 transferred to Goose Pit from the D/S pond. This was recommended by the MDRB's steady flow test. Golder reviewed the Central Dike seepage analysis and confirmed that the operation of the TSF should resume. Golder also estimated that the seepage flow will vary from 0 to 850m^3/h until the end of the operation. A pumping system was put in place prior to the beginning of winter 2015-2016.

Pit flooding volumes and sequencing (including Portage, Goose and Vault Pits) is presented in this report. Reflooding commenced in 2015 with Goose Pit as mining was completed by accumulating runoff and pit inflow water. It is planned to commence reflooding of Goose in 2016 with water from Third Portage Lake. Flooding of both Portage and Vault Pits will follow late in 2018. The entire pit flooding process will be completed by the end of 2025. Once water quality in the flooded pits meet CCME Guidelines for the Protection of Aquatic Life and/or site specific criteria for parameters not listed in the CCME Guidelines, dike breaching of the surrounding structures will occur to reconnect the Portage and Goose areas to Second Portage Lake and Vault area to Wally Lake (2029). AEM plans at least four years of monitoring to assess the pit water quality prior to breaching. It should be understood that the dikes will not be breached unless the water quality meets the CCME or other closure criteria.

A water quality forecasting model was completed by SNC Lavalin (SNC, 2016) for the life of mine and is included in this report. The mandate of this report is to analyze the water quality as we proceed through the operating life of the mine and the pit flooding operation in order to determine the needs for potential treatment of contaminants of concern. The impact of transferring the TSF water to the pits during the flooding process was explored using the all available water quality results from the North Cell TSF (since mine commencement) and actual mill tailings composition. Based on current water quality and the 2015 water balance, the report identifies that copper, silver and total nitrogen may require removal treatment in order for the pit water quality to meet CCME criteria in 2029. In addition selenium levels are predicted to be slightly below CCME criteria therefore this parameter will be monitored closely in 2016. AEM is committed to updating this forecast on a yearly basis.

A revised and updated Freshet Action Plan (2016) is included in the 2015 Water Management Plan as Appendix D. The plan details the RSF seepage issue at ST-16 and the Assay Road seepage as well as providing revised monitoring. The 2015 Ammonia Management Plan is included in Appendix E.

Section 7.0 - RECOMMENDATIONS

This section presents a series of recommendations in order to improve on the current water management strategies and water balance. It is AEM's intent to implement all recommendations listed.

- Continue to monitor and include any new flow monitoring locations/devices for any additional or new inflows observed in 2015.
- Continue to update the deposition plans of the North and South Cell as needed to maximize water use and availability as well as increasing the accuracy of the models including but not limited to bathymetric readings.
- Validate new tailings parameters with 2016 North and South Cells bathymetries.
- Conduct the water quality modelling analysis on a yearly basis based on updated water quality results and water balance through the life of mine.
- Continue development of the sediment flux model to evaluate erosion of geotechnical structures on site for the closure, primarily for TSS control: diversion ditches, rock storage facilities, capping of the tailings storage facilities, dikes and dams.
- Evaluate opportunities to reduce contaminants concentration in the reclaim pond prior to closure.
- Continue follow up of the Central Dike seepage flow and adjust pumping station capacity in function of the decreasing flow.
- Implement 2015 Meadowbank water quality forecasting (SNC, 2016) recommendations.

Section 8.0 - REFERENCES

1. SNC (2013) – Water Management Plan 2012. SNC Lavalin. March 2013.
2. Golder (2009) – Meadowbank Gold Project Updated Water Management Plan. Golder Associated Limited. July 2009.
3. Environment Canada (2011a) - National Climate Data and Information Archive, http://climat.meteo.gc.ca/advanceSearch/searchHistoricData_f.html.
   14. Nunavut Water Board, Water Licence NO: 2AM-MEA0815, June 9 2008 to May 3 2015.
4. AEM (2015) – Waste Management Plan 2014
5. SNC (2015) – Meadowbank Water Quality Forecasting Update Base on the 2014 Water Management Plan. February 2015.

APPENDIX A – WATER BALANCE

	Year 2015 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL TOTAL
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Tailings (tonnes):	363,487	304,126	323,696	300,420	356,980	359,079	353,266	360,861	280,777	354,968	358,504	313,994	**4,030,158**
Cummulative Tailings (tonnes):	13,812,419	14,116,545	14,440,241	14,740,661	15,097,641	15,456,720	15,809,986	16,170,847	16,451,624	16,806,592	17,165,096	17,479,090	-
Cummulative Tailings (m^3) - North Cell	13,303,248	13,303,248	13,303,248	13,303,248	13,303,248	13,303,248	13,522,395	13,753,717	13,933,702	14,167,927	14,167,927	14,167,927	-
Cummulative Tailings (m^3) - South Cell	576,864	788,063	1,012,852	1,221,477	1,469,379	1,718,740	1,725,233	1,725,233	1,725,233	1,756,069	2,049,924	2,307,297	-
North Cell (TSF)													
Eom total pond volume													
Starting Pond Volume (m^3)	252,449	252,449	252,449	252,449	252,449	254,074	451,243	316,212	302,473	318,624	181,114	181,114	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	205,929	212,328	186,691	120,427	0	0	**725,375**
Runoff (m^3)	0	0	0	0	0	63,784	13,960	2,142	3,028	-29	0	0	**82,885**
Pumped from ST16, WEP & Interception sump	0	0	0	0	1,625	142,535	34,581	9,815	16,165	1,298	0	0	**206,019**
Total Inflow (m^3)	0	0	0	0	1,625	206,319	254,470	224,285	205,884	121,696	0	0	**1,014,279**
Transfer to South Cell (m^3)	0	0	0	0	0	9,150	389,501	238,024	189,733	259,206	0	0	**1,085,614**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	9,150	389,501	238,024	189,733	259,206	0	0	**1,085,614**
Net Inflow (m^3)	0	0	0	0	1,625	197,169	-135,031	-13,739	16,151	-137,510	0	0	**-71,335**
End-of-Month Volume (m^3)	252,449	252,449	252,449	252,449	254,074	451,243	316,212	302,473	318,624	181,114	181,114	181,114	-
South Cell (TSF)													
Pumped From Goose Pit (m^3)	14,286	5,387	15,912	16,167	1,523	3,108	0	0	0	0	0	0	**56,383**
Pumped From Portage Pit (m^3)	0	0	0	0	0	4,075	28,620	43,930	27,719	27,008	5,275	0	**136,627**
Runoff (m^3)	0	0	0	0	0	91,007	63,763	10,650	6,447	-21	0	0	**171,846**
Transfer from North Cell (m^3)	0	0	0	0	0	9,150	389,501	238,024	189,733	259,206	0	0	**1,085,614**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	0	36,536	0	0	14,414	2,444	0	0	**53,394**
Water from tailings slurry (m^3)	223,039	175,661	158,342	214,687	197,043	190,663	7,191	0	0	25,763	150,021	141,139	**1,483,548**
Water pumped from D/S Central Dike (seep)	0	0	0	0	0	251,541	498,141	589,190	392,244	458,572	337,878	287,674	**2,815,240**
Total Inflow (m^3)	237,325	181,048	174,254	230,854	198,565	586,081	987,216	881,794	630,557	772,972	493,174	428,813	**5,802,652**
Reclaim water to the mill (m^3)	231,414	184,168	164,872	185,716	240,272	238,425	255,118	259,582	226,604	265,987	252,364	239,301	**2,743,821**
Transfer to Goose Pit (m^3)	0	0	0	0	0	0	0	0	50,431	0	0	0	**50,431**
Central Dike Seepage volume (m^3)	0	0	0	0	0	168,148	499,587	577,530	336,098	343,551	326,754	320,995	**2,572,663**
Total Outflow (m^3)	231,414	184,168	164,872	185,716	240,272	406,573	754,704	837,112	613,133	609,538	579,118	560,296	**5,366,915**
Net Inflow (m^3)	5,910	-3,120	9,382	45,138	-41,706	179,508	232,512	44,682	17,424	163,434	-85,944	-131,483	**435,737**
End-of-Month Volume (m^3)	882,015	878,895	888,277	933,415	891,709	1,071,217	1,303,729	1,348,411	1,365,835	1,529,269	1,443,325	1,311,842	-
Mill/Camp													
Ore water (m^3)	4,327	2,473	2,714	2,282	2,679	3,622	3,210	2,408	2,419	3,765	3,607	3,629	**37,135**
Reclaim water (m^3)	231,414	184,168	164,872	185,716	240,272	238,425	255,118	259,582	226,604	265,987	252,364	239,301	**2,743,821**
Freshwater from Third Portage Lake (m^3)	89,933	97,527	121,020	103,837	73,807	64,165	48,658	43,152	40,528	40,444	46,921	42,293	**812,285**
Total Inflow (m^3)	322,730	281,509	285,661	288,984	313,813	303,362	303,991	303,325	266,701	307,251	300,042	282,278	**3,559,646**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	319,785	278,849	282,716	286,134	310,868	300,512	301,046	300,380	263,851	304,306	297,192	279,333	**3,524,971**
Total Outflow (m^3)	322,730	281,509	285,661	288,984	313,813	303,362	303,991	303,325	266,701	307,251	300,042	282,278	**3,559,646**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	311	274	222	258	323	331	343	349	315	358	351	322	-
Freshwater pumping rate (m^3/hr)	121	145	163	144	99	89	65	58	56	54	65	57	-
TSF Water Balance													
Slurry water (m^3)	322,730	281,509	285,661	288,984	313,813	303,362	303,991	303,325	266,701	307,251	300,042	282,278	**3,559,646**
Tonnage destination (1=100% SC, 0=100% NC)	1.000	1.000	1.000	1.000	1.000	1.000	0.032	0.000	0.000	0.129	1.000	1.000	
NC Tailings water/ice entrampment (%)	100%	90%	90%	90%	60%	30%	30%	30%	30%	55%	80%	90%	
SC Tailings water/ice entrampment (%)	31%	38%	45%	26%	37%	37%	27%	27%	26%	35%	50%	50%	
Slurry water returned to the NC pond (m^3)	0	0	0	0	0	0	205,929	212,328	186,691	120,427	0	0	**725,375**
Slurry water returned to the SC pond (m^3)	223,039	175,661	158,342	214,687	197,043	190,663	7,191	0	0	25,763	150,021	141,139	**1,483,548**

	Year 2015												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	14,286	5,387	15,912	16,167	43,500	96,108	53,600	48,000	33,265	19,131	19,313	19,131	**383,800**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	50,431	0	0	0	**50,431**
Total Inflow (m^3)	14,286	5,387	15,912	16,167	43,500	96,108	53,600	48,000	83,696	19,131	19,313	19,131	**434,231**
Pumped to Attenuation Pond (m^3)	14,286	5,387	15,912	16,167	1,523	3,108	0	0	0	0	0	0	**56,383**
Total Outflow (m^3)	14,286	5,387	15,912	16,167	1,523	3,108	0	0	0	0	0	0	**56,383**
Net Inflow (m^3)	0	0	0	0	41,978	93,000	53,600	48,000	83,696	19,131	19,313	19,131	**377,849**
End-of-Month Volume (m^3)	0	0	0	0	41,978	134,978	188,578	236,578	320,274	339,405	358,718	377,849	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	4,075	28,620	43,930	27,719	27,008	5,275	0	**136,627**
East Dike Seepage (m^3)	0	0	0	0	0	2,079	28,620	12,046	0	0	0	0	**42,744**
Total Inflow (m^3)	0	0	0	0	0	6,154	57,240	55,976	27,719	27,008	5,275	0	**179,372**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	4,075	28,620	43,930	27,719	27,008	5,275	0	**136,627**
Total Outflow (m^3)	0	0	0	0	0	4,075	28,620	43,930	27,719	27,008	5,275	0	**136,627**
Net Inflow (m^3)	0	0	0	0	0	2,079	28,620	12,046	0	0	0	0	**42,744**
End-of-Month Volume (m^3)	101,074	101,074	101,074	101,074	101,074	103,153	131,773	143,818	143,818	143,818	143,818	143,818	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	642,775	31,435	100,000	30,000	11,456	0	0	**815,666**
Pumped From Vault Pit (m^3)	0	0	0	0	0	41,133	24,503	11,224	34,476	0	0	0	**111,336**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	683,908	55,938	111,224	64,476	11,456	0	0	**927,002**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	398,490	547,986	118,957	0	0	0	**1,065,433**
Total Outflow (m^3)	0	0	0	0	0	0	398,490	547,986	118,957	0	0	0	**1,065,433**
Net Inflow (m^3)	0	0	0	0	0	683,908	-342,552	-436,762	-54,481	11,456	0	0	**-138,431**
End-of-Month Volume (m^3)	658,133	658,133	658,133	658,133	658,133	1,342,041	999,489	562,727	508,246	519,702	519,702	519,702	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	41,133	24,503	11,224	34,476	0	0	0	**111,336**
Total Inflow (m^3)	0	0	0	0	0	41,133	24,503	11,224	34,476	0	0	0	**111,336**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	41,133	24,503	11,224	34,476	0	0	0	**111,336**
Total Outflow (m^3)	0	0	0	0	0	41,133	24,503	11,224	34,476	0	0	0	**111,336**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	0	0	0	-40,000	0	0	0	**-40,000**
Phaser Lake dewatering (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	0	0	0	-40,000	0	0	0	-40,000
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	0	0	0	-40,000	0	0	0	**-40,000**
End-of-Month Volume (m^3)	488,311	488,311	488,311	488,311	488,311	488,311	488,311	488,311	448,311	448,311	448,311	448,311	-

	Year 2016												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**29**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**366**
Tailings (tonnes):	356,345	332,688	315,735	331,560	348,719	315,480	342,922	336,288	296,010	344,162	334,800	349,897	**4,004,606**
Cummulative Tailings (tonnes):	17,835,435	18,168,123	18,483,858	18,815,418	19,164,137	19,479,617	19,822,539	20,158,827	20,454,837	20,798,999	21,133,799	21,483,696	-
Cummulative Tailings (m^3) - North Cell	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	-
Cummulative Tailings (m^3) - South Cell	2,599,383	2,872,078	3,130,877	3,353,400	3,587,440	3,799,172	3,994,014	4,185,086	4,353,274	4,615,993	4,871,565	5,138,662	-
North Cell (TSF)													
Starting Pond Volume (m^3)	181,114	181,114	181,114	181,114	181,114	182,739	201,938	94,219	96,896	59,299	60,583	60,583	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Pumped from ST16, WEP & Interception sump	0	0	0	0	1,625	142,535	34,581	9,815	16,165	1,298	0	0	**206,019**
Total Inflow (m^3)	0	0	0	0	1,625	219,200	42,281	52,677	37,403	1,285	0	0	**354,470**
Transfer to South Cell (m^3)	0	0	0	0	0	200,000	150,000	50,000	75,000	0	0	0	**475,000**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	200,000	150,000	50,000	75,000	0	0	0	**475,000**
Net Inflow (m^3)	0	0	0	0	1,625	19,200	-107,719	2,677	-37,597	1,285	0	0	**-120,531**
End-of-Month Volume (m^3)	181,114	181,114	181,114	181,114	182,739	201,938	94,219	96,896	59,299	60,583	60,583	60,583	-
South Cell (TSF)													
Pumped From Goose Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Portage Pit (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Runoff (m^3)	0	0	0	0	0	41,175	-12,145	23,408	3,879	-28	0	0	**56,290**
Transfer from North Cell (m^3)	0	0	0	0	0	200,000	150,000	50,000	75,000	0	0	0	**475,000**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,180	0	0	0	11,590	0	0	0	**34,770**
Water from tailings slurry (m^3)	152,857	143,919	152,701	148,004	183,512	206,940	214,587	213,401	206,738	183,188	147,375	152,653	**2,105,873**
Total Inflow (m^3)	152,857	143,919	152,701	148,004	206,692	526,654	373,427	343,437	323,901	183,160	147,375	152,653	**2,854,778**
Reclaim water to the mill (m^3)	267,840	250,560	267,840	259,200	267,840	259,200	267,840	267,840	259,200	238,080	208,800	215,760	**3,030,000**
Transfer to Portage Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	267,840	250,560	267,840	259,200	267,840	259,200	267,840	267,840	259,200	238,080	208,800	215,760	**3,030,000**
Net Inflow (m^3)	-114,984	-106,641	-115,140	-111,196	-61,148	267,454	105,587	75,597	64,701	-54,920	-61,426	-63,108	**-175,222**
End-of-Month Volume (m^3)	1,196,858	1,090,217	975,078	863,882	802,734	1,070,188	1,175,775	1,251,372	1,316,073	1,261,153	1,199,728	1,136,620	-
Mill/Camp													
Ore water (m^3)	3,618	5,233	3,306	3,658	3,759	3,279	4,458	2,763	2,990	3,218	2,399	3,210	**41,891**
Reclaim water (m^3)	267,840	250,560	267,840	259,200	267,840	259,200	267,840	267,840	259,200	238,080	208,800	215,760	**3,030,000**
Freshwater from Third Portage Lake (m^3)	37,200	34,800	37,200	36,000	37,200	36,000	37,200	37,200	36,000	66,960	86,400	89,280	**571,440**
Total Inflow (m^3)	308,658	290,593	308,346	298,858	308,799	298,479	309,498	307,803	298,190	308,258	297,599	308,250	**3,643,331**
Freshwater for camp purposes (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Slurry water (m^3)	305,713	287,838	305,401	296,008	305,854	295,629	306,553	304,858	295,340	305,313	294,749	305,305	**3,608,561**
Total Outflow (m^3)	308,658	290,593	308,346	298,858	308,799	298,479	309,498	307,803	298,190	308,258	297,599	308,250	**3,643,331**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	360	360	360	360	360	360	360	360	360	320	290	290	-
Freshwater pumping rate (m^3/hr)	50	50	50	50	50	50	50	50	50	90	120	120	-
TSF Water Balance													
Slurry water (m^3)	305,713	287,838	305,401	296,008	305,854	295,629	306,553	304,858	295,340	305,313	294,749	305,305	**3,608,561**
SC Tailings water/ice entrampment (%)	50%	50%	50%	50%	40%	30%	30%	30%	30%	40%	50%	50%	
Void and ice entrapment losses (m^3)	152,857	143,919	152,701	148,004	122,342	88,689	91,966	91,457	88,602	122,125	147,375	152,653	**1,502,688**
Slurry water returned to the SC pond (m^3)	152,857	143,919	152,701	148,004	183,512	206,940	214,587	213,401	206,738	183,188	147,375	152,653	**2,105,873**

	Year 2016												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumpped from Third Portage Lake (m^3)	0	0	0	0	0	0	450,000	450,000	450,000	0	0	0	**1,350,000**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	480,242	499,297	483,265	19,131	19,313	19,131	**1,677,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	480,242	499,297	483,265	19,131	19,313	19,131	**1,677,114**
End-of-Month Volume (m^3)	396,980	416,293	435,424	454,555	473,868	534,584	1,014,826	1,514,123	1,997,388	2,016,519	2,035,832	2,054,963	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
East Dike Seepage (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Total Outflow (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	143,818	143,818	143,818	143,818	143,818	143,818	143,818	143,818	143,818	143,818	143,818	143,818	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	119,051	9,922	64,582	32,212	-22	0	0	**225,745**
Pumped From Vault Pit (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	325,000	120,000	113,511	0	0	**558,511**
Total Inflow (m^3)	0	0	0	0	0	185,578	27,697	437,549	174,824	113,489	0	0	**939,136**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	185,578	27,697	437,549	174,824	113,489	0	0	**939,136**
Total Outflow (m^3)	0	0	0	0	0	185,578	27,697	437,549	174,824	113,489	0	0	**939,136**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	519,702	519,702	519,702	519,702	519,702	519,702	519,702	519,702	519,702	519,702	519,702	519,702	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Total Inflow (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Total Outflow (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	71,065	-9,486	23,587	25,033	0	0	0	**110,200**
Total Inflow (m^3)	0	0	0	0	0	71,065	-9,486	23,587	25,033	0	0	0	110,200
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	325,000	120,000	113,511	0	0	**558,511**
Total Outflow (m^3)	0	0	0	0	0	0	0	325,000	120,000	113,511	0	0	558,511
Net Inflow (m^3)	0	0	0	0	0	71,065	-9,486	-301,413	-94,967	-113,511	0	0	**-448,311**
End-of-Month Volume (m^3)	448,311	448,311	448,311	448,311	448,311	519,376	509,891	208,478	113,511	0	0	0	-

	Year 2017												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Tailings (tonnes):	335,296	302,848	335,296	334,260	345,402	334,260	333,188	333,188	322,440	348,657	337,410	348,657	**4,010,902**
Cummulative Tailings (tonnes):	21,818,992	22,121,840	22,457,136	22,791,396	23,136,798	23,471,058	23,804,246	24,137,434	24,459,874	24,808,531	25,145,941	25,494,598	-
Cummulative Tailings (m3) - North Cell	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	-
Cummulative Tailings (m3) - South Cell	5,413,495	5,661,731	5,936,564	6,160,900	6,392,713	6,617,049	6,806,360	6,995,671	7,178,876	7,443,010	7,755,427	8,078,257	-
North Cell (TSF)													
Starting Pond Volume (m^3)	60,583	60,583	60,583	60,583	60,583	62,208	131,408	73,689	76,365	13	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Pumped from ST16, WEP & Interception sump	0	0	0	0	1,625	142,535	34,581	9,815	17,463	0	0	0	**206,019**
Total Inflow (m^3)	0	0	0	0	1,625	219,200	42,281	52,677	38,701	-13	0	0	**354,470**
Transfer to South Cell (m^3)	0	0	0	0	0	150,000	100,000	50,000	115,053	0	0	0	**415,053**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	150,000	100,000	50,000	115,053	0	0	0	**415,053**
Net Inflow (m^3)	0	0	0	0	1,625	69,200	-57,719	2,677	-76,352	-13	0	0	**-60,584**
End-of-Month Volume (m^3)	60,583	60,583	60,583	60,583	62,208	131,408	73,689	76,365	13	0	0	0	-
South Cell (TSF)													
Pumped From Goose Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Portage Pit (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Runoff (m^3)	0	0	0	0	0	40,462	-18,494	617	2,655	-25	0	0	**25,216**
Transfer from North Cell (m^3)	0	0	0	0	0	150,000	100,000	50,000	115,053	0	0	0	**415,053**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Water from tailings slurry (m^3)	152,658	138,701	152,757	147,959	183,448	206,912	214,448	213,714	206,620	76,387	58,956	30,534	**1,783,094**
Total Inflow (m^3)	152,658	138,701	152,757	147,959	206,533	475,913	316,939	320,960	362,612	76,362	58,956	30,534	**2,440,883**
Reclaim water to the mill (m^3)	215,760	194,880	215,760	208,800	238,080	230,400	238,080	238,080	230,400	215,760	151,200	156,240	**2,533,440**
Transfer to Portage Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	215,760	194,880	215,760	208,800	238,080	230,400	238,080	238,080	230,400	215,760	151,200	156,240	**2,533,440**
Net Inflow (m^3)	-63,102	-56,179	-63,004	-60,842	-31,547	245,513	78,859	82,880	132,212	-139,398	-92,244	-125,706	**-92,557**
End-of-Month Volume (m^3)	1,073,518	1,017,339	954,336	893,494	861,947	1,107,461	1,186,320	1,269,199	1,401,411	1,262,013	1,169,769	1,044,063	-
Mill/Camp													
Ore water (m^3)	3,221	4,542	3,418	3,567	3,652	3,239	4,259	3,211	2,822	3,453	2,430	3,244	**41,058**
Reclaim water (m^3)	215,760	194,880	215,760	208,800	238,080	230,400	238,080	238,080	230,400	215,760	151,200	156,240	**2,533,440**
Freshwater from Third Portage Lake (m^3)	89,280	80,640	89,280	86,400	66,960	64,800	66,960	66,960	64,800	89,280	144,000	148,800	**1,058,160**
Total Inflow (m^3)	308,261	280,062	308,458	298,767	308,692	298,439	309,299	308,251	298,022	308,493	297,630	308,284	**3,632,658**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	305,316	277,402	305,513	295,917	305,747	295,589	306,354	305,306	295,172	305,548	294,780	305,339	**3,597,983**
Total Outflow (m^3)	308,261	280,062	308,458	298,767	308,692	298,439	309,299	308,251	298,022	308,493	297,630	308,284	**3,632,658**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	290	290	290	290	320	320	320	320	320	290	210	210	-
Freshwater pumping rate (m^3/hr)	120	120	120	120	90	90	90	90	90	120	200	200	-
TSF Water Balance													
Slurry water (m^3)	305,316	277,402	305,513	295,917	305,747	295,589	306,354	305,306	295,172	305,548	294,780	305,339	**3,597,983**
SC Tailings water/ice entrampment (%)	50%	50%	50%	50%	40%	30%	30%	30%	30%	75%	80%	90%	
Void and ice entrapment losses (m^3)	152,658	138,701	152,757	147,959	122,299	88,677	91,906	91,592	88,552	229,161	235,824	274,805	**1,814,889**
Slurry water returned to the SC pond (m^3)	152,658	138,701	152,757	147,959	183,448	206,912	214,448	213,714	206,620	76,387	58,956	30,534	**1,783,094**

	Year 2017												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	300,000	300,000	300,000	0	0	0	**900,000**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	330,242	349,297	333,265	19,131	19,313	19,131	**1,227,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	330,242	349,297	333,265	19,131	19,313	19,131	**1,227,114**
End-of-Month Volume (m^3)	2,074,094	2,093,407	2,112,538	2,131,669	2,150,982	2,211,698	2,541,940	2,891,237	3,224,502	3,243,633	3,262,946	3,282,077	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
East Dike Seepage (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Total Outflow (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	143,818	143,818	143,818	143,818	143,818	143,818	143,818	143,818	143,818	143,818	143,818	143,818	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	119,051	9,922	64,582	32,212	-22	0	0	**225,745**
Pumped From Vault Pit (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	259,230	47,376	165,654	79,857	-22	0	0	**552,094**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	259,230	47,376	165,654	79,857	-22	0	0	**552,094**
Total Outflow (m^3)	0	0	0	0	0	259,230	47,376	165,654	79,857	-22	0	0	**552,094**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	519,702	519,702	519,702	519,702	519,702	519,702	519,702	519,702	519,702	519,702	519,702	519,702	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Total Inflow (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Total Outflow (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Outflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-

AGNICO EAGLE
MEADOWBANK

	Year 2018												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Tailings (tonnes):	279,000	252,000	279,000	270,000	279,000	270,000	227,530	227,530	220,191	0	0	0	**2,304,251**
Cummulative Tailings (tonnes):	25,773,598	26,025,598	26,304,598	26,574,598	26,853,598	27,123,598	27,351,128	27,578,658	27,798,849	27,798,849	27,798,849	27,798,849	-
Cummulative Tailings (m3) - North Cell	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	-
Cummulative Tailings (m3) - South Cell	8,336,591	8,569,924	8,828,257	9,078,257	9,289,621	9,462,698	9,608,550	9,754,403	9,895,551	9,895,551	9,895,551	9,895,551	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Transfer to South Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Pumped From Portage Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	40,462	-18,494	617	2,655	-21	0	0	**25,220**
Transfer from North Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Water from tailings slurry (m^3)	24,074	21,883	24,091	23,327	96,406	163,099	168,869	168,311	162,729	0	0	0	**852,788**
Total Inflow (m^3)	24,074	21,883	24,091	23,327	119,491	280,226	158,075	211,790	198,212	-34	0	0	**1,061,134**
Reclaim water to the mill (m^3)	92,148	83,231	92,148	168,376	211,188	204,376	211,188	211,188	204,376	0	0	0	**1,478,218**
Transfer to Portage Pit (m^3)	0	0	0	0	0	0	0	0	330,000	296,980	0	0	**626,980**
Total Outflow (m^3)	92,148	83,231	92,148	168,376	211,188	204,376	211,188	211,188	534,376	296,980	0	0	**2,105,198**
Net Inflow (m^3)	-68,074	-61,348	-68,058	-145,049	-91,697	75,850	-53,113	602	-336,164	-297,014	0	0	**-1,044,064**
End-of-Month Volume (m^3)	975,989	914,641	846,583	701,535	609,838	685,688	632,575	633,177	297,013	0	0	0	-
Mill/Camp													
Ore water (m^3)	2,734	3,856	2,902	2,943	3,013	2,673	3,238	2,441	2,145	0	0	0	**25,945**
Reclaim water (m^3)	92,148	83,231	92,148	168,376	211,188	204,376	211,188	211,188	204,376	0	0	0	**1,478,218**
Freshwater from Third Portage Lake (m^3)	148,800	134,400	148,800	64,800	29,760	28,800	29,760	29,760	28,800	2,945	2,850	2,945	**652,420**
Total Inflow (m^3)	243,682	221,487	243,850	236,119	243,961	235,849	244,186	243,389	235,321	2,945	2,850	2,945	**2,156,583**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	240,737	218,827	240,905	233,269	241,016	232,999	241,241	240,444	232,471	0	0	0	**2,121,908**
Total Outflow (m^3)	243,682	221,487	243,850	236,119	243,961	235,849	244,186	243,389	235,321	2,945	2,850	2,945	**2,156,583**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	124	124	124	234	284	284	284	284	284	0	0	0	-
Freshwater pumping rate (m^3/hr)	200	200	200	90	40	40	40	40	40	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	240,737	218,827	240,905	233,269	241,016	232,999	241,241	240,444	232,471	0	0	0	**2,121,908**
SC Tailings water/ice entrampment (%)	90%	90%	90%	90%	60%	30%	30%	30%	30%	0%	0%	0%	
Void and ice entrapment losses (m^3)	216,663	196,944	216,815	209,942	144,610	69,900	72,372	72,133	69,741	0	0	0	**1,269,119**
Slurry water returned to the SC pond (m^3)	24,074	21,883	24,091	23,327	96,406	163,099	168,869	168,311	162,729	0	0	0	**852,788**

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL TOTAL
	Year 2018												
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	313,872	313,871	313,871	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	344,114	363,168	347,136	19,131	19,313	19,131	**1,268,728**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	344,114	363,168	347,136	19,131	19,313	19,131	**1,268,728**
End-of-Month Volume (m^3)	3,301,208	3,320,521	3,339,652	3,358,783	3,378,096	3,438,812	3,782,926	4,146,094	4,493,230	4,512,361	4,531,674	4,550,805	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	330,000	296,980	0	0	**626,980**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	1,000,000	1,000,000	1,000,000	0	0	0	**3,000,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	78,539	1,020,985	1,056,628	1,368,284	326,980	30,000	30,000	**4,084,501**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	78,539	1,020,985	1,056,628	1,368,284	326,980	30,000	30,000	**4,084,501**
End-of-Month Volume (m^3)	173,818	203,818	233,818	263,818	316,903	395,442	1,416,427	2,473,055	3,841,339	4,168,319	4,198,319	4,228,319	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	119,051	9,922	64,582	32,212	-22	0	0	**225,745**
Pumped From Vault Pit (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	259,230	47,376	165,654	79,857	-22	0	0	**552,094**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	185,578	27,697	112,549	54,824	-22	0	0	**380,625**
Total Outflow (m^3)	0	0	0	0	0	185,578	27,697	112,549	54,824	-22	0	0	**380,625**
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	519,702	519,702	519,702	519,702	519,702	593,354	613,034	666,138	691,172	691,172	691,172	691,172	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Total Outflow (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Outflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-

	Year 2019												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Tailings (tonnes):	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Cummulative Tailings (tonnes):	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	-
Cummulative Tailings (m3) - North Cell	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	-
Cummulative Tailings (m3) - South Cell	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Transfer to South Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Pumped From Portage Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	40,982	-10,260	8,951	5,933	-22	0	0	**45,584**
Transfer from North Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Transfer to Portage Pit (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Total Outflow (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Mill/Camp													
Ore water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Freshwater from Third Portage Lake (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Total Inflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	-
Freshwater pumping rate (m^3/hr)	4	4	4	4	4	4	4	4	4	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tailings water/ice entrampment (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Void and ice entrapment losses (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slurry water returned to the pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

	Year 2019												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	4,569,936	4,589,249	4,608,380	4,627,511	4,646,824	4,707,540	4,737,782	4,787,079	4,820,344	4,839,475	4,858,788	4,877,919	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from South Cell (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	1,130,000	0	0	0	**4,520,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,326,185	1,148,425	1,238,440	1,195,455	29,965	30,000	30,000	**5,171,555**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,326,185	1,148,425	1,238,440	1,195,455	29,965	30,000	30,000	**5,171,555**
End-of-Month Volume (m^3)	4,258,319	4,288,319	4,318,319	4,348,319	4,401,404	5,727,589	6,876,013	8,114,453	9,309,908	9,339,873	9,369,873	9,399,873	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	118,708	6,053	60,667	30,672	0	0	0	**216,100**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	118,708	6,053	60,667	30,672	0	0	0	**216,100**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	118,708	6,053	60,667	30,672	0	0	0	**216,100**
End-of-Month Volume (m^3)	691,172	691,172	691,172	691,172	691,172	809,880	815,933	876,600	907,272	907,272	907,272	907,272	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	0	0	0	0	0	670,309	1,694,391	3,102,695	4,337,484	4,337,484	4,337,484	4,337,484	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	0	0	0	0	0	73,652	93,331	146,436	171,469	171,469	171,469	171,469	-

	Year 2020 Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL TOTAL
No. of days	**31**	**29**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**366**
Tailings (tonnes):	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Cummulative Tailings (tonnes):	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	-
Cummulative Tailings (m3) - North Cell	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	-
Cummulative Tailings (m3) - South Cell	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Transfer to South Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Runoff (m^3)	0	0	0	0	0	40,982	-10,260	8,951	5,933	-22	0	0	**45,584**
Transfer from North Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Transfer to Portage Pit (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Total Outflow (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Mill/Camp													
Ore water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Freshwater from Third Portage Lake (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Total Inflow (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Freshwater for camp purposes (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	-
Freshwater pumping rate (m^3/hr)	4	4	4	4	4	4	4	4	4	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tailings water/ice entrapment (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Void and ice entrapment losses (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slurry water returned to the pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

	Year 2020												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	4,897,050	4,916,363	4,935,494	4,954,625	4,973,938	5,034,654	5,064,896	5,114,193	5,147,458	5,166,589	5,185,902	5,205,033	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from South Cell (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	1,130,000	0	0	0	**4,520,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,326,185	1,148,425	1,238,440	1,195,455	29,965	30,000	30,000	**5,171,555**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,326,185	1,148,425	1,238,440	1,195,455	29,965	30,000	30,000	**5,171,555**
End-of-Month Volume (m^3)	9,429,873	9,459,873	9,489,873	9,519,873	9,572,958	10,899,143	12,047,568	13,286,008	14,481,463	14,511,428	14,541,428	14,571,428	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
End-of-Month Volume (m^3)	907,272	907,272	907,272	907,272	907,272	1,091,249	1,114,354	1,221,706	1,274,416	1,274,416	1,274,416	1,274,416	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	4,337,484	4,337,484	4,337,484	4,337,484	4,337,484	5,007,793	6,031,874	7,440,179	8,674,967	8,674,967	8,674,967	8,674,967	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	171,469	171,469	171,469	171,469	171,469	245,122	264,801	317,906	342,939	342,939	342,939	342,939	-

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL TOTAL
	Year 2021												
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Tailings (tonnes):	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Cummulative Tailings (tonnes):	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	-
Cummulative Tailings (m3) - North Cell	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	-
Cummulative Tailings (m3) - South Cell	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Transfer to South Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Runoff (m^3)	0	0	0	0	0	40,982	-10,260	8,951	5,933	-22	0	0	**45,584**
Transfer from North Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Transfer to Portage Pit (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Total Outflow (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Mill/Camp													
Ore water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Freshwater from Third Portage Lake (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Total Inflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	-
Freshwater pumping rate (m^3/hr)	4	4	4	4	4	4	4	4	4	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tailings water/ice entrapment (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Void and ice entrapment losses (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slurry water returned to the pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

	Year 2021												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	5,224,164	5,243,477	5,262,608	5,281,739	5,301,052	5,361,768	5,392,010	5,441,307	5,474,572	5,493,703	5,513,016	5,532,147	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from SC (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	1,130,000	0	0	0	**4,520,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,326,185	1,148,425	1,238,440	1,195,455	29,965	30,000	30,000	**5,171,555**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,326,185	1,148,425	1,238,440	1,195,455	29,965	30,000	30,000	**5,171,555**
End-of-Month Volume (m^3)	14,601,428	14,631,428	14,661,428	14,691,428	14,744,513	16,070,698	17,219,122	18,457,562	19,653,017	19,682,982	19,712,982	19,742,982	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
End-of-Month Volume (m^3)	1,274,416	1,274,416	1,274,416	1,274,416	1,274,416	1,458,393	1,481,498	1,588,850	1,641,559	1,641,559	1,641,559	1,641,559	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	8,674,967	8,674,967	8,674,967	8,674,967	8,674,967	9,345,276	10,369,358	11,777,662	13,012,451	13,012,451	13,012,451	13,012,451	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	342,939	342,939	342,939	342,939	342,939	416,591	436,270	489,375	514,408	514,408	514,408	514,408	-

	Year 2022												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Tailings (tonnes):	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Cummulative Tailings (tonnes):	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	-
Cummulative Tailings (m3) - North Cell	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	-
Cummulative Tailings (m3) - South Cell	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Transfer to South Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Runoff (m^3)	0	0	0	0	0	40,982	-10,260	8,951	5,933	-22	0	0	**45,584**
Transfer from North Cell (m^3)	0	0	0	0	0	76,665	7,700	42,862	21,238	-13	0	0	**148,451**
Total Inflow (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Transfer to Portage Pit (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Total Outflow (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Mill/Camp													
Ore water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Freshwater from Third Portage Lake (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Total Inflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	-
Freshwater pumping rate (m^3/hr)	4	4	4	4	4	4	4	4	4	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tailings water/ice entrampment (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Void and ice entrapment losses (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slurry water returned to the pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

	Year 2022												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	5,551,278	5,570,591	5,589,722	5,608,853	5,628,166	5,688,882	5,719,124	5,768,421	5,801,686	5,820,817	5,840,130	5,859,261	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from SC (m^3)	0	0	0	0	0	117,646	-2,560	51,812	27,171	-35	0	0	**194,034**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	1,130,000	0	0	0	**4,520,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,326,185	1,148,425	1,238,440	1,195,455	29,965	30,000	30,000	**5,171,555**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,326,185	1,148,425	1,238,440	1,195,455	29,965	30,000	30,000	**5,171,555**
End-of-Month Volume (m^3)	19,772,982	19,802,982	19,832,982	19,862,982	19,916,067	21,242,252	22,390,677	23,629,117	24,824,572	24,854,537	24,884,537	24,914,537	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
End-of-Month Volume (m^3)	1,641,559	1,641,559	1,641,559	1,641,559	1,641,559	1,825,537	1,848,642	1,955,993	2,008,703	2,008,703	2,008,703	2,008,703	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	13,012,451	13,012,451	13,012,451	13,012,451	13,012,451	13,682,760	14,706,841	16,115,146	17,349,934	17,349,934	17,349,934	17,349,934	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	514,408	514,408	514,408	514,408	514,408	588,061	607,740	660,845	685,878	685,878	685,878	685,878	-

	Year 2023												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Tailings (tonnes):	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Cummulative Tailings (tonnes):	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	-
Cummulative Tailings (tonnes) - North Cell	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	-
Cummulative Tailings (tonnes) - South Cell	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Transfer to South Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Runoff (m^3)	0	0	0	0	0	42,909	11,465	30,938	14,584	0	0	0	**99,896**
Transfer from North Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Transfer to Portage Pit (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Total Outflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Mill/Camp													
Ore water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Freshwater from Third Portage Lake (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Total Inflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	-
Freshwater pumping rate (m^3/hr)	4	4	4	4	4	4	4	4	4	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tailings water/ice entrapment (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Void and ice entrapment losses (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slurry water returned to the pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

	Year 2023												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	31	28	31	30	31	30	31	31	30	31	30	31	365
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	5,878,392	5,897,705	5,916,836	5,935,967	5,955,280	6,015,996	6,046,238	6,095,535	6,128,800	6,147,931	6,167,244	6,186,375	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from SC (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	0	11,590	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	1,130,000	0	0	0	**4,520,000**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,329,274	1,183,244	1,273,681	1,209,320	30,000	30,000	30,000	**5,258,603**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,329,274	1,183,244	1,273,681	1,209,320	30,000	30,000	30,000	**5,258,603**
End-of-Month Volume (m^3)	24,944,537	24,974,537	25,004,537	25,034,537	25,087,622	26,416,895	27,600,139	28,873,820	30,083,139	30,113,139	30,143,139	30,173,139	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
End-of-Month Volume (m^3)	2,008,703	2,008,703	2,008,703	2,008,703	2,008,703	2,192,681	2,215,786	2,323,137	2,375,847	2,375,847	2,375,847	2,375,847	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	17,349,934	17,349,934	17,349,934	17,349,934	17,349,934	18,020,243	19,044,325	20,452,629	21,687,418	21,687,418	21,687,418	21,687,418	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73652.3	19679.2	53104.9	25033.1	0	0	0	**171,470**
End-of-Month Volume (m^3)	685,878	685,878	685,878	685,878	685,878	759,530	779,209	832,314	857,347	857,347	857,347	857,347	-

	Year 2024												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**29**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**366**
Tailings (tonnes):	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Cummulative Tailings (tonnes):	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	-
Cummulative Tailings (m3) - North Cell	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	-
Cummulative Tailings (m3) - South Cell	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Transfer to South Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Runoff (m^3)	0	0	0	0	0	42,909	11,465	30,938	14,584	0	0	0	**99,896**
Transfer from North Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Transfer to Portage Pit (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Total Outflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Mill/Camp													
Ore water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Freshwater from Third Portage Lake (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Total Inflow (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Freshwater for camp purposes (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	2,945	2,755	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,770**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	-
Freshwater pumping rate (m^3/hr)	4	4	4	4	4	4	4	4	4	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tailings water/ice entrapment (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Void and ice entrapment losses (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slurry water returned to the pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

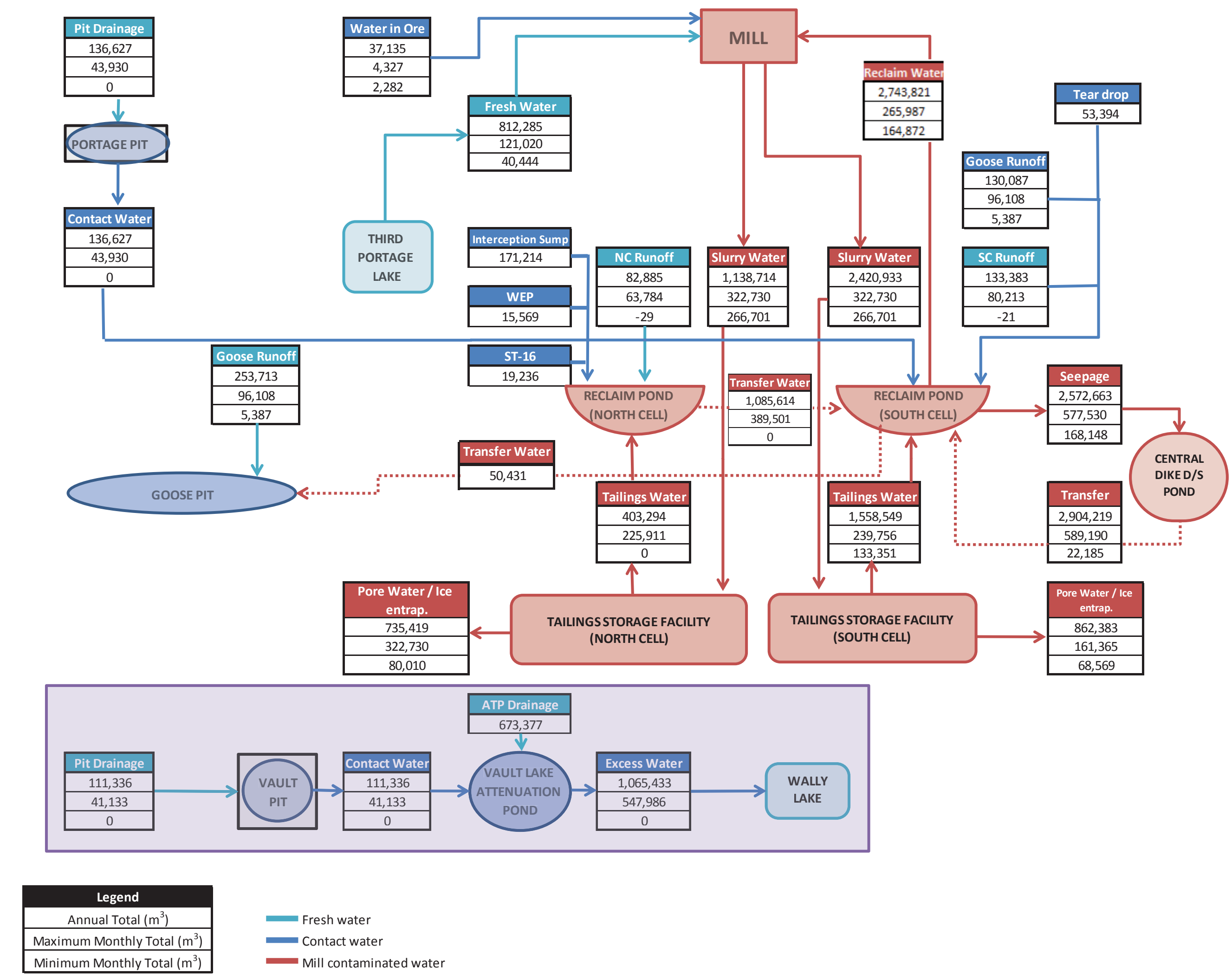
	Year 2024												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	6,205,506	6,224,819	6,243,950	6,263,081	6,282,394	6,343,110	6,373,352	6,422,649	6,455,914	6,475,045	6,494,358	6,513,489	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from SC (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	23,085	0	0	11,590	0	0	0	0	**34,675**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	1,130,000	1,130,000	1,130,000	984,647	0	0	0	**4,374,647**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,329,274	1,183,244	1,285,271	1,052,377	30,000	30,000	30,000	**5,113,250**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	53,085	1,329,274	1,183,244	1,285,271	1,052,377	30,000	30,000	30,000	**5,113,250**
End-of-Month Volume (m^3)	30,203,139	30,233,139	30,263,139	30,293,139	30,346,224	31,675,498	32,858,742	34,144,012	35,196,389	35,226,389	35,256,389	35,286,389	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
End-of-Month Volume (m^3)	2,375,847	2,375,847	2,375,847	2,375,847	2,375,847	2,559,824	2,582,929	2,690,281	2,742,991	2,742,991	2,742,991	2,742,991	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,360,338	1,212,177	0	0	0	**4,182,604**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,408,305	1,234,788	0	0	0	**4,337,484**
End-of-Month Volume (m^3)	21,687,418	21,687,418	21,687,418	21,687,418	21,687,418	22,357,727	23,381,808	24,790,113	26,024,901	26,024,901	26,024,901	26,024,901	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	857,347	857,347	857,347	857,347	857,347	931,000	950,679	1,003,784	1,028,817	1,028,817	1,028,817	1,028,817	-

	Year 2025												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL TOTAL
No. of days	**31**	**29**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**366**
Tailings (tonnes):	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Cummulative Tailings (tonnes):	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	27,798,849	-
Cummulative Tailings (m3) - North Cell	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	14,167,927	-
Cummulative Tailings (m3) - South Cell	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	9,895,551	-
North Cell (TSF)													
Starting Pond Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Water from tailings slurry (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Runoff (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Transfer to South Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
South Cell (TSF)													
Runoff (m^3)	0	0	0	0	0	42,909	11,465	30,938	14,584	0	0	0	**99,896**
Transfer from North Cell (m^3)	0	0	0	0	0	77,826	20,794	56,114	26,452	0	0	0	**181,187**
Total Inflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Reclaim water to the mill (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Transfer to Portage Pit (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Total Outflow (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
End-of-Month Volume (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	-
Mill/Camp													
Ore water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Freshwater from Third Portage Lake (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Total Inflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Freshwater for camp purposes (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	2,945	2,660	2,945	2,850	2,945	2,850	2,945	2,945	2,850	2,945	2,850	2,945	**34,675**
Net Inflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Reclaim water pumping rate (m^3/hr)	0	0	0	0	0	0	0	0	0	0	0	0	-
Freshwater pumping rate (m^3/hr)	4	4	4	4	4	4	4	4	4	4	4	4	-
TSF Water Balance													
Slurry water (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Tailings water/ice entrampment (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	
Void and ice entrapment losses (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Slurry water returned to the pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**

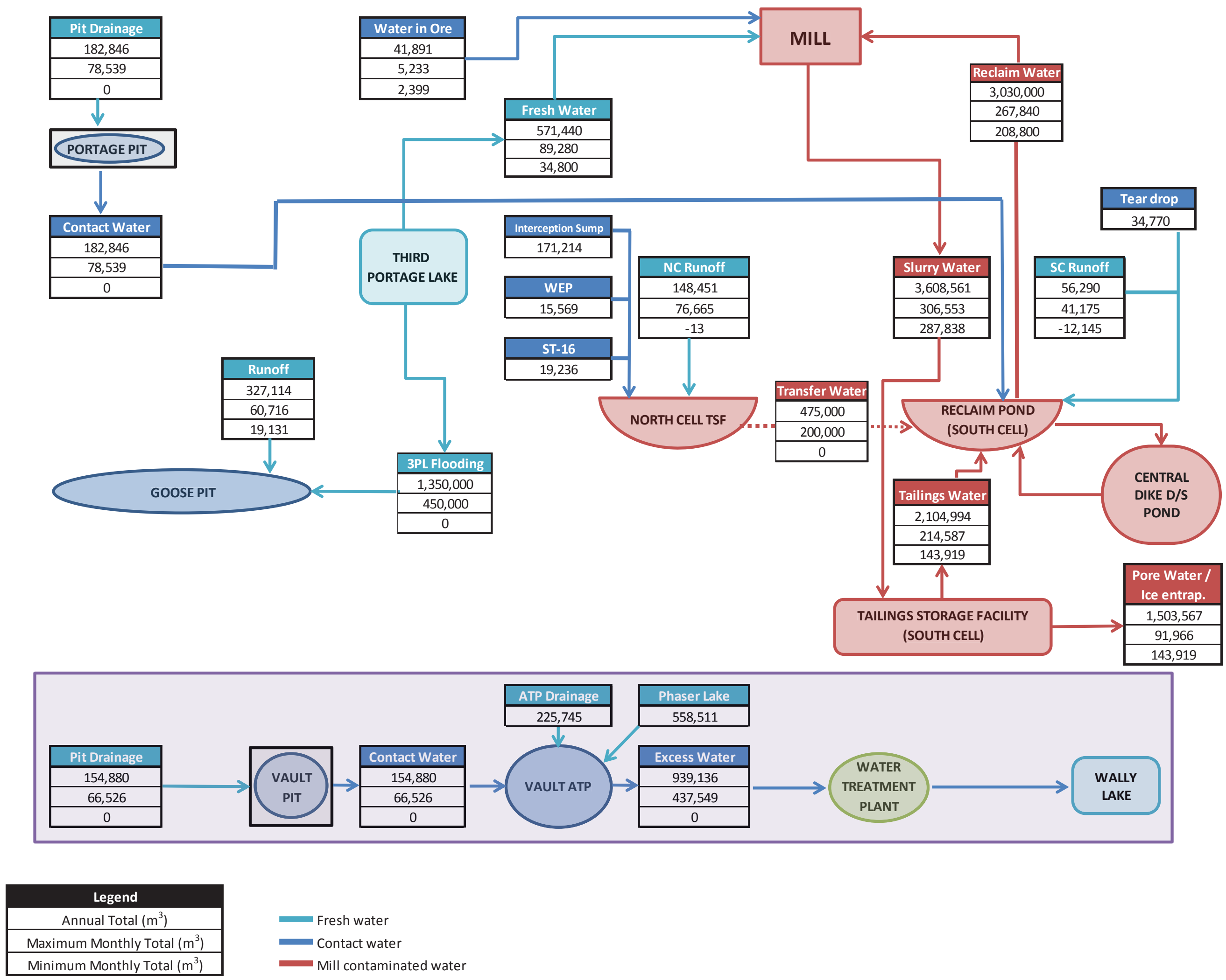
	Year 2025												ANNUAL TOTAL
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
No. of days	**31**	**28**	**31**	**30**	**31**	**30**	**31**	**31**	**30**	**31**	**30**	**31**	**365**
Goose Pit (ATP)													
Runoff (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Transfer from South Cell (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	19,131	19,313	19,131	19,131	19,313	60,716	30,242	49,297	33,265	19,131	19,313	19,131	**327,114**
End-of-Month Volume (m^3)	6,532,620	6,551,933	6,571,064	6,590,195	6,609,508	6,670,224	6,700,466	6,749,763	6,783,028	6,802,159	6,821,472	6,840,603	-
Portage Pit													
Runoff (m^3)	0	0	0	0	0	78,539	20,985	56,628	26,694	0	0	0	**182,846**
Transfer from SC (m^3)	0	0	0	0	0	120,735	32,259	87,052	41,036	0	0	0	**281,082**
Sewage water from Tear Drop Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Third Portage Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
East Dike Seepage (m^3)	30,000	30,000	30,000	30,000	30,000	0	0	0	0	30,000	30,000	30,000	**240,000**
Total Inflow (m^3)	30,000	30,000	30,000	30,000	30,000	199,274	53,244	143,681	67,730	30,000	30,000	30,000	**703,928**
Pumped to Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	30,000	30,000	30,000	30,000	30,000	199,274	53,244	143,681	67,730	30,000	30,000	30,000	**703,928**
End-of-Month Volume (m^3)	35,316,389	35,346,389	35,376,389	35,406,389	35,436,389	35,635,662	35,688,906	35,832,587	35,900,316	35,930,316	35,960,316	35,990,316	-
Vault Attenuation Pond													
Runoff (m^3)	0	0	0	0	0	183,978	23,105	107,352	52,710	0	0	0	**367,144**
Pumped From Vault Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped From Phaser Pit (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Pumped from Wally Lake (m^3)	0	0	0	0	0	0	0	0	314,194	0	0	0	**314,194**
Total Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	366,904	0	0	0	**681,338**
Decant - TSS to Wally Lake (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	183,978	23,105	107,352	366,904	0	0	0	**681,338**
End-of-Month Volume (m^3)	2,742,991	2,742,991	2,742,991	2,742,991	2,742,991	2,926,968	2,950,073	3,057,425	3,424,329	3,424,328	3,424,328	3,424,328	-
Vault Open Pit													
Runoff (m^3)	0	0	0	0	0	66,526	17,775	47,967	22,611	0	0	0	**154,880**
Pumped from Wally Lake (m^3)	0	0	0	0	0	603,783	1,006,306	1,345,383	0	0	0	0	**2,955,472**
Total Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,393,350	22,611	0	0	0	**3,110,352**
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Net Inflow (m^3)	0	0	0	0	0	670,309	1,024,081	1,393,350	22,611	0	0	0	**3,110,352**
End-of-Month Volume (m^3)	26,024,901	26,024,901	26,024,901	26,024,901	26,024,901	26,695,210	27,719,292	29,112,641	29,135,253	29,135,253	29,135,253	29,135,253	-
Phaser Open Pit (including Phaser Lake)													
Runoff (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
Total Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	171,470
Pumped to Vault Attenuation Pond (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	**0**
Total Outflow (m^3)	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Inflow (m^3)	0	0	0	0	0	73,652	19,679	53,105	25,033	0	0	0	**171,470**
End-of-Month Volume (m^3)	1,028,817	1,028,817	1,028,817	1,028,817	1,028,817	1,102,469	1,122,148	1,175,253	1,200,286	1,200,286	1,200,286	1,200,286	-

APPENDIX B – GENERAL WATER MOVEMENT

General Water Movement – 2015

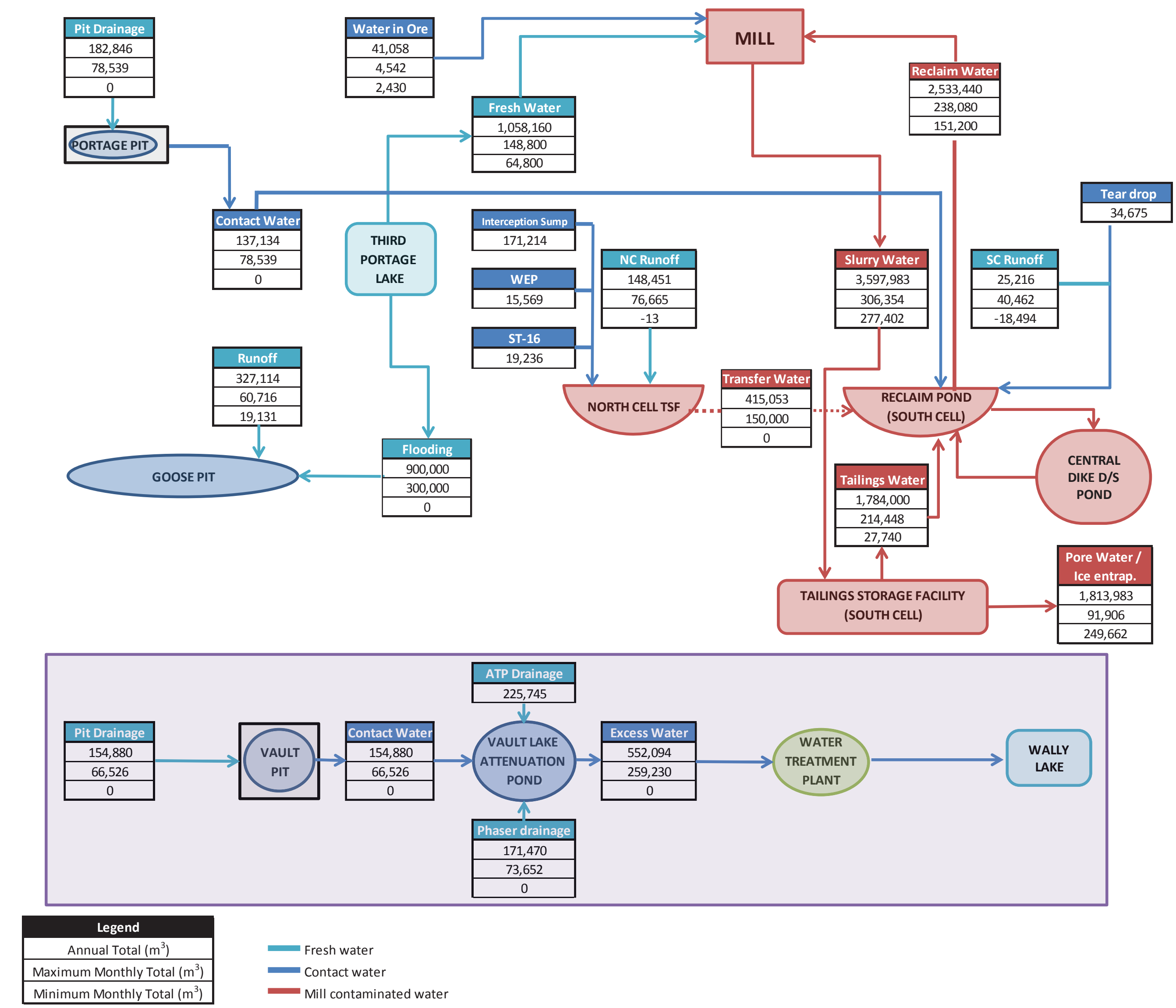


General Water Movement – 2016



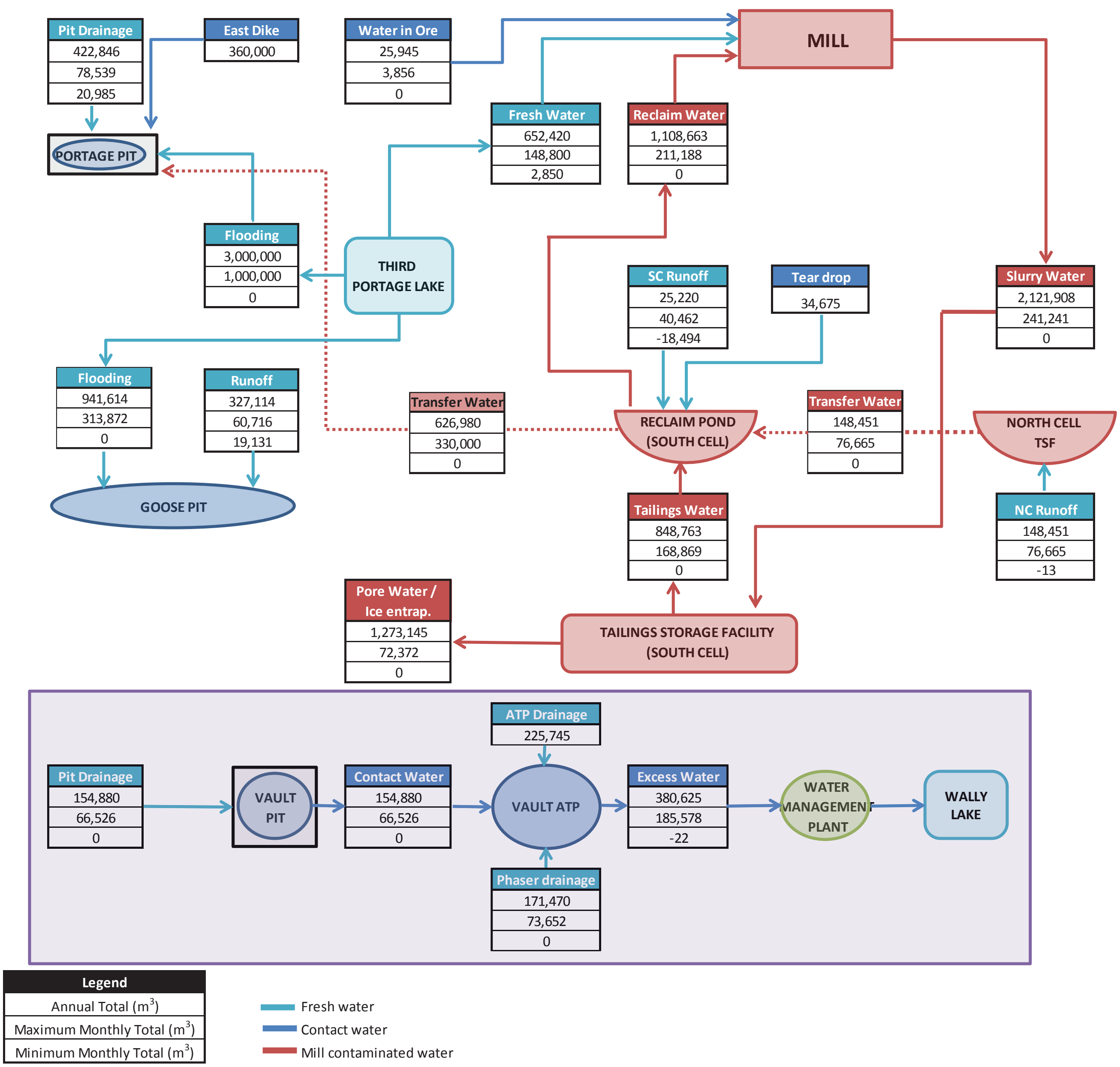
Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

General Water Movement – 2017



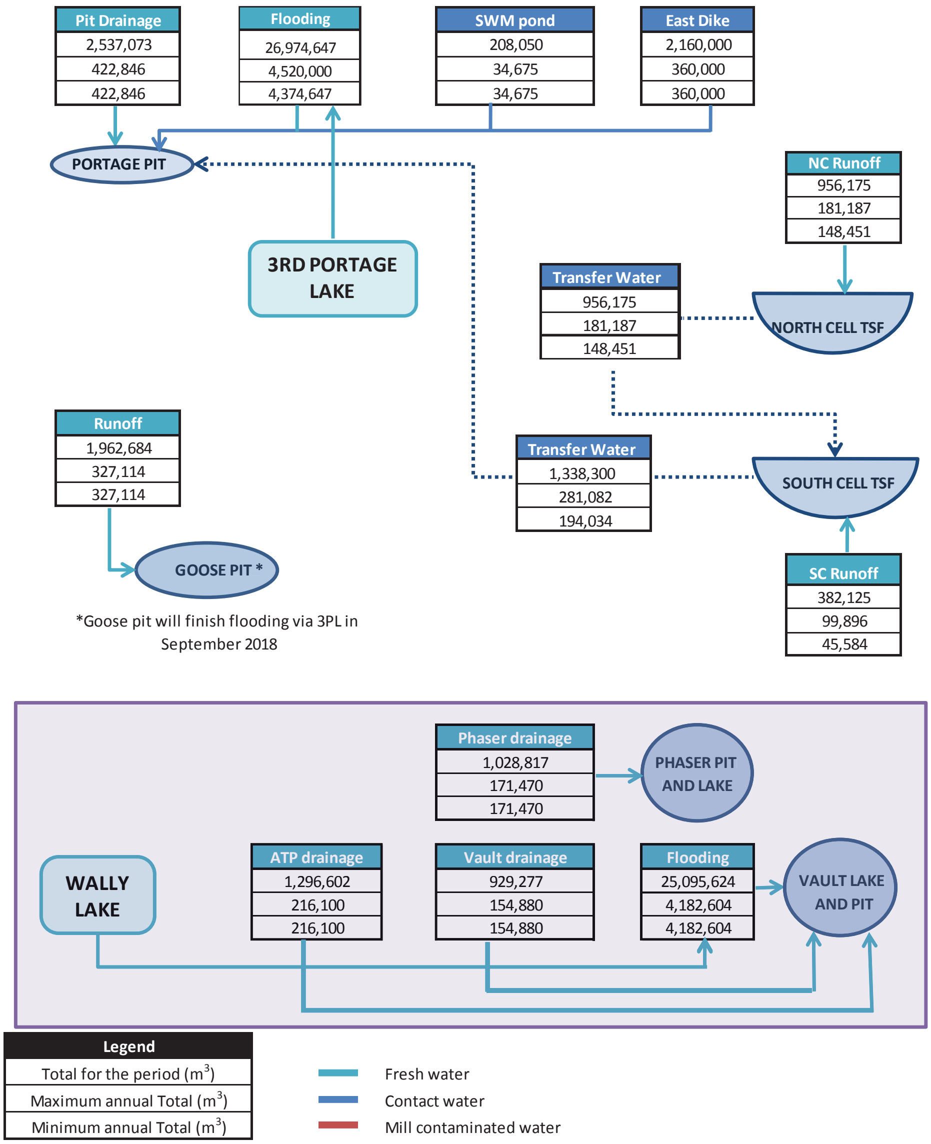
*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

General Water Movement – 2018

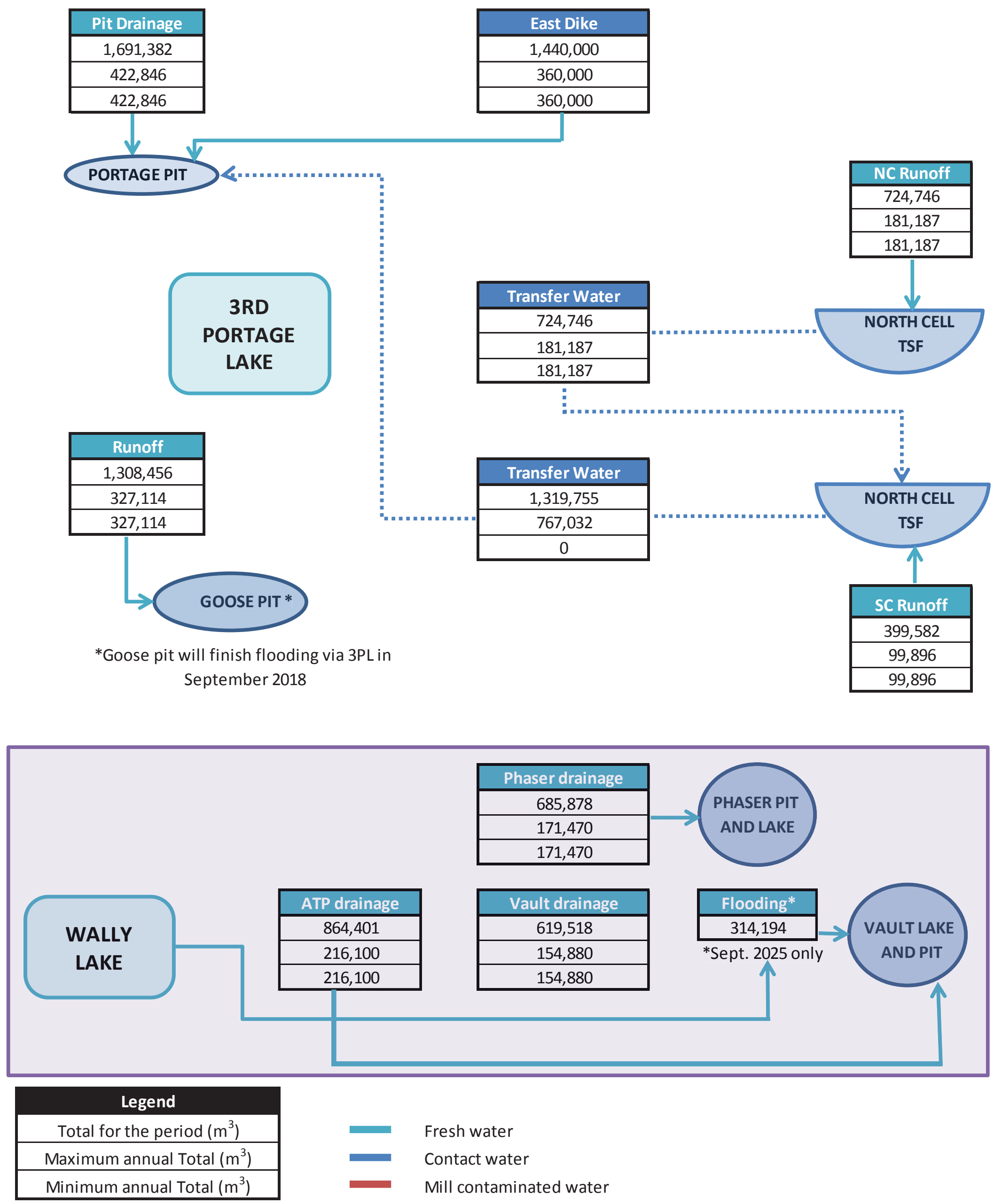


*Small water transfers are not shown on this drawing, refer to water balance tables for detailed water movement.

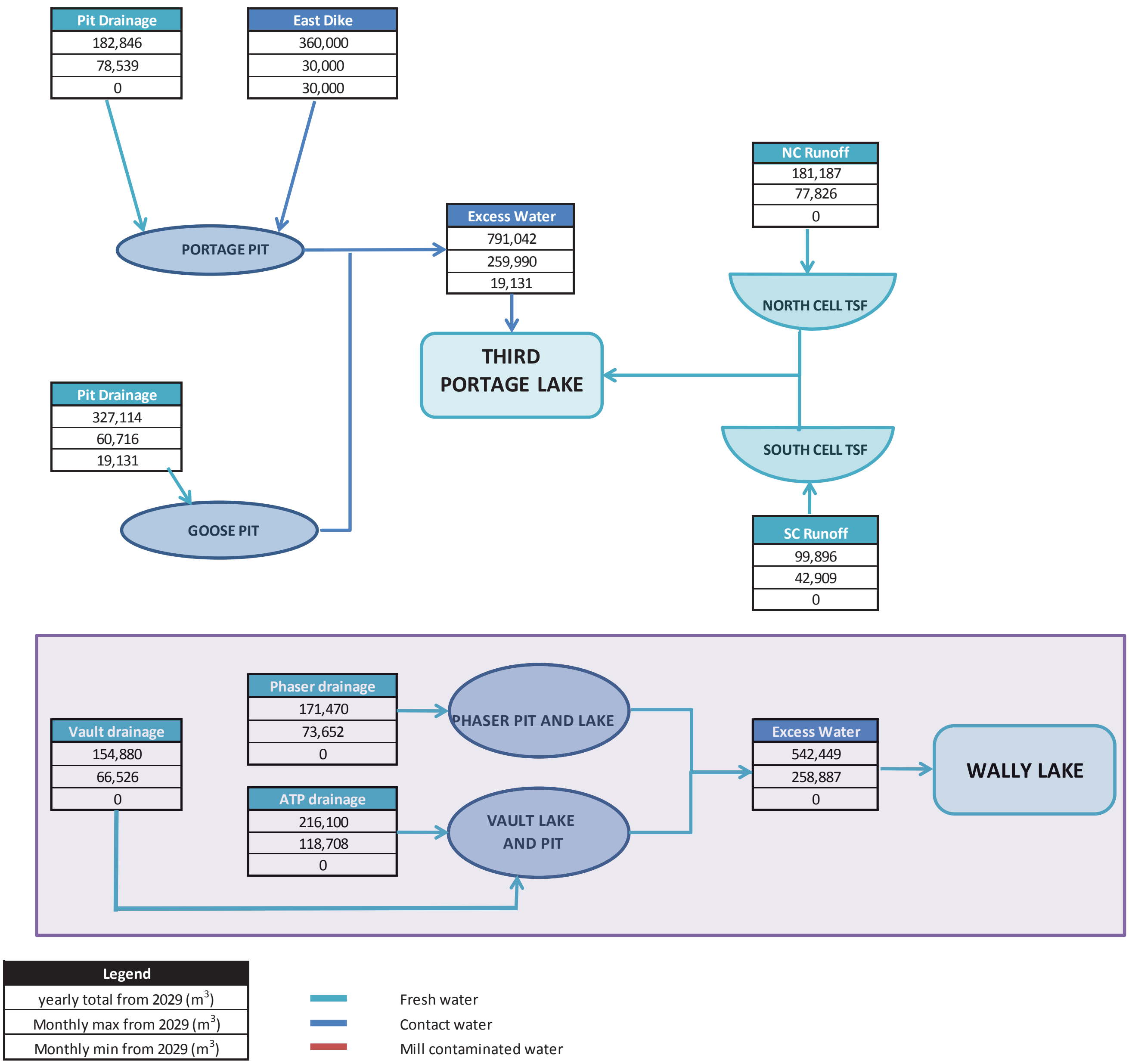
General Water Movement – 2019-2024



General Water Movement – 2025-2028



General Water Movement – 2029



APPENDIX C – 2015 MEADOWBANK WATER QUALITY FORECASTING UPDATE

SNC·LAVALIN

MINING & METALLURGY

AGNICO-EAGLE MINES
Meadownbank Mine

TECHNICAL NOTE

Meadowbank Water Quality Forecasting Update for the 2015 Water Management Plan

Our file: 635062-0000-40ER-0001, revision 00

March 2016

Certified ISO 9001

SNC·LAVALIN	TECHNICAL NOTE **Meadowbank Water Quality Forecasting Update for the 2015 Water Management Plan**	Prepared by: G. Beaudoin-Lebeuf Reviewed by: A.-L. Nguyen		
		Rev.	Date	Page
	635062-0000-40ER-0001	00	March 23, 2016	i

Title of document: **Meadowbank Water Quality Forecasting Update for the 2015 Water Management Plan**

Client : **AGNICO-EAGLE MINES**

Project : **Meadowbank Gold Project**

Prepared by: Geneviève Beaudoin-Lebeuf, ing.

Reviewed by: Anh-Long Nguyen, ing., M.Sc.

REVISION INDEX

Revision				Pages Revised	Remarks
#	Prep.	App.	Date		
PA	GBL	ALN	2016-02-10	All	For internal review
PB	GBL	ALN	2016-02-15	All	For client's review
00	GBL	ALN	2016-03-23	All	For information

NOTICE TO READER

This document contains the expression of the professional opinion of SNC-Lavalin Inc. ("SLI") as to the matters set out herein, using its professional judgment and reasonable care. It is to be read in the context of the agreement dated December 31st, 2015 (the "Agreement") between SLI and Agnico Eagle Mine (the "Client") and the methodology, procedures and techniques used, SLI's assumptions, and the circumstances and constraints under which its mandate was performed. This document is written solely for the purpose stated in the Agreement, and for the sole and exclusive benefit of the Client, whose remedies are limited to those set out in the Agreement. This document is meant to be read as a whole, and sections or parts thereof should thus not be read or relied upon out of context.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

1.1 MANDATE

SNC-Lavalin (SLI) was mandated by Agnico-Eagle Mines (AEM) to review and update the water quality forecasting model developed in 2012, and updated yearly using the Water Balance reported in the appendix A of the 2015 Water Management Report and Plan (WMP 2015) to be submitted in March 2016 by AEM.

1.2 STUDY OBJECTIVES AND CONTENT

This Technical Note presents the water quality forecast model updated for the Meadowbank Gold Project, based on the Water Balance 2015 (WB 2015) of AEM. The WB 2015 was developed according to the updated Life of Mine (LOM) (version V2C 2015) and the mine development sequence provided by AEM and summarized in Table 1-1. The updated water quality forecast model applies to the North and South Cell TSF Reclaim Ponds, and the Portage and Goose Pits.

The objective of this Technical Note is to forecast the concentration of the selected parameters of concern within the North and South Cell TSF Reclaim Ponds, and the Portage and Goose Pits from 2015 until closure, verify last year’s assumptions and results, update the model if necessary, develop recommendations and determine whether water treatment will be required.

For the Vault pit, no treatment is expected when re-flooding the pit. This is largely due to the fact that there is no tailings disposal facility at the Vault site. The Vault Attenuation pond only receives mine pit and freshet water. This will be confirmed through regular monitoring required by the Type A Water License from 2014 – 2018. The first values of this monitoring campaign were analyzed and are presented in section 5.0.

1.3 WATER BALANCE

The WB 2015 was developed by AEM. In 2015, SNC re-evaluated the pit run off inflows for each underlying pit and TSF watersheds according to their most up to date footprint area. Following this, AEM examined the water transfers required for the water management infrastructure during the active life of mine, pit re-flooding activities and post closure, all under average hydrologic conditions.

The WB 2015 was based on the revised mining schedule presented in Table 1-1 below for Meadowbank and Vault areas.

Table 1-1: Water Management Phases (based on LOM version V2C 2015)

ACTIVITY	UPDATED START DATE[1]	UPDATED END DATE[1]	WMP 2012 START DATE	WMP 2012 END DATE
Pits Mining				
Portage Pit	January 2010	June 2018	January 2010	December 2016
North (Pit A)	January 2010	June 2018	January 2010	December 2015
Central (Pit B, C D)	January 2010	April 2013	January 2010	December 2013
South (Pit E)	January 2010	Dec 2017	January 2010	December 2016
Goose Pit	April 2012	May 2015	April 2012	June 2015
Vault Pit	January 2014	September 2018	January 2014	February 2018
Phaser Pit	July 2015	September 2018	-	-
Tailings Storage Facility Operations				
North Cell	January 2010	October 2015	January 2010	March 2015
South Cell	October 2014	September 2018	April 2015	February 2018
Rock Storage Facility (RSF) Operations				
Portage RSF	January 2009	June 2018	January 2009	December 2016
Vault RSF	January 2014	September 2018	January 2014	February 2018
Attenuation / Reclaim Pond Water Management				
Attenuation Pond (South Cell) [2]	January 2009	November 2014	January 2009	March 2015
Attenuation Pond Vault Lake	January 2014	September 2018	January 2014	February 2018
Mill Operations	January 2010	September 2018	January 2010	February 2018
Other Key Activities				
Dewatering of Vault Lake	June 2013	July 2014	September 2013	November 2013
Dewatering of Phaser Lake	July 2016	October 2016	September 2016	October 2016
Flooding of Portage Pit[3]	July 2018	September 2024	March 2017	September 2023
Flooding of Goose Pit[3]	July 2016	September 2018	July 2015	September 2023
Flooding of Vault Pit[3]	June 2019	August 2025	March 2018	October 2023
Flooding of Phaser Pit	June 2019	Aug. 2025	-	-
Breaching of dikes	n/a	2029 only if water criteria are met	n/a	n/a

Note :
[1] Periods are given from the beginning of the starting month to the end of the ending month.
[2] After October 2014, the Reclaim Pond is relocated to the South Cell TSF. After this date, there is no Attenuation Pond.
[3] Artificial flooding only with a combination of pumps and siphons, natural run off inflow as part of re-flooding not accounted in this table.

2.0 REVIEW OF MEADOWBANK WATER QUALITY DATA FOR 2015

2.1 DOCUMENTS REVIEWED

A review of the available water quality data measured in 2015 was undertaken by SLI. This included a review of the following documents:

- Chemical analysis results for the Portage Area for 2015. The chemical analysis results of interest for this Technical Note are presented in Appendix A and were integrated in the data previously obtained, specifically:
  - North Cell TSF Reclaim Pond (ST-21) from January 2013 to September 2015.
  - South Cell TSF Reclaim Pond (ST-21) (former South Cell TSF Attenuation Pond ST-18) from June 2013 to December 2015.
  - Mill effluent metal and cyanide concentrations from January 2013 to December 2015.
  - Four grab samples of Mill Effluent taken in 2015.

It should be noted that the Mill Effluent is currently being discharged to the South Cell TSF and has been since November, 2014. It was discharged previously in the North Cell TSF. The South Cell TSF Reclaim Pond thus collected water from the Mill Effluent and additional runoff water from surrounding areas until May 2015. The Mill Effluent was then sent to the North Cell TSF from July to October 2015 to complete tailings deposition for that cell. From October, 2015 until September, 2018 the mill effluent will be discharged only in the South Cell TSF.

It is important to remember that the review of the Meadowbank water quality data was undertaken to gain a better understanding of the water quality in the Portage Area, particularly as it affects the TSF Reclaim Ponds, and to provide a basis for the development and update of the mass balance.

2.1.1 Updates to the Water Balance

In the 2012 Water Balance (WB), South Cell TSF Reclaim Water was to be transferred to the pits in 2018 when there was approximately 6 Mm^3 of non-contact water already accumulated in the pits.

In the 2013 WB, the South Cell TSF Reclaim water was to be transferred to the pits beginning in 2015 when there would be very little water in the pits. Runoff water will then be allowed to flow into the pit and mix with the South Cell Reclaim Water.

In the 2014 WB, based on the volume of Reclaim Water anticipated in the North Cell TSF and South Cell TSF Ponds, South Cell Reclaim Water was to be transferred to Portage pit starting August 2017. Based on the updated water balance model, no Reclaim Water was to be transferred to Goose Pit. Furthermore, the percentage of tailings water/ice entrapment was also updated in the 2014 WMP to better reflect what was currently observed on site.

In the updated 2015 WB, based on the volume of Reclaim Water anticipated in the North Cell TSF and South Cell TSF Ponds, South Cell Reclaim Water will be transferred to Portage pit starting September 2018. The transfer was postponed one year due to a longer life of mine. Based on the updated water balance model, no Reclaim Water will be transferred to Goose Pit other than 50,431 m^3 transferred from the Central Dike seepage collection pond during September 2015, which is similar to the South Cell Reclaim Pond water quality.

Moreover, a different percentage of tailings water/ice entrapment for North and South Cell TSF was used in order to better characterize the difference of ice entrapment cover between the two, partly due to the continuing water inflow from the mill effluent in the South Cell TSF.

2.2 REVIEW OF MEADOWBANK WATER QUALITY DATA

Based on the flows in the Portage Area, it was determined that the most important contributor to the water quality in the TSF Reclaim Ponds was the Mill Effluent, since the other inflows consist of snow and ice melt, precipitation, and runoff from nearby areas.

2.2.1 North Cell TSF and South Cell TSF Reclaim Ponds (ST-21)

A review of the chemical analysis for water samples collected in the North Cell and South Cell TSF Reclaim Ponds (station ST-21) was undertaken by SLI in order to identify contaminants that were either above discharge criteria (as stipulated in the MMER, CCME and/or the Water License, Part F). It is understood that the MMER, CCME and Water License criteria apply to mining effluents discharged to the environment and are as such not applicable to the TSF Reclaim Ponds since no effluent is discharged from this area to the environment. However, the MMER, CCME and Water License criteria are used as a guide, to identify potential parameters that may become a problem should they be discharged to the environment without treatment.

In 2015, the mill effluent was discharged to the South Cell TSF Reclaim Pond eight (8) months of the year. Furthermore, between June to October 2015, the mill effluent and tailings were deposited in the North Cell TSF and the reclaim water was transferred from the North to the South Cell during this period. Thus, most of the contaminant load in 2015 accumulated in the South Cell TSF Reclaim Pond. Also note that the transfer of water from the North to the South Cell will occur during the summer months each year until dike breaching.

As mentioned in section 2.1.1, water transfer from the South Cell TSF Pond to Goose Pit was required in September 2015 to validate assumptions about the Central Dike seepage impacts on the South Cell inflow/outflow balance. The water originates more precisely from the South Cell downstream pond, where seepage water from South Cell TSF Pond is collected. Please refer to the 2015 WMP for further details.

It should also be noted that the parameters of concern were only determined based on the chemical analyses provided by Meadowbank and summarized in Appendix A.

The parameters of concern identified in the previous water quality forecasting reports that may represent a potential long term contamination risk are the following:

- Cyanide (total)
- Copper
- Iron
- Selenium
- Nitrate
- Chloride
- Ammonia

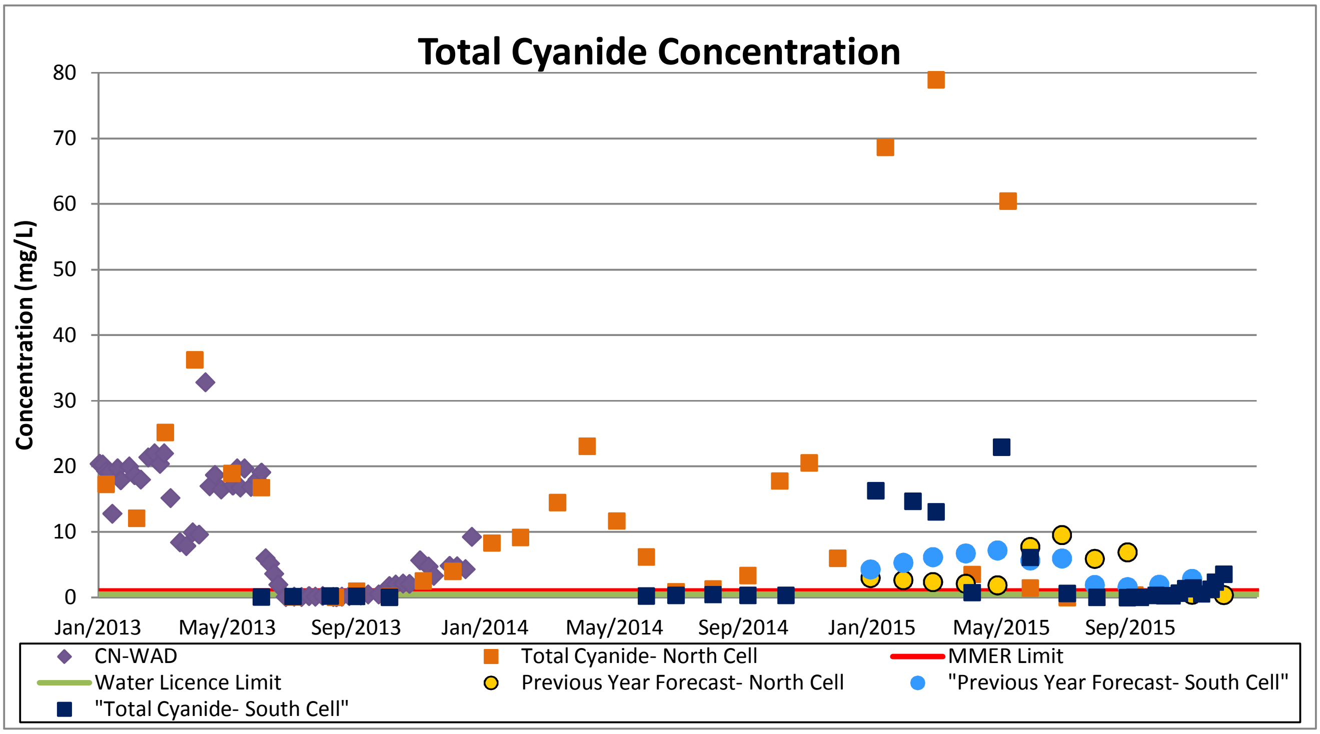
Table 2-1 presents the MMER, Water License and CCME discharge criteria for the 2015 parameters that may represent a potential contamination risk in the Portage Area when filling Portage and Goose Pits after the mining sequence is complete. These criteria are also presented in Figure 2-1, where applicable. Figure 2-1 presents the concentration of the 2015 parameters measured in the North and South Cell TSF Reclaim Ponds from 2013 until 2015. Also shown in this figure are the forecasted concentrations from the 2014 Water Quality Forecasted Model.

Table 2-1: Discharge Criteria for the Parameters Evaluated

PARAMETER	DISCHARGE CRITERIA		
	MMER (1)	***Water License (2) (Part F)***	***CCME (3) (criteria date)***
Cyanide (CN)	1.00 mg/L (as total CN)	0.5 mg/L (as total CN)	5 µg/L (as free CN) (1987)
Copper (Cu)	0.30 mg/L	0.1 mg/L	4 µg/L(4) (1987)
Iron (Fe)	*no criteria*	*no criteria*	0.3 mg/L (1987)
Ammonia (NH_3)	*no criteria*	16 mg N/L	0.86 mg N/L(5) (2001)
Nitrate (NO_3)	*no criteria*	20 mg N/L	2.94 mg N/L (2012)
Chloride (Cl)	*no criteria*	1,000 mg/L	120 mg/L(6) (2011)
Selenium	*no criteria*	*no criteria*	5 µg/L (1987)

Notes:
(1) MMER criteria corresponding to the maximum average monthly concentration
(2) Water License (Part F) criteria corresponding to the maximum average concentration
(3) CCME criteria as per the Water Quality Guidelines for the Protection of Aquatic Life for freshwater and long-term exposure. Criteria referenced from www.ccme.ca in Feb. 2016.
(4) The copper discharge criterion depends on hardness. For water hardness between 200 to 1400 mg/L of $CaCO_3$ (average hardness levels in the North Cell and South Cell TSF Reclaim Pond and in Third Portage Lake) the copper limit is 4 µg/L.
(5) The ammonia concentration limit depends on temperature and pH (an increase in temperatures and pH leads to a more stringent ammonia concentration limit). In this case, 1.04 mg/L of NH_3, or 0.855 mg N/L was determined assuming a temperature of 10°C and a pH of 8.0.
(6) This is the long-term chloride concentration limit. The short term concentration limit is 640 mg/L.

Figure 2-1: Concentration in the North and South Cell TSF Reclaim Ponds



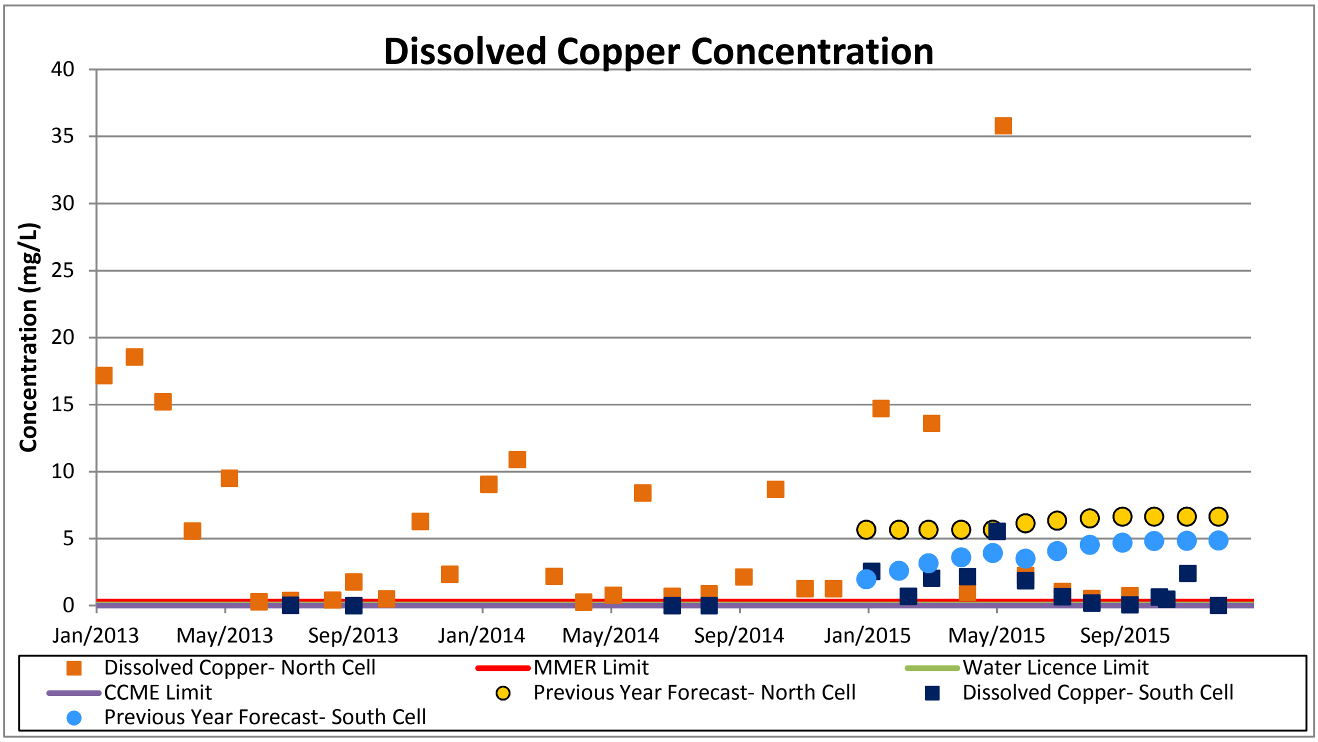
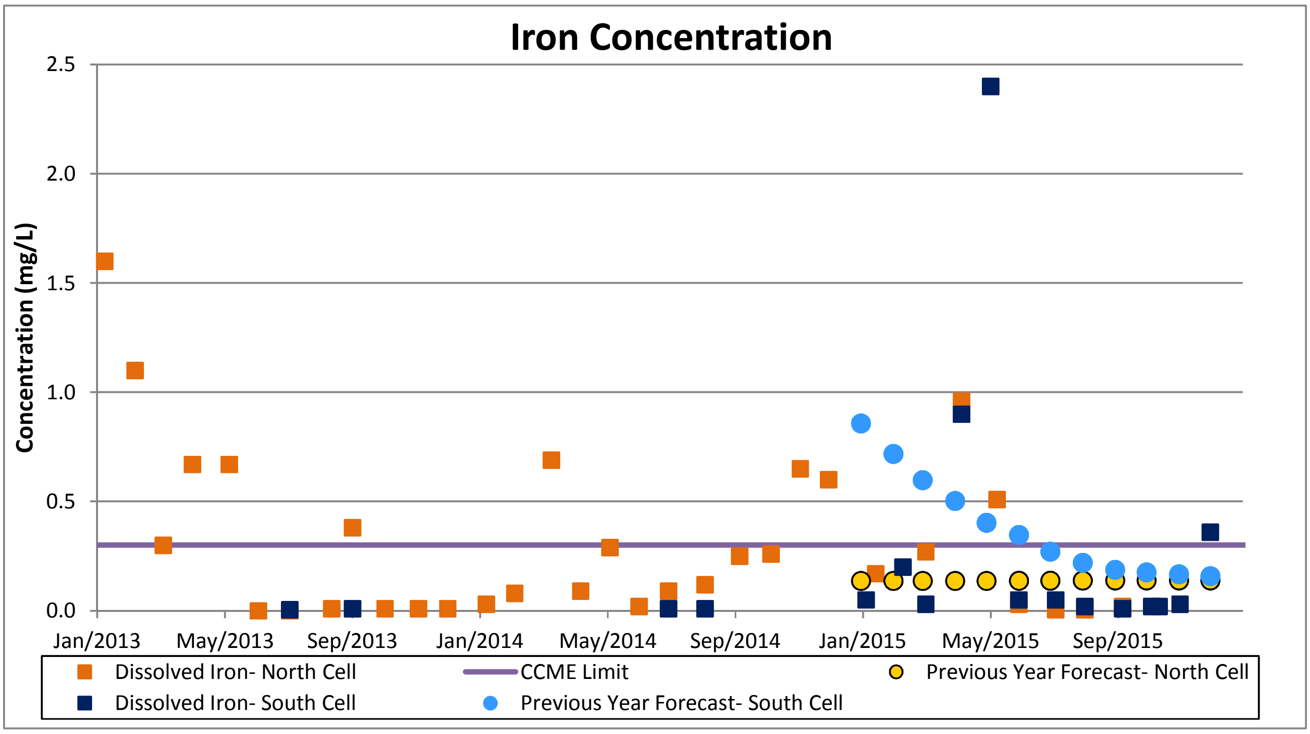


Figure 2-1: (continued) Concentration in the North and South Cell TSF Reclaim Ponds



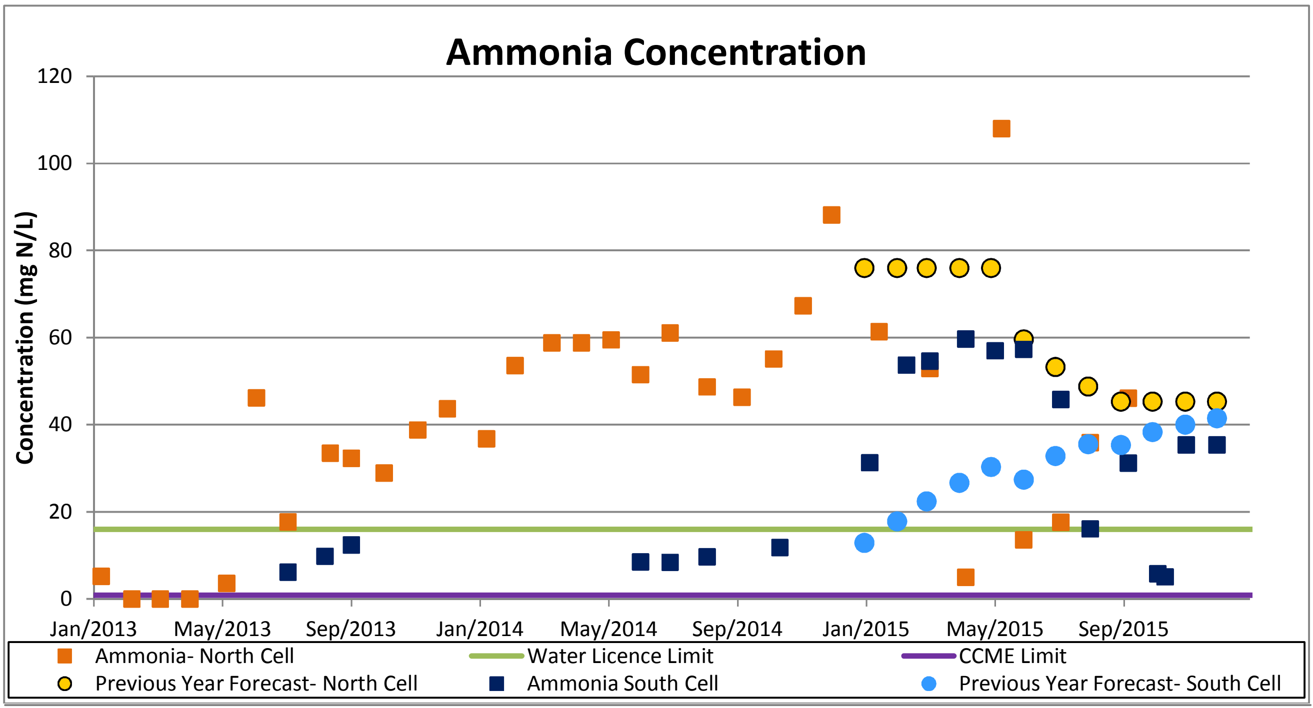
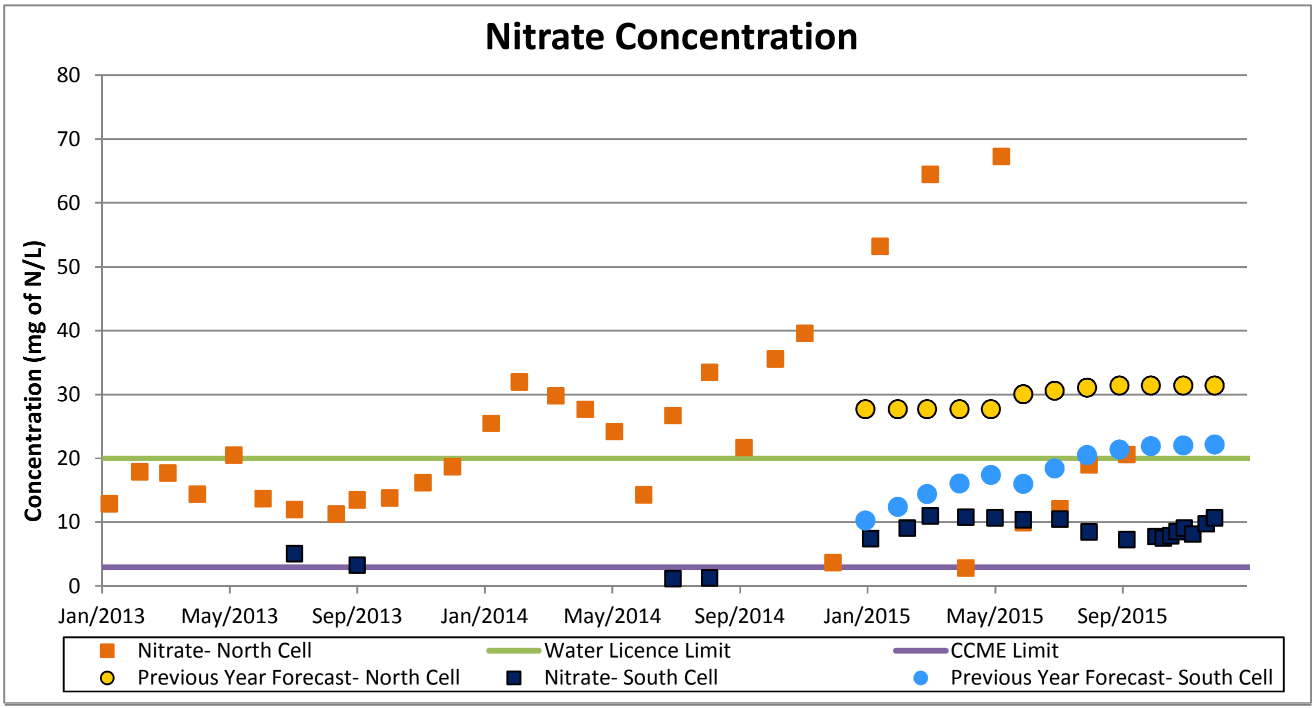


Figure 2-1: (continued) Concentration in the North and South Cell TSF Reclaim Ponds



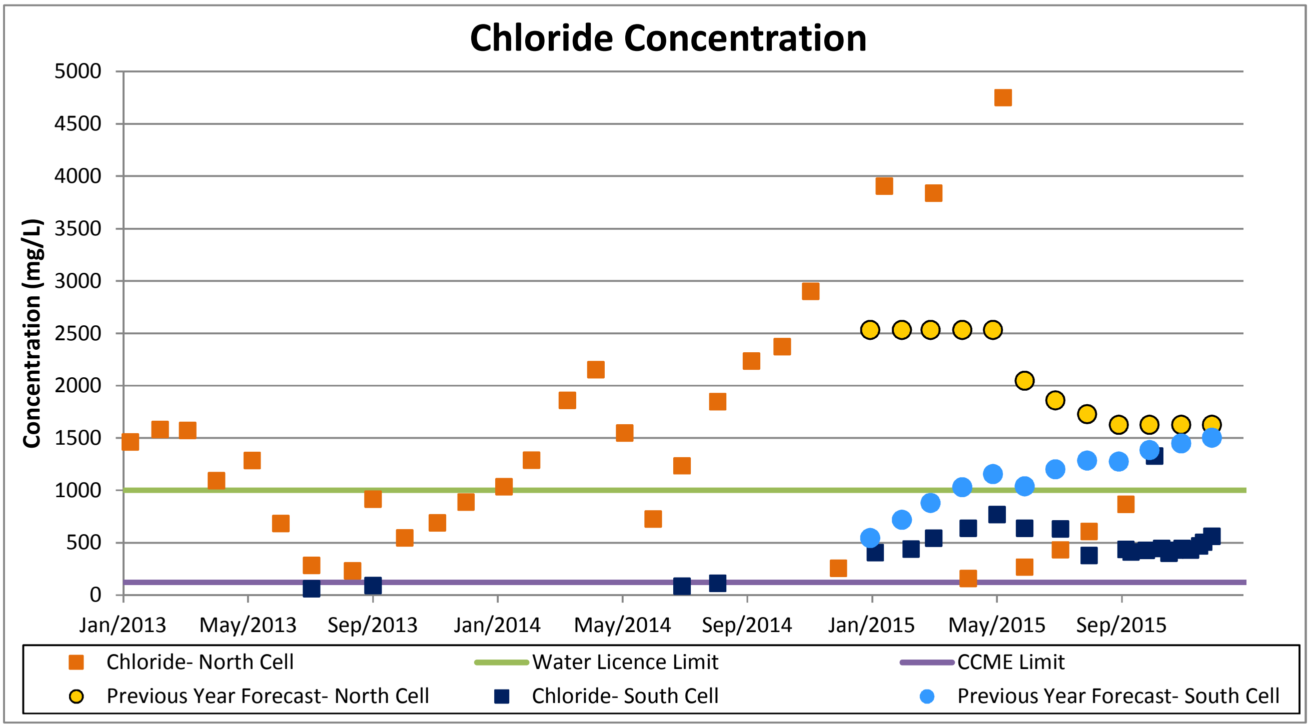
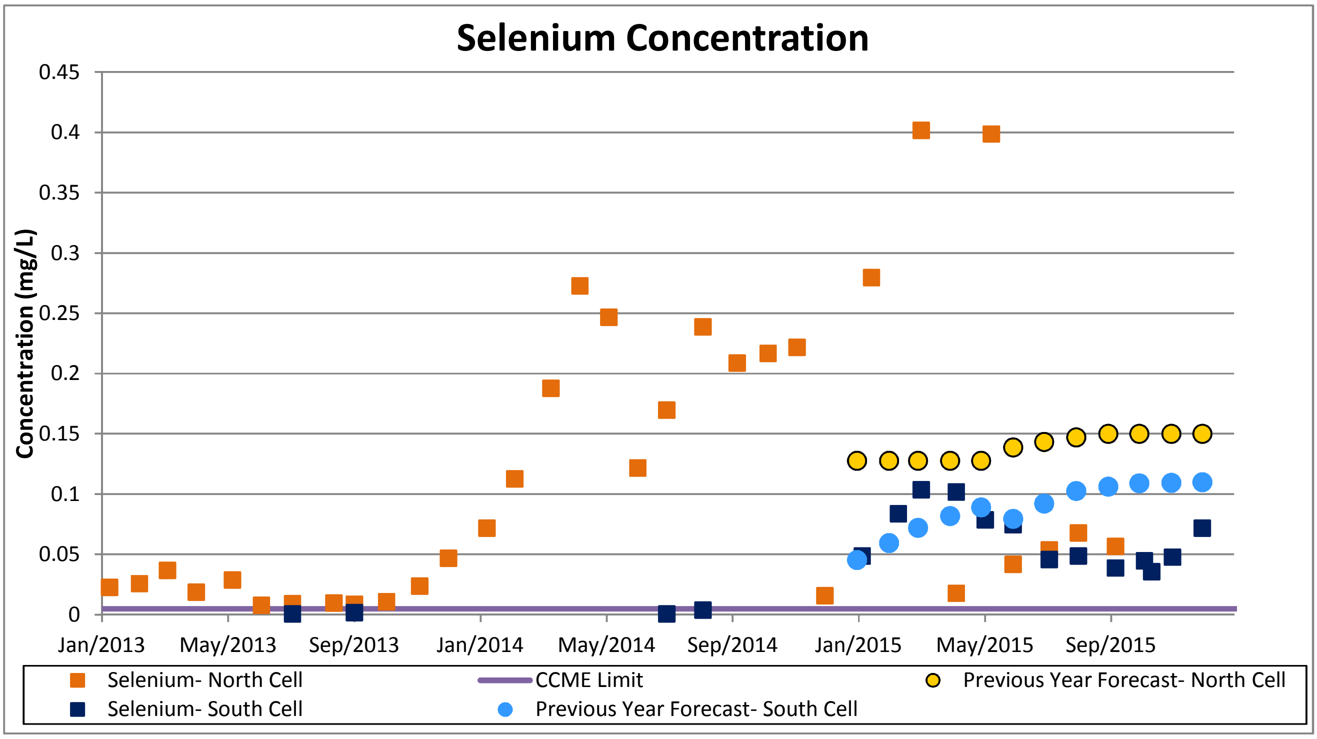


Figure 2-1: (continued) Concentration in the North and South Cell TSF Reclaim Ponds



From the graphs shown in Figure 2-1, the following observations can be made based on the measured concentrations:

i. Total cyanide concentration in the North Cell TSF Reclaim Pond was variable during 2015. The values peaked in January and March at 69 mg/L and 79 mg/L respectively. Since there was no tailing deposition between January to June 2015 in the North Cell, the cyanide concentration measured in this pond are residuals from tailings deposition that occurred in 2014. As usual, the concentrations were higher during the winter months and decreased significantly during the summer months. Thus, the measure data demonstrated that cyanide volatilization does occur efficiently during the summer months. Total cyanide concentration in the South Cell TSF Reclaim Pond started to increase once tailings deposition began in this area at the start of the year, and showed significant decrease over the warmer summer months.

ii. Copper concentrations followed approximately the same trend as cyanide in 2015 in both Reclaim Ponds. In the North Cell TSF Reclaim Pond, the measured copper concentration increased over the winter months mainly due to the lower volume of water available in this pond. Once runoff water flowed into the North Cell, the concentration decreased. Furthermore, once tailings deposition resumed in this area in July 2015, the copper concentration decreased once more since the mill effluent discharged with the tailings is alkaline (i.e. high pH) and helped precipitate out the copper as copper hydroxide particles in the TSF. In the South Cell TSF Reclaim Pond, copper concentrations started to increase once tailings deposition started in this area.

iii. Most of the dissolved iron concentrations measured in 2015 were below the CCME limits for both North and South Cell TSF Reclaim Ponds. There is no criterion for iron in the Water License (Part F) or in the MMER.

iv. Ammonia concentrations in the North Cell TSF Reclaim Pond decreased during the summer, with an unexpected peak at 108 mg/L in May and increased progressively during the fall. This increase coincided with the resumption of tailings deposition in the North Cell TSF during the summer of 2015. As for the South Cell TSF Reclaim Pond, ammonia concentration increased from January to June, coinciding with the period of tailings deposition. Once tailings deposition stopped in this area for the summer, a decrease in ammonia concentration was observed. Once tailings deposition resumed in the South Cell at the end of October, ammonia concentration increased once more. Ammonia is produced by the hydrolysis of cyanate, which is a by-product of the cyanide destruction system. Therefore, when the cyanide destruction system is operating efficiently, it is expected that the concentration of ammonia will increase in the Reclaim Ponds.

v. Nitrate concentrations in the North Cell TSF Reclaim Pond had several peaks at the beginning of 2015, one of them being the highest in three years with 67 mg/L. The concentrations were then lower and more stable during the summer months since no tailings were being discharged to the North Cell. For the South Cell TSF Reclaim Pond, the measured concentrations started to increase and coincide with the deposition of tailings in the area.

vi. Chloride concentrations in the North Cell followed the same trend as nitrate, with peaks at the beginning of the year, and lower measured values for summer and fall 2015. In the South Cell TSF Reclaim Pond, the measured concentrations started to increase and coincide with the deposition of tailings in the area. The primary source of chloride found in the TSF Reclaim Ponds is thought to be due to the use of calcium chloride as an anti-freeze solution. There is a reduction in its use during the summer months, which could explain the drop seen during those months.

vii. Selenium concentrations in the North Cell TSF Reclaim Pond had also several variations during winter and spring 2015, the highest peak being 0.4 mg/L in March.

The concentrations were then lower for the rest of the year. In the South Cell TSF Reclaim Pond, the concentrations oscillated between 0.035 and 0.1 mg/L.

The graphs in Figure 2-1 also present the forecasted values for 2015 versus the actual measured values. A couple of points to note:

i. The forecasted concentrations for cyanide in the North Cell were very similar as the actual measured values during July to September 2015. However, during the winter months, the forecasted values were too low. In the South Cell, the forecasted trend followed approximately the actual values. The data suggest that very little natural cyanide degradation occurs during the winter months.

ii. Forecasted concentrations for copper and iron were slightly higher when compared to the actual measurements, aside from a couple of elevated concentrations measured in the North Cell TSF Reclaim Pond during the first half of the year. The current forecasting model is based on a mass balance using the water balance around the site. It does not take into account possible geochemical reactions that could help precipitate out the metals of the water column phase at equilibrium. For this reason, the forecasted concentrations for these metals will be more conservative.

iii. Forecasted concentrations for ammonia in both TSF Reclaim Ponds indicated an increase over the year. The model took into consideration the hydrolysis of cyanate (CNO^-) to ammonia (NH_3). The measured concentrations confirmed this trend, but some of the actual measured values were higher in both ponds. The period of tailings deposition in each of the TSF Cells directly influence the measured concentration of ammonia in the Reclaim Ponds.

iv. The forecasted nitrate concentrations in the North Cell showed a gradual increase over the year while the actual measured values were much higher between January and May 2015, and were much lower for the rest of the year. In the South Cell, the forecasted concentration indicated a gradual increase over the year. The measured values confirm this increase but were lower than the forecasted values.

v. In the North Cell, the measured chloride values were higher than the forecasted concentration at the beginning of the year. However, once summer runoff water flowed in the area, the forecasted concentration indicated a decrease, which was reflected in the actual measured value, though at a much lower concentration than anticipated. As for the South Cell, the forecast model indicated a gradual increase over the year, while the measured values showed an increase at the start of the year, which coincided with the start of tailings deposition, and then a stabilization during the summer months, which coincided with a stop in tailings deposition (tailings deposition returned to the North Cell during this period).

vi. Forecasted selenium concentration in the North Cell indicated a gradual increase over the year while the measured values were much higher in the winter months and decreased significantly during the summer months. For the South Cell, the forecasted value indicated an increase over the year, which was confirmed with the measured values. The actual and forecasted values are within the same range.

2.2.2 Mill Effluent

A review of the chemical analysis for the Mill Effluent was undertaken by SLI in order to identify the impact of the Mill Effluent water quality on the water quality observed in the North and South Cell TSF Reclaim Ponds. The Mill Effluent is tested twice daily for gold (solid and dissolved) and iron (dissolved), copper (dissolved) and cyanide (CN-WAD) using the on-site lab, which is not accredited for environmental water quality chemical analysis. These chemical analyses were provided to SLI for January 2013 to December 2015 and the results are presented in Appendix A.

Figure 2-2 shows the daily average dissolved metal concentrations and cyanide (CN-WAD) in the Mill Effluent. This figure illustrates the following:

- Dissolved iron and copper concentrations are present in the Mill Effluent. Thus the main source of iron and copper in the TSF Reclaim Pond comes from the Mill Effluent.
- There is a relationship between copper and cyanide concentrations at the Mill Effluent. This is clearly represented in Figure 2-2, where the two trends behaved similarly in 2015. A low concentration of CN-WAD is generally accompanied with lower copper concentration. During the previous year, iron concentrations also followed the trends of copper and cyanide, but this is less the case in 2015, since its concentrations remains low throughout the year.
- Compared to the values of 2014, the concentrations for all three parameters in 2015 are generally lower, but the peaks are higher and occurred more frequently, as shown in Figure 2-3, since the Mill operation was probably less constant in 2015 and higher peaks of cyanide occurred more frequently.

Figure 2-2: Dissolved Metal Concentrations and Cyanide (CN-WAD) in the Mill Effluent from January 2015 to December 2015

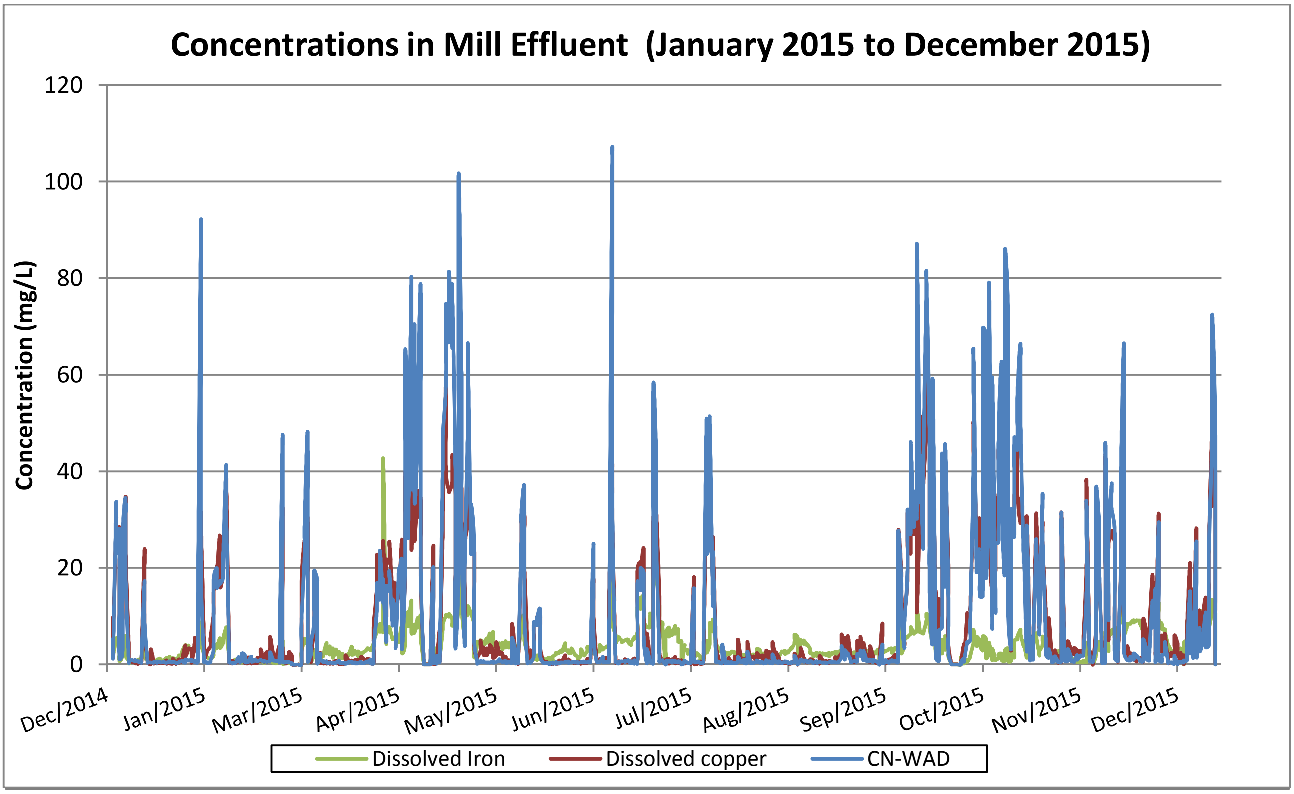
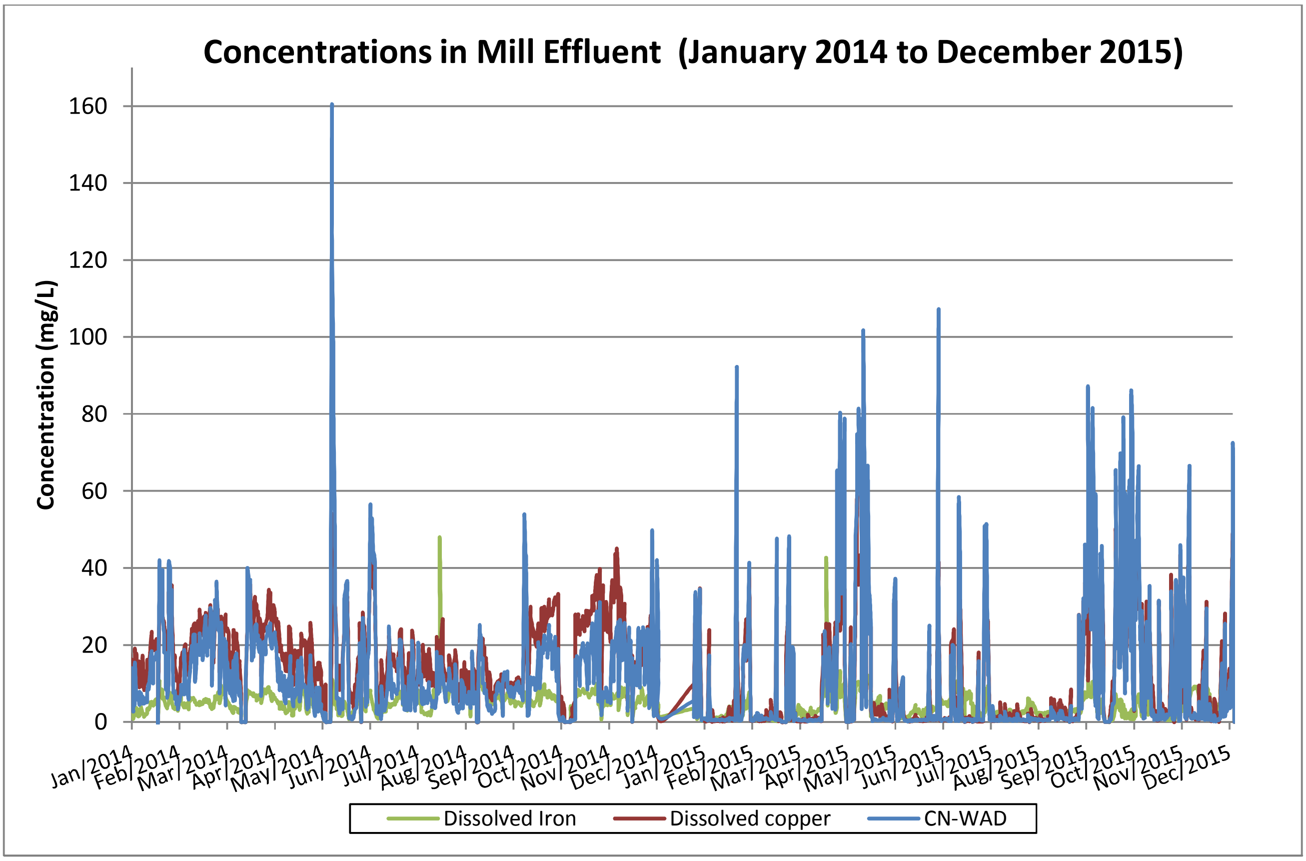


Figure 2-3: Dissolved Metal Concentrations and Cyanide (CN-WAD) in the Mill Effluent from January 2014 to December 2015



2.2.3 Additional Mill Effluent Water Quality Results

AEM analyzed four different samples of the water fraction of Mill Effluent after cyanide destruction in order to have representative data of the tailings water being discharged to the North or South Cell TSF in 2015.

The chemical analysis results of the additional Mill Effluent samples taken in 2015 are presented in Appendix A and are summarized in Table 2-2. Table 2-2 also compares the Mill Effluent average with the South and North Cell average.

Table 2-2: Mill Effluent Concentrations Sampled in 2015

PARAMETER	MILL EFFLUENT CONCENTRATION (mg/L)					SOUTH CELL (mg/L)	NORTH CELL (mg/L)
	January 22nd, 2015	April 9th, 2015	July 13th, 2015	October 15th, 2015	Average 2015	Average 2015	Average 2015
Total Cyanide (CN)	4.39	51.9	0.08	16.3	18.2	4.1	26.7
Copper (Cu)	0.0394	28.5	0.0237	15.5	11.0	N/A	N/A
Dissolved Copper	0.0145	36.7	0.0172	5.28	10.5	1.5	8.7
Iron (Fe)	2.09	13.3	3.93	4.43	5.9	N/A	N/A
Dissolved Iron	1.08	11.7	2.78	1.74	4.3	0.3	0.2
Ammonia (NH_3) (mg N/L)	90.6	52.9	325	40.7	127.3	37.6	42.5
Nitrate (NO_3) (mg N/L)	10.8	12.1	18	22.8	15.9	9.1	31.2
Chloride (Cl)	400	930	570	1200	775.0	536.7	1853.8

With regard to the Mill Effluent, the measured data from the four different samples exhibit a high variability; the standard deviation is large and the average tends to be less reliable. Indeed, the values of April suggest the cyanide destruction system was not operating optimally, and thus the concentration of copper (total and dissolved) as well as iron, were much higher. However, when the cyanide destruction system is operating effectively, the copper and iron concentrations are lower and the ammonia concentration is higher, suggesting that the cyanate, a by-product of the cyanide destruction system, is hydrolyzing to ammonia in the mill effluent.

The average concentration in the Mill Effluent is higher than the average measured concentrations in the South Cell, where the majority (8 months) of the effluent was discharged in 2015. These results indicate that the main parameters of concern identified in the South Cell TSF Reclaim Pond can be traced to the Mill Effluent.

In the North Cell, the average concentration is higher than in the South Cell. This is expected since tailings have been deposited in this area since the beginning of mine operation. The higher concentrations reflect the accumulation of the contaminant loads over time in the North Cell Reclaim Pond. The higher average nitrate concentrations suggest that some of the ammonia present in the Reclaim Pond is being gradually biodegraded to nitrate year after year.

2.2.4 Ammonia Loading to Environment at Meadowbank

Ammonia that is found in the TSF Reclaim Water at Meadowbank originates mainly from the hydrolysis of cyanate into ammonia, the by-product produced following cyanide destruction. To a lesser extent, ammonia also comes from un-reacted ammonium nitrate based explosive used in Portage and Goose pits and from the treated effluent from the mine site sewage treatment plant which is discharged to the Stormwater Management Pond. The Stormwater Management Pond is now pumped twice yearly to the South Cell TSF. In 2015, as per the Water License, there was no discharge of North or South Cell TSF Reclaim Water to Third Portage Lake.

It is worth mentioning that in the month of September 2015, approximately 50,431 m^3 of Reclaim Water from the South Cell was transferred to Goose Pit. The concentration of ammonia measured in one sample taken that month in the South Cell TSF Reclaim Pond was 31.2 mg N/L. Thus, assuming an average concentration of 31.2 mg N/L of ammonia, the total load of ammonia transferred to Goose Pit in September is evaluated at approximately 1573 kg of ammonia (expressed as N). Again, there was no discharge of water within Goose Pit to Third Portage Lake. This additional load of ammonia in Goose Pit was taken into account in the forecasting model. This information was, among others, compiled during the mandate 632112-Central Dike Investigation WQA, performed by SNC-Lavalin. For more information, please refer to the WMP 2015, at Section 3.10.9.4 Central Dike Seepage.

2.2.5 Total Suspended Solids in the Reclaim Water

There is very limited data available on the measured Total Suspended Solids (TSS) in the Reclaim Water. However, turbidity values measured from sampling point ST-21 are generally low. In 2014, the average turbidity value for the year was about 4.9 NTU, with a maximum measured in June 2014 of 13.9 NTU. Turbidity measurements are indirect measurements of TSS; generally, the higher the turbidity value, the higher the TSS concentration.

Considering that no Reclaim Water was discharged to Third Portage Lake in 2015, the higher turbidity value will only impact, if any, the process plant.

When Reclaim Water will be transferred to Portage Pit, it will be important to transfer water with little to low TSS concentrations. Every effort should be made to limit the transfer of tailings and sediments from the TSF to the pits. This is particularly true once the water level in the cell reaches the tailings surface.

3.0 UPDATED MASS BALANCE MODEL

3.1 DESCRIPTION

The water quality updated mass balance model presented in this Technical Note was developed to help forecast trends in water quality in the Portage Area of Meadowbank for different parameters of interest. The starting date for the model was arbitrarily set for January 2014 in order to keep in-line with the previous model. The end date of the model is set when the dykes will be breached in 2029. This mass balance model was based on the following:

- Flows and volumes provided in the WB 2015 (AEM, 2015);
- Assumptions presented below in section 3.2;
- Chemical analyses for ST-21 (North and South Cell TSF Reclaim Pond) (2014-2015);
- Chemical analyses for Third Portage Lake (2015);
- Chemical analyses for the Mill Effluent (four samples taken in 2015).

3.2 ASSUMPTIONS

The assumptions used in the development of the mass balance model for the Portage Area of Meadowbank were the following:

i. For simplification of the model, the North and South Cell TSF Reclaim Ponds and the Portage and Goose Pits are assumed to be completely mixed systems.

ii. The main source of cyanide, copper, ammonia (i.e via the hydrolysis of cyanate), iron, nitrate, chloride, selenium, sulfates and total dissolved solids in the TSF Reclaim Pond is the Mill Effluent. The influent loading from Portage pit, Goose pit and Stormwater Management Pond into the Reclaim Ponds was included in this year water quality forecasting model. All other inflow contaminant concentrations (Third Portage Lake[1], precipitation, runoff, etc.) are assumed to be negligible.

iii. The water quality of the Mill Effluent is assumed to be constant over time for all parameters, except for ammonia, chloride, sulfates and total dissolved solids. For ammonia, the water quality for this parameter will continue to vary due to the hydrolysis of cyanate to ammonia. For chloride, the water quality for this parameter will continue to increase due to the continued use of calcium chloride as a dust suppressant in the mill and crusher. For sulfates, the oxidation of sulphide in ore

[1] 2015 water quality data continue to show that the concentrations observed in Third Portage Lake were on average 95% lower than those in the North Cell TSF Reclaim Pond. It was therefore assumed that any input of contaminants from Third Portage Lake would be negligible.

produces sulfates and the TDS increases since it is assumed that the water used in the mill is charged with dissolved solids.

iv. The pH in the South Cell TSF Reclaim Pond is on average at 7.56 during the summer months, and on average 7.96 for the year (2015). The pH in the North Cell TSF Reclaim Pond is on average 7.20 per year.

v. For simplification of the model, the parameters are assumed to be inert: they do not degrade or react with other elements in the system, with the exception of cyanide.

vi. For cyanide, it is assumed that the Mill Effluent meets AEM's CN-WAD operational target of 15 mg/L at all times, which is assumed to correspond to a total cyanide concentration of 18.2 mg/L based on the effluent analysis made at an accredited lab.

vii. The total cyanide in the TSF Reclaim Pond is comprised of free cyanide and metal-cyanide complexes (weak and strong metal cyanide complexes). As per discussions with AEM, most of the iron- and metal-cyanide complexes are precipitated in the mill. However, since the reaction is not complete or perfect, some dissolved iron- and metal-cyanide complexes are expected to remain in the Mill Effluent. Therefore it was assumed that 10% of the total cyanide concentration was bound as strong iron-cyanide complexes, and that another 10% of the total cyanide concentration was present as weak metal-cyanide complexes (cyanide bound with copper, zinc, and nickel). The balance is present as free cyanide (i.e. HCN and CN^-). This agrees with values observed at other gold mine tailings sites (Simovic, 1984). These same proportions are assumed to apply to the cyanide at the Mill Effluent.

viii. For this model, natural cyanide degradation is only considered for the summer months.

ix. The initial concentration of all parameters in the Portage and Goose are assumed to be the average of 2015, and a sample taken on August 9th, 2015 respectively. For Portage Pit, an average of both South and North Pit was used. Also, only one sample was taken in Goose Pit Lake during the year since it was not safe to access it. More samples will be collected when access is safe, in 2016.

x. The initial concentration of all parameters in the North Cell TSF Reclaim Pond is the concentration obtained in January 8th, 2014 for station ST-21.

xi. The initial concentration of all parameters in the South Cell TSF Reclaim Pond is assumed to be the average concentration obtained in 2014 for station ST-18 before tailings deposition (known as Attenuation Pond from January to October 2014).

xii. The initial concentration of all parameters in the Third Portage Lake is assumed to be the average concentration obtained in summer 2015 in the East Basin.

xiii. For this analysis, it is assumed that no treatment will take place at the North or South Cell TSF Reclaim Pond, or at the Portage or Goose Pits.

xiv. Because of the similarities between the actual and dissolved forecasted concentrations, it is assumed that the suspended fraction should settle and not be mobile during the breaching of dikes. Therefore, the dissolved parameters are used again in the forecasting model this year, compared to the total parameters.

3.3 LIMITATIONS

The limitations of the Meadowbank water quality mass balance model and ensuing results and conclusions presented in this Technical Note are listed below:

i. In order to simplify the model, the mass balance model assumes that the pond and pits are completely mixed systems. Consequently, the results from this model provide an indication of the concentrations in the ponds and pits and should not to be considered as an absolute value at this time. Future monitoring results both for flows and water quality will provide for a better indication of concentrations of contaminants.

ii. The mass balance model is based on the water quality analysis results provided by AEM:

  – Water quality data provided for ST-21 is taken from samples collected at the surface of the North and South Cell TSF Reclaim Pond. Therefore the concentrations provided by AEM for ST-21 may not be representative of the entire TSF Reclaim Pond water quality.

  – Water quality data measured from samples taken of the Mill Effluent.

iii. The model does not make allowances for the impact that changes in the TSF (surface area, volume, tailings characteristics, etc.) will have on the TSF Reclaim Pond water quality over time.

iv. The model is based on a monthly time-step and the resulting concentrations provided represent monthly values.

v. It should be noted that at this point, given the limitations, assumptions and data currently available, the model should be used as a preliminary means to evaluate the impact of Mill Effluent on the future water quality in the North and South Cell TSF Reclaim Pond and Portage and Goose Pits.

vi. Furthermore, this model is intended as an initial model for the mass balance in the Portage Area and should be updated and calibrated as concentrations of different flows in the Portage Area become available. Refer to section 6.3 for recommendations on improving the mass balance.

vii. The model does not currently take into consideration the influence of saline mine water inflows on the water quality at Portage and Goose pits. However, the model does account for chloride loadings from the pit water to the North/South Cell TSF

Reclaim Pond, assuming a constant pit water chloride concentration over time. Thus, the chloride load originating from the pit water will be accounted for in the accumulated chloride load in the TSF Reclaim Water and in the loads transferred back to the pits at closure. Furthermore, it is assumed that chlorides will less likely accumulate in the pit water due to saline water because eventually, when the pit will be full, there should be no water infiltration from underground. This will then prevent an infiltration of further mass of chlorides in the pits. Still, it would be important to take into consideration in the model the contribution of groundwater in the chloride concentration in the pit water over time. With a year of data on measured chlorides concentrations in the pit water, the forecasted contribution of groundwater to the chloride load in the pit water could be estimated and included in next year's model.

3.4 INPUT PARAMETERS

The mass balance model for the Portage area of Meadowbank was developed to forecast the long-term concentration of cyanide, copper, iron, ammonia, nitrate and chloride in the North and South Cell TSF Reclaim Pond and in the pits. As of last year, the report also evaluated a broader selection of parameters: alkalinity, hardness, aluminum, silver, arsenic, barium, cadmium, chromium, manganese, mercury, molybdenum, nickel, lead, selenium, zinc, fluoride, sulphate and total dissolved solids.

The mass balance model is based on the assumptions presented in section 3.2 and on the following input parameters:

- Mill effluent concentration;
- Initial concentration in the North and South Cells TSF Reclaim Pond;
- Initial concentration in the Portage and Goose Pits, and Third Portage Lake.
- Leaching of tailings at Portage and Goose Pits and at Vault (concentration in the liquid portion) used to compute the loading coming from the tailings leachate.
- Stormwater Management Pond concentration (only ammonia and nitrate) used to compute the influent loading to the TSF Reclaim Pond.

3.4.1 Mill Effluent Concentration

Table 3-1 presents the Mill Effluent concentrations considered for the input parameters of the mass balance. The average of the four samples taken in 2015 was used in the model. The key parameters are also compared to the 2014, 2013 and 2012 WMP values used in the previous models.

Table 3-1: Mill Effluent Concentrations Selected for the Mass Balance Model

PARAMETER	MILL EFFLUENT CONCENTRATION (mg/L)			
	For 2015 WMP Forecast	For 2014 WMP Forecast	For 2013 WMP Forecast	For 2012 WMP Forecast
Alkalinity	74.75 (mg CaCO3/L)			
Hardness	1690 (mg CaCO3/L)			
Dissolved Aluminium (Al)	0.116			
Dissolved Silver (Ag)	0.028			
Dissolved Arsenic (As)	0.0337			
Dissolved Barium (Ba)	0.1245			
Dissolved Cadmium (Cd)	0.00197			
Dissolved Chromium (VI)	0.0005			
Dissolved Copper (Cu)	10.503	6.7951	7.81	28.31
Dissolved Iron (Fe)	0.432	0.141	0.81	11.81
Dissolved Manganese (Mn)	0.00714			
Dissolved Mercury (Hg)	0.000016			
Dissolved Molybdenum (Mo)	0.8555			
Dissolved Nickel (Ni)	0.423			
Dissolved Lead (Pb)	0.00037			
Dissolved Selenium (Se)	0.2023			
Dissolved Zinc	0.139			
Ammonia (NH3) (ionized)	+ 50 (mg N/L/month)	+41 (mg N/L/month)	+45 (mg N/L/month)	17.1 (mg N/L)4
Chloride	North Cell: Winter:+2K/mth Summer: +1K/mth South Cell: Winter: +700/mth Summer: +350/mth	+1500 (mg/L/month)	+600 (mg/L/month)	6741

[1] The dissolved copper and iron concentration were used instead of the total concentrations, since the solids will tend to decant in the TSF.
[2] The value of copper was adjusted to better match the actual concentration. A value of 0.43 mg/L was used instead of the measured concentration, which was 10 times greater (4.325 mg/L).
[3] The value of selenium was adjusted to better match the actual concentration. A value of 0.202 mg/L was used instead of the measured concentration, which was 1.5 times smaller (0.1345 mg/L).
[4] Average concentration measured between January to December 2012 at ST-21.

PARAMETER	MILL EFFLUENT CONCENTRATION (mg/L)			
	For 2015 WMP Forecast	For 2014 WMP Forecast	For 2013 WMP Forecast	For 2012 WMP Forecast
Fluoride (F)	0.545			
Nitrate (NO3)	15.925 (mg N/L)	27.9 (mg N/L)	31.6 (mg N/L)	9.9 (mg N/L) [1]
Total Cyanide (CNt)	18.1675	111	15	16.7 [2]
Sulphate (SO4)	**+ 1600** (mg SO4/L)	+2400 (mg SO4/L)		
Total dissolved solids	North Cell: Winter:+4964/mth Summer: +3307/mth South Cell: Winter: +2810/mth Summer: +2230/mth	-		

A couple of items to note on the parameters used for the 2015 updated water quality forecast model:

- To evaluate the concentration of ammonia that may be added to the TSF Reclaim Pond on a monthly basis, the difference in concentration of CN-WAD before and after the cyanide destruction system was evaluated. In 2015, on average, 121.8 mg/L of CN-WAD was removed and converted to cyanate (CNO^-), compared to 76 mg/L in 2014. Assuming that 70% of the cyanate is hydrolyzed to ammonia (NH_3), it was evaluated that on average approximately 45.9 mg N/L of ammonia was added to the Mill Effluent. For the purpose of the model, it is assumed that 50 mg N/L of ammonia, is added to the Mill Effluent every month. This additional ammonia load is added to the load already present in the Reclaim Water.
- Based on the measured data, the chloride concentration continues to increase in the Mill Effluent. To account for this trend, it is assumed that 1000 mg/L of chloride is added to the Mill Effluent going to the North Cell during the summer months (June, July, August, and September) and 2000 mg/L during the winter months. In the South Cell, 350 mg/L is assumed to be added in the summer months while 700 mg/L is added in the winter months. This additional chloride load is added to the load already present in the Reclaim Water. These values were selected by adjusting the model to fit with the measured chloride values in the Reclaim Ponds in 2015.

[1] Average April to December 2012 Mill Effluent concentrations.
[2] The internal CN-WAD criterion for the Mill Effluent is a CN-WAD concentration of 15 mg/L. Assuming that CN-WAD represents 90% of total CN (refer to section 3.2), then this CN-WAD internal criterion translates to a CN total criterion of 16.7 mg/L.

- Measured data showed that sulfate tends to accumulate in the Mill Effluent and Reclaim Pond. The sulfate probably originates from the oxidation of sulfide in the ore. To account for this trend, 50 mg SO_4/L is added per month in the Mill Effluent. This value was selected by adjusting the model to fit with the measured values in the Reclaim Ponds in 2015.
- The concentration of the total dissolved solids added in the Mill Effluent is the sum of chloride, sulfate, ammonia, and sodium equivalent. Based on the measured data, the TDS concentration also continues to increase in the Mill Effluent. Therefore, it is assumed that 4964 mg/L is added in the North Cell during the winter months while 3307 mg/L is added in the summer months. In the South Cell, 2810 mg/L is assumed to be added in the winter months while 2230 mg/L is added in the summer months.
- In order to match with the actual trends, the input concentration for selenium and copper were adjusted from 0.1345 mg/L to 0.202 mg/L and 4.325 mg/L to 0.43 mg/L, respectively.

3.4.2 Initial Concentrations used in the Model

As noted previously, the mass balance model arbitrarily begins in January 2014 to fit the previous model. Therefore, the initial concentrations selected for the North Cell TSF Reclaim Pond correspond to the January 8th, 2014 chemical analysis results from station ST-21. These initial concentrations are presented in Table 3-2.

Concentrations selected for the South Cell TSF Reclaim Pond (former Attenuation Pond) correspond to the 12-month (2014) average concentration results from station ST-18 (current Attenuation Pond). When there was no or little data available, the average values from 2010 to 2014 were used. In general, the concentrations observed in the Attenuation Pond had little variation from one month to the other. These initial concentrations are also presented in Table 3-2.

Input parameters for Goose and Portage Pit, Third Portage Lake and leaching rate of tailings in the North and South Cell TSF are also shown in Table 3-2. For Goose Pit, the sample taken on August 9th, 2015 was used. The average of 2015 was used for Portage Pit and the average value of taken during summer 2015 in the East Basin was used for Third Portage Lake. The average leaching rate inferred from the results obtained from the Shake Flask Extraction (SFE) Leach Tests conducted on the tailings in 2015 were used to account for possible leaching of contaminants from the tailings.

Furthermore, when volumes of water are transferred from Portage Pit, Goose Pit and/or Stormwater Management Pond to the South Cell TSF Reclaim Pond, the contaminant loads to the South Cell Reclaim pond are taken into account in the water quality forecast model. It is assumed that the water qualities of these streams are similar to the values listed in Table 3-2.

Table 3-2: Initial Concentrations used in the Water Quality Forecast Model

Parameters	Units	RECLAIM ST-21 NORTH CELL	THIRD PORTAGE LAKE	ATTENUATION POND / SOUTH CELL	PORTAGE PIT ST-19	GOOSE PIT ST-20	STORMWATER MANAGEMENT POND	TAILINGS LEACHING RATE IN TSF (kg/ton)	CCME Guidelines	MMER, Max. Monthly Mean	Water License, Max. Avg Conc.
Basis of data used for model:		January 8th, 2014	Average- East Basin Summer 2015	Avg 2014	Average 2015	August 09, 2015	Avg 2013	From SFE Leach Test			Part F of License
Alkalinity	mg $CaCO_3$/L	135	9.100	106.400	72.900	75	0	0.035	n/a	n/a	n/a
Hardness	mg $CaCO_3$/L	1329	12	362.000	224.33	104.0000	0	0.18	n/a	n/a	n/a
Dissolved Aluminium (Al)	mg/L	0.072	0.0018	0.0060	0.0030	0.0030	0.0000	0.0001	0.1	n/a	1.5
Dissolved Silver (Ag)	mg/L	0.0001	0.000005	0.0001	0.00005	0	0	0.00000	0.0001	n/a	n/a
Dissolved Arsenic (As)	mg/L	0.021	0.0005	0.0055	0.0182	0.0003	0.0000	0.00001	0.005	0.5	0.3
Dissolved Barium (Ba)	mg/L	0.0838	0.0037	0.0455	0.0101	0.0163	0.0000	0.00002	n/a	n/a	n/a
Dissolved Cadmium (Cd)	mg/L	1.34E-03	2.50E-06	8.50E-05	1.00E-05	1.00E-05	0.00E+00	n/a	0.00004	n/a	0.002
Dissolved Chromium (VI)	mg/L	0	0.0001	0.0000	0.0016	0.0003	0.0000	0.00000	0.001	n/a	n/a
Dissolved Copper (Cu)	mg/L	9.053	0.0005	0.0047	0.0005	0.0003	0.0000	0.00000	0.002	0.3	0.1
Dissolved Iron (Fe)	mg/L	0.03	0.005	0.010	0.0063	0.0100	0.0000	0.00039	0.3	n/a	n/a
Dissolved Manganese (Mn)	mg/L	0.0595	0.001	2.644	0.0814	0.0058	0.0000	0.00001	n/a	n/a	n/a
Dissolved Mercury (Hg)	mg/L	0.0002	0.000003	0.0001	0.00001	0.0001	0.0000	0.00000	0.000026	n/a	0.0004
Dissolved Molybdenum (Mo)	mg/L	0.5826	0.0002	0.025	0.0405	0.0148	0.0000	0.00005	0.073	n/a	n/a
Dissolved Nickel (Ni)	mg/L	0.2525	0.00049	0.038	0.020	0.0097	0	0.00000	0.025	0.5	0.2
Dissolved Lead (Pb)	mg/L	0.0016	0.00003	0.0003	0.00019	0.0002	0.0000	0.00000	0.001	0.2	0.1
Dissolved Selenium (Se)	mg/L	0.072	0.00003	0.003	0.0013	0.0005	0.0000	0.00001	0.001	n/a	n/a
Dissolved Zinc	mg/L	0.001	0.001	0.001	0.001	0.001	0.000	0.00000	0.03	0.5	0.4
Ammonia (NH_3)	mg N/L	36.8	0.015	9.600	2.857	0.570	9.6	0.00483	0.855296	n/a	16
Chloride	mg/L	1035	0.79	98.2000	16.6167	13.7000	0	n/a	120	n/a	1000
Fluoride (F)	mg/L	0.180	0.079	0.565	0.2917	0.5500	0.00	0.00029	0.12	n/a	n/a
Nitrate (NO_3)	mg N/L	25.500	0.033	1.250	11.4200	4.1100	0.1	0.00108	2.94	n/a	20.00
Total Cyanide (CNt)	mg/L	8.330	0.0005	0.3462	0	0.0025	0.0000	n/a	0.005	1	0.5
Sulphate (SO4)	mg SO4/L	2115.0000	5.1000	541.5000	164.7667	45.8000	0	0.31500	n/a	n/a	n/a
Total dissolved solids	mg/L	1329	22.1250	1437	428.7	217	0	n/a	n/a	n/a	n/a

Legend

(green)	Regulations or guidelines
XXX (pink)	Values higher than CCME Guidelines
(grey)	No data collected

3.5 CYANIDE DECAY

The water quality model developed during this study takes natural cyanide degradation into account: the most important mechanism in the natural degradation of cyanide is the volatilization of hydrogen cyanide (HCN). In fact, tests carried out in Canada found that volatilization of HCN accounted for 90% of cyanide removed from solution in a tailings impoundment (Botz and Mudder, 2000).

Oxidation of cyanide ions (CN-) to orthocyanate (OCN) with atmospheric oxygen is possible but extremely slow when compared to HCN volatilization. Similarly, the probability of microbial degradation of cyanide to carbon dioxide, ammonia, nitrite and nitrate is low due to the limited presence of microorganisms and low nutrient levels in tailings water.

Cyanide volatilization can be summarized as a two (2) step process presented in Figure 3-1 below. First, metal-cyanide complexes dissociate to free cyanide (HCN and CN^-)[1] based on a first-order decay constant[2] (k_1); followed by HCN volatilization based on a first-order decay constant[2] (k_v). Both decay constants k_1 and k_v depend on the presence of UV light (sun) and air (wind), and water temperature and pH. The volatilization decay constant, k_v, also depends on the surface area to volume ratio of the pond.

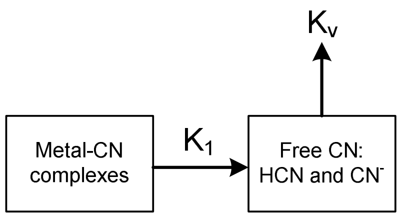


Figure 3-1: Cyanide Volatilization Process

Since both constants depend to a great extent on temperature, UV light and air, separate constants were determined for summer (May to October) and winter (November to April) conditions. The decay constants were based on laboratory values recorded by Simovic (1984). The assumptions made for the development of the cyanide decay constants were the following:

- Summer conditions: an average water temperature of 10℃, presence of air and UV light. Furthermore, since metal-CN dissociation and HCN volatilization by air and UV is particularly important in the summer months, the decay constant factors in the physical property of the tailings impoundment, represented by the open surface area

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[1] Equilibrium between HCN and CN^- is based on pH.
[2] A first order decay constant signifies that the final concentration (C_f) can be estimated as, $C_f = C_i e^{-kt}$, where k is the first order decay constant.

to volume ratio. Multiplying the decay constant by this ratio takes into account the accelerated reaction due to a large exposed surface area of the Reclaim Pond.

- Winter conditions: no natural cyanide degradation occurs.
- The pH in the Reclaim Pond is maintained constant at 8.0, which means that most (94%)[1] of the free cyanide will be present as HCN. Note that as the pH decreases, the proportion of free cyanide as HCN increases, which increases cyanide degradation through volatilization.
- As stated in section 3.2, it was assumed that 10% of the total cyanide concentration was bound as iron-cyanide complexes, another 10% as metal (copper, nickel and zinc) cyanide complexes, and 80% as free cyanide. This agrees with values observed at other gold mine tailings impoundments.

It should be noted that these decay constants (referred to as k_0) were established based on an hourly time step, and were not deemed reliable for longer time-periods (i.e. months). Therefore, the summer and winter decay constants obtained based on volatilization conditions and assumptions, were calibrated so as to represent more accurately and conservatively the expected cyanide concentrations on a monthly time-step.

Table 3-3 presents the assumptions and cyanide decay constants used in the water quality model.

Table 3-3: Natural Cyanide Degradation: Assumptions and Constants

DECAY CONSTANT	DESCRIPTION	WINTER CONDITIONS[2]			SUMMER CONDITIONS		
		Conditions	k_0	Calibrated value (k)	Conditions	k_0	Calibrated value (k)
K_1	Metal-CN dissociation	4° No air No UV	n/a	n/a	10° Air (wind) UV (sunlight)	0.01443/hr	2.11/month
K_V [(3)]	HCN volatilization		n/a	n/a		2.382 cm/hr	58.0 m/month

[1] The dissociation constant for HCN is pKa = $10^{-9.2}$.
[2] During the winter, most of the Reclaim Pond is covered in ice and/or snow. Assume no natural degradation of cyanide is occurring.
[3] In the summer k_v strongly depends on the presence of air and UV, and thus it also depends on the surface area to volume ratio (A/V). Therefore, the k_v value for the summer season has units of cm/h or m/month and should be multiplied by A/V.

4.0 WATER QUALITY FORECAST RESULTS

4.1 RESULTS

The results of the mass balance model around the North and South Cell TSF Reclaim Ponds, Portage Pit and Goose Pit are presented in the Figures 4-1 to 4-14, for total cyanide, copper, iron, ammonia, nitrate, chloride and selenium. Sulfate and TDS were also identified as parameters of concern and will be discussed in section 4.2.3. The graphs show the forecasted monthly concentration of the parameter from 2014 to 2029. A total of two (2) graphs are presented per parameter: the first shows the forecasted concentration in the North and South Cells TSF Reclaim Ponds and the second shows the forecasted concentration in the Portage and Goose Pits, assuming that the water is pumped without treatment.

The Water License and Canadian Council of Ministers of the Environment (CCME) limits (refer to Table 2-1) were also included in the figures, where applicable. For items with no CCME guideline, AEM will meet site specific criteria (or background within the range of natural variability) developed through review of the final closure plan by regulatory agencies

Again, it is important to remember that the results presented in Figures 4-1 to 4-19 are based on the concentrations presented in Tables 3-1 and 3-2. It is also important to note that the results from this model assume that no treatment of the Reclaim Pond effluent is undertaken and provide only a forecast of the concentrations of the selected parameters. These results must be reviewed while keeping in mind the assumptions and limitations described in sections 3.2 and 3.3.

4.2 DISCUSSION

4.2.1 Key Dates

The mass balance model presented in this Technical Note is based on the WB 2015. The following key dates are important to keep in mind while reviewing the forecasted concentration data presented in Figures 4-1 to 4-14:

1. November 2014: The former Attenuation Pond becomes the South Cell and TSF Reclaim Pond.
2. September 2018: start of water transfer from South Cell TSF Reclaim Pond to Portage Pit
3. October 2018: South Cell TSF Reclaim Pond is completely empty.
4. July 2016 to September 2018: Pumping water from Third Portage Lake to Goose Pit and allow runoff water and ground water to accumulate in the pit.

5. July 2018 to September 2024: Pumping water from Third Portage Lake to Portage Pit and allow runoff water, ground water and East Dike Seepage to accumulate in the pit.

4.2.2 Forecasted Concentrations in the North and South Cells TSF Reclaim Pond

Table 4-1 summarizes the observations noted in Figures 4-1 to 4-14, specifically for the forecasted concentrations of parameters of concern in the Reclaim Pond (North and South cells).

Table 4-1: Summary of Forecasted Concentrations in Reclaim Pond

PARAMETER	FORECASTED CONCENTRATION (mg/L)				WATER LICENSE PART F (CCME) (mg/L)
	NORTH CELL TSF RECLAIM POND		SOUTH CELL TSF RECLAIM POND		
	Jan. 2014 (initial)	2013 to 2017	August 2014[1] (initial)	2014 to 2018	
Total Cyanide (CN)	8.33	Fluctuate from 0,0001 to 12.7	0.35	Fluctuate from 0.24 to 16	0.5 (free CN 0.005)
Copper (Cu)	9.053	Fluctuate from 0.1 to 21	0.005	Fluctuate from 0.7 to 13	0.1 (0.002)
Iron (Fe)	0.03	Fluctuate from 0.01 to 0.87	0.01	Fluctuate from 0.01 to 0.52	n/a (0.3)
Ammonia (NH_3)	36.8 (mg N/L)	Fluctuate from 1.4 to 242	9.6 (mg N/L)	Fluctuate from 1.8 to 193	16 (0.86) (mg N/L)
Nitrate (NO_3)	25.5 (mg N/L)	Fluctuate from 0.2 to 37	1.25 (mg N/L)	Fluctuate from 1.5 to 22	20 (2.9) (mg N/L)
Chloride (Cl)	1035	Fluctuate from 17 to 4641	98.2	Fluctuate from 18 to 2174	1000 (120)
Selenium (Se)	0.072	Fluctuate from 0.002 to 0.45	0.003	Fluctuate from 0.05 to 0.27	n/a (0.001)
Sulphate (SO_4)	2115	Fluctuate from 34 to 9062	541.5	Fluctuate from 97 to 7210	n/a (n/a)
TDS	1329	Fluctuate from 52 to 14195	1437	Fluctuate from 276 to 9041	n/a (n/a)

[1] Values of November were not available, so the average from January to October 2014 was used.

Based on the model for forecasting concentrations in the North and South Cell TSF Reclaim Pond, the following notes and observations can be made:

i. The fluctuations observed from 2014 to 2018 are primarily due on seasonal variability (runoff from nearby areas, snow and ice melt, temperature, etc.).

ii. Natural degradation of cyanide during summer plays a significant role in reducing the concentration of cyanide in the TSF Reclaim Ponds and is taken into account in the model.

iii. For ammonia, it is important to note that (1) the mass balance model developed here does not include seasonal variability (sunlight, microbial or algae degradation of ammonia, etc.), and (2) ammonia concentrations can vary significantly depending on temperature, pH, sunlight, algae activity, etc. Ammonia concentrations may be lower in the summer and higher in the winter.

iv. Similarly, for nitrate, it is important to remember that (1) the mass balance model developed here does not include seasonal variability, and (2) ammonia decomposes to nitrate, therefore nitrate concentrations can vary significantly depending on temperature, pH, sunlight, algae activity, etc. Nitrate concentrations may be lower in the winter and higher in the summer.

v. Guidelines:

   a. For comparison purposes, the forecasted concentrations in the North and South Cells TSF Reclaim Ponds for almost all the parameters are above the Water License discharge criteria.

   b. For comparison purposes, almost all forecasted concentrations in the North and South Cells TSF Reclaim Ponds for the parameters of concern are also above the CCME guidelines for the protection of aquatic life

   c. However, it is important to note that <u>no water</u> in the TSF Reclaim Pond from June 2014 to July 2018 is discharged to the environment. Thus, the Water License discharge criteria are not applicable but rather are used as a comparison herein. Also, the dikes will only be breached once the water quality in the pits meets the CCME guidelines.

4.2.3 Forecasted Concentrations in Portage and Goose Pits

Table 4-2 presents the forecasted concentration of all parameters for Portage and Goose Pits in December 2028 at mine closure. The first forecasted values were obtained by the mass balance approach and the second set of values were obtained with the geochemical modeling tool PHREEQC, simulating equilibrium concentration in the pits at closure, before dike breaching.

Table 4-2: Summary of Forecasted Concentrations in Portage and Goose Pits

PARAMETERS	UNITS	*CCME GUIDELINES*	*3rd PORTAGE LAKE (avg. Summer 2015)*	AT CLOSURE, BEFORE BREACHING DEC. 2028					
				PORTAGE PIT		GOOSE PIT		MIXED PITS	
				Mass Balance Conc.	*PHREEQC Eq. Conc.*	*Mass Balance Conc.*	*PHREEQC Eq. Conc.*	*Mass Balance Conc.*	*PHREEQC Eq. Conc.*
pH				7.5	7.50	7.5	7.57	7.50	7.54
Alkalinity	mg $CaCO_3$/L	*n/a*	*9.1*	10	10	10	10	10.21	10.21
Hardness	mg $CaCO_3$/L	*n/a*	*12*	37		20		33.89	
Total dissolved solids	mg/L	*n/a*	*22.1*	88.6	-	43.17	-	80.91	-
Aluminium (Al)	mg/L	*0.1*	*0.0018*	0.00676	0.000141	0.00321	0.00016	0.006158	0.00015
Silver (Ag)	mg/L	*0.0001*	*0.000005*	0.00038850	0.000124	0.0001215	0.0000638	0.000343	0.0000732
Arsenic (As)	mg/L	*0.005*	*0.0005*	0.00118	4.508E-08	0.000685	3.463E-08	0.001096	3.454E-08
Barium (Ba)	mg/L	*n/a*	*0.0037*	0.00529	0.00517	0.00423	0.00408	0.005114	0.00412
Cadmium (Cd)	mg/L	*0.00004*	*0.000003*	0.00002615	4.515E-07	0.0000099	2.084E-07	0.000023	2.560E-07
Chromium (VI)	mg/L	*0.001*	*0.0001*	0.000059	3.498E-06	0.0000528	3.955E-06	0.000058	3.671E-06
Copper (Cu)	mg/L	*0.002*	*0.0005*	0.1277	0.0000161	0.0397	0.0000082	0.1128	0.0000094
Iron (Fe)	mg/L	*0.3*	*0.0100*	0.0098	1.231E-08	0.0066	1.089E-08	0.009284	1.153E-08
Manganese (Mn)	mg/L	*n/a*	*0.0015*	0.00172	1.082E-10	0.00245	7.435E-11	0.001848	8.774E-11
Mercury (Hg)	mg/L	*0.000026*	*0.000003*	0.00000264	3.770E-07	0.00000264	4.011E-07	0.000003	4.480E-07
Molybdenum (Mo)	mg/L	*0.073*	*0.0002*	0.01197	0.00437	0.00375	0.00262	0.010576	0.00285
Nickel (Ni)	mg/L	*0.025*	*0.0006*	0.005643	0.000112	0.002090	0.000051	0.005041	0.000062
Lead (Pb)	mg/L	*0.001*	*0.0001*	0.0000298	0.00E+00	0.0000269	1.06E-10	0.000029	1.10E-10
Selenium (Se)	mg/L	*0.001*	*0.0001*	0.00273	0.00271	0.00085	0.00084	0.00241	0.00240
Zinc	mg/L	*0.03*	*0.0010*	0.002270	0.0000132	0.00114	0.0000072	0.002079	0.0000083
Chloride	mg/L	*120*	*0.79*	13.6	13.6	6.3	6.3	12.4	12.4
Fluoride (F)	mg/L	*0.12*	*0.079*	0.0807	0.0807	0.083	0.0830	0.081	0.0830
Sulphate (SO4)	mg SO4/L	*n/a*	*5.1*	68.4	68.4	20.3	20.1	60.3	60.3
Total Cyanide (CNt)	mg/L	*0.005*	*0.001*	0.00000206	2.875E-07	0.0000010	1.278E-07	0.0000019	1.442E-07
Ammonia (NH_3) (ionized)	mg N/L	*0.86*	*0.019*	1.700	-	0.424	-	1.484	-
Nitrate (NO_3)	mg N/L	*2.94*	*0.033*	0.2834	-	0.105	-	0.253	-
Total N equivalent	mg N/L	*0.35*	*0.052*	1.983	1.983	0.528	0.528	1.737	1.737

Legend: XXX: PHREEQC concentration higher than the CCME guidelines.
XXX: Mass balance concentration higher than the CCME guidelines.

Based on the model for forecasting of the concentrations in Portage and Goose Pits, the following notes and observations can be made (note that items i. and ii. concern the forecast model using the mass balance approach, while items v. to vii. concern results obtained with the PHREEQC analysis):

i. All forecasted concentrations meets the CCME guidelines in 2025 except for silver, copper and total nitrogen in Portage Pit, Goose Pits and when we consider mixed pit condition. Selenium and ammonia concentrations also do not meet the CCME guidelines in Portage Pit and when we consider mixed pit condition.

ii. Forecasted silver concentrations are slightly higher, and copper concentrations are higher, than the CCME guidelines in Goose Pit. The load for these two contaminants originates from the transfer from the Central Dike seepage collection pond to Goose Pit in September 2015, which was required to the manage the volume of seepage through Central Dike. Since no other transfers from the TSF are planned, no additional contaminant load is expected in Goose Pit.

iii. It is important to note that the water quality in the pits will be subject to CCME guidelines or site specific criteria once the water level in the Goose and Portage Pits are equal to the water level in Third Portage Lake, and the dikes are breached.

iv. It is also important to note that once the water elevation in the pits reaches a level above 131 m, both Portage and Goose Pits will be hydraulically connected. This should help in attenuating some of the concentrations in Portage Pit. As shown in the 9^{th} column of Table 4-2, when assuming complete mixing of both pits, the concentrations of copper, silver, selenium, ammonia and total nitrogen are reduced, but not sufficiently to meet the CCME guidelines.

v. When using the USGS geochemical modelling tool PHREEQC (USGS 2014) to evaluate the equilibrium concentration of dissolved copper in the water column, the forecasted concentration is evaluated to be lower than 0.00001 mg/L in both pits, much lower than the CCME guideline. Thus, at equilibrium, most of the copper could precipitate out as an oxide, hydroxide or co-precipitate and adsorb to amorphous ferrihydrite.

vi. When using the USGS geochemical modelling tool PHREEQC (USGS 2014) to evaluate the equilibrium concentration of dissolved silver in the water column, the forecasted concentration is evaluated approximately at 0.00007 mg/L in the mixed pits, lower than the CCME guideline which is 0.0001 mg/L. The difference between the mass balance and PHREEQC results comes from the adsorption of silver to ferrihydrite.

vii. The total nitrogen equivalent concentration is higher than the CCME guidelines, even after the using the PHREEQC modeling tool. However, both the mass balance model and PHREEQC modeling tool do not take into account any natural nitrogen degradation cycle that could occur over the summer months. However, if an increase in ammonia and nitrate concentrations is observed in the TSF Reclaim Ponds and in the pit water after transfer, the total nitrogen issue will have to be re-assessed at closure. Natural degradation could be sufficient to reduce the total nitrogen concentration, or active treatment solutions such as mechanical aeration could be implemented.

viii. Sulfate and TDS were also identified as possible parameters of concern. The forecasted results for these two parameters are represented in Figure 4-16 to 4-19.

ix. Silver is listed as a parameter of concern for the first time since 2012. The actual concentrations in the mill effluent in 2015 were elevated, and it can be observed an increase in measured concentrations in the North Cell TSF Reclaim Pond. The silver may be leaching from the ore body as it is being handled in the process plant.

x. Selenium remains a possible parameter of concern since its forecasted concentration in Portage Pit at closure is close to the CCME guidelines.

Consequently, copper remains a parameter of concern and should be closely monitored, as well as silver and selenium. However, overall the forecasted water quality in the pits in 2029 does not raise any major concerns at the moment.

4.2.4 Treatment Requirements

4.2.4.1 Possible Treatment Approach

Based on the results of the water quality mass balance presented in section 4.2.3, treatment may be required for copper, silver, selenium and total nitrogen. Treatment could be undertaken at the South Cell TSF Reclaim Pond, or in the Portage Pit.

- If high copper concentrations persist, this metal may be removed through pH adjustment: caustic or lime can be added to the effluent to increase the pH to 9, causing the formation of metal hydroxide precipitates, which settle out. The different treatment options that may be considered to implement the precipitation of copper are listed below:

  a) The existing Attenuation Pond water treatment plant (WTP) can be modified for copper precipitation with the addition of lime or caustic dosing system. The water from the South Cell TSF pond can be pumped to the WTP for treatment, with the treated water recycled back to the pond. Alternatively, the pH of the mill effluent could be raised prior to discharge to the TSF.

  b) Treatment in situ at South Cell TSF Reclaim Pond or at Portage pit.

- If high silver concentrations persist, one of the most efficient techniques to reduce its concentration is by coagulation-clarification/filtration process. Lime softening is not efficient in the removal of silver from solution. Possible treatment options includes the following:

a) The existing Attenuation Pond water treatment plant (WTP) can be used to coagulate and clarify the reclaim water. The water from the South Cell TSF pond can be pumped to the WTP for treatment, with the treated water recycled back to the pond.

b) A small portable treatment unit could also be installed on the outskirts of Portage Pit.

- If selenium remains an issue, one possible treatment option is to oxidize and adsorb the selenium on a specialized media. Alternatively, it could also be removed by coagulation-clarification via co-precipitation.
- If high total nitrogen concentrations persist, even after simulating or testing during one summer the effects of natural degradation in the pits at Meadowbank, more active treatment solutions could be implemented, such as.

a) Mechanical aerations could be installed in either the South Cell TSF Reclaim Pond, or in Portage pit.

b) The Reclaim Water in the South Cell TSF can be treated "in-situ" by either stripping or biological treatment process.

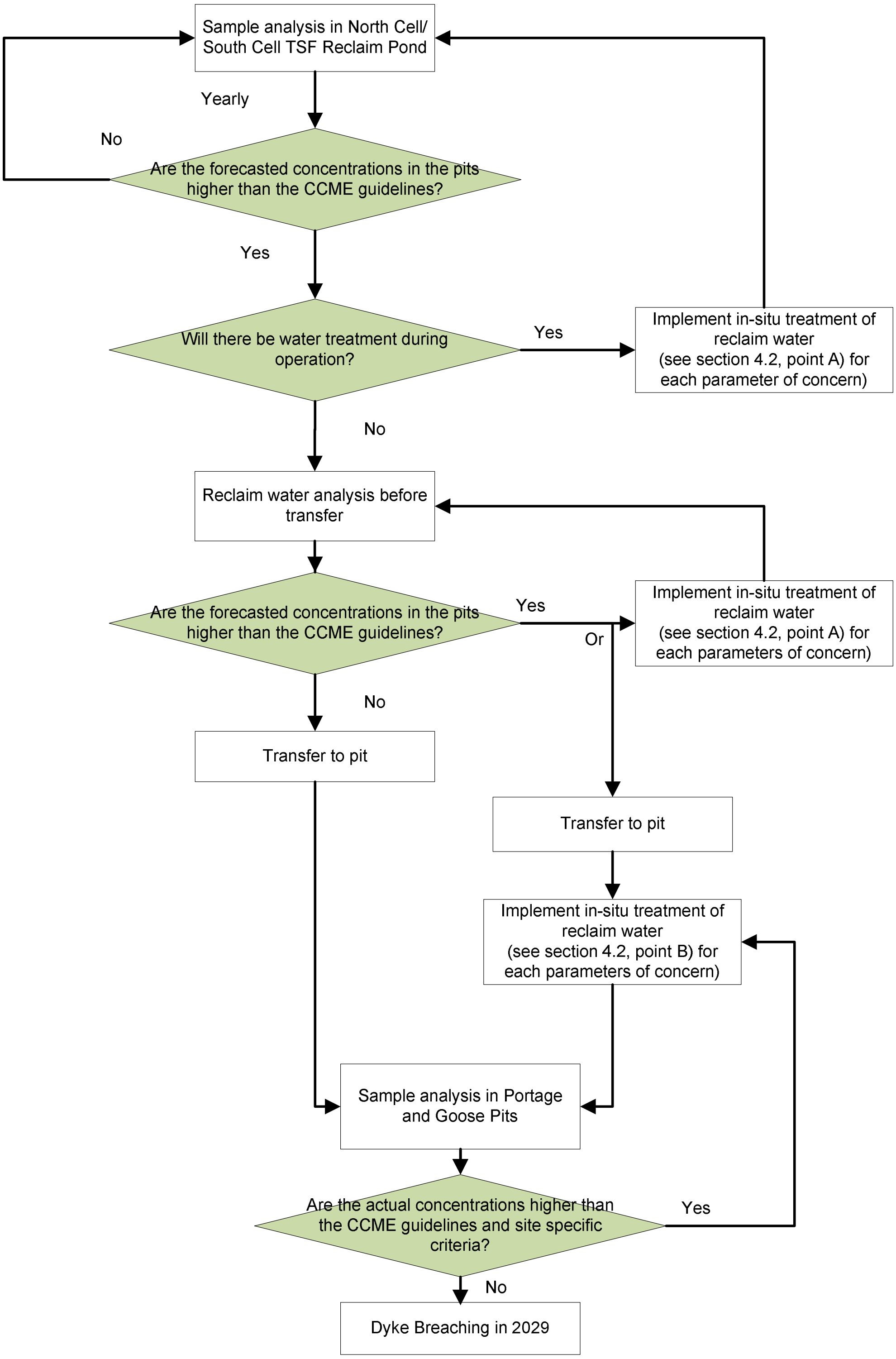
c) Alternative treatment technology like snow making could be considered.

These technologies should be studied and evaluated in detail to determine if they are applicable to site and effluent conditions at Meadowbank. Laboratory and/or in-situ pilot tests should also be considered to validate the treatment method selected.

4.2.4.2 Water Treatment Decision Flow Process

Figure 4-1 presents a high-level decision tree flow process that could be used by AEM to help in their decision on when to consider implementing a water treatment technology and the type of water treatment technology to implement based on the parameter of concerns.

Figure 4-1: Water Treatment Decision Flow Process



4.2.5 Summary of volume of Reclaim Water sent to the Pits

Based on the WB 2015, the Reclaim Water from South Cell will be transferred to Portage Pit in September and October 2018. After, runoff accumulating in the South Cell will be transferred to Portage Pit until closure (2029). A total volume of about 3,370,688 m^3 of water will be transferred to Portage Pit. Approximately 626,978 m^3 will be Reclaim Water that originated mainly from the Mill Effluent. The balance will be runoff water collected from the restored North and South TSF Cells.

Furthermore, in September 2015, some Reclaim Water from South Cell was transferred to Goose Pit (approx. 50,431 m^3) as part of the water management approach to deal with the high seepage volume flowing through the Central Dike.

As shown in the figure below, almost 100% of the South Cell TSF Reclaim and Runoff Water is sent to Portage Pit.

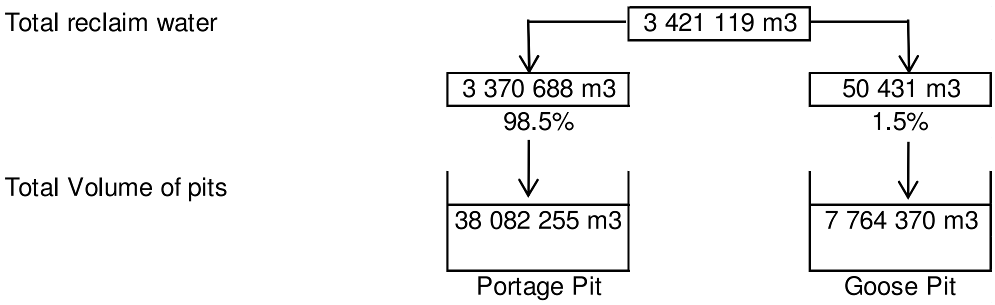


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Figure 4-2: Total Cyanide Concentration in the North and South Cells TSF Reclaim Pond

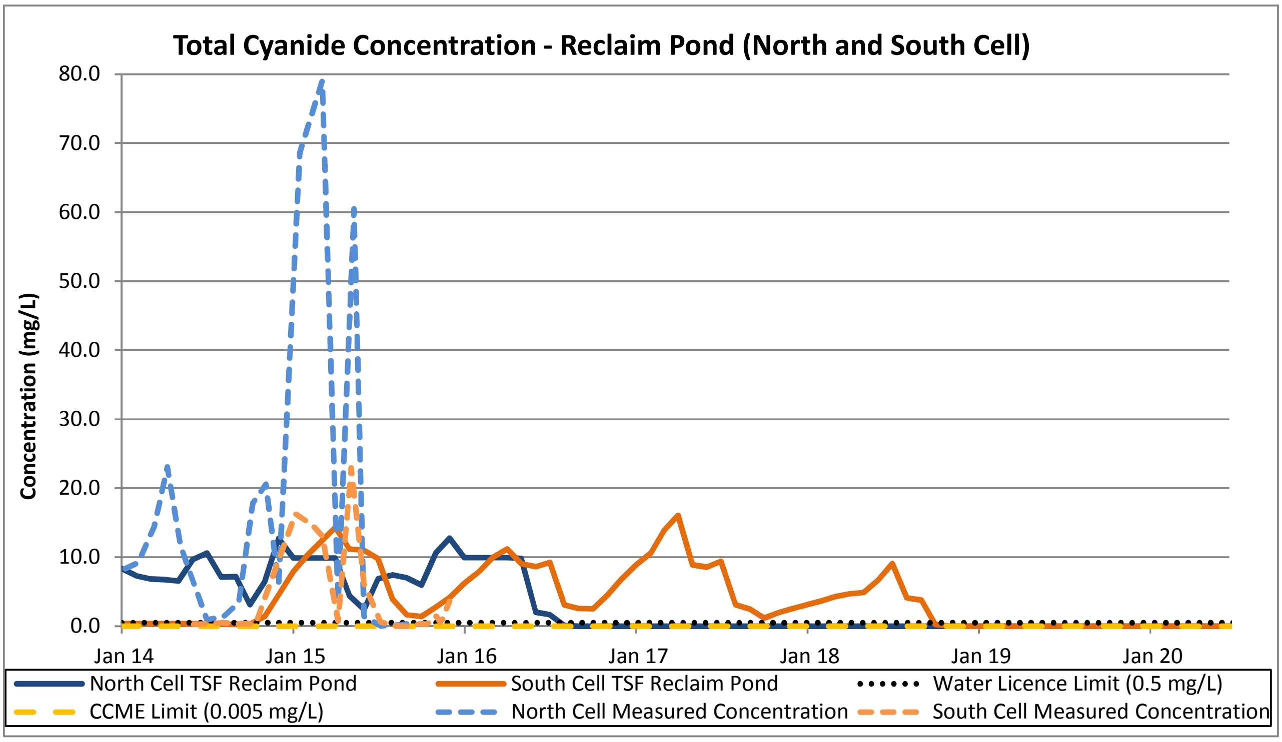


Figure 4-3: Total Cyanide Concentration in the Portage and Goose Pits

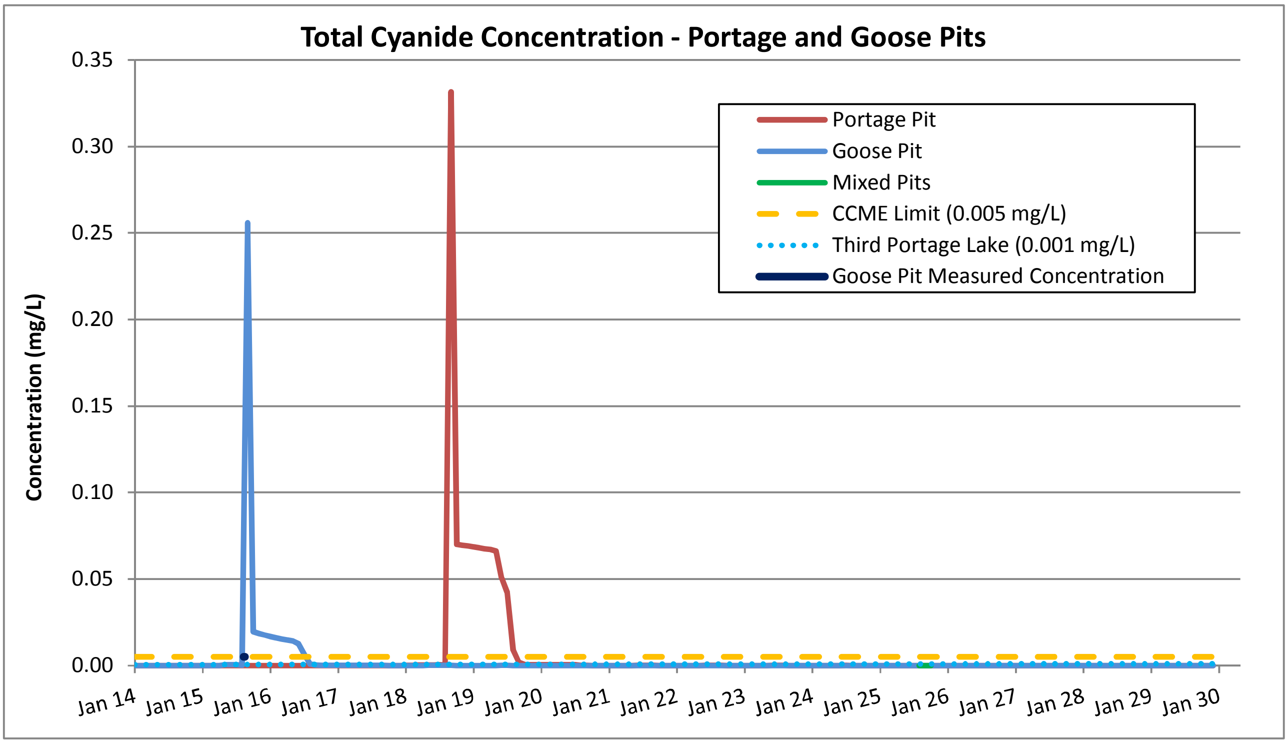


Figure 4-4: Dissolved Copper Concentration in the North and South Cells TSF Reclaim Pond

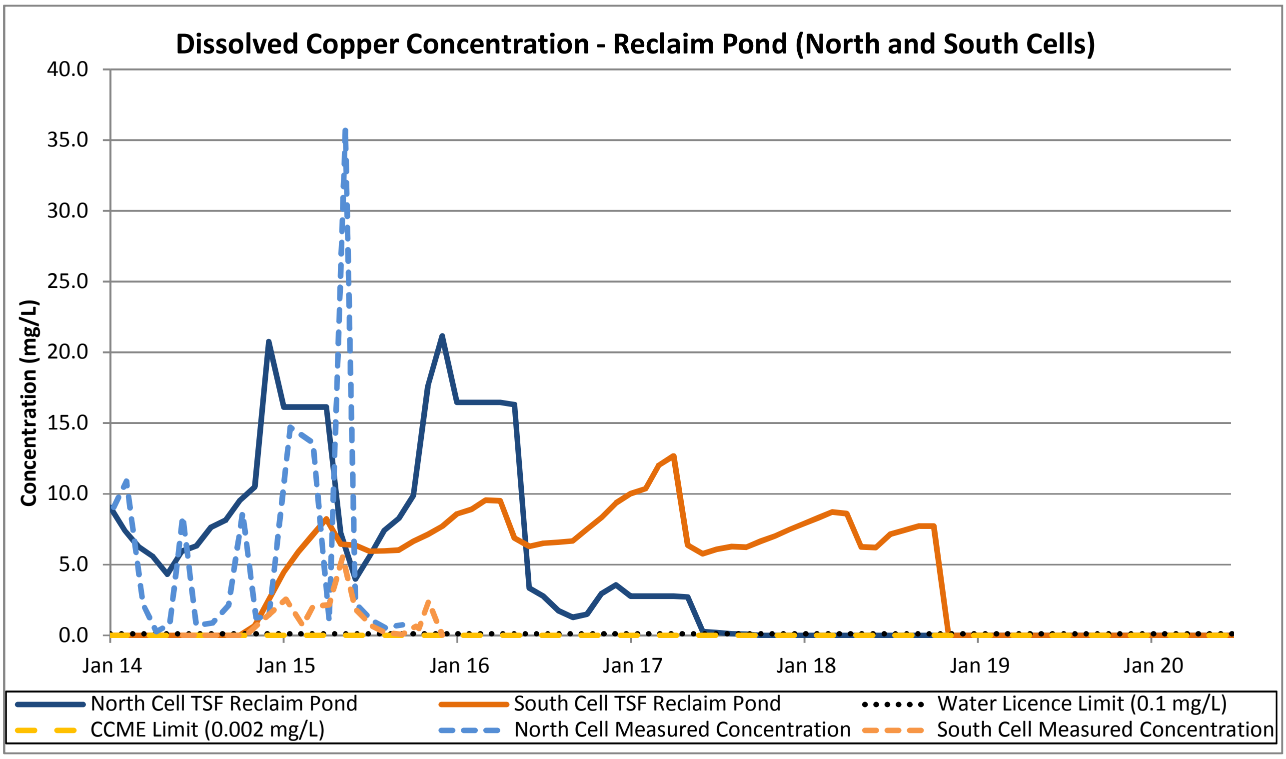


Figure 4-5: Total Copper Concentration in the Portage and Goose Pits

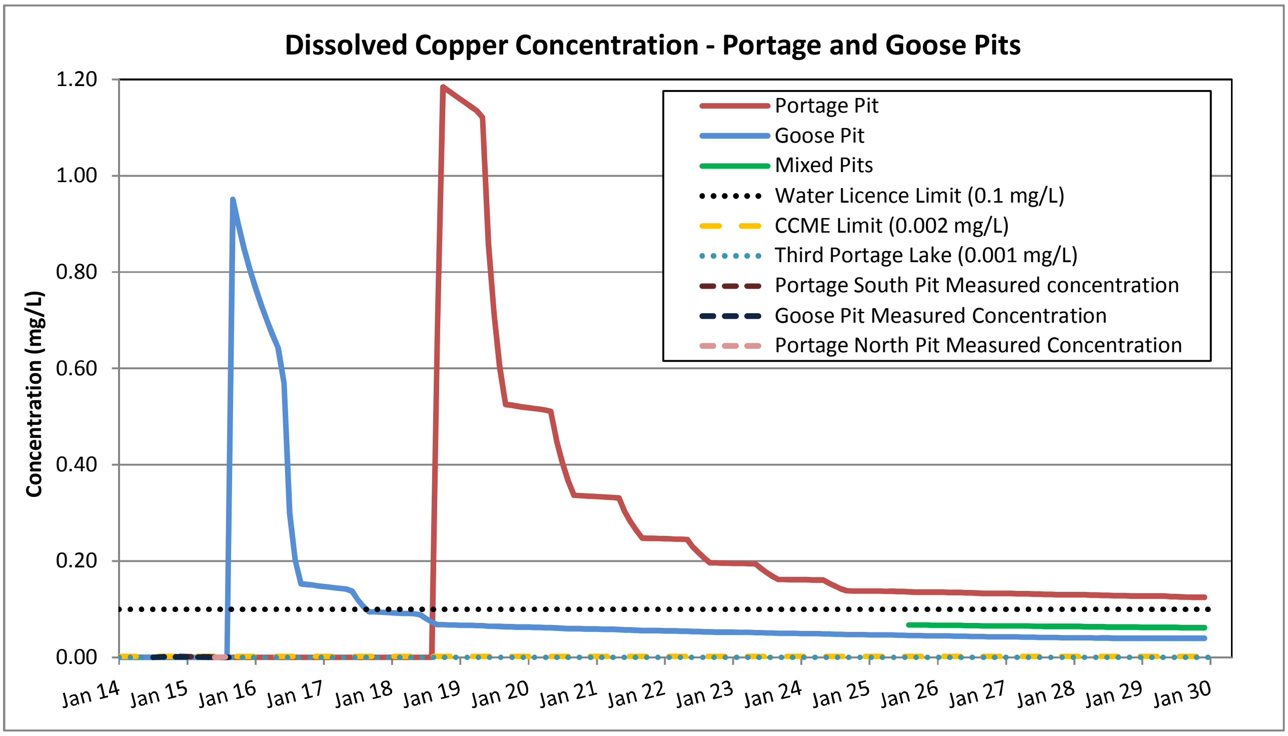


Figure 4-6: Total Iron Concentration in the North and South Cells TSF Reclaim Pond

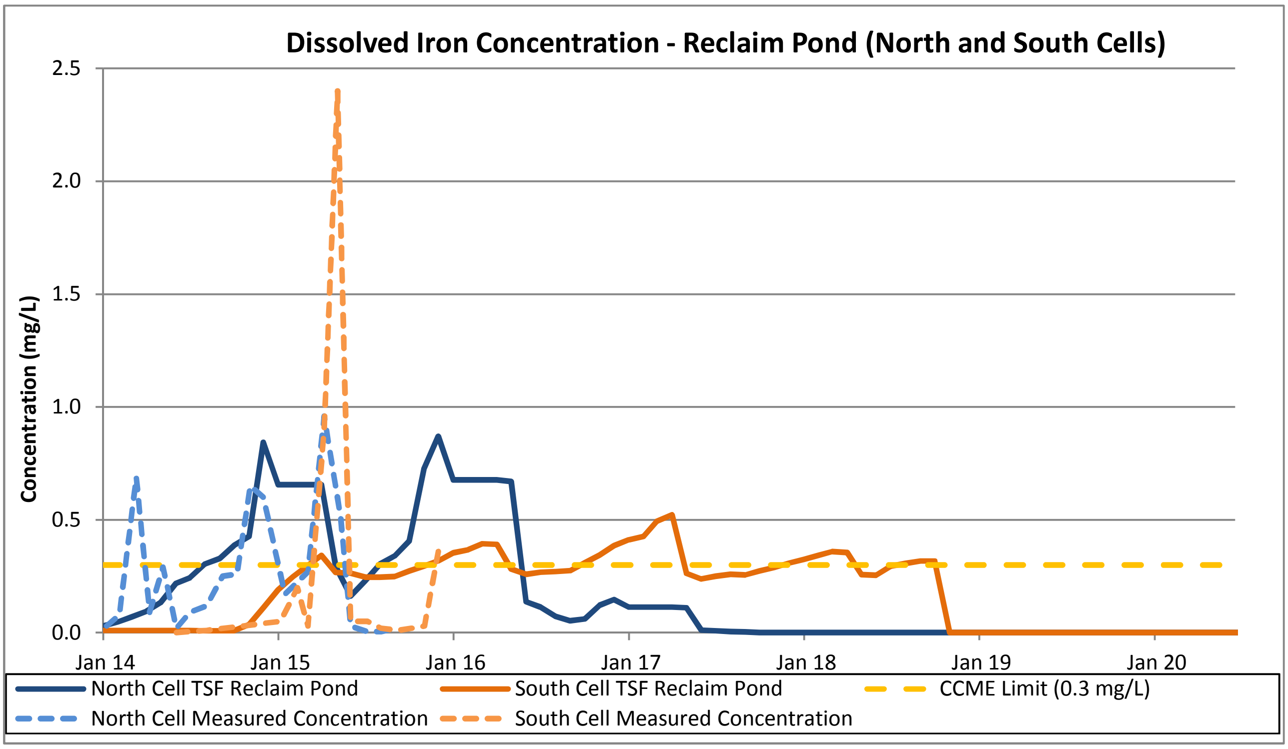


Figure 4-7: Total Iron Concentration in the Portage and Goose Pits

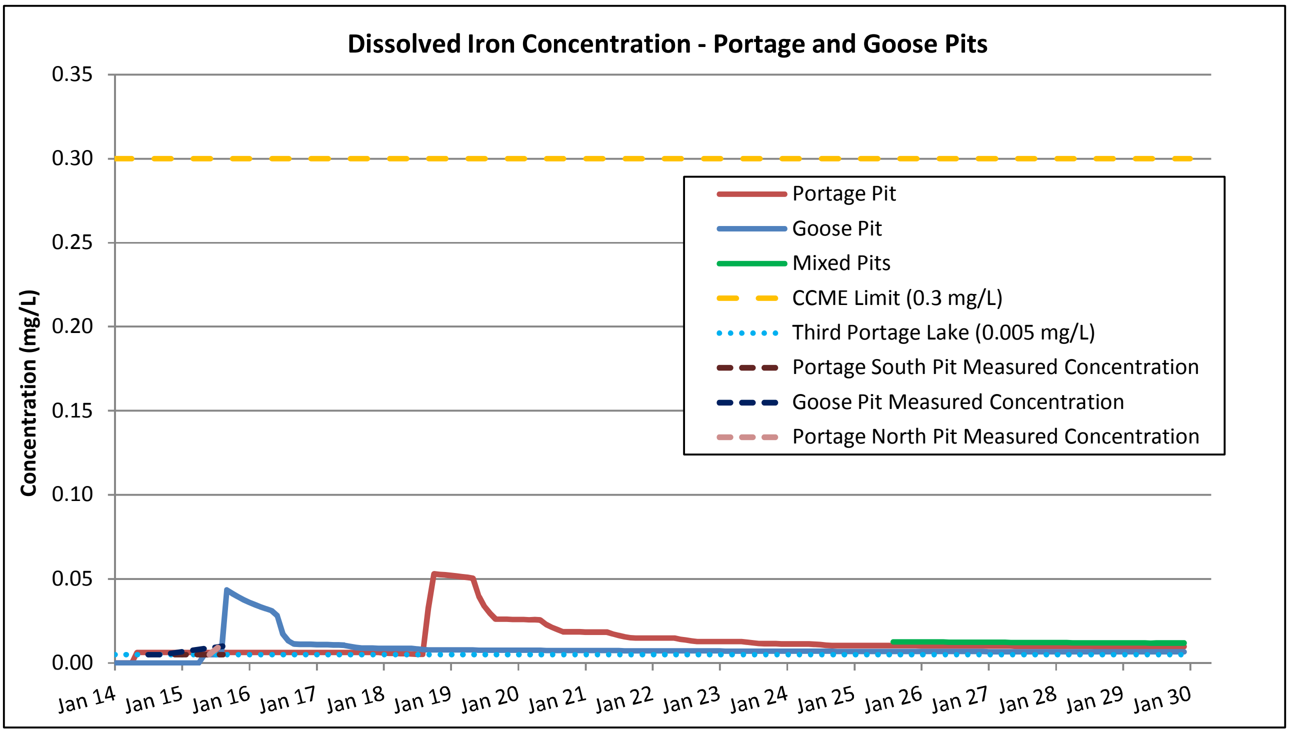


Figure 4-8: Ammonia Concentration in the North and South Cells TSF Reclaim Pond

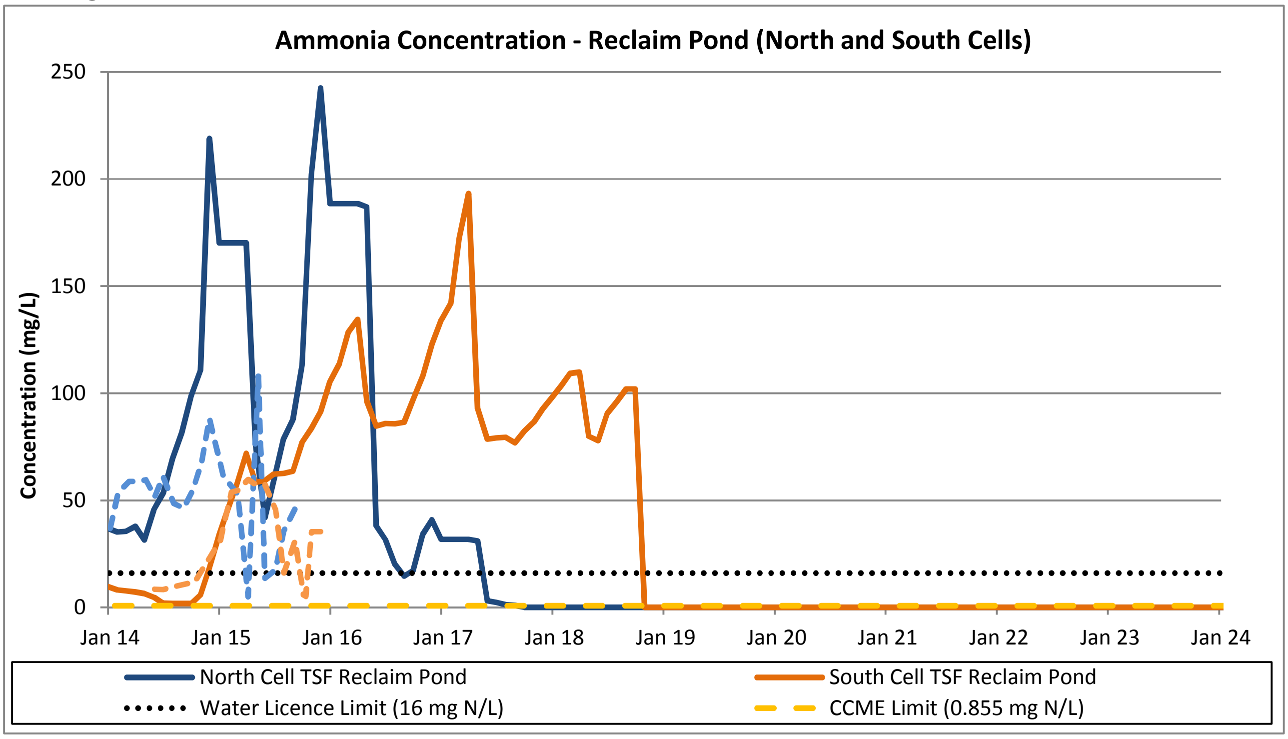


Figure 4-9: Ammonia Concentration in the Portage and Goose Pits

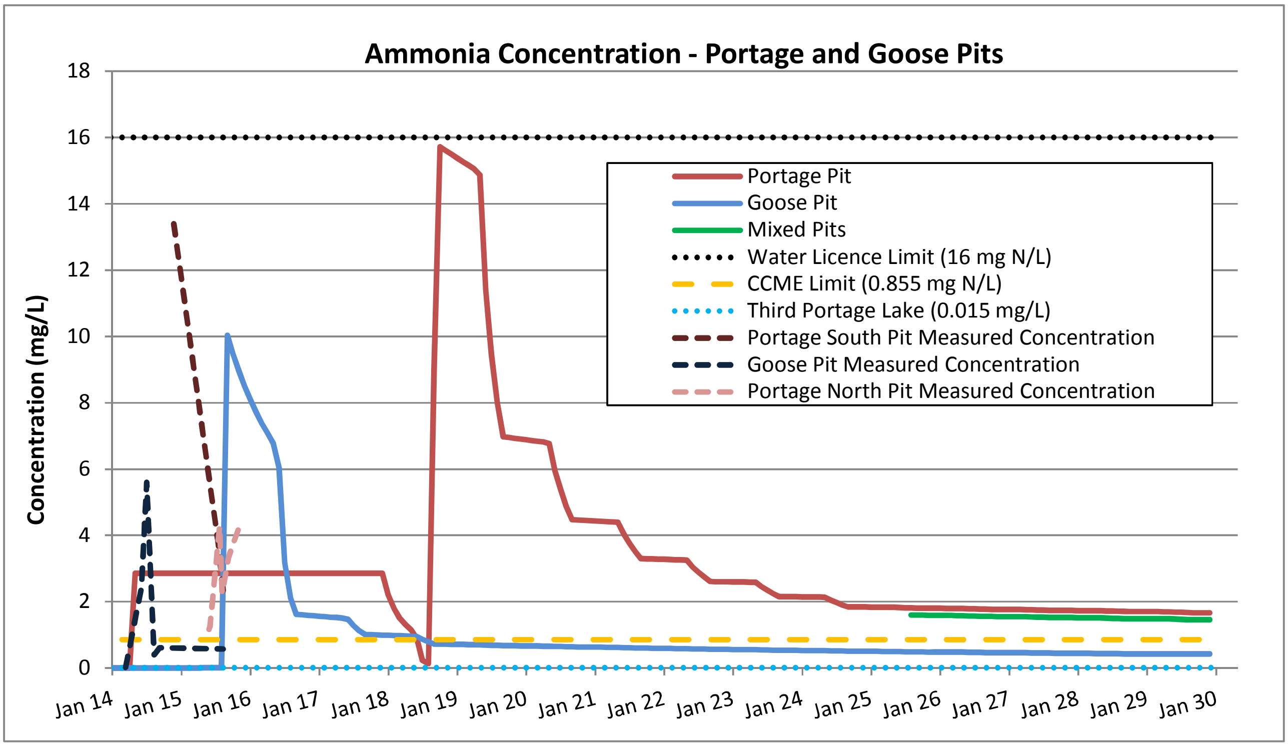


Figure 4-10: Nitrate Concentration in the North and South Cells TSF Reclaim Pond

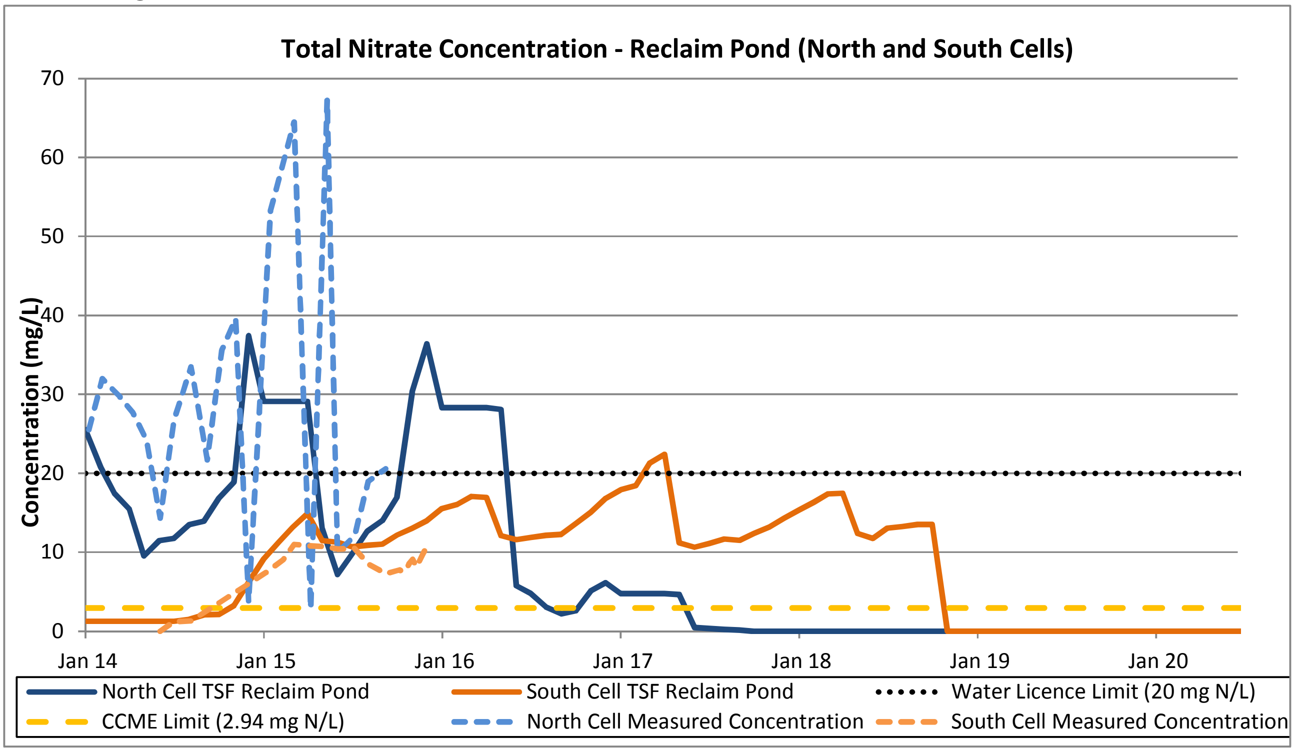


Figure 4-11: Nitrate Concentration in the Portage and Goose Pits

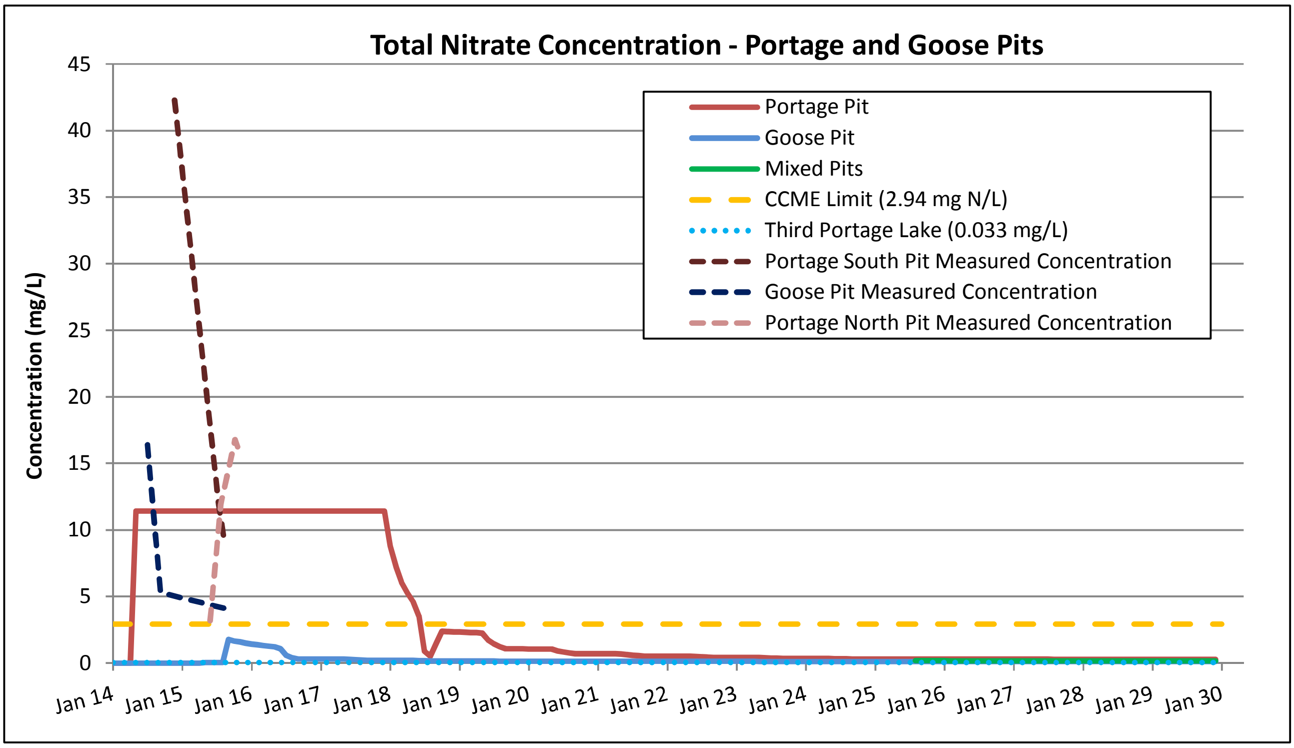


Figure 4-12: Chloride Concentration in the North and South Cells TSF Reclaim Pond

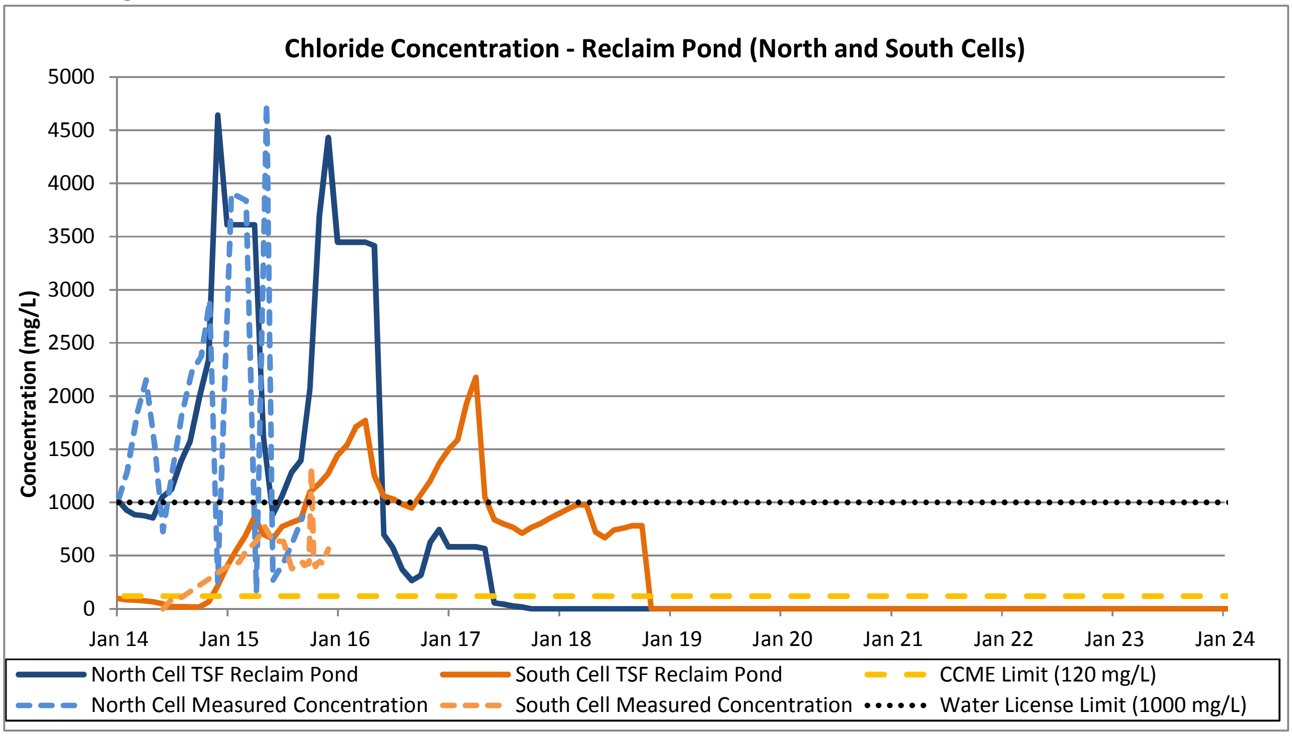


Figure 4-13: Chloride Concentration in the Portage and Goose Pits

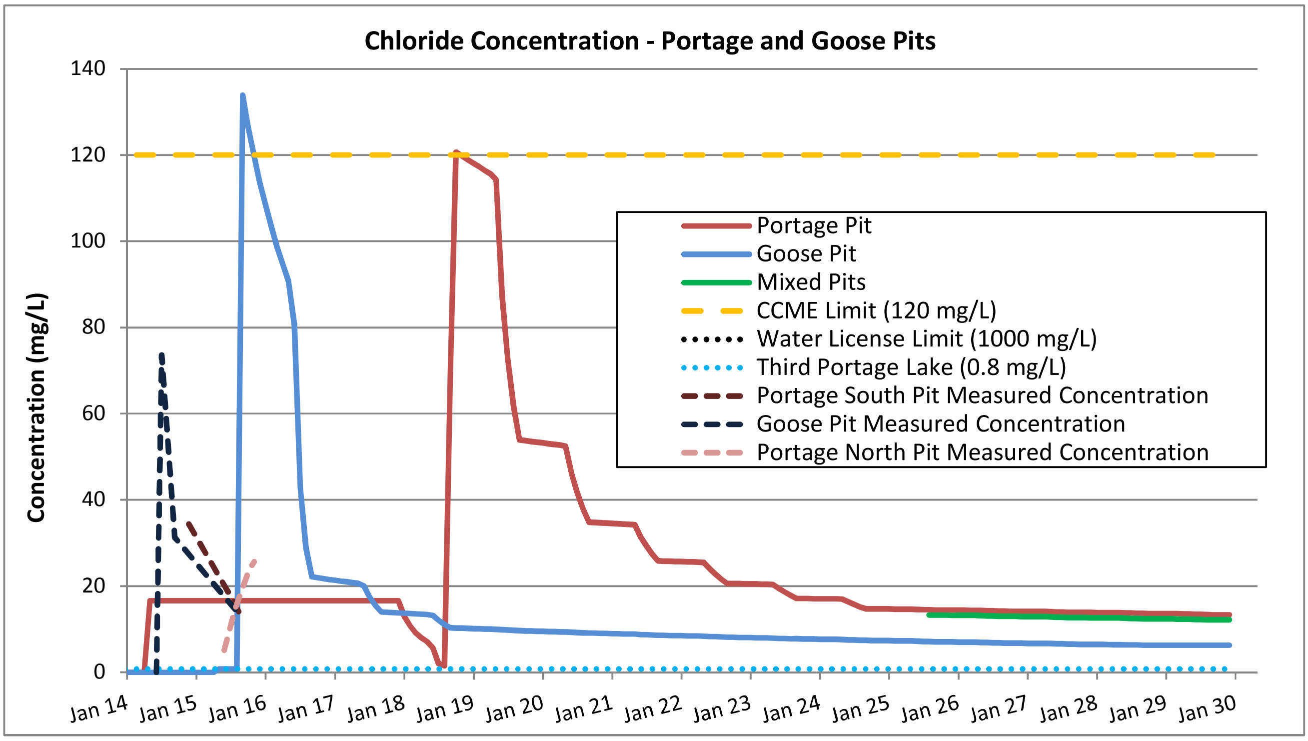


Figure 4-14: Selenium Concentration in the North and South Cells TSF Reclaim Pond

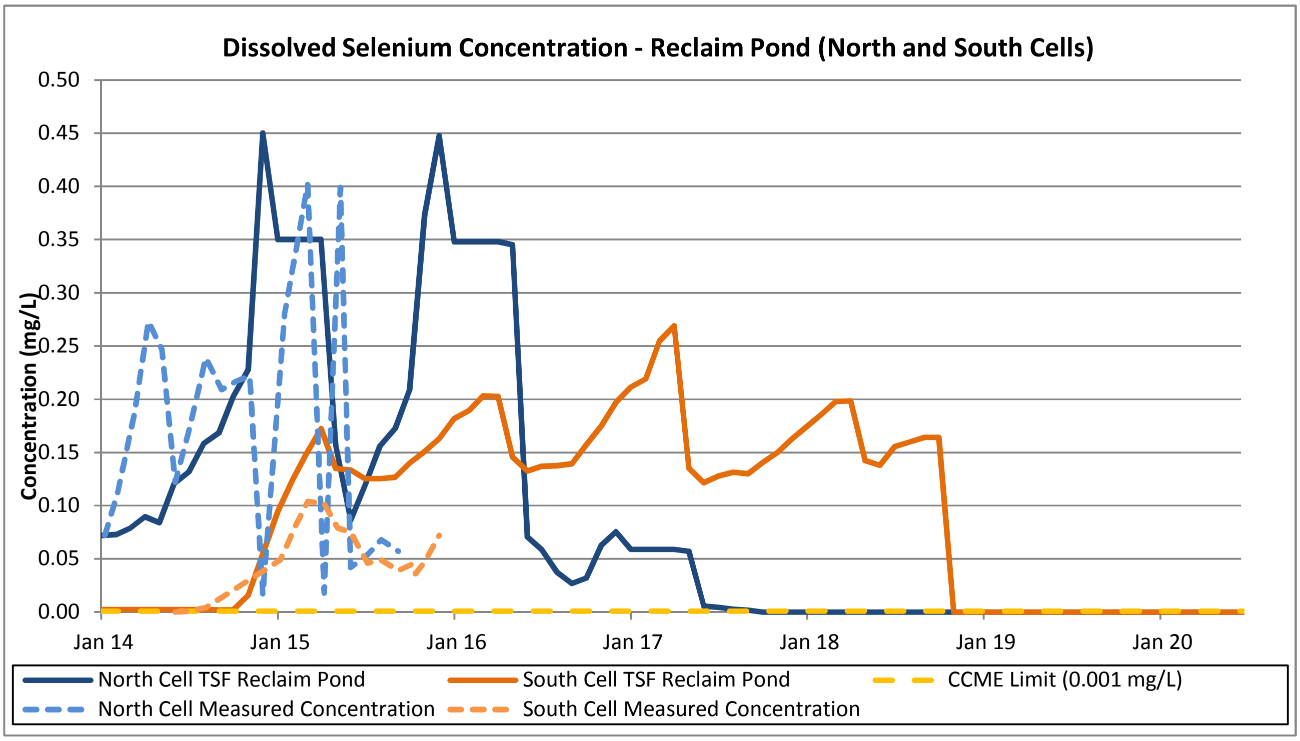


Figure 4-15: Selenium Concentration in the Portage and Goose Pits

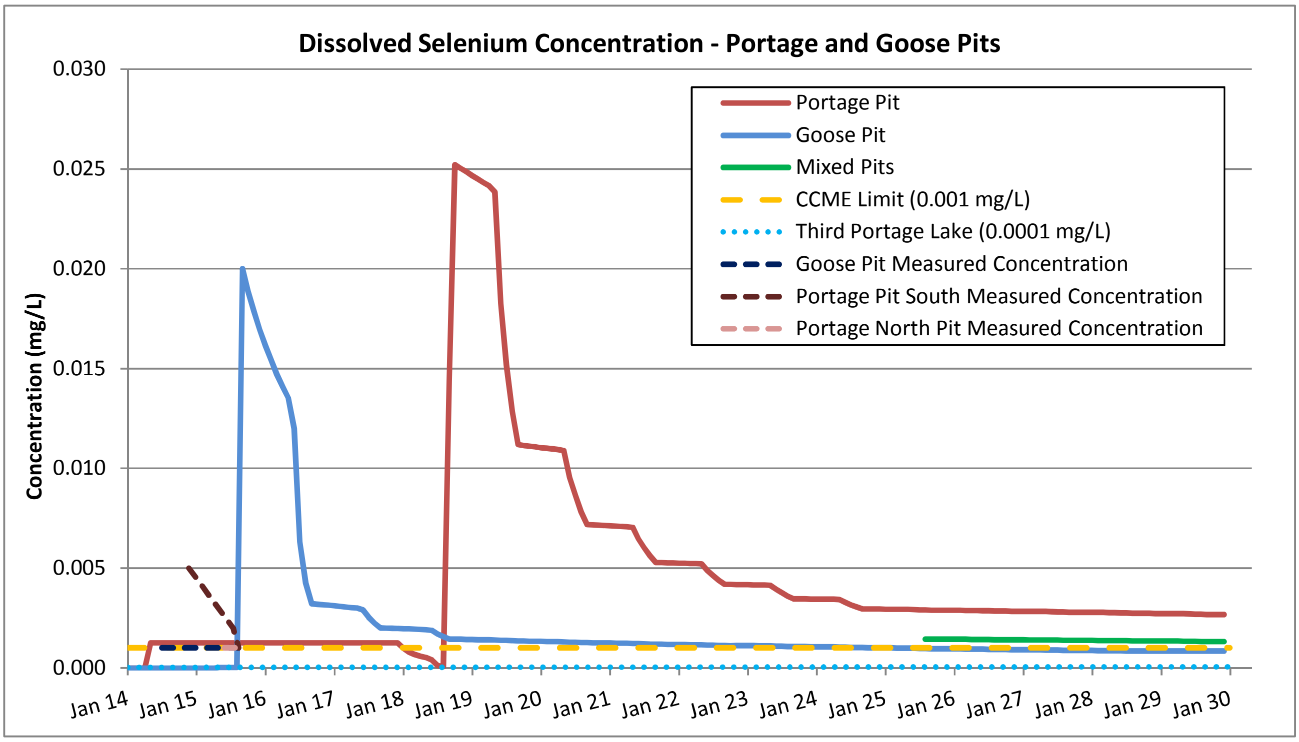


Figure 4-16: Sulphate Concentration in the North and South Cells TSF Reclaim Pond

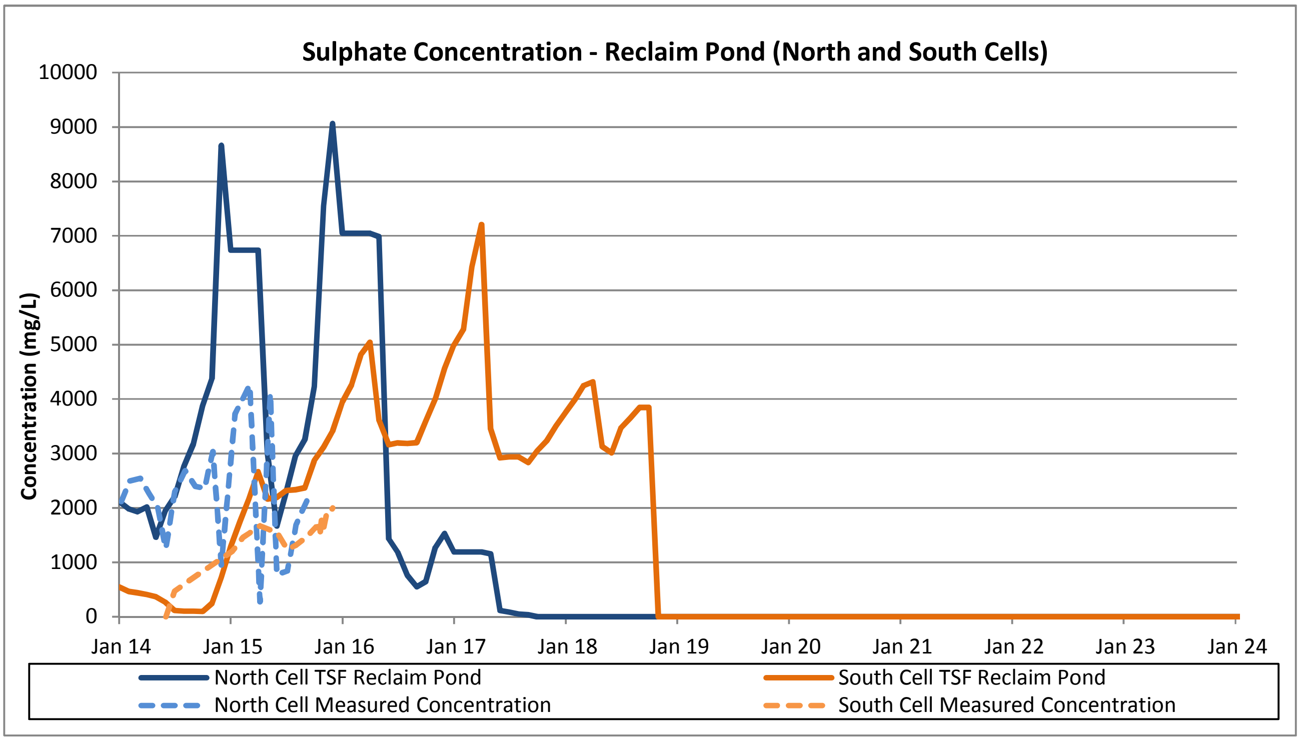


Figure 4-17: Sulphate Concentration in the Portage and Goose Pits

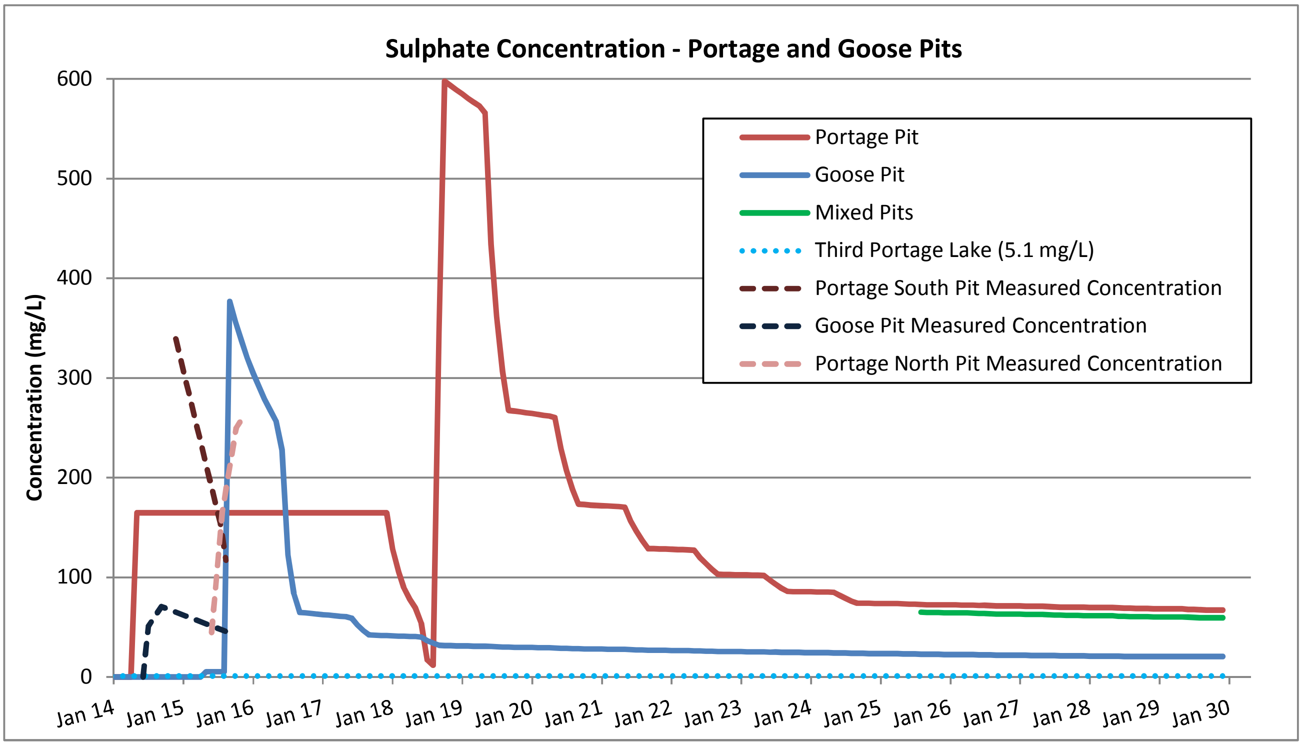


Figure 4-18: TDS Concentration in the North and South Cells TSF Reclaim Pond

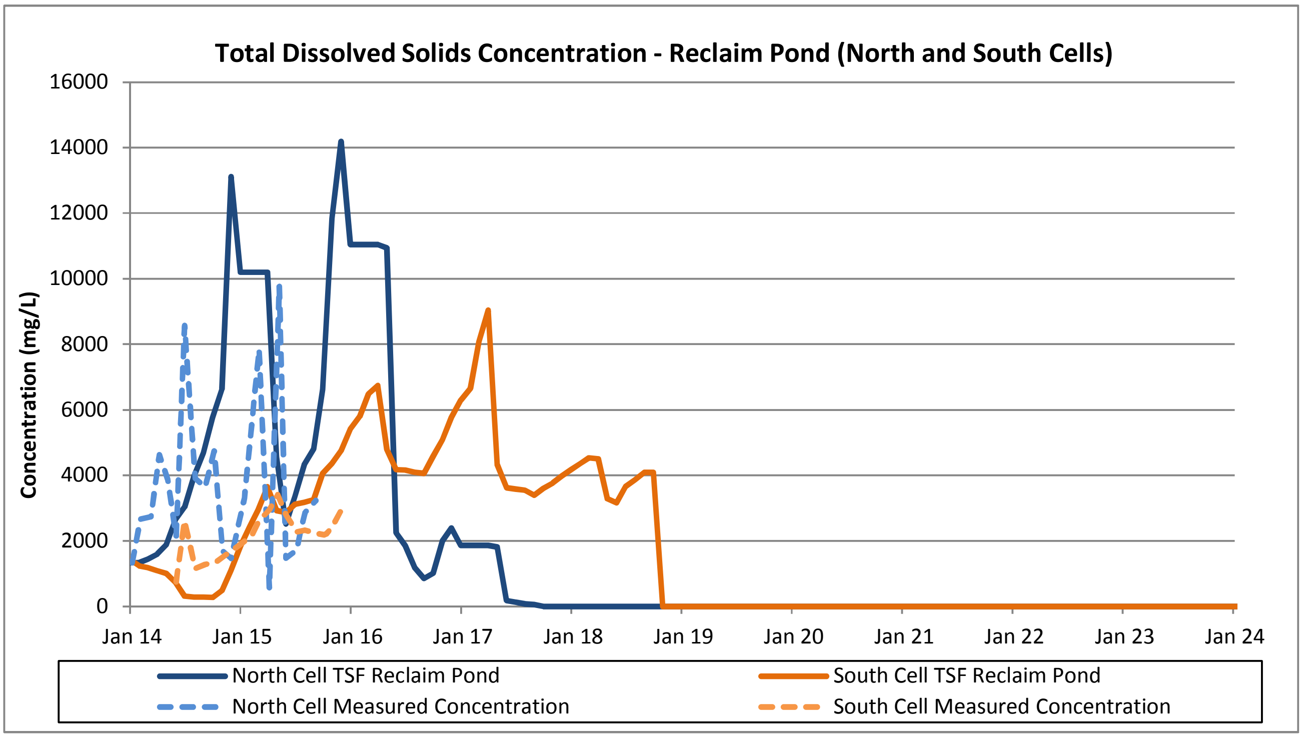
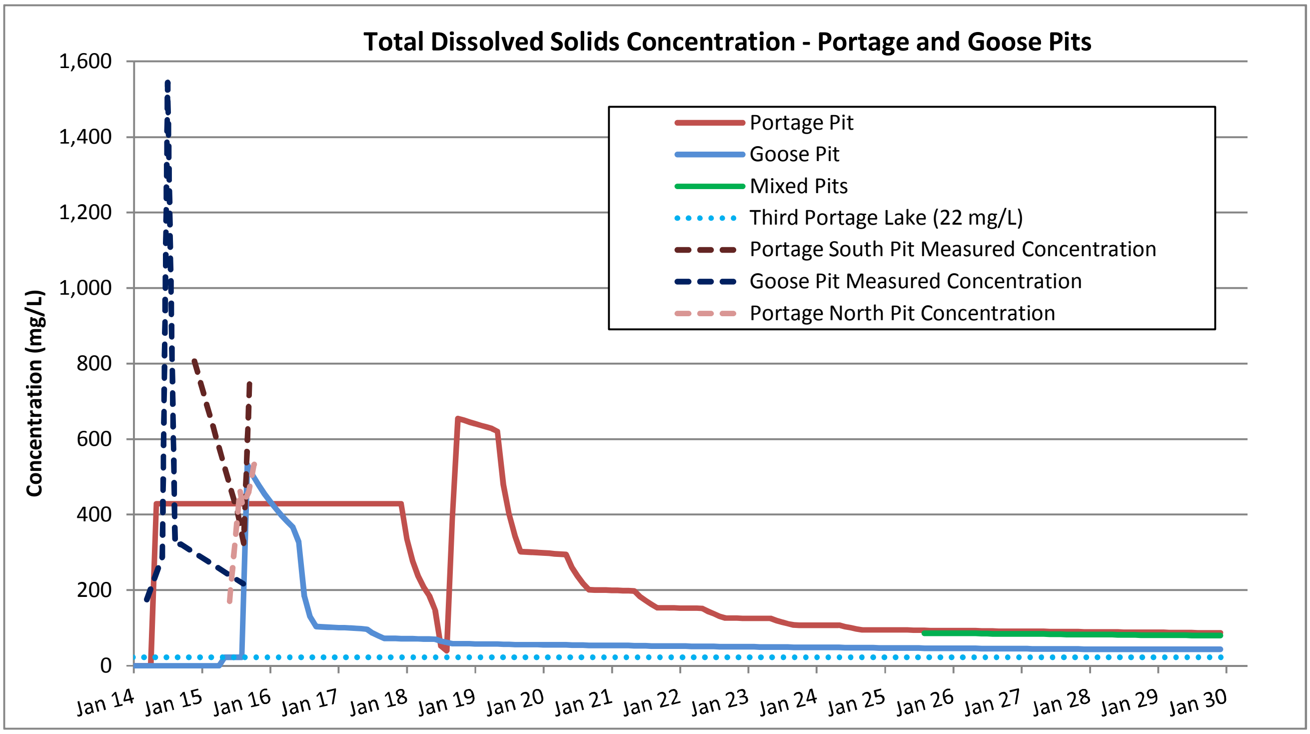


Figure 4-19: TDS Concentration in the Portage and Goose Pits



4.2.6 Comparison of Forecasted Values

Figures 4-20 to 4-24 compare the different forecasted concentrations in the North and South Cells for copper and chloride assessed using AEM Water Balance model developed in 2012, 2013, 2014 and the most recent WB 2015. The figures also show the evolution of the forecasted concentration against the actual measured concentration of copper and chlorides.

Based on these figures, the following notes and observations can be made:

i. Since 2012/2013, the Water Balance model provided by AEM has improved and is reflecting more accurately the volumes of water managed around the North and South Cells TSF.

ii. For each water quality update, an effort is made to adjust the model to align the forecasted value with the measured values. As shown in the figures 4-20 and 40-21, the copper concentrations that were initially forecast in the North and South cells are much higher than the values measured on site. The model was adjusted using dissolved copper concentrations measured in the TSF and in the mill effluent to calibrate the model.

iii. Unlike copper which can precipitate out of solution as a copper hydroxide precipitate, chloride builds up in a closed loop system. The water quality forecast model initially under estimated its build-up in the TSF Reclaim Pond. The model was then adjusted to account for this build-up.

In the future, the site Water Balance and Water Quality Forecast model will continue to be updated on a yearly basis, using the actual volumes and measured concentration to calibrate the models.

Figure 4-20: Comparison of Forecasted Copper Concentration - North Cell TSF Reclaim Pond

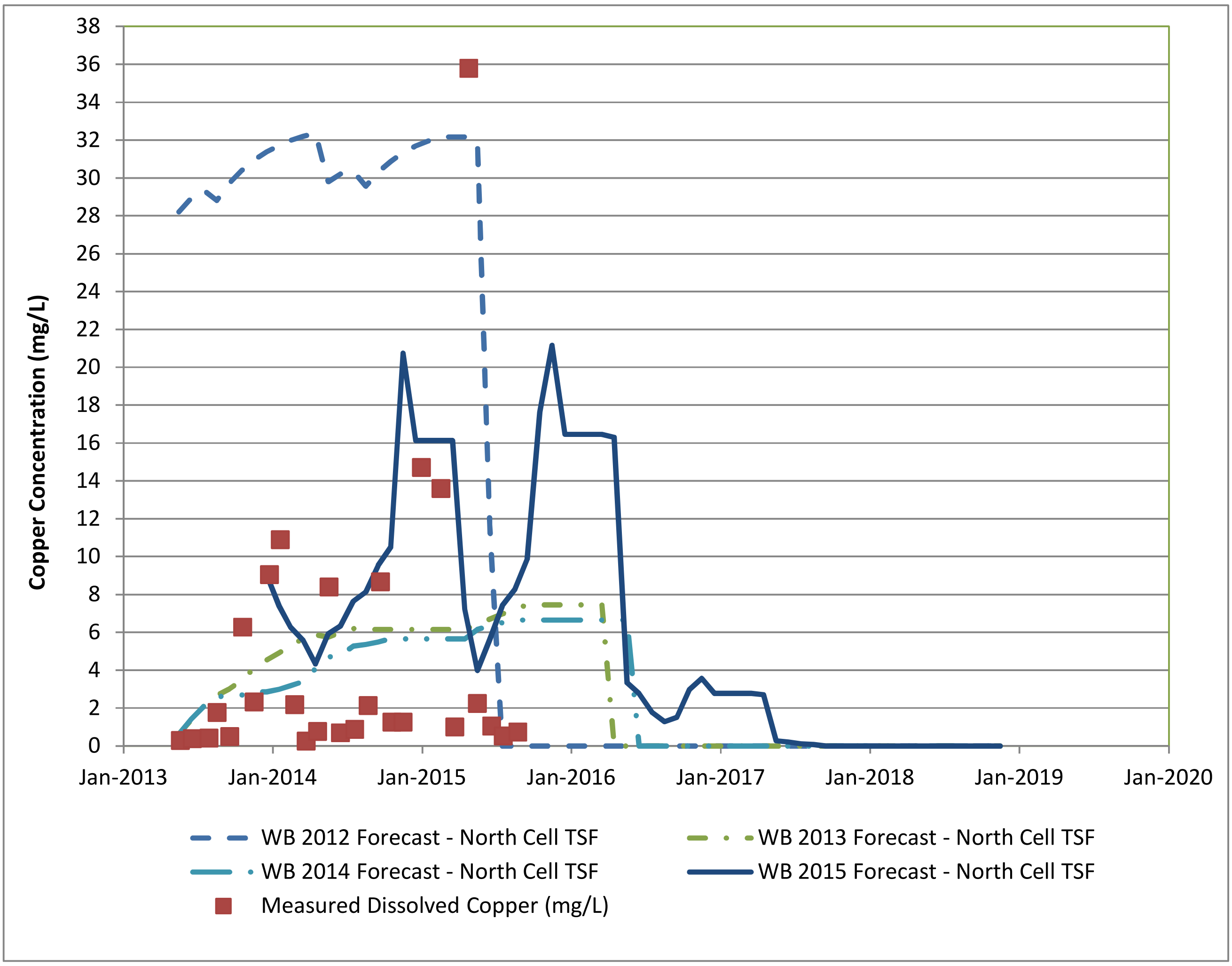


Figure 4-21: Comparison of Forecasted Copper Concentration - South Cell TSF Reclaim Pond

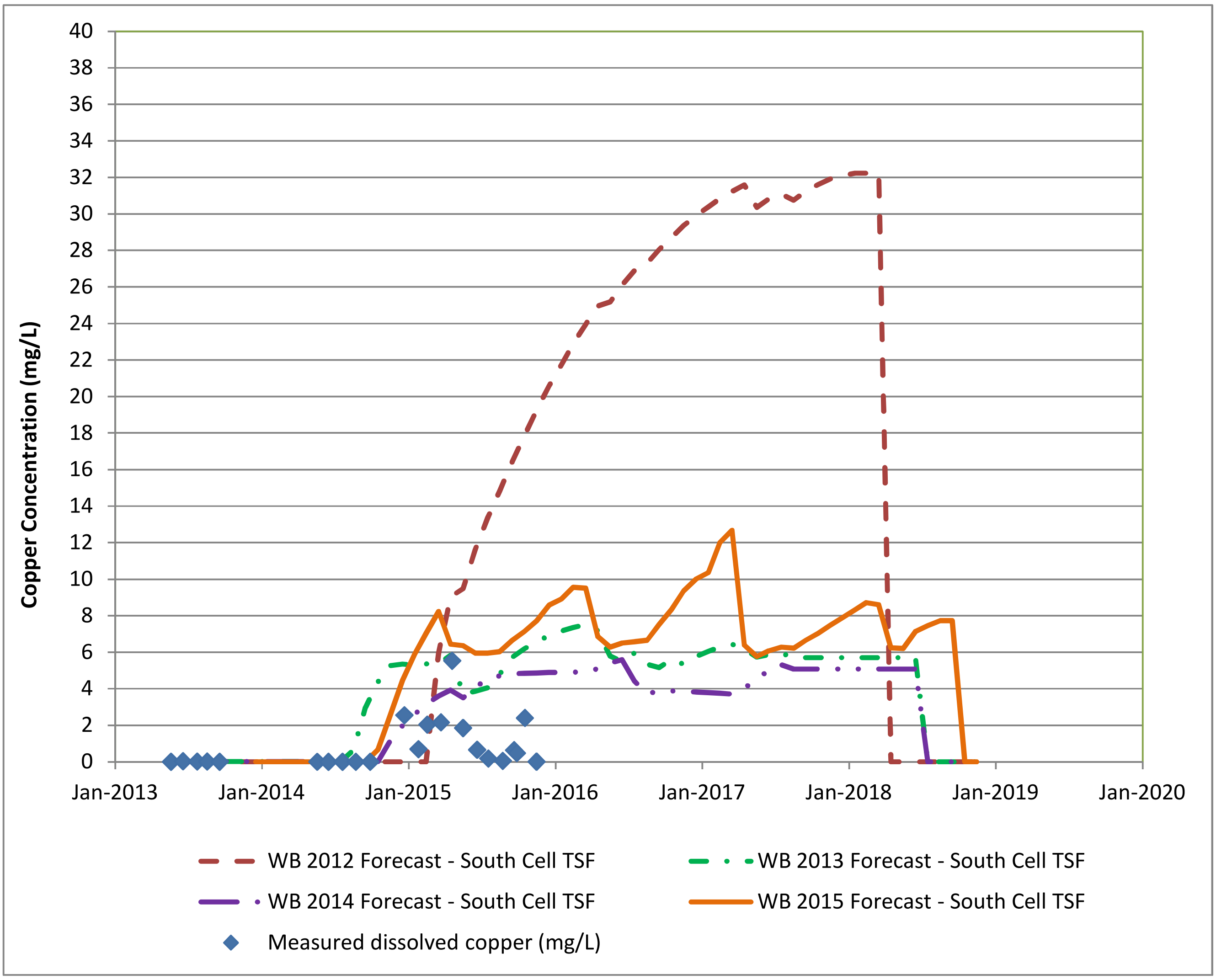


Figure 4-22: Comparison of Forecasted Chloride Concentration - North Cell TSF Reclaim Pond

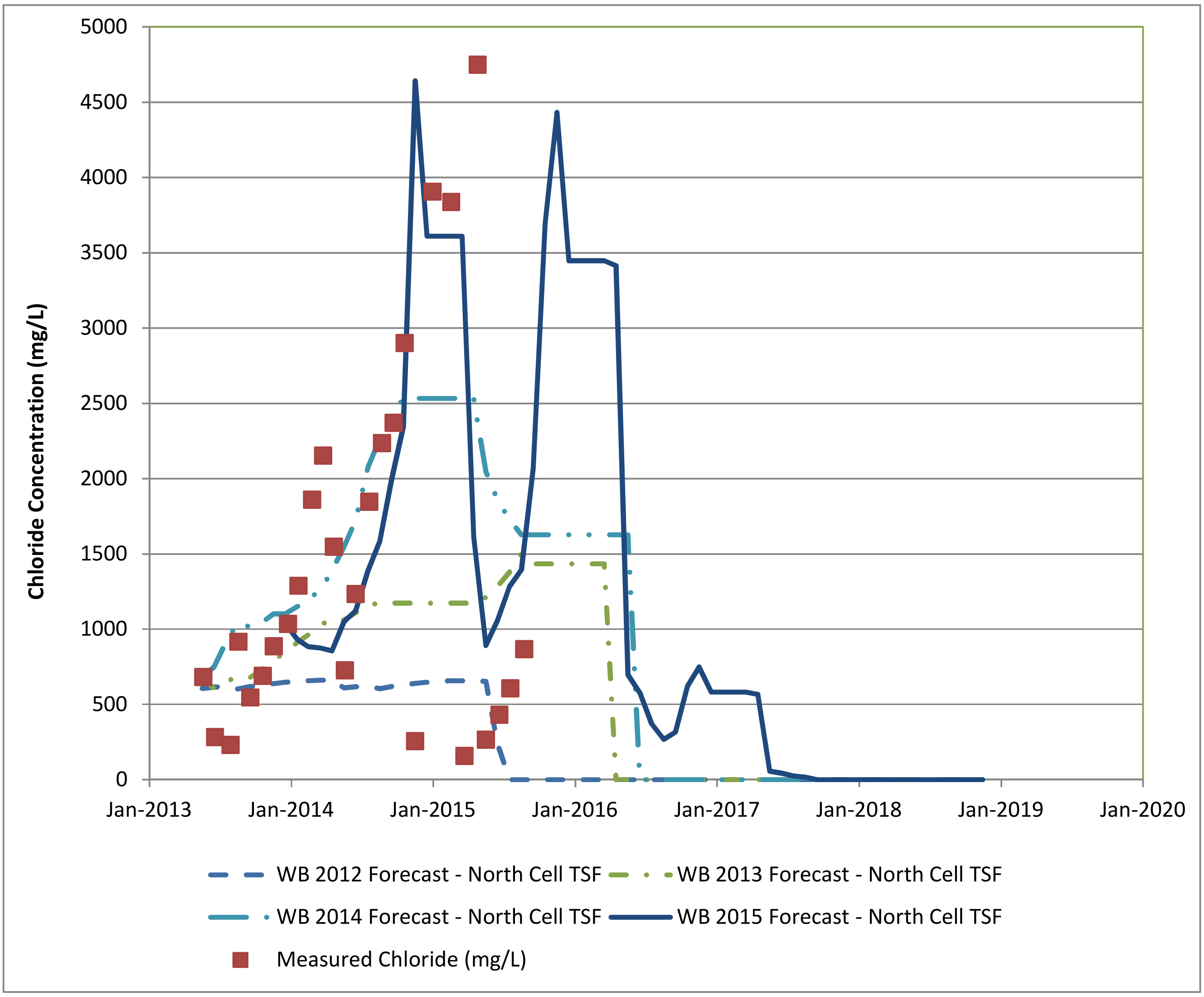
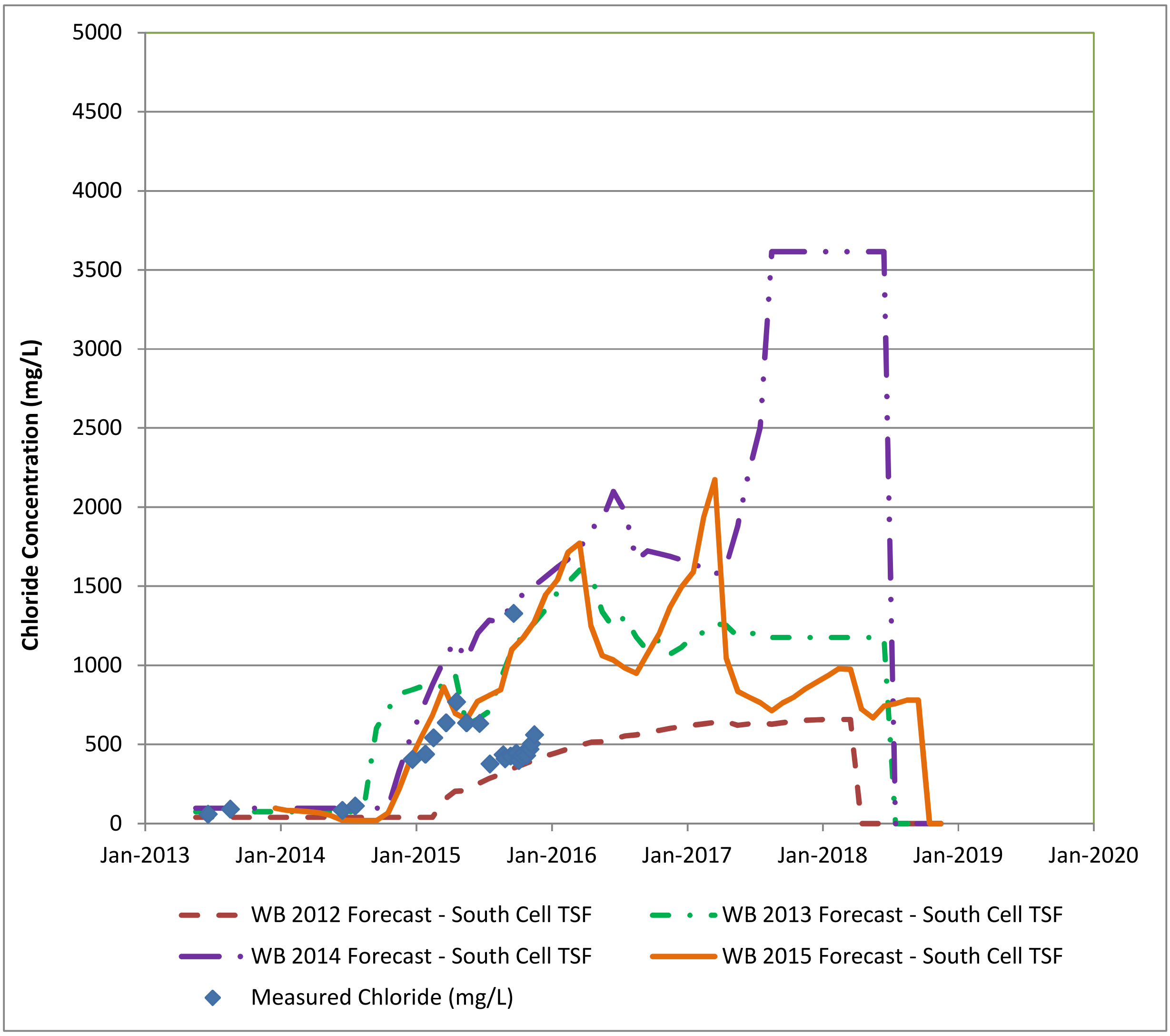


Figure 4-23: Comparison of Forecasted Chloride Concentration - South Cell TSF Reclaim Pond



5.0 VAULT WATER QUALITY FORECASTING

The Vault area is located around 10 km North East of the facilities of the Portage Area of Meadowbank, including among others a mining pit, an attenuation pond, a rock storage facility and a water treatment plant.

Water is transferred from Vault Pit to the Vault Attenuation Pond, which goes through the water treatment plant in operation, designed for total suspended solids removal. The water is then currently discharged each summer to Wally Lake until 2018. Vault Pit will be flooded from 2018 to 2015, and Vault Dike will be breached in 2029 if water quality criteria are met.

A review of the chemical analysis for water samples collected in the Vault area was undertaken by SLI in order to identify contaminants that were currently either above the discharge criteria or present in significant concentration. The discharge criteria applied to mining effluents discharged to the environment in this case is the Water License (Nunavut Water Board License, 2008). The CCME guidelines were also used as a guide to identify potential parameters that may become a problem, should they be discharged to the environment without appropriate treatment and dispersion in the receiving environment.

5.1 REVIEW OF VAULT WATER QUALITY DATA

5.1.1 Review of Water Quality Discharged to Environment

Compilation of actual measured data from the Vault Area between 2014 and 2015 was performed. The average for each parameter monitored for the Meadowbank Water Quality Forecast Model is presented in Table 5-1:

Table 5-1: Average Concentrations of Water Quality Samples taken in the Vault Area

Parameters	Units	Vault Pit (St-23)	Vault Attenuation Pond (St-25)	Discharge in Wally Lake (ST-10)	CCME Guidelines	MMER, Max. Monthly Mean	Water License Vault, Max. Avg Conc.
Basis of data used for model:		Avg 2014-2015	Avg 2014-2015	Avg 2015			Part F of License
Alkalinity	mg $CaCO_3$/L	107.25	41.75	35.25	n/a	n/a	n/a
Hardness	mg $CaCO_3$/L	340	70	63.5	n/a	n/a	n/a
Total Aluminium (Al)	mg/L	0.003	0.027	0.08942	0.1	n/a	1.5
Total Silver (Ag)	mg/L	0.00005	0.00005	0.00005	0.0001	n/a	n/a
Total Arsenic (As)	mg/L	0.01058	0.00025	0.001275	0.005	0.5	0.1
Total Barium (Ba)	mg/L	0.0703	0.014050	0.018583	n/a	n/a	n/a
Total Cadmium (Cd)	mg/L	0.00001	0.000010	0.000014	4.00E-05	n/a	0.002
Total Chromium (VI)	mg/L		0.000950	0.006391	1.00E-03	n/a	n/a
Total Copper (Cu)	mg/L	0.01013	0.0034	0.002113	0.002	0.3	0.1
Total Iron (Fe)	mg/L	0.59	0.165	0.15	0.3	n/a	n/a
Total Manganese (Mn)	mg/L	0.09	0.02915	0.03	n/a	n/a	n/a
Total Mercury (Hg)	mg/L	0.000005	0.000005	0.000005	0.000026	n/a	0.004
Total Molybdenum (Mo)	mg/L	0.1111	0.011200	0.005617	0.073	n/a	n/a
Total Nickel (Ni)	mg/L	0.024475	0.003620	0.003333	0.025	0.5	0.2
Total Lead (Pb)	mg/L	0.02106	0.00048	0.00229	0.001	0.2	0.1
Total Selenium (Se)	mg/L	0.004	0.0005	0.0005	0.001	n/a	n/a
Total Zinc	mg/L	0.014125	0.0018	0.0009	0.03	0.5	0.2
Ammonia (NH_3)	mg N/L	18.4825	2.2	1.06	0.855296	n/a	20
Chloride	mg/L	33.20	7	5.29	120	n/a	500
Fluoride (F)	mg/L	0.25	0.087	0.073333333	0.12	n/a	n/a
Nitrate (NO_3)	mg N/L	45.9	4.670	2.504166667	2.94	n/a	50
Total Cyanide (CNt)	mg/L		0.007	0.0025	0.005	1	n/a
Sulphate (SO4)	mg SO4/L	124	7.1000	32.725	n/a	n/a	n/a
Total dissolved solids	mg/L	511.75	142.125	103.8333333	n/a	n/a	n/a

The blue fonts represent dissolved values when the total values were not available. The yellow cells represent the concentrations not meeting the CCME guidelines for Protection of Aquatic Life, which are used for comparison purpose only. Any concentrations above the Water License discharge criteria would be highlighted in red, which is not the case based on the samples taken in 2014 and 2015.

Based on this evaluation, the concentration of the parameters discharged to Wally Lake are below the Water License requirements. Furthermore, the concentrations of metals, chlorides and sulfates in the water sampled in the Vault Pit and the Vault Attenuation Pond are relatively low compared to the Water License requirements. Only ammonia and nitrate concentrations, specifically in the Vault Pit, are relatively elevated and are discussed further in section 5.2.4.

5.1.2 Ammonia Loading to Environment

In 2015, the ammonia loading discharged to the environment is approximately 1310 kg of NH_3. This value was computed using the water balance and the average ammonia concentration of the samples collected in July, August and September (i.e. period when water was discharged to Wally Lake).

5.2 VAULT WATER QUALITY FORECAST

5.2.1 Model description

A mass balance model was developed to assess the water quality forecast trends in the Vault Area for ammonia and nitrate. The starting date for the model was set for June 2014. The end date of the model was set when the dikes at Vault will be breached in 2029.

5.2.2 Assumptions

The assumptions used in the development of the mass balance model for the Vault Area of Meadowbank were the following:

i. The Vault Attenuation Pond is a combination of Pond A, B, C and D. The model does not take into consideration the transfers between Pond A, B, C and D, only transfers inside and outside the Vault Attenuation Pond.

ii. The model does not take into consideration the variations of volume due to ice (no free volume, as well as ice ratio and water/ice entrapment).

iii. The water quality from Vault Pit is assumed to be constant over time for ammonia and nitrate.

iv. The water mass balance is performed around the Vault Attenuation Pond. The volume of water transferred out of the Vault Attenuation Pond to the water treatment plant is assumed to be completely discharged to Wally Lake.

v. It is assumed that the primary source of ammonia and nitrate loading is from Vault Pit. All other inflow contaminant concentrations (Phaser Pit, Phaser Lake, runoffs, etc) are assumed to have a negligible impact on ammonia and nitrate loading.

vi. For simplification of the model, ponds and pits are assumed to be completely mixed systems.

vii. For simplification of the model, the parameters are assumed to be inert: they do not degrade or react with other elements in the system.

viii. For this analysis, it is assumed that the water treatment plant between the Attenuation Pond and Wally Lake does not reduce the concentration of ammonia and nitrate.

ix. The dissolved parameters are used in this study.

5.2.3 Input to Model

The mass balance model is based on the assumptions above and on the following input parameters:

- Vault Pit (ST-23);
- Vault Attenuation Pond (ST-25);

- Final Effluent to Wally Lake(ST-10).

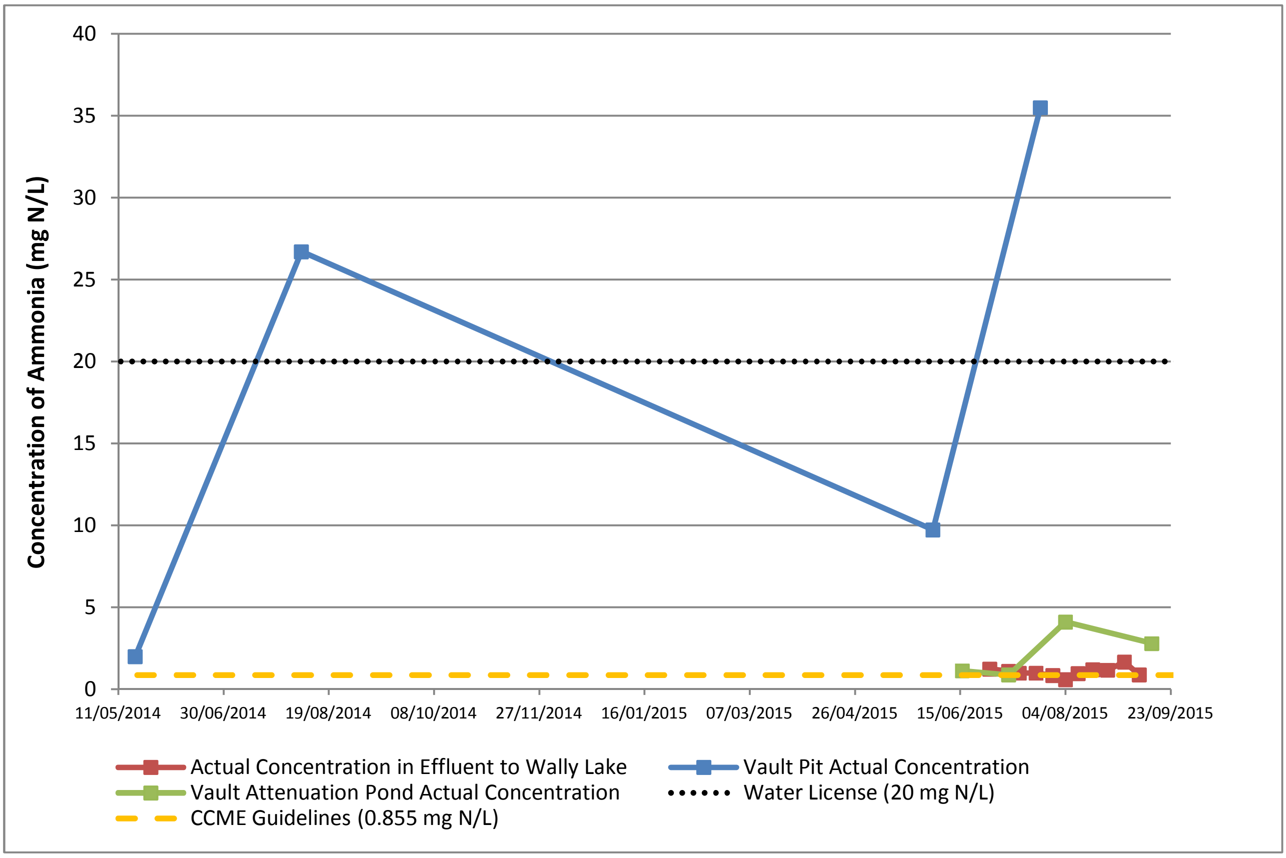
The initial concentration of parameters in Vault Pit and Vault Attenuation Pond are assumed to be the average of 2014-2015. For the discharged in Wally Lake, an average of values from 2015 was used. Table 5-1 in section 5.1.1 presents the averages used as input parameters.

5.2.4 Forecasting Results

Ammonia

Ammonia concentrations sampled in Vault Pit are elevated because of the explosives use during the mining process. Figure 5-1 presents the concentrations monitored in Vault Pit, Vault Attenuation Pond and at the final effluent to Wally Lake.

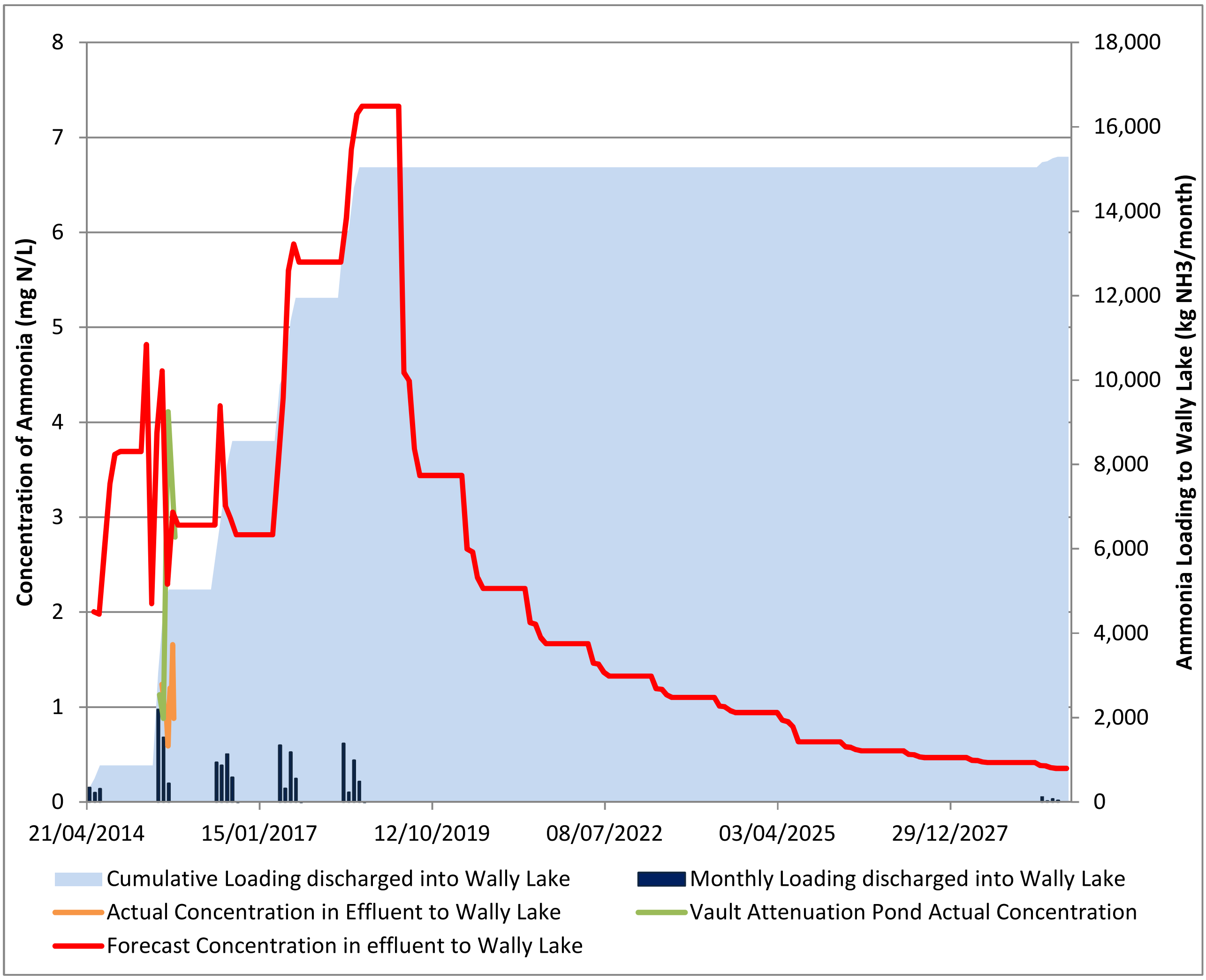
Figure 5-1: Actual Ammonia Concentration in Vault Area



Two monitored values in Vault Pit exceeded the Water License limit, but all the sampled concentrations in the Vault Attenuation Pond and the final effluent towards Wally Lake were below the discharge requirements.

When forecasting the concentration of the effluent discharged to Wally Lake until closure, the concentration of ammonia reached a peak of over 7 mg-N/L in 2018, the last year where Vault Pit water is transferred to the Vault Attenuation Pond.. The concentration then dropped to around 1 mg/L at closure. AEM is required to meet the criteria for discharge to Wally Lake as stated in the Type A Water License which is set at 20 mg N/L. No exceedance occurred and is foreseen with the current Vault water quality forecasting model. Figure 5-2 shows the forecasted concentration, the monthly loadings and the cumulative loadings of ammonia in the treated effluent discharged to Wally Lake.

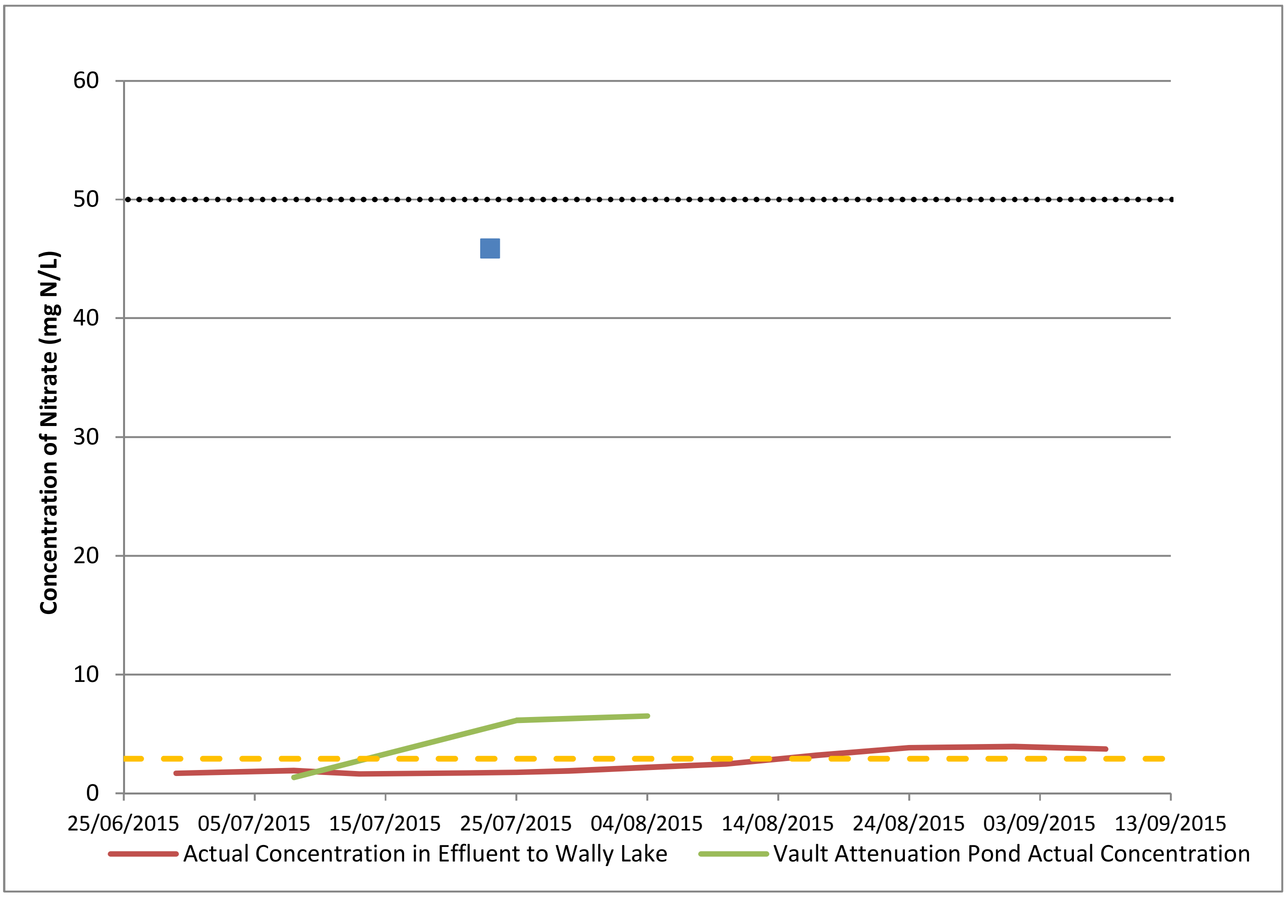
Figure 5-2: Forecasted Ammonia Concentration in Vault Area



Nitrate

Nitrate concentrations sampled in the Vault Pit are also found to be elevated because of the use of ammonium-nitrate explosives for the pit development. Figure 5-3 presents the concentrations monitored in Vault Pit, Vault Attenuation Pond and at the final effluent towards Wally Lake.

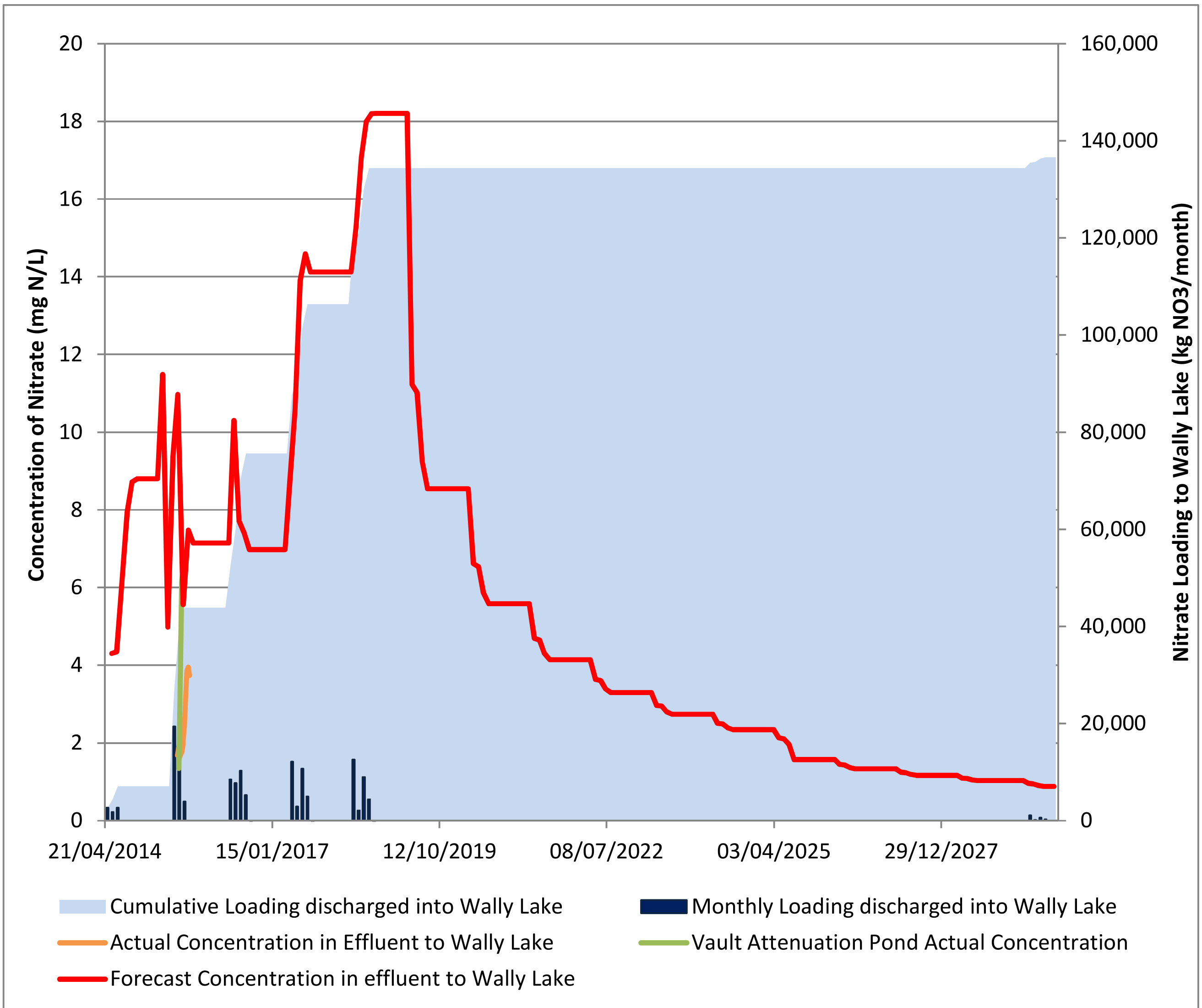
Figure 5-3: Actual Nitrate Concentration in Vault Area



Only one water sample was analyzed for nitrate in the Vault Pit. The concentration measured was 46 mg N/L, which is below the Water License limit of 50 mg N/L for nitrate. The monitored values in Vault Attenuation Pond and in the final effluent are well below the Water License requirements.

The forecasted trend of nitrate concentration in the effluent discharged to Wally Lake until closure is similar to ammonia. It reaches a peak of over 18 mg-N/L in 2018, last year of Vault Pit discharge into the Vault Attenuation Pond. The concentration then decreases to around 1.5 mg/L before rising to 3 mg/L before closure. Since the Water License discharge limit for nitrate is 50 mg N/L, no exceedance is foreseen. Figure 5-4 shows the forecasted concentration, the forecasted monthly loadings and the cumulative loadings of nitrate in the treated effluent discharged to Wally Lake.

Figure 5-4: Forecasted Nitrate Concentration in Vault Area



In conclusion, the forecasted concentrations for nitrate and ammonia in the treated effluent discharged to Wally Lake from the Vault area are expected to remain below the discharge requirements as defined in the Type A Water License. The primary source of ammonia and nitrate in the water comes from the use of ammonium-nitrate based explosive in the development of the Vault Pit.

6.0 CONCLUSION

Based on the WB 2015 developed by AEM, the objective of this Technical Note was to forecast the long term concentration of different contaminants in the North and South Cells TSF Reclaim Pond and in the Portage and Goose Pits from 2014 until closure in 2029. The water quality mass balance model was updated to forecast these long-term concentrations.

6.1 LIMITATIONS

It is important to understand the limitations of the mass balance model and of this Technical Note. The limitations are presented in section 3.3 and are briefly summarized here:

- In order to simplify the model, the mass balance model assumes the following:
  - Pond and pits are completely mixed systems;
  - No change in the water quality of the Mill Effluent;
  - A monthly time-step.
- The mass balance model is based on a limited set of water quality analysis results provided by AEM:
  - Water quality data provided for ST-21 is taken from samples collected at the surface of the North and South Cell TSF Reclaim Pond;
  - Limited water quality data available for the Mill Effluent;
  - Limited water quality data for some of the inflows and outflows of the Reclaim Pond.

6.2 RESULTS SUMMARY AND TREATMENT

Based on the results of the water quality mass balance presented in section 4.2, treatment may be required for copper, silver, selenium and total nitrogen as the pit water quality may exceed CCME limits if the water is not treated. All three parameters have also higher forecasted equilibrium concentrations than the guidelines. These concentrations are modeled using the PHREEQC modeling tool also presented in section 4.2. Treatment could be undertaken at the Reclaim Pond, or in the Portage Pit if the trends shown in the model reveal to be true in the field. A potential treatment option for the removal of copper prior to discharge in Portage Pit is caustic or lime precipitation, while aeration is recommended for total nitrogen reduction via ammonia volatilization. A coagulation-clarification process could be a potential treatment solution for removal of dissolved silver.

Selenium concentration also exceeds the CCME limits in Portage Pit. Consequently, treatment may be required. This parameter still requires close monitoring.

For the Vault area, ammonia and nitrate are the parameters of concern, but no actual or forecasted concentration exceeds the Type A Water License discharge requirements for this area.

It is important to note that the water quality in the pits will be subject to CCME guidelines or site specific criteria once the water level in the Goose and Portage Pits are equal to the water level in Third Portage Lake. The dikes will only be breached once the water quality in the pits meets CCME guidelines or site specific criteria.

6.3 RECOMMENDATIONS

The water quality mass balance developed for this study is intended as an updated model (from SNC 2012 model) for the mass balance in the Portage Area. Therefore, in order to improve the accuracy of the model so that it can better forecast the concentration of certain parameters in the Reclaim Pond or Portage and Goose Pits, the following studies, tests and monitoring are recommended.

1. In addition to the current set of chemical analyses, regular (at least monthly) monitoring of all inflows and outflows of the North and South Cells TSF Reclaim Pond for cyanide, total and dissolved copper, total and dissolved iron, ammonia, nitrate, chloride, total and dissolved silver, total and dissolved selenium, sulfates and total dissolved solids (TDS) should be undertaken.
2. Regular monitoring of pit water quality (Portage and Goose) should also be undertaken, when the site can be safely accessed and analyzed for Total Suspended Solids, Total Dissolved Solids, chloride, sulfates, sodium, as well as a total and dissolved metal scans. This information will be useful in developing a water quality forecast model of the pit water quality based on loadings from surface runoff and possible underground water infiltration.
3. Once transfer of South Cell Reclaim Water begins to the Portage Pit (September 2018), regular (at least monthly) monitoring of all outflows of the TSF Reclaim Pond for all parameters should be undertaken.
4. Sample and analyze the South Cell TSF Reclaim Pond at different depths and locations to determine if there is a concentration gradient in the Reclaim Pond.
5. Continued monitoring of the water in the South Cell TSF Reclaim Pond in 2016 on a regular basis to monitor the evolution of the parameters of concern listed in section 2.2.1. It is understood that this recommendation is required as per the water license.

6. In order to validate the assumption of a well mixed system in Portage and Goose Pits, it is recommended to sample and analyze the water at different depths before, during and after the pits are filled with water from South Cell TSF and/or Third Portage Lake, when or if it is safe to do so. Furthermore, it may be useful to evaluate the assumption of a well mixed versus stratified pit water quality prior to mixing Portage and Goose Pits.
7. Once Portage and Goose Pits are hydraulically connected, it is recommended to sample the water at different points in the pit area in order to evaluate the mixing efficiency over the entire area. The samples should be taken at different depths over the entire area of the flooded pits before and after the filling season.
8. A bench scale test could be performed in order to validate the geochemical equilibrium, and therefore, verify if treatment for copper and/or silver is required.
9. Continue to sample and analyze as per the Water License requirement the Vault Pit and Vault Attenuation Pond and include ammonia and nitrate in the list of parameters to analyze for.

7.0 REFERENCES

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APPENDIX A
WATER QUALITY ANALYSES

1. North Cell TSF Reclaim Pond (ST-21)
2. Attenuation Pond (ST-18) / South Cell TSF Reclaim Pond (ST-21)
3. Goose Pit (ST-20)
4. Portage pit (ST-19)

RECLAIM WATER DATA ST-21 (ACTUAL) - NORTH CELL | limite de détection/2

DATE	Alkalinity	Hardness	Ammonia nitrogen (NH_3)	Nitrate (NO_3)	Chloride	Fluoride	Sulphate	TDS	Total Cyanide (CNt)	Dissolved Aluminum	Dissolved Arsenic	Dissolved Barium	Dissolved Cadmium	Dissolved Copper	Dissolved Iron	Dissolved Lead	Dissolved Manganese	Dissolved Mercury	Dissolved Molybdenum	Dissolved Nickel	Dissolved Selenium	Dissolved Silver	Dissolved Thallium	Dissolved Titanium	Dissolved Zinc
	mg CaCO3/l	mg CaCO3/l	mg N/L	mg N/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L
2014-01-08	135	1329	36.8	25.5	1035	0.18	2115	1329	8.33	0.072	0.021	0.0838	0.00134	9.053	0.03	0.0016	0.0595	0.0002	0.5826	0.2525	0.072	0.0001		0.005	0.001
2014-02-04	120	1428	53.6	32	1289	0.02	2496	2660	9.17	0.15	0.031	0.0914	0.00173	10.9	0.08	0.0003	0.0141	0.0004	0.7348	0.0754	0.113	0.0107		0.005	0.001
2014-03-11	95	1286	58.8	29.8	1860	6.8	2542	2740	14.49	0.006	0.024	0.1096	0.00417	2.189	0.69	0.0003	0.0035	0.0004	0.6747	0.0871	0.188	0.0036		0.005	0.002
2014-04-08	110	1721	58.8	27.7	2153	0.32	2275	4633	23.1	0.079	0.0229	0.1219	0.0004	0.2578	0.09	0.0003	0.0005	0.0003	0.1866	0.0578	0.273	0.0041		0.005	0.001
2014-05-06	73	949	59.5	24.2	1549	2.2	2015	3878	11.69	0.139	0.0162	0.0826	0.00267	0.7796	0.29	0.0003	0.003	0.0005	0.3037	0.0756	0.247	0.0016		0.005	0.007
2014-06-03	67	674	51.5	14.3	727	0.41	1251	2142	6.21	0.046	0.0085	0.0512	0.00065	8.398	0.02	0.0003	0.0447	0.0002	0.2232	0.2941	0.122	0.0042		0.005	0.001
2014-07-01	90	1265	61.1	26.7	1235	2	2289	8573	0.913	0.099	0.007	0.0691	0.00084	0.7023	0.09	0.0003	0.0615	0.0003	0.359	0.6107	0.17	0.0001		0.005	0.001
2014-08-05	89	1246	48.7	33.5	1847	0.48	2683	3909	1.33	0.134	0.0143	0.0791	0.0013	0.8784	0.12	0.0003	0.0212	0.0006	0.5202	0.2237	0.239	0.0001		0.005	0.001
2014-09-07	84	1390	46.3	21.7	2236	3.7	2400	3636	3.36	0.072	0.0075	0.0893	0.00114	2.139	0.25	0.0003	0.0269	0.0004	0.5631	0.5444	0.209	0.0222		0.005	0.001
2014-10-07	93	1387	55.1	35.6	2372	4.8	2359	4746	17.79	0.034	0.018	0.1068	0.00266	8.68	0.26	0.0003	0.0285	0.0006	0.65	1.399	0.217	0.0333		0.005	0.001
2014-11-04	120	1693	67.3	39.6	2902	1.5	3033	1694	20.54	0.109	0.0254	0.1048	0.00303	1.261	0.65	0.0003	0.0261	0.0009	0.721	1.518	0.222	0.1837		0.005	0.011
2014-12-01	127	659	88.2	3.7	256	0.01	951	1461	6.02	0.04	0.0122	0.0439	0.00026	1.267	0.6	<0.0003	1.355	<0.0001	0.0641	0.2428	0.016	0.0032		<0.005	0.001
2015-01-15	197	1961	61.4	53.2	3907	0.58	3724	3304	68.67	0.176	0.0372	0.1626	0.00302	14.71	0.17	0.00015	0.0236	0.00151	0.9494	1.787	0.28	0.00005		0.0025	0.0005
2015-03-04	296	1803	52.9	64.5	3838	7.4	4261	7846	78.98	0.003	0.0643	0.1226	0.00354	13.6	0.27	0.001	0.0217	0.00102	1.14	2.494	0.402	0.00005		0.0025	0.006
2015-04-07	24	123	4.99	2.85	159	0.09	274	559	3.54	0.003	0.0011	0.0085	0.00026	1.008	0.96	0.00015	0.0032	0.00002	0.0668	0.1586	0.018	0.0056		0.0025	0.0005
2015-05-11	374	1447	108	67.3	4751	7.5	4103	9773	60.47	0.003	0.0424	0.0507	0.00289	35.8	0.51	0.00015	0.0075	0.00359	1.308	4.271	0.399	0.0069		0.0025	0.009
2015-06-01	43	385	13.6	9.93	267	0.03	770	1474	1.45	0.003	0.00025	0.0233	0.00024	2.258	0.03	0.0008	0.035	0.035	0.1116	0.2058	0.042	0.0098		0.0025	0.0005
2015-07-06	62	559	17.6	12.1	432	2.37	843	1720	0.009	0.003	0.00025	0.0289	0.00001	1.06	0.005	0.00015	0.0529	0.00011	0.1765	0.3169	0.054	0.005		0.0025	0.0005
2015-08-03	97	1005	35.9	19	608	0.32	1692	2863	0.079	0.003	0.00025	0.0809	0.00001	0.5371	0.005	0.00015	0.0229	0.00036	0.38	0.0883	0.068	0.0068		0.0025	0.0005
2015-09-08	99	1880	46.1	20.6	868	0.55	2140	3232	0.396	0.033	0.00025	0.0874	0.00141	0.7407	0.02	0.00015	0.029	0.00053	0.5175	0.0758	0.057	0.00005		0.0025	0.0005

RECLAIM WATER DATA ST-21 (ACTUAL) - SOUTH CELL

DATE	Alkalinity	Hardness	Ammonia nitrogen (NH_3)	Nitrate (NO_3)	Chloride	Fluoride	Sulphate	TDS	Total Cyanide (CNt)	Dissolved Aluminum	Dissolved Arsenic	Dissolved Barium	Dissolved Cadmium	Dissolved Copper	Dissolved Iron	Dissolved Lead	Dissolved Manganese	Dissolved Mercury	Dissolved Molybdenum	Dissolved Nickel	Dissolved Selenium	Dissolved Silver	Dissolved Thallium	Dissolved Titanium	Dissolved Zinc
	mg CaCO3/l	mg CaCO3/l	mg N/L	mg N/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L
2014-06-03	113		8.5					754	0.247		0.0041			0.0076		0.00015				0.0427					0.002
2014-07-01	96	318	8.4	1.2	84.4	0.57	471	2628	0.34	0.003	0.0041	0.0447	0.00007	0.0041	0.005	0.00015	2.43	0.00005	0.0237	0.0346	0.001	0.0001	0.0025		0.0005
2014-08-05	103	406	9.7	1.3	112	0.56	612	1155	0.462	0.003	0.0068	0.0462	0.0001	0.0052	0.01	0.00015	2.858	0.00005	0.0269	0.041	0.004	0.0001	0.0025		0.0005
2014-09-07	114							1283	0.346		0.0111			0.0054		0.00015				0.0659					0.006
2014-10-13	106		11.8					1363.0	0.336		0.0084			0.0065		0.0017				0.0727					0.012
2015-01-06	117	893.5444	31.3	7.45	406	2.5	1200	1924	16.29	0.037	0.0203	0.0827	0.00026	2.561	0.05	0.00015	0.02	0.00038	0.1849	0.1146	0.049			0.0025	0.001
2015-02-10	116	1099	53.7	9.08	439	0.26	1456	2190	14.71	0.036	0.022	0.1157	0.00068	0.6986	0.2	0.00015	0.003	0.00061	0.2755	0.0571	0.084			0.0025	0.0005
2015-03-04	126	1224	54.6	11	543	0.42	1537	2628	13.08	0.024	0.0379	0.1208	0.00079	2.045	0.03	0.00015	0.0254	0.00077	0.3331	0.1832	0.104			0.0025	0.002
2015-04-07	113	1325	59.7	10.8	638	0.01	1670	2946	0.762	0.029	0.0126	0.1296	0.00094	2.165	0.9	0.00015	0.014	0.00058	0.3948	0.0258	0.102			0.0025	0.004
2015-05-05	80	1395	57	10.7	770	2.4	1604	3411	22.93	0.232	<0.0005	0.1062	0.00066	5.541	2.4	0.00015	0.0084	0.00057	0.4086	0.0304	0.079			0.0025	0.0005
2015-06-01	76	1329	57.3	10.4	637	0.03	1557	2801	6.13	0.022	0.0005	0.107	0.00086	1.857	0.05	0.00015	0.057	0.00037	0.3877	0.0287	0.075			0.0025	0.003
2015-07-06	107	1315	45.8	10.5	633	0.03	1235	2270	0.638	0.006	0.0005	0.0772	0.00002	0.6646	0.05	0.00015	0.1811	0.00031	0.3019	0.0853	0.046			0.0025	0.0005
2015-08-03	157	1029	16.1	8.51	378	0.04	1316	2328	0.047	0.006	0.0005	0.0581	0.00078	0.1869	0.02	0.00015	0.6803	0.00015	0.25	0.0834	0.049			0.0025	0.005
2015-09-01									0.0025																
2015-09-08	150	1176	31.2	7.29	436	0.01	1473	2230	0.078	0.006	0.0015	0.0485	0.00061	0.0618	0.01	0.00015	1.018	0.00009	0.244	0.0578	0.039			0.0025	0.0005
2015-09-13					411				0.024							0.00015									
2015-09-28					427				0.34							#REF!									
2015-10-06	135	1222	5.79	7.77	1329	0.44	1650	2184	0.307	0.003	0.0025	0.0585	0.00043	0.6453	0.02	0.0003	1.254	0.00007	0.3034	0.0962	0.045			0.0025	0.0005
2015-10-13	137	1100	5.09	7.53	445	0.47	1656	2210	0.272	0.003	0.0081	0.0453	0.00063	0.485	0.02	0.0003	1.129	0.00005	0.2468	0.0668	0.036			0.0025	0.0005
2015-10-20				7.88	399		1500		0.676							0.0003									
2015-10-26				8.56	429		1811		1.37							0.0015									
2015-11-02	137	1263	35.4	9.09	445	0.4	1651	2433	1.45	0.01	0.0088	0.0535	0.00081	2.403	0.03	0.0003	0.9792	0.00024	0.3123	0.1404	0.048			0.0025	0.001
2015-11-10				8.17	431		1866		0.56							0.0003									
2015-11-19					471		1852		1.28							0.0003									
2015-11-23				9.77	505				2.37							0.0003									
2015-12-01	144	1461	35.4	10.7	562	0.13	1998	2926	3.58	0.014	0.00025	0.076	0.0008	0.0155	0.36	0.0003	0.1727	0.00028	0.3233	0.018	0.072	0.0003		0.0025	0.0005

Goose Pit

Parametre	Alkalinity	Hardness	Ammonia-nitrogen	Nitrate (NO3)	Chloride	Fluoride	Sulphate	TDS	Total Cyanide	Dissolved Aluminum	Dissolved Arsenic	Dissolved Barium	Dissolved Cadmium	Dissolved Copper	Dissolved Iron	Dissolved Lead	Dissolved Manganese	Dissolved mercury	Dissolved Molybdenum	Dissolved Nickel	Dissolved Selenium	Dissolved Silver	Dissolved Thallium	Dissolved Titanium	Dissolved Zinc	Dissolved Chromium
Date	mg CaCO3/L	mg CaCO3/L	mg N/L	mg N/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		mg/L	mg/L	mg/L	**mg/L**
2014-03-11	93.0000		0.0170					175.0000																		
2014-06-03	90.0000		2.4000					288.0000																		
2014-07-01	94.0000	111	5.6000	16.4000	73.6000	0.9100	50.9000	1544.0000		0.0160	0.0013	0.0163	0.0000	0.0003	0.0050	0.0002	0.0115	0.0001	0.0191	0.0043	0.0010	0.0001		0.0025	0.0005	
2014-08-10	83.0000		0.4000					319.0000																		
2014-09-08	88.0000	151	0.6100	5.3000	31.3000	0.9600	70.6000	322.0000		0.0460	0.0059	0.0387	0.0000	0.0013	0.0050	0.0002	0.1072	0.0001	0.0166	0.0253	0.0010	0.0001		0.0025	0.0005	
2015-08-09	75.0000	104.0000	0.5700	4.11	13.7000	0.5500	45.8	217.0000	0.005	0.003	0.00025	0.0163	0.00001	0.00025	0.01	0.00015	0.0058	0.00006	0.0148	0.0097	0.001		0.005	0.01	0.001	0.0003

Portage Pit

Parametre	Alkalinity	Hardness	Ammonia-Nitrogen (NH3-NH4)	Nitrate	Chloride	Fluoride	Sulphate	TDS	Total Cyanide	Dissolved Aluminum	Dissolved Arsenic	Dissolved Barium	Dissolved Cadmium	Dissolved Copper	Dissolved Iron	Dissolved Lead	Dissolved Manganese	Dissolved Mercury	Dissolved Molybdenum	Dissolved Nickel	Dissolved Selenium	Dissolved Silver	Dissolved Thallium	Dissolved Titanium	Dissolved Zinc
Date	mg CaCO3/L	**mg CaCO3/L**	mg N/L	mgN/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
2014-11-21	90.0000	432.0000	13.4000	42.3000	34.4000	0.2900	339	806.0000		0.026	0.0203	0.0291	0.00093	0.002	0.005	0.00015	0.1502	0.00005	0.3088	0.0539	0.005	0.00005	0.0025		0.005
2015-07-13	72.0000	198.0000	3.8500	11.8000	16.7000	0.2400	154	401.0000		0.003	0.0182	0.0124	0.00001	0.00025	0.005	0.00015	0.0788	0.00002	0.1074	0.0243	0.002	0.00005	0.0025		0.0005
2015-08-11	70.0000	193.0000	2.2400	9.1300	14.1000	0.2900	117	324.0000		0.003	0.0138	0.0098	0.00001	0.00025	0.005	0.00015	0.1054	0.000005	0.0181	0.0402	0.001	0.00005	0.0025		0.0005
2015-09-14	49.0000		2.1700					768.0000																	
2015-05-28	60.0000	82	1.1700	3.1900	5.1000	0.0600	44.6000	171.0000		0.0030	0.0318	0.0047	0.0000	0.0003	0.0050	0.0002	0.0433	0.0000	0.0359	0.0137	0.0010	0.0001	0.0025		0.0005
2015-06-01	55.0000		1.2400					192.0000																	
2015-07-23	76.0000	227	4.2700	11.9000	14.6000	0.3700	165.0000	464.0000		0.0030	0.0091	0.0136	0.0000	0.0011	0.0100	0.0003	0.0979	0.0000	0.0005	0.0005	0.0010	0.0001	0.0050		0.0010
2015-08-04	75.0000		2.2600					426.0000																	
2015-09-08	86.0000		3.3500					461.0000																	
2015-10-05	86.0000	306	3.8000	16.8000	23.6000	0.3700	250.0000	532.0000																	
2015-11-02	100.0000	340	4.2200	15.7000	25.6000	0.4200	258.0000	548.0000																	

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APPENDIX D – 2015 FRESHET ACTION PLAN

AGNICO EAGLE

MEADOWBANK GOLD MINE

FRESHET ACTION AND INCIDENT RESPONSE PLAN

MARCH 2016

EXECUTIVE SUMMARY

The purpose of this Action and Response Plan is to identify areas of concern around the Meadowbank mine site and the AWAR that need to be managed in an organized and timely manner during the annual freshet period to prevent adverse environmental and operational impacts. The Incident Response section of the Plan outlines specified actions that will be taken by AEM to manage and mitigate areas where environmental incidents have occurred, specifically seepage on the north-east side of the Portage Waste Rock Storage area, known as sampling location ST-16 (2013) and seepage from the mill (inside) containment structures through the Assay Road southwest of the mill (Mill Seepage - 2013). Any future incidents that have the potential to affect off site water or land will be added and would include any specific mitigation and monitoring actions.

The freshet period typically occurs during the annual snow and ice melt sometime around mid-May and extends until the end of July. During this period excess water is created and must be managed through additional pumping and management practices at vulnerable areas around the site. Mitigation techniques, timeframes and specified roles and responsibilities are outlined in this document for each area of concern.

The main areas of concern are the mining pits and pit walls, the East and West diversion ditches, Vault Road culverts, the areas around the Portage Waste Rock Storage Facility (RSF) including the northern portions of the NPAG waste rock extension, which includes two new collection ponds known as WEP1 and WEP2, Vault Waste Rock Storage Facility, Northwest corner of the North Cell TSF, Saddle Dam 1 corner, Saddle Dam 2 sump, AWAR culverts near the site and along the road to Baker Lake, RSF – ST-16 Seepage, Assay Road (Mill) Seepage and the Vault Pit area.

It is important that all dewatering and associated infrastructure be in good working order and adequate to manage the expected water flows associated with the freshet period; this includes but is not limited to pumps, ditch, culvert and sump maintenance, critical piping system installation and inspection, adequate resource allocation for preparative work and establishing a viable monitoring program for the areas of concern and incident response locations. A concise summary of the 2016 preparation works and roles and responsibilities is presented in the attached Appendix 1 (2016 Freshet Action Plan Procedures). Appendix 1 will be updated yearly to reflect changes in conditions at the Meadowbank site. Appendix 2 contains diagrams depicting the areas of concern and incident response locations. Schedules 1 and 2 describe the monitoring programs for incident responses.

DOCUMENT CONTROL

Revision				Pages Revised	Remarks
#	Prep.	Rev.	Date		
01	AEM	Internal	April 2014	All	
02	AEM	Internal	May 2015	All	Comprehensive update from 2014 Plan
03	AEM	Internal	October 2015	All	Comprehensive update from May 2015 Plan
04	AEM	Internal	March 2016	All	2016 Comprehensive review

Prepared By: ____________________________

Engineering and Environmental Department

Approved by:

____

Engineering and Environmental Department

TABLE OF CONTENTS

LIST OF FIGURES

List of Appendix

List of Schedule

1 INTRODUCTION

The purpose of this Freshet Action and Incident Response Plan is to ensure that AEM can address and manage excess water associated with the freshet season at the Meadowbank site and to ensure AEM has implemented specific management and mitigation measures in response to environmental incidents with potential for off site impacts to water or land.

The freshet season is loosely defined as being a period of time from approximately May 15 – July 30; in some cases this period of time can extend up to early fall when freezing re-occurs (October 15). There are many areas around the site that are vulnerable to this excess water; the goal is to identify these areas and develop a clear plan with defined roles and responsibilities (among AEM Departments), and to manage the freshet flows.

In addition, several guiding principles are applicable to the formation of this plan. The highest priority principles are:

1) to ensure that mine contact water from runoff or seepage is managed to prevent adverse environmental impacts;
2) to ensure that the health and safety of AEM employees is protected, especially with respect to mining operations when excess water is present; and
3) to make sure the site is in compliance with the Nunavut Water Board (NWB) License, Part D, Item 19 and Part E, Item 10.

The plan will identify the areas of concern and discuss the potential risks as well as mitigation measures necessary to address the identified issues. Appendix 1 contains the actual defined 2015 procedures, the roles and responsibilities and associated timelines. AEM's intent is to update the Procedural Appendix on a yearly basis. For example, there may be additional mitigation measures for a defined problem area or in some cases a previously defined issue may be permanently rectified.

The main areas of concern are the mining pits and pit walls, the East and West diversion ditches, Vault Road culverts, the area around the Portage Waste Rock Storage Facility (RSF) including the northern portions of the NPAG waste rock extension, which include the newly constructed (2015) collection ponds known as WEP 1 and WEP 2, Vault Waste Rock Storage Facility, Northwest corner of the North Cell TSF, Saddle Dam 1 corner, Saddle Dam 2 sump, AWAR culverts near the site and along the road to Baker Lake, RSF – ST-16 Seepage, Assay Road (Mill) Seepage and the Vault Pit area including pit sumps.

Each area identified above will be discussed in detail below. All areas of concern are considered priorities based on the guiding principles.

2 AREAS OF CONCERN

2.1 MINING PITS AND PIT WALLS

All permanent ramps, jump ramps, ditches and sumps must be cleaned of all ice and snow before mid May in order to contain any water resulting from the snow melt. All pumps must be checked and serviced before the month of May. In addition, a check must be completed confirming that all piping systems starting from the different pits leading to the Vault attenuation pond or the South Cell TSF are free of ice by validating pumping values (if pumping systems are active) and/or performing an air test in the pipe with a compressor.

2.1.1 Goose pit

Mining in Goose pit was completed in April 2015. All pumping equipment has been removed from the pit. Runoff water that accumulates in the Goose pit will now form part of the Goose pit reflooding process.

2.1.2 Portage pit

Water management in the Portage pit has been simplified since the mining of pits B, C and D has been completed. However, infrastructure is in place to prevent runoff water from reaching Pit A and E.

- A pond and ditch system south of Pit E pushback is presented in Figure 2-1. Runoff water accumulated in ponds GP-3, GP-4, and GP-8 will be pumped into Goose pit;
- A pumping station is located in pit B (not shown) and will be used to manage runoff water affecting the active mining production area in pit A. The water will be pumped to the South Cell Tailings Storage Facility (TSF); and
- A pumping station located in pit E (not shown) will be used to manage runoff water affecting the active mining production area in pit E. The water will be pumped to the South Cell TSF.

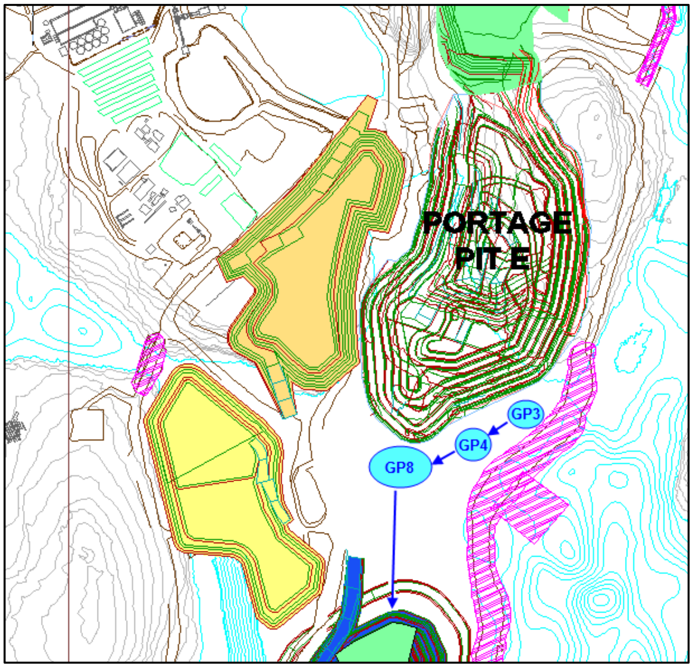


Figure 2-1: View of Portage Pit E area with the associated sumps and trenches

2.1.3 Vault Pit

Since the summer of 2014 (dewatering completed) Vault Lake is now used as an Attenuation pond. The light blue surfaces in Figure 2-2 represent four isolated ponds that form the Attenuation pond (A, B, C & D) used to collect contact water from Vault Pit. Runoff from the pit area and the waste rock storage area that flows into the active mining areas will be pumped to the Attenuation pond.

Discharge from the Vault attenuation pond to Wally Lake may require treatment at the Vault WTP if the water quality does not meet discharge criteria. The Actiflo treatment plant is designed to remove TSS. A diffuser was installed in Wally Lake to meet the Type A Water License requirement. The Environmental department must be notified ten days before discharging any water to Wally Lake to comply with notification and sampling requirements. All piping and the discharge diffuser must be inspected in April in order to have all installations in place to proceed with pumping and/or treatment activities during freshet. The WTP will also be available should removal of TSS be required. To date all discharge has been compliant with the NWB Water License and MMER criteria.

Furthermore, in 2016 as part of the *Water Management Report and Plan*, AEM will build a permanent sump in Vault pond D to avoid overflows. It will act as a low point to redirect all the freshet water in Vault ponds B and C. Its storage capacity will be considered as zero as the pond should be maintained dry throughout the summer season.

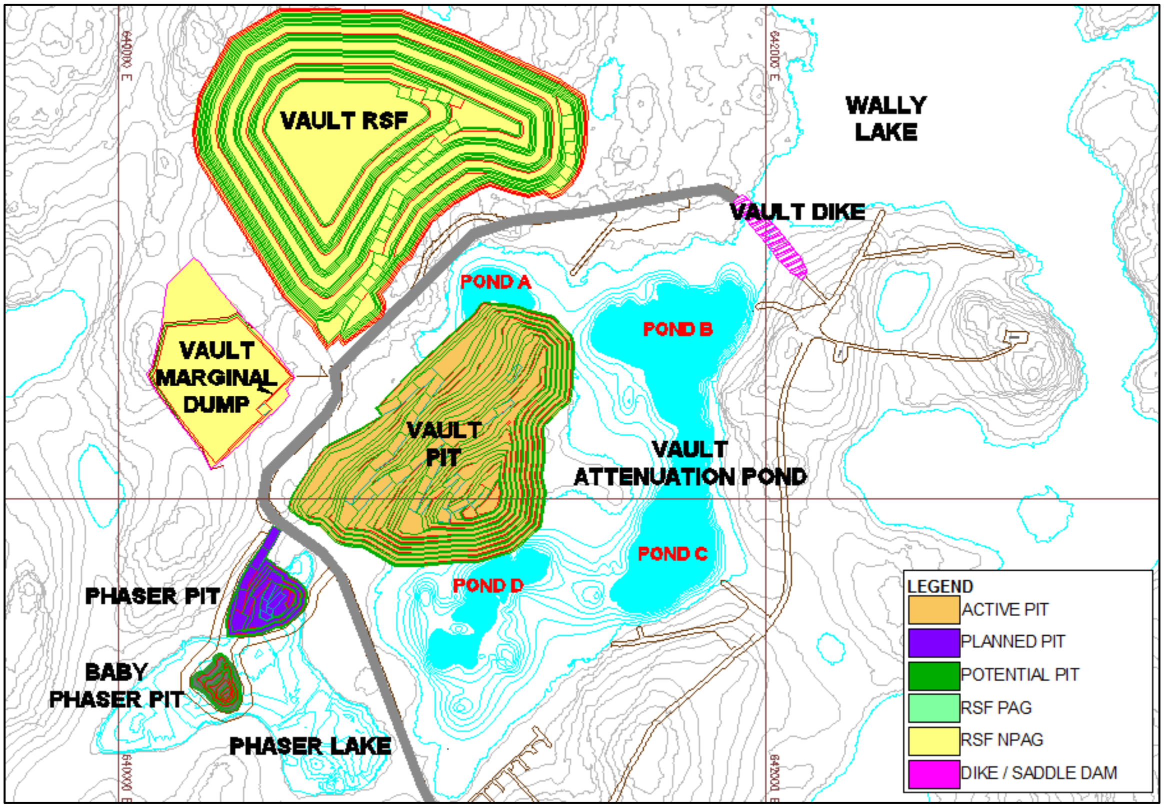


Figure 2-2: View of Vault Attenuation pond and its associated ponds

2.2 WASTE ROCK STORAGE AREAS

2.2.1 PORTAGE RSF

The Portage Rock Storage Facility (RSF) will require weekly inspections around the perimeter beginning in mid-May to identify any seepage. As will be noted in the following section, seepage was identified in 2013 at location ST-16. In the event that additional seepage is observed from the RSF, it must be reported to the Engineering and Environment Departments and samples must be taken to determine the water quality and source. A mitigation plan will be prepared and implemented if necessary.

2.2.2 VAULT RSF

Much like the RSF located near Portage pit, the Vault RSF will require some monitoring during the freshet period to ensure adequate water management. Weekly inspections around the RSF perimeter will be conducted to identify any seepage. In the event that seepage is observed, the Engineering and Environment Departments must be notified and samples taken to determine water quality. The sample monitoring will be in accordance with the Water License requirements.

It is anticipated that there will be no water quality issues as primary drainage is towards the Vault Pit and Vault Attenuation Pond and the waste rock from the Vault Pit is primarily NPAG.

2.3 NORTH CELL TAILINGS STORAGE FACILITY

Water management around the North Cell Tailings Storage Facility (TSF) is required to maintain integrity of the tailings pond and to prevent any adverse environmental impacts. This section describes the infrastructure in place to control runoff water and reduce possible impact on both the tailings storage facility and the receiving environment.

2.3.1 Diversion Ditches

The East and West Diversion ditches were constructed in 2012 around the North Cell TSF and the Portage RSF. The diversion ditches are designed to redirect the fresh water from the northern area watershed away from the tailings pond and RSF and direct it to Second and Third Portage Lakes. As seen in Figure 2-3, seven zones associated with the diversion ditches have been identified where actions will be taken during or before freshet:

2. 1. AWAR culvert – Discharge to Third Portage Lake;
2. 2. West Diversion Ditch elbow;
2. 3. Northwest corner of North Cell TSF;
2. 4. Waste Extension Pool sumps (WEP 1 and WEP 2);
2. 5. East Diversion Ditch Outlet to NP-2 Lake;
2. 6. North portion of NPAG waste rock expansion; and
2. 7. Vault road culvert – NP-2 Lake exit to NP-1 Lake.

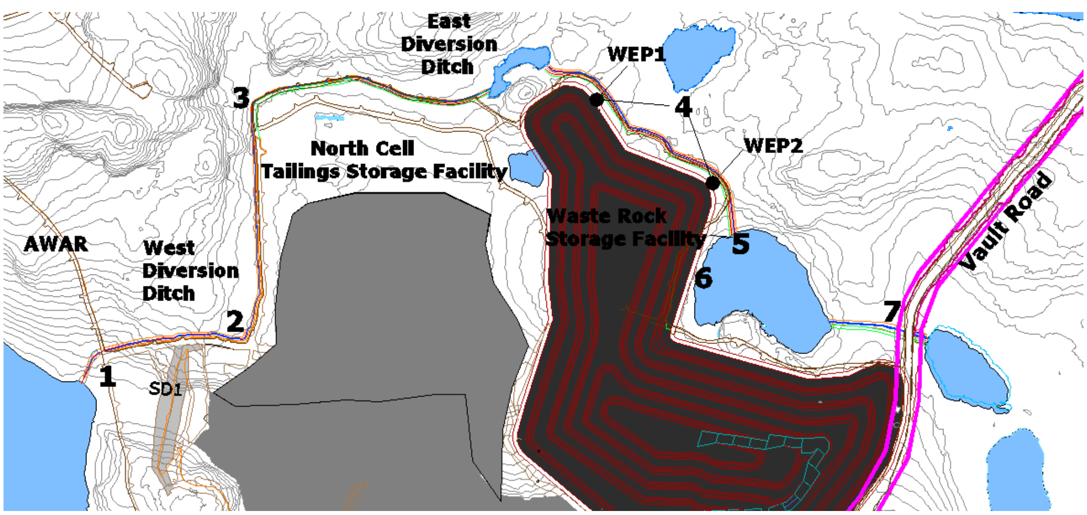


Figure 2-3: Location of the areas of interest for the 2016 Freshet Action Plan

2.3.1.1 AWAR culvert – discharge to Third Portage Lake

Ditch outflows are important to ensure proper flow of freshet drainage. The culvert under the AWAR (Figure 2-3 #1) is a critical section of the West Diversion Ditch. Snow removal must be performed to avoid ponding and damage to the ditch/trench structure as well as to maintain the integrity of the AWAR which, in turn, is critical to transportation at the Meadowbank mine site.

Figure 2-4 illustrates this culvert. Snow and/or ice must be removed using an excavator on each side of the culvert to allow water to flow through to prevent upstream ponding. The culvert may need to be steamed if blocked by ice. Before starting the cleaning operation, it is important to ensure that the electrical cable (5kV) location has been visually identified.

After flowing through the culvert the water discharges across the tundra into Third Portage Lake – see Figure 2-4 below. Snow and ice needs to be removed in early May to prevent any back up in the West Diversion ditch. This could increase water levels upstream in the ditch causing problems discussed in Section 2.3.1.2.

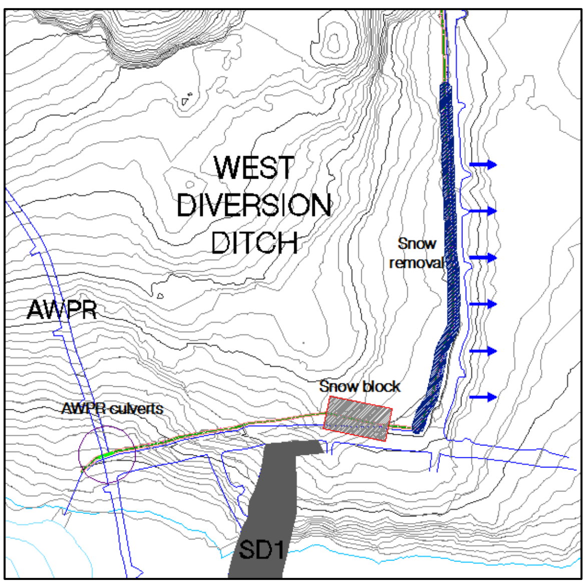


Figure 2-4: West diversion ditches area of interest

A turbidity barrier has been installed in Third Portage Lake as a precautionary measure. This barrier will remain in place over winter and will be replaced if damaged in the future. Additional barriers can be installed after ice melt as a contingency. Daily inspections will be conducted starting in mid-May. Sample monitoring will commence when open water is present in accordance with the Water License (ST-6). Sampling frequency of ST-6 may be increased if TSS results are near 30 mg/L (grab) and 15 mg/L (monthly average), which is the license limit, or visually elevated. If a discharge of TSS occurs, the Environment Department will notify DFO.

2.3.1.2 West Diversion Ditch Elbow

One of the deepest sections of the West Diversion ditch is located in the corner next to the Saddle Dam 1 – see Figure 2-4 and Figure 2-3 #2 above. In early May of each year, AEM will remove the snow accumulation to allow the water to flow freely preventing the water upstream from increasing in level and hydraulic head pressure. In addition, large flows can scour the ditch system causing sediment migration through the ditches which could impact Third Portage Lake. To prevent this, snow must be removed from the corner area with a long reach excavator in early May.

As a further precaution, AEM constructed an interception sump located at the west diversion ditch elbow location in 2014. The sump has a capacity of 3000 m³. The sump is designed to intercept water coming from the most critical parts of the West Ditch. Sample monitoring will determine if there is any seepage from the TSF or elevated TSS from the ditch. If water does not meet discharge criteria it will be pumped back to the North Cell TSF. These measures will prevent any contaminated water from reaching Third Portage Lake. This sump will also act as a settling pond to prevent water with elevated TSS from reaching Third Portage Lake. Daily inspections will be conducted during the freshet. Sample monitoring will also be conducted if necessary. Figure 2-5 shows the North Cell interception/settling sump after the completion of the construction. In 2016, elevated TSS should not be an issue as a result of rock armour work conducted in 2015 on the banks of the West diversion ditch preventing sediment migration.

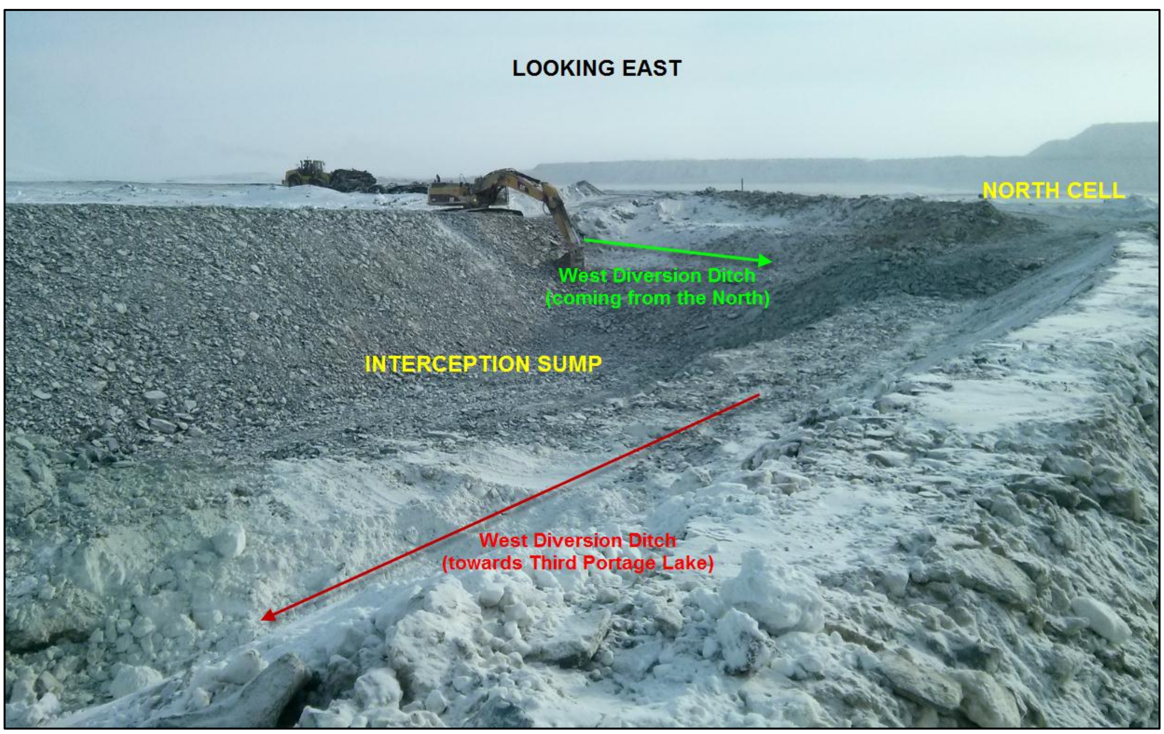


Figure 2-5: North Cell West Diversion ditch interception sump

2.3.1.3 Northwest Corner of North Cell TSF

The construction access road at the Northwest corner of the North Cell TSF (see Figure 2-6 and Figure 2-3 #3) was vulnerable to damage from the freshet water flow from the northern watershed (see watercourse flow in Figure 2-6 denoted by blue line and area of concern – small red circle). The start of the West Diversion ditch is also located in this area and is designed to collect most of the freshet flow – note arrows in Figure 2-6. Water was observed ponding during the 2013 and 2014 freshet. No water is ponding anymore in this area.

Tailings deposition was completed in the North Cell in October 2015. Water was removed in the North Cell TSF and capping was completed in the northern section (Figure 2-6). As a result, this is no longer an area of concern during freshet and this section will be removed in the next update of this plan. In 2016, AEM will continue to conduct visual inspections of this area.

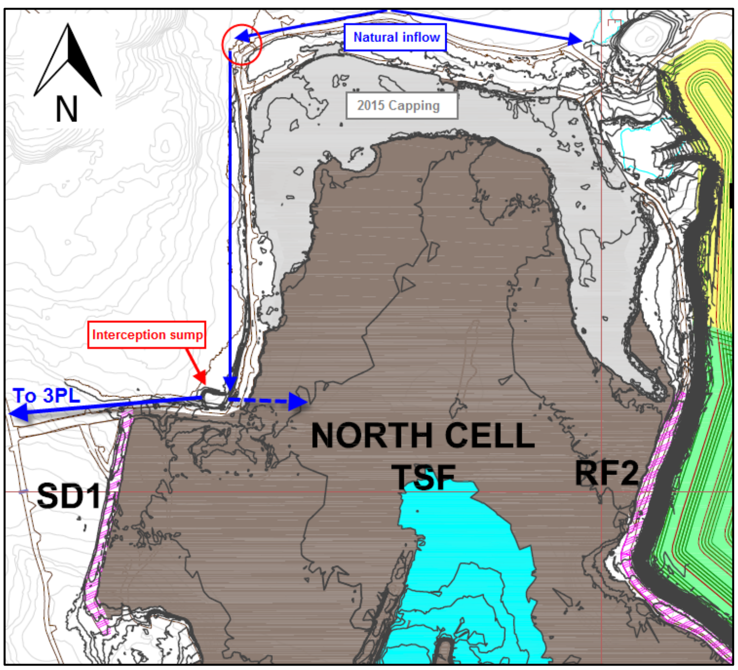


Figure 2-6. View of the northwest corner of the ditches

2.3.1.4 Waste Extension Pool (WEP) sumps

In 2014, as per inspections conducted within the framework of the Freshet Action Plan, run off was noted at the northeast side of the NPAG waste rock extension pile in a natural depression forming a collection system (WEP). WEP1 and WEP2 sumps were constructed in September 2015 to better manage water around the northeast side of the RSF and to ensure that all water ponding behind the RSF is transferred back to the North Cell TSF – see Figure 2-7 below. The WEP1 and WEP 2 sumps will replace the WEP collection system formed by the natural depression. Water collected at WEP1 will be pumped to WEP2 which will in turn be pumped to

ST-16. Water collected at the latter will be pumped back into the North Cell TSF. Daily inspections will be undertaken to ensure water remains contained within WEP1 and does not enter the East Diversion Ditch.

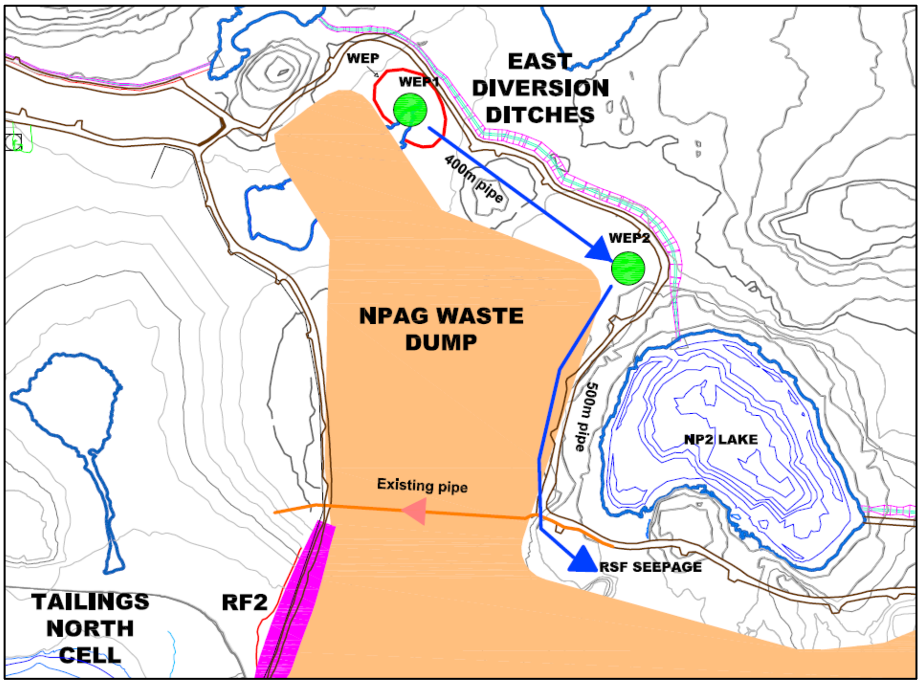


Figure 2-7. WEP1 and WEP2 sumps locations

2.3.1.5 East Diversion ditch outlet to NP-2 Lake

This area of the East Diversion ditch, seen in Figure 2-8 and Figure 2-3 #5, is critical as it acts as the outflow of the North part of the East Diversion ditch into NP-2 Lake. This outlet must be cleared of obstructions – snow and ice in early May to promote drainage through the ditch and into NP-2 Lake. The presence of ice blocks will be mitigated using the steam machine to melt away the obstruction. Daily inspections will commence in early May and sample monitoring will be conducted monthly during open water in accordance with the Water License (location ST-5). Sampling frequency of ST-5 may be increased if TSS results are near 30 mg/L (grab) and 15 mg/L (monthly average), or visually elevated. Turbidity barriers have been installed at the ditch outlet into NP-2 in 2013 to mitigate elevated TSS. If a discharge of TSS occurs, the Environmental Department will notify DFO.

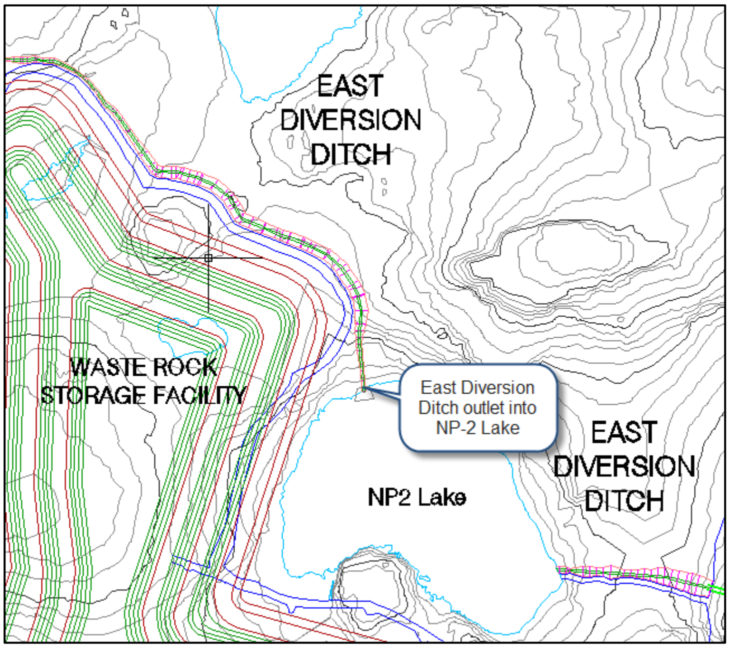


Figure 2-8: View of the East Diversion ditch outlet into NP-2 Lake

2.3.1.6 North Portion of NPAG Waste Rock Expansion

The northwestern area of the RSF, which consists entirely of NPAG material, extends towards the East Diversion ditch as shown in Figure 2-3 #6. Runoff from this area, while not anticipated to be contaminated could, if significant, discharge to NP-2 lake after crossing the tundra. No issue occurred in this area in 2015 and it is no longer considered as a primary area of concern during freshet. However, the Environmental Department will continue to conduct daily visual inspections in 2016. Sample monitoring will be undertaken when water is observed in order to determine water quality. Contaminated water must be kept from reaching NP-2 Lake.

2.3.1.7 NP-2 Outlet and Vault Road Culvert

This area of the East Diversion ditch is critical as it acts as the outflow of NP-2 Lake through the Vault Road culvert (see Figure 2-3 #7). The culvert seen in Figure 2-9 connects the East Diversion ditch from Lake NP-2 to NP-1. Snow and ice must be removed from the culvert area, including upstream at the exit of NP-2 Lake in early May to ensure that the outlet of NP-2 flows freely to NP-1 and ultimately to Dogleg Lake. Back up could cause upstream water raises in Lake NP-2 which could cause overflow into the RSF at ST-16. First, snow from the ditch between NP1 and the road (1) willbe removed in early May. Next, the culvert (3) will be steamed, if necessary, to remove any ice/snow. If needed snow/ice around the outlet of NP2 Lake (4) would be removed to allow free flow of melt water. Daily inspections will commence in early May and TSS sample monitoring will be conducted monthly. Sampling frequency may be increased if TSS results are near 30 mg/L (grab) and 15 mg/L (monthly average), or visually elevated. A turbidity barrier (orange barrier #1) was installed in 2014 at the ditch outlet into NP-1 to mitigate the risk of elevated TSS (Figure 2-10). If a discharge of TSS occurs, the Environmental Department will notify DFO.

As a result of an incident of elevated TSS observed in water running under the Vault Road Culvert in June, 2015 (reported to authorities and KIA). AEM installed, in addition to a permanent turbidity and silt barrier, additional turbidity barriers (4) in and at the exit of NP-1 (non fish bearing) (Figure 2-11). The incident was of short duration and the turbidity barriers prevented migration of TSS to Dogleg Lake which is fish bearing. AEM also proceeded to raise the Vault road near NP-1 culverts (Figure 2-12). A different source of aggregate – NPAG from Vault was used (harder material) for the road raise which will prevent an accumulation of fine material and allow for water to runoff instead of accumulating or percolating through the road. Also, a snow management plan has been implemented that will ensure there are no large accumulations of stored snow, which could contribute to runoff problems. The additional turbidity barriers (4) were removed from NP-1 in the fall of 2015. These barriers are stored in the NP-1 area for rapid deployment in case they are needed in the future.

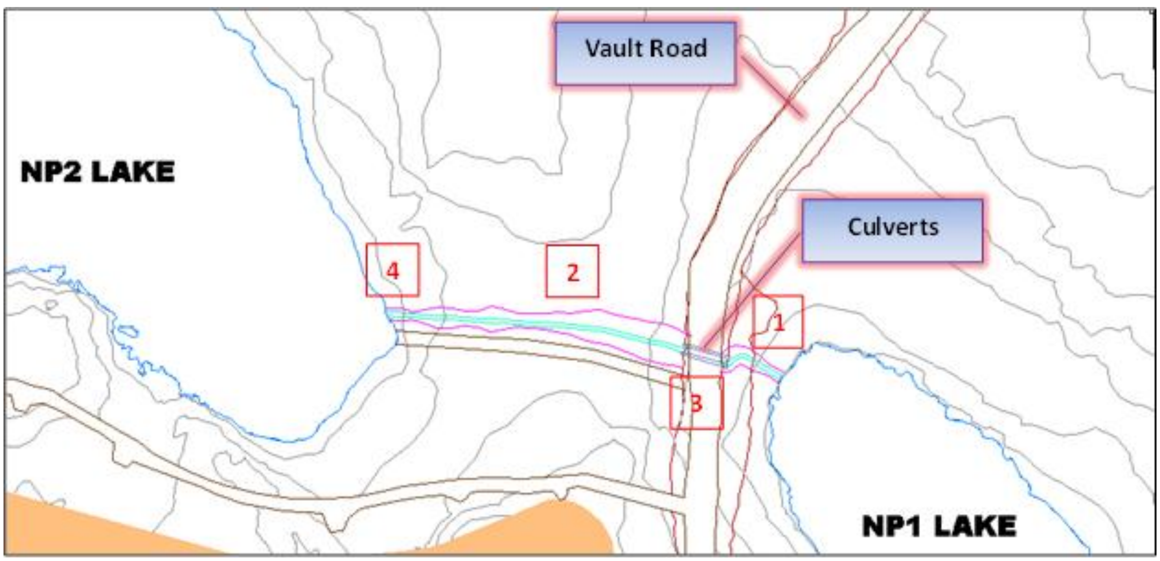


Figure 2-9: View of the diversion ditches at the Vault road area

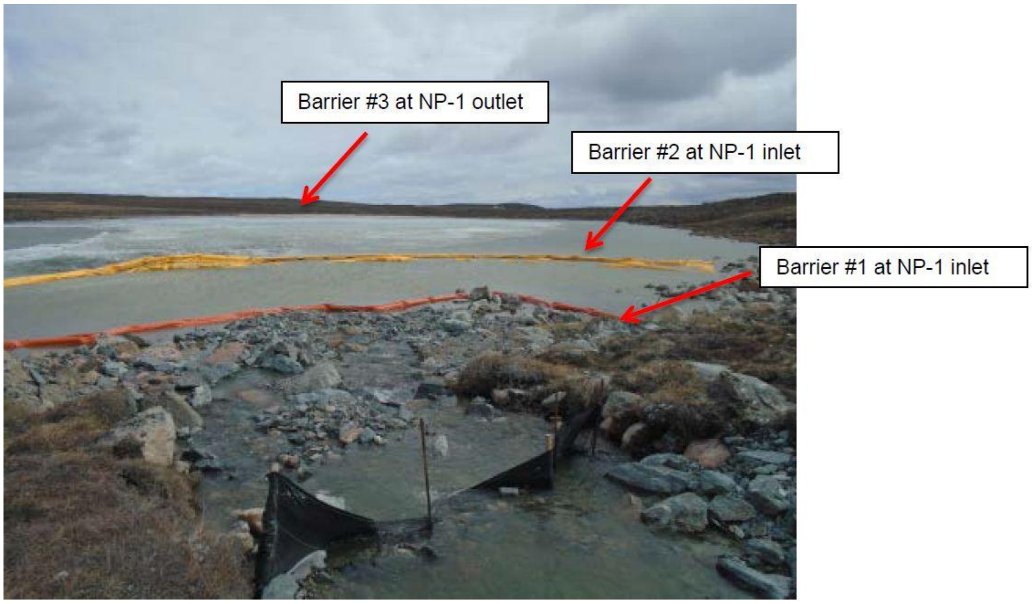


Figure 2-10: Turbidity barriers at inlet of NP1 installed in June 2015

Figure 2-11: Turbidity barriers at the inlet of Dogleg Lake

Figure 2-12: Vault Road repair

2.3.2 Saddle Dams

2.3.2.1 Saddle Dam 1

This dam, peripheral to the North Cell TSF, is critical to the normal operation of the North Cell TSF. Daily inspections starting mid-May will be required for Saddle Dam 1 (SD1) to ensure that water does not pool against the toe of the dike. A pumping station located along the toe of the dike was installed previously to mitigate the pooling of water at the toe. This pumping station must be operational once water is observed at the toe to pump the water to the TSF. The pumping system will be checked in early May to ensure proper operation. Monthly sampling will be conducted at this station (ST-S-2) during open water conditions in accordance with the Water License.

2.3.2.2 Saddle Dam 2

This dam, just South of SD1, is also critical to the normal operation of the North Cell TSF. Historically, this structure has not had any issues with water pooling at the toe, therefore monthly inspections starting mid-May will be required for Saddle Dam 2 (SD2) to ensure that water does not pool against the toe of the dike. If water is observed at the toe, a mitigation plan will be determined and implemented by the Geotechnical department.

2.4 VAULT ROAD CULVERT

The Vault road crosses over a connection between two water bodies, Turn Lake and Drill Tail Lake, at approximately km 2. A system of culverts was installed to allow flow to occur between the two waterbodies. Beginning in mid-May it will be important to complete daily inspections. In the case that excessive TSS is observed, samples will be taken and analyzed. In the case, where the TSS levels go beyond 30 mg/L, a report will be made to the DFO. Turbidity barriers will be installed as a mitigation measure if needed.

2.5 STORMWATER MANAGEMENT POND

The Stormwater Management Pond is a small shallow and fishless water body that can be seen in Figure 2-13 adjacent to Portage Pit. Treated sewage is discharged into this pond before being transferred to the active TSF. The quantity of water transferred each year is recorded. Weekly inspections in the spring and fall are undertaken to determine the commencement of pumping.

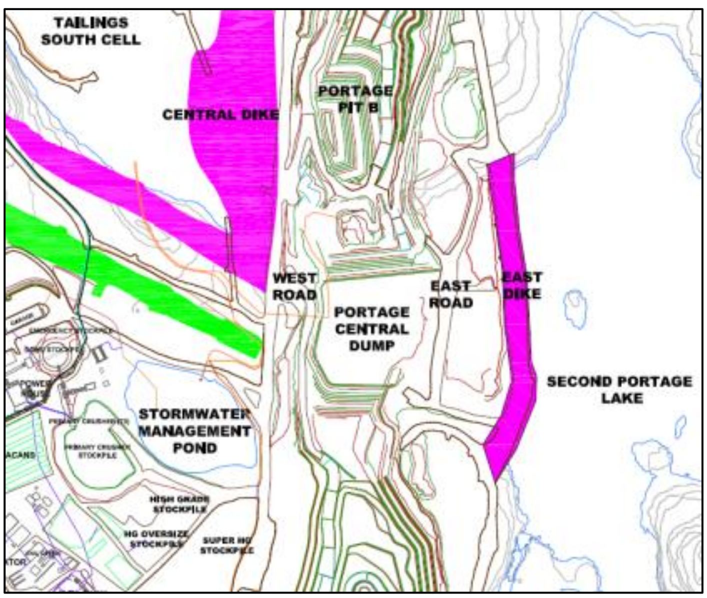


Figure 2-13: Portage Pit area with the Stormwater Management Pond

2.6 FUEL TANK FARMS

2.6.1 Meadowbank Tank Farm

Snow and ice accumulation within the fuel tank farm must be adequately managed to prevent overflow to the environment and/or damage to the fuel handling systems. The Site Services Department will advise the Environmental Department of their intent to pump the containment area once ice/snow begins to melt. Water samples will be taken in accordance with the Water License to ensure compliance prior to its release. A notice must be provided to the Inspector 10 days prior to this pumping activity. Once sample results have been obtained, the Environmental Department will advise the Site Services Department if pumping can begin. If sample results permit, the pumping may begin; to direct water to the tundra/ground in a way to prevent erosion. In the event that the water sample results do not meet discharge criteria the water can be pumped to the Stormwater Management Pond.

2.6.2 Baker Lake Tank Farms

Snow and ice accumulation within the fuel tank farms at Baker Lake must be adequately managed to prevent overflow to the environment and/or damage to the fuel handling systems. The Site Services Department will advise the Environmental Department of their intent to pump the containment area once ice/snow begins to melt. Water samples will be taken in accordance with the Water License to ensure compliance prior to its release. A notice must be provided to the Inspector 10 days prior to this pumping activity. Once sample results have been obtained, the Environmental Department will advise the Site Services Department if pumping can begin. If sample results permit, water can be directed to the tundra but the flow rate shall be such to avoid erosion or damage to the tundra. **In the event that the water sample results do not meet discharge criteria the water cannot be pumped to the tundra. If this occurs the water will be pumped to a tanker and transported to the Meadowbank site to be disposed of in the TSF or placed in containers for shipment south as hazmat.**

2.6.3 Vault Tank Farm

All fuel tanks at the Vault facility are approved double walled tanks. In accordance with CCME Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petrleum Products (2013), secondary containment is not required. As a result, there is no pumping required at freshet.

2.7 AWAR CULVERTS ON THE BAKER LAKE PORTION

Weekly inspections will be undertaken at all culverts along the AWAR to ensure that water during freshet is flowing freely and no erosion is occurring. If elevated TSS levels are observed sampling will occur and the results assessed. In addition snow and ice removal may be required to allow the water to flow as per design specifications.

3 INCIDENT RESPONSE

3.1 ST-16 SEEPAGE

In July 2013, it was noted that seepage from the Rock Storage Facility (RSF) had migrated through a rockfill road at a seepage sump located on the north-east side of the RSF (see ST-16 on Figure 3-1). The seepage, which contained elevated copper, nickel, ammonia and cyanide entered NP-2 Lake. It was determined through investigation that the likely source of the contaminants was reclaim water from the North Cell TSF. This water migrated underneath the RSF through a former watercourse into the seepage sump area (ST-16). AEM took immediate measures to stop the seepage and implement corrective measures to prevent a recurrence. This included, keeping the sump area pumped to a low level, installation of an impermeable barrier (till plug) in the rockfill road, implementation of a comprehensive monitoring program and ensuring tailings deposition was enhanced in the North Cell to create beaches that would stop any water egress (this activity was continuous as part of AEM's Tailings Deposition Plan in 2014). A permanent pumping system was installed in 2014 in order to direct seepage back to the North Cell TSF. A filter was also installed at RF-1 and RF-2 to assist the beaches in preventing tailings water migration. In addition, as mentioned previously (Section 2.3.1.7), snow will be removed from the ditches and culvert at the outlet of NP- 2 to NP-1 Lake to ensure freshet flows do not back up and overflow into the ST-16 seep location and that the north watershed non-contact runoff flows freely through to NP-1 Lake and further downstream (Dogleg Lake). Pumped volumes will be documented and daily inspections of the area will be undertaken. Please note that 2015 pumped volumes are reported in the AEM 2015 Annual Report within the Water Management Report and Plan (Section 3.1.9) and in Table 1 below. The lower volume of water pumped to the North Cell in 2015 compared to 2014, despite increased freshet volumes in 2015, further indicates that mitigation efforts (completion of tailings beaches and filter material against RF-1 and RF-2) were successful in minimizing any North Cell reclaim water from migrating to the ST-16 sump area.

Table 1: Water pumped from ST-16 Seepage back to TSF

	Volume (m^3)		
	2013	**2014**	**2015**
January	0	0	0
February	0	0	0
March	0	0	0
April	0	0	0

May	0	14,591	1,625
June	0	9,294	10,832
July	2,091	3,810	3,414
August	2,900	3,386	1,755
September	1,364	1,088	2,403
October	227	0	0
November	0	0	0
December	0	0	0
Total	**6,582**	**32,169**	**20,029**

During the renewal process for the Meadowbank Type A Water License (2014 – 2015) the KIA requested additional monitoring related to this incident. Details and the sampling schedule of the revised Monitoring program, which includes a full suite of total and dissolved metals plus Ammonia, Cyanide Total, WAD and Free analysis, are included in the attached Schedule 1. The KIA requested that AEM continue monitoring until there is a 5 year period of non-detect cyanide results. To date (previous 2 years) the monitoring has indicated no CN levels in NP-2, NP-1 and further downstream lakes, Dogleg and Second Portage. Thus the current program will continue in 2016, 2017 and 2018. In 2016, AEM will assess the data after the sampling season as required.

A discussion and analysis of the 2015 monitoring results can be found in the AEM 2015 Annual Report (Section 8.1.3.11). The water quality in NP-2 Lake has improved significantly to the point that water quality for all parameters, including the main parameters of concern (Cn Total, Free and WAD as well as copper, nickel and ammonia) in NP-2 Lake is near or below CCME criteria for the Protection of Aquatic Life. No parameters of concern (ie Cyanide, copper and nickel) have been noted (above CCME criteria) in the aforementioned downstream lakes. It also should be noted that during the final approval process of several environmental management plans related to AEM's renewed water license (July, 2015), including the Freshet Action Plan, the KIA stated that AEM "proposes monthly sampling at the locations affected by freshet, which is insufficient for freshet as it may only last a month. Therefore sampling should be conducted weekly until a large proportion of snow and ground ice has melted". In response, AEM agrees that the "initial" snowmelt of the freshet may only last a month however, the freshet, in fact, continues into early September as the water entrained in the active layer continues to melt and discharge through ditches and water conveyance infrastructure around the site. This is based on actual observations noted during the regular inspections undertaken as part of this Plan. Weekly sampling during the active melt period of snow/ice will not likely add any value to the current monitoring schedule as intial results during this period tend to be diluted. A sample monitoring program's value is based on data collected over time. To date, as mentioned previously, the results from 2013 – 2015 indicate a significant decrease in parameters of concern including at the ST-16 sump location. In fact, no cyanide in any form has been detected in NP-2 or downstream lakes for the past 2 years. A valid case can be made that the action plan implemented by AEM has been very successful in preventing any further seepage into NP-2 Lake and into the ST-16 sump itself. The MDRB has commented on the success of this action plan. The till plug, pumping system, installation of filters and effective tailings beaches at RF-1 and RF-2, progressive tailings capping at RF- 1 and RF- 2 and the dewatering of the North Cell in 2015 have effectively mitigated this problem. In addition, thermistors installed in the RSF indicate freezing in the former seep path is occurring (which would mean that no water is migrating). However, in consideration of the KIA's concern regarding extra monitoring during freshet, AEM will conduct extra weekly monitoring in July for parameters of concern, namely Cyanide – Total, Free and WAD, copper and nickel at sample stations in the immediate area of ST-16, namely NP-2 South and NP–2 West. These were the elevated parameters noted initially and are indicative or TSF reclaim water. If these sample events detect any concerns or elevated levels AEM will increase the monitoring immediately and include all sampling stations (including downstream lakes).

As soon as the Lake and seep area are ice free the sample monitoring program will commence. AEM also conducts winter sampling in NP-2 Lake as part of the monitoring program.

In the event that seepage water flows through the rockfill road reaching NP-2 Lake, the Environmental Department will notify authorities.

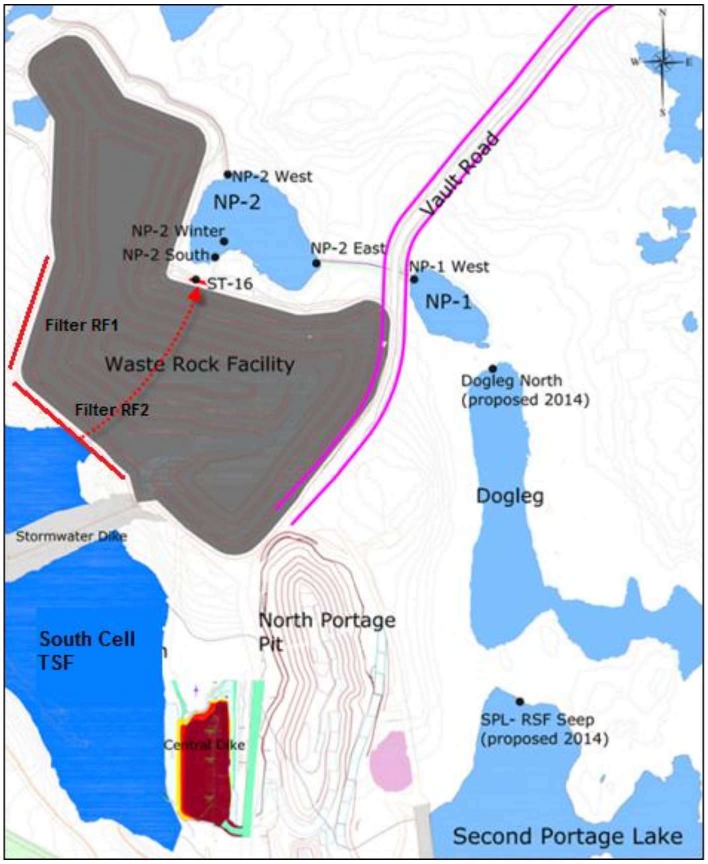


Figure 3-1. View of the RSF seepage observed at the ST-16 station.

Footnote: The red arrow represents the seepage flow. Red Lines represent installed filters and areas where tailings beaches were built up to minimize flow through.

3.2 MILL SEEPAGE

In November 2013, AEM observed seepage discharging at a location West of the site access road in front of the Assay Lab (see Figure 3-2). Initial sample results revealed elevated cyanide and copper which is indicative of mill processes. After an investigation, which included sampling, the source was determined to be seepage from several containment areas within the mill; the worst being the CIP tank overflow collection sump. Repairs to seal all the mill sumps and containment areas was completed in 2014 thus stopping the source of the seep. AEM engaged Tetra Tech in December 2013 to propose a drilling delineation program and further steps necessary to control the seepage and prevent offsite migration to Third Portage Lake – see Figure 3-2 for the seep location. AEM completed the drilling program and based on the results constructed an interception/collection trench prior to the 2014 freshet (completed early May 2014).

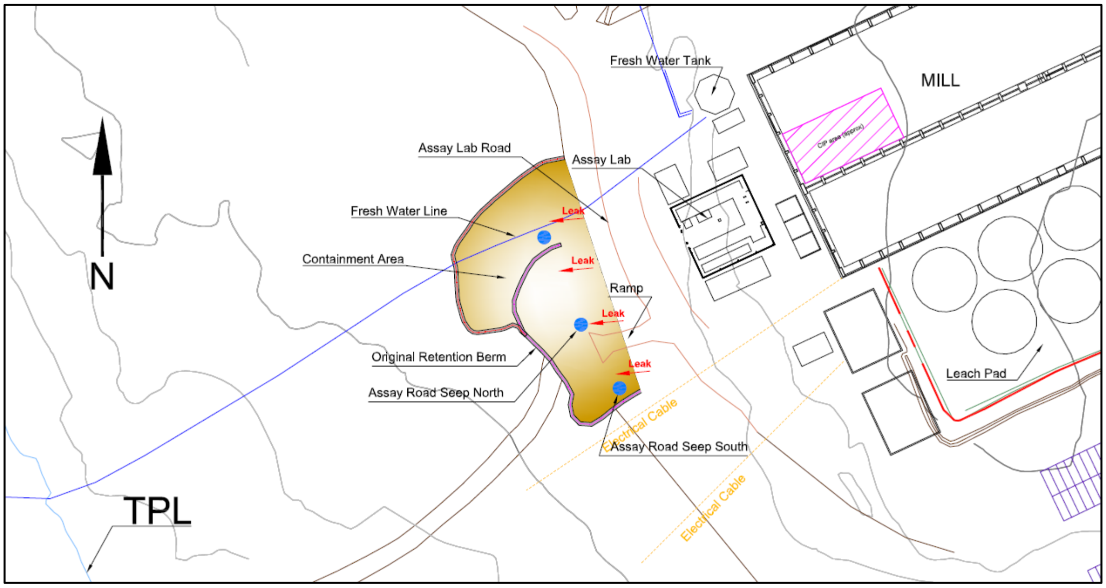


Figure 3-2. View of the mill seepage area and initial retention berm construction

The design of the trench can be seen in Figure 3-3. A pumping system was installed and all water collected is pumped back to the mill. Pumping begins as soon as water is evident and volumes are recorded monthly – See Table 2 below.

Table 2: Water pumped from Mill Seepage back to the mill

	Volume (m^3)		
	2013	2014	2015
January	0	0	871
February	0	0	306
March	0	0	500
April	0	0	680
May	0	2,450	347
June	0	1,935	10,803
July	0	1,158	6,633
August	0	3,979	4,467

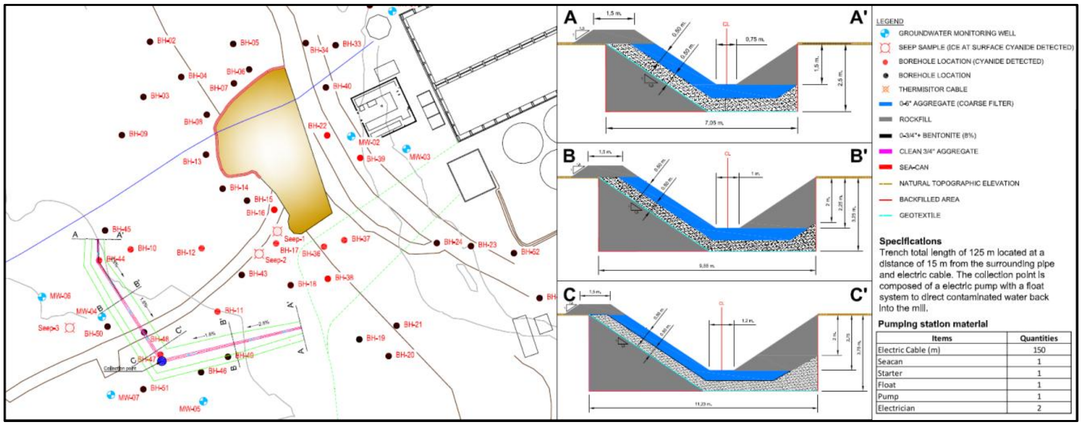
September	0	2,420	4,584
October	0	1,043	1,188
November	Ice	842	164
December	0	871	0
Total	**0**	**14,698**	**30,543**

In addition, a recovery/monitoring well, MW-203, located beside the Assay Lab upstream of the trench is continuously pumped back to the mill to intercept the seepage. 2015 pumped volumes are reported in the AEM 2015 Annual Report within the Water Management Report and Plan, and included in Table 2 above. The increased volume in 2015 was due to increased snow and freshet flows above those seen in 2014. This is confirmed by decreasing contaminant levels. More details are provided in section 7 of the 2015 Annual Report.

CN WAD (on site uncertified lab) levels in MW-203 have diminished significantly over the winter of 2015 as have the flow rates. This well will remain in operation. MW-203 can be considered as an interception well. In 2016 AEM will no longer use the onsite laboratory (uncertified) but will monitor this well for CN Total and copper (sent to accredited lab) on a monthly basis.

As soon as the trench, monitoring wells and Third Portage Lake are unfrozen a comprehensive monitoring program will be implemented. This program is attached in Schedule 2. In accordance with a KIA request during a review of the Plan during the Water License renewal process AEM will sample the Mill Trench on a weekly basis for CN Total, Free and Copper during the month of July in 2016. The monitoring program will be re evaluated (as is the case every year) at the end of 2016 to determine if any changes are warranted in 2017. A complete discussion of the monitoring results for 2015 is included in AEM's 2015 Annual Report (Section 7). In summary, the results of monitoring indicate that the interception trench and initial containment berm were substantially successful in preventing any contaminants from reaching Third Portage Lake. The levels of contaminants decreased significantly during the monitoring period in the interception trench. The seepage appears to have been effectively contained and the source area has been repaired.

Daily inspections will be conducted of the pumping, collection systems and perimeter area and the pumped volumes will be recorded in 2016.



Items	Quantities
Electric Cable (m)	150
Seacan	1
Starter	1
Float	1
Pump	1
Electrician	2

Figure 3-3. View of the mill seepage area and interception trench design

4 SNOW MANAGEMENT

The snow management procedure developed internally in 2015 is illustrated in Appendix 3. Temporary snow storage dumps and snow accumulation areas of concern are identified on the map.

APPENDIX 1

2016 Freshet Action Plan Procedure

Section	Area of Concern	Role/Action	Responsbilities	Dates
2.1	**Mining Pits and Pit Walls**			
2.1	Mining Pit and Pit walls - General	1) Clean all ice, mud and snow on all permanent ramps, jump ramps, etc.	Mine Operations	Before May
		2) Check and service all pumps.	Dike/Dewatering and Maintenance	Before May
		3) Check that all piping systems starting from the different pits leading to the South Cell TSF are free of ice by validating pumping values (if pumping systems is active) and/or performing an air test in the pipe with a compressor.	Dike/Dewatering	Before May
2.1.1	**Goose Pit**			
2.1.1	Goose Pit	1) No further action in this area during the freshet period as mining is complete in Goose Pit. Water and/or ice will remain as part of the pit reflooding activity.	Engineering	N/A
2.1.2	**Portage Pit**			

2.1.2 Portage Pit	1) Runoff water accumulated in ponds GP-3, GP-4 and GP-8 will be pumped into Goose pit; 2) Runoff water accumulated in pit B will be pumped to the South Cell Tailings Storage Facility (TSF); 3) Runoff water accumulated in pit E will be pumped to the South Cell Tailings Storage Facility (TSF).	Geotech tech and Engineering	Before June
2.1.3 Vault Pit			
2.1.3 Vault Pit	1) The dewatering of Vault Lake was completed in 2014. During the freshet period water management consists of making sure all sumps are pumped to the Vault Attenuation Pond (former Pond D).	Mine Operations	May to Sept
	2) Set-up pumping from pond A & D to Vault Attenuation Pond (former Pond B & C) to prevent water from flowing into the Vault pit area.	Mine Operations	
	3) Notify Environmental Department before discharging any water to Wally Lake. **NOTE: Any discharge of contact water must be through the Diffuser.**	Water engineers and Engineering	Freshet/Summer 2015
	4) Inspect all piping and discharge diffuser	Dike/Dewatering	May
2.2 WASTE ROCK STORAGE FACILITY			
2.2.1 Portage RSF Inspection	1) Weekly inspection around the RSF perimeter to	Env. Department	May - as soon as freshet starts

	identify any seepage.		until freeze up
	2) If seepage observed notify Eng Department AND sample for Cn and Water License Parameters.	Env. Department	May - as soon as freshet starts until freeze up
2.2.2 Vault RSF Inspection	1) Weekly inspection around the RSF perimeter to identify any seepage.	Env. Department	May - as soon as freshet starts until freeze up
	2) If seepage observed notify Eng Department AND sample for Water License Parameters – ST-24.	Env. Department	May - as soon as freshet starts until freeze up
2.3 NORTH CELL TAILINGS STORAGE FACILITY			
2.3.1 North Cell Tailings Storage Facility (Diversion Ditch areas)			
2.3.1.1 AWAR Culvert - West Diversion ditch exit to TPL	1) Snow and/or ice must be removed with an excavator on each side of the culvert to allow water flow.	Engineering to coordinate with Site Service, Mine and Dikes/Dewatering	Before May 20
	2) If needed, steam to free any ice blockage.	Engineering to coordinate with Site Service, Mine and Dikes/Dewatering	Before May 20
	3) Before starting snow clearing operation, make sure the electrical cable location has been visually	Engineering to coordinate with Site Service, Mine and	Before May 20

	identified in the field.	Dikes/Dewatering	
	4) Daily inspection - keep record.	Env. Department	May - until Freshet complete and after rain events
	5) ST-6 sampling as per Water License and weekly inspection.	Env. Department	Monthly as soon as freshet starts (open water) and continue until freeze up.
	6) Increase frequency of ST-6 sampling if TSS near 30 mg/L (grab) and 15 mg/L (monthly average), or visually elevated,. Any extra samples to Multilab.	Env. Department	Depends on TSS result
	7) Have turbidity and silt barriers in place at TPL (2) and maintain.	Env. Department	May - before freshet starts and until water freezes up
	8) Report any discharge of TSS to DFO/NWB (grab > 30 mg/L).	Env. Department	May - as soon as freshet starts and until water freezes up

2.3.1.2 West Diversion Ditch elbow near SD1	1) Snow and/or ice must be removed with an excavator to allow water flow and prevent ponding upstream.	Engineering to coordinate with Site Service, Mine and Dikes/Dewatering	Early May
	2) Daily inspection - keep record.	Env. Department	May - until Freshet complete and after rain events
	3) Sample for TSS monthly (Multi Lab) and as needed for Turbidity - Samples to Multi Lab. Increase frequency of sampling if TSS near 30 mg/L (grab) and 15 mg/L (monthly average).	Env. Department	May - until Freshet complete and after rain events
	4) If water exceeds Water License criteria (TSS - 30 mg/L (grab) and 15 mg/L (monthly average), contact Engineering to pump water to TSF and temporarily stop (dam) flow through ditch to prevent impact to TPL.	Env Dept/ Eng Dept if limits exceeded, Dikes/Dewatering if pumping needed	May - as soon as freshet start and until water freeze up
2.3.1.3 Northwest corner of North Cell TSF (West Diversion ditch)	1) Daily inspection - keep record.	Env. Department	May - until Freshet complete and after rain events
2.3.1.4 Waste Extension Pool sumps	1) Snow removal to allow free water flow.	Engineering to coordinate with Site Service, Mine and Dikes/Dewatering	Early May

		2) Daily inspection - keep record.	Env. Department	May - until Freshet complete and after rain events
		5) Sample monthly during open water as per Water License Schedule 1 (Group 1).	Env. Department	May - until Freshet complete and after rain events
2.3.1.5	East Diversion ditch outlet to NP-2 Lake	1) Snow and/or ice must be removed with an excavator on each side of the culvert to allow water flow.	Engineering to coordinate with Site Service, Mine and Dikes/Dewatering	Early May
		2) If needed, steam to free any ice blockage.	Engineering to coordinate with Site Service, Mine and Dikes/Dewatering	Before May 20
		3) Daily inspection - keep record.	Env. Department	May - until Freshet complete and after rain events
		4) ST-5 sampling as per Water License and monthly inspection (keep record).	Env. Department	Monthly as soon as freshet starts and until water freezes up

		5) Increase frequency of ST-5 sampling if TSS near 30 mg/L (grab) and 15 mg/L (monthly average). Extra samples to Multi Lab if necessary.	Env. Department	Depends on TSS result
		6) Install turbidity barriers in NP-2, if needed, and maintain.	Env. Department	May - before freshet starts and until freeze up or water clears
		7) Report any discharge of TSS to DFO/NWB (if grab > 30 mg/L).	Env. Department	May - as soon as freshet starts and until water freezes up
2.3.1.6	East Diversion Ditch - NP2 Oulet and Vault Road culvert.	1) Snow and/or ice must be removed with an excavator on each side of the culvert and upstream at the exit of NP-2 Lake to allow water flow.	Engineering to coordinate with Site Service, Mine and Dikes/Dewatering	Early May
		2) If needed, steam culvert to free any ice/snow blockage.	Engineering to coordinate with Site Service, Mine and Dikes/Dewatering	Before May 20
		3) Daily inspection - keep record.	Env. Department	May - until Freshet complete and after rain events

		4) Install turbidity barriers in NP-1, if needed, and maintain - see # 5 below.	Env. Department	May - before freshet starts and until freeze - up
		6) Sample for TSS monthly (Multi Lab) and as needed for Turbidity. Increase frequency of sampling if TSS near 30 mg/L (grab) and 15 mg/L (monthly average). Multi Lab for any increased sampling frequency.	Env. Department	May - until Freshet complete and after rain events
2.3.1.7	North portion of NPAG Waste Rock Expansion	1) Daily inspection - keep record	Env. Department	May until runoff complete
		2) Sample for ST-S-XX and ST-16 metals when water observed; sample upstream (background) in diversion ditch for same parameters and compare results (rush analysis). If results indicate potential for impact, ie results are > background, meet with engineering and determine necessity of ditching	Env. Dept + Eng Dept assistance if ditches needed	May until runoff complete
		3) Prevent **contaminated** contact water from reaching NP-2.	Env. Department	May until runoff complete
2.3.2	**Saddle Dams**			
2.3.2.1	Saddle Dam 1	1) Inspect pumping system	Dikes/Dewatering	Early May
		2) Daily inspection - keep record	Eng Dept and Dikes/Dewatering	May and until water freezes

		3) Start pumping to TSF when water observed. Keep volume pumped out.	Eng Dept and Dikes/Dewatering	After May and until water freezes
		4) ST-S-2 sampling as per Water License.	Env. Department	Monthly as soon as freshet starts and until water freezes
2.3.2.2	Saddle Dam 2	1) Monthly Inspection - keep record.	Geotech engineer and Engineering	May until water freezes
2.4	**VAULT ROAD CULVERT**			
2.4	Vault road culvert from Turn Lake to Drill Trail Lake (~km 2 on Vault road)	1) Daily inspection - keep record	Env. Department	May - until Freshet complete and after rain events
		2) Install turbidity barriers, if needed (elevated TSS observed), and maintain	Env. Department	May - until freshet complete and after rain events
		3) Sample monitoring for TSS, if excess turbidity observed - use Multi Lab.	Env. Department	May - until freshet complete and after rain events
		4) Report any discharge of TSS to Drill Tail to DFO/NWB (if grab > 30 mg/L).	Env. Department	May - until freshet complete and

				after rain events
2.5	**STORMWATER MANAGEMENT POND**			
2.5	Stormwater Management Pond	1) Pump Stormwater to applicable TSF in Spring/Fall - pumped volume must be kept.	Site Services and Dike/Dewatering	When required in Spring and/or Fall
2.6	**FUEL TANK FARMS**			
2.6.1 Meadowbank Tank Farm		1) SITE SERVICES Dept to advise Env Dept in advance of intent to pump once ice melts in containment area.	Sites Servies and Env. Department	Probably mid-June and September
		2) Sample water in accordance with Water License to ensure compliance with limits prior to release.	Env. Department	Probably mid-June and September
		3) Provide notice to Inspector 10 days prior to pumping.	Env. Department	Probably mid-June and September
		4) Advise SITE SERVICES Dept if pumping can begin based on sample results.	Env. Department	Probably mid-June and September

	5) Pump to tundra/ground or Stormwater Mgt Pond (note pumping to Stormwater Mgt Pond does not require compliance with limits - at Meadowbank only). **NOTE: The water cannot be pumped out to the tundra if it does not meet the Water License criteria.**	Site Services	Probably mid-June and September
2.6.2 Baker Lake Tank Farms	1) SITE SERVICES Dept to advise Env Dept in advance of intent to pump once ice melts in containment area.	Sites Servies and Env. Department	Probably mid-June and September
	2) Sample water in accordance with Water License to ensure compliance with limits prior to release.	Env. Department	Probably mid-June and September
	3) Provide notice to Inspector 10 days prior to pumping.	Env. Department	Probably mid-June and September
	4) Advise Site Servicess Dept if pumping can begin based on sample results.	Env. Department	Probably mid-June and September

		5) Once approval given by Env Dept, Site Servicess Dept can pump to tundra but must avoid erosion during pumping, ie., low flow, the volume must also be determined by Site Servicess Dept personnel. **NOTE: The water cannot be pumped out to the tundra if it does not meet the Water License criteria. Any wastewater unsuitable for discharge will be transported back to Meadowbank for disposal in the TSF or shipped south for disposal.**	Site Services Dept Env Department	Probably mid-June and September
2.7	**AWAR CULVERTS ON THE BAKER LAKE PORTION**			
2.7	AWAR Culverts on the Baker Lake Portion	1) Weekly inspection of culverts along AWAR to Baker Lake.	Env. Department	May 2015
		1) Sample for TSS and Turbidity if elevated TSS observed.	Env. Department	May - until freeze up
		2) Notify Site Services Dept if severe erosion/scouring observed - for repair action.	Env. Department	May - until freeze up
		3) Install turbidity barriers if required.	Env. Department	May - until freeze up
3.0	**INCIDENT RESPONSE**			

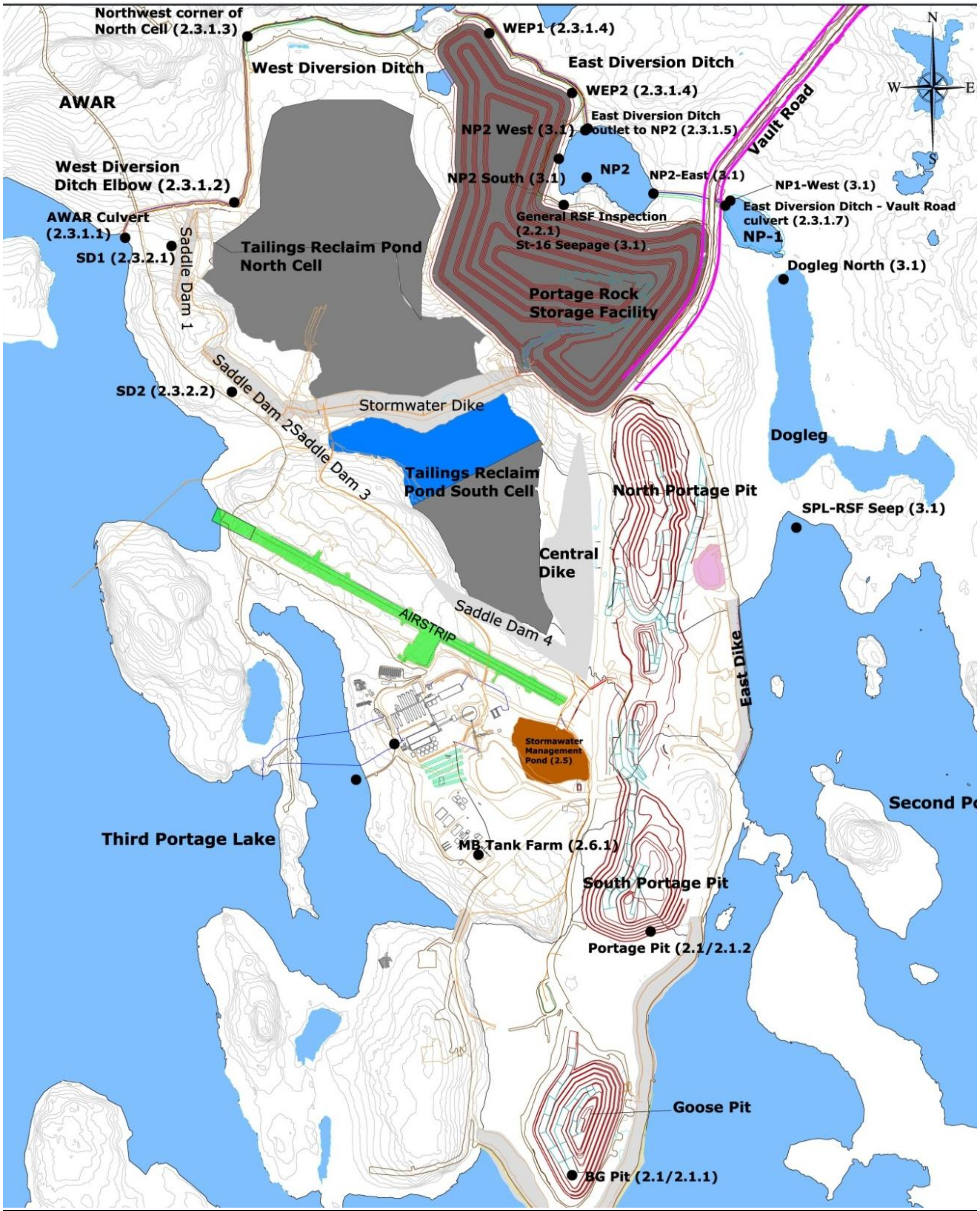
3.1	**ST-16 Seepage**			
3.1	ST-16 Seepage	1) Check Piping from pump to discharge area at North Cell TSF.	Engineering and Dikes/Dewatering	Early May
		2) If the snow accumulation is judged to be too great, then snow must be removed.	Engineering to coordinate with Site Service, Mine and Dikes/Dewatering	Early May
		3) Daily inspection - keep record.	Env. Dept, Eng Dept and Dikes/Dewatering	May - as soon as freshet starts until freeze up
		4) Notify Eng. Dept and Dikes/Dewatering when water present and pumping can start. **Water level to be maintained, as a minimum, below the till plug elevation. Water should not pond against the Till plug for extended time periods - ie < 2 - 3 hours. For emergencies the mine water trucks can be requested. Start pumping.**	Env. Department	May/early June - as soon as free water present and ice has melted until freeze up
		5) Water sampling program starts when water present in accordance with attached Schedule 1.	Env. Department	May/early June - as soon as water present until freeze up
		6) Any seepage through rockfill road to NP-2 must immediately be reported to Env Dept and authorities.	Env. Dept, Eng Dept and Dikes/Dewatering	May/early June - as soon as water is present until

				freeze up
		7) Thermistor Monitoring.	Env. Department	Ongoing throughout the year
		8) Submit progress/update report to regulators.	Env. Department	Annual Report 2015
3.2	**Mill Seepage**			
3.2	Mill Seepage	1) Pump water from the trench to the mill - volumes documented.	Env. Dept with assistance from Site Services	Start May/early June when water present until freeze-up
		2) Daily inspection of pumping, collection systems, bermed areas and perimeter area – keep record. **For emergencies the mine water trucks can be requested.**	Env. Department	Start May/early June when water present until freeze-up
		3) Monitoring Program – in accordance with attached Schedule 2, commences when water present and ice has melted.	Env. Department	May/early June as soon as water present until water freeze

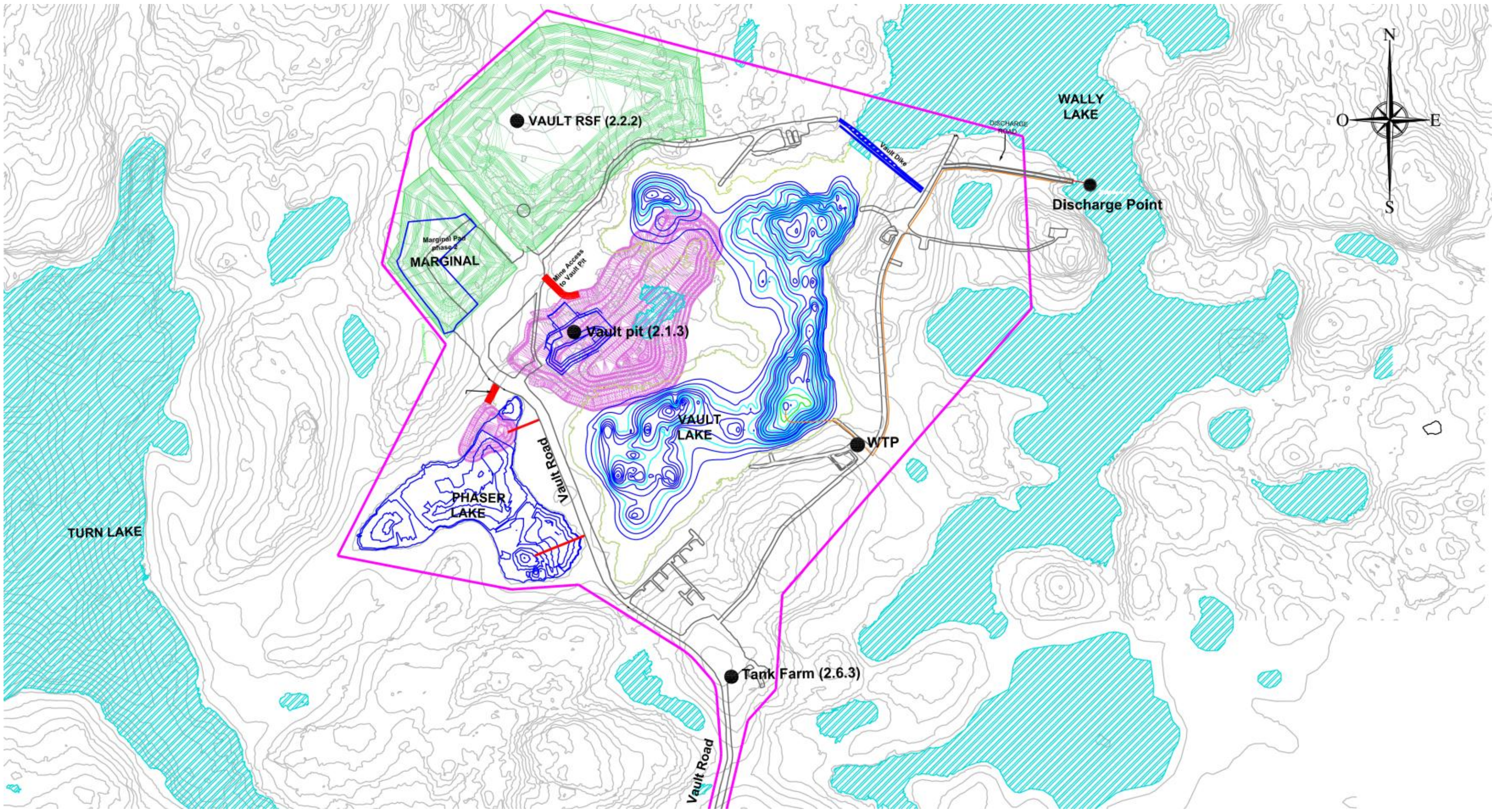
APPENDIX 2

2016 Monitoring Locations and Areas of Concern for the Freshet Action and Incident Response Plan

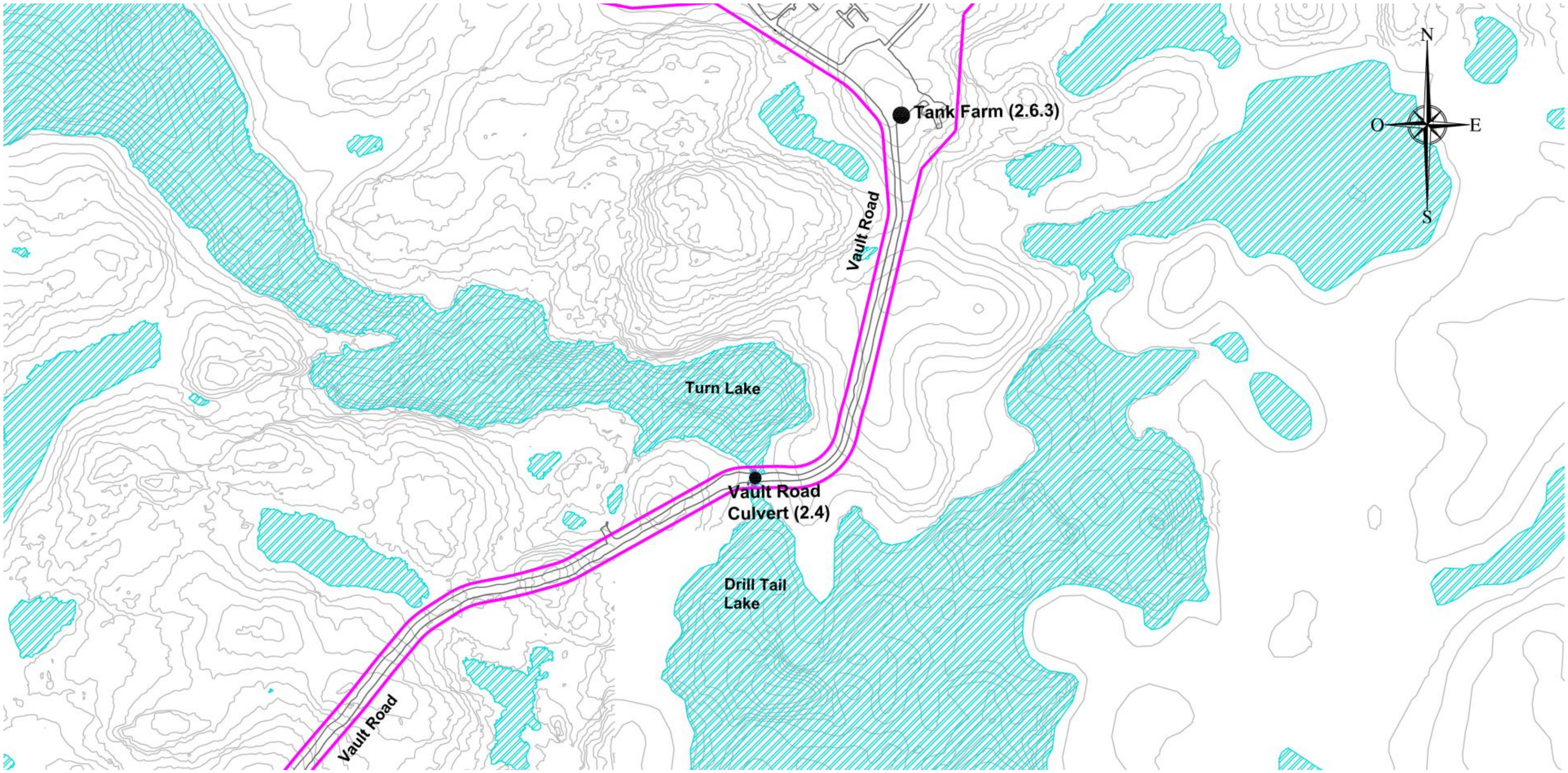
Meadowbank Areas of Concern and Monitoring Locations



Vault areas of concern



Vault Road areas of concern



SCHEDULE 1

ST-16 Seepage Monitoring Program

ST-16 Seepage Monitoring Program (May/early June - as soon as water present until freeze up)			
Parameters	**Laboratory**	**Station**	**Frequency**
pH, Conductivity, Turbidity, Colour, Hardness, Bromide, Thiosulfate, Fluoride, Thiosulphate, Thiocyanate, Alkalinity, Bicarbonate Alkalinity, Carbonate Alkalinity, Ammonia-nitrogen, Total Ammonia, Nitrite, Nitrate, Reactive silica, TDS, Chloride, Sulfate, Ortho-Phosphate, DOC, TOC, TSS, Dissolved Oxygen (DO), Total Kjeldahl Nitrogen (TKN), Ca, Mg, Na, K, Dissolved and total metal: Al, Sb, As, B, Ba, Be, B, Cd, Cu, Cr, Co, Fe, Li, Mn, Mg, Hg, Mo, Ni, Pb, Se, Ag, Sn, Sr, Te, Ti, Tl, U, V, Zn, and Chlorophyll A (Lake site), CN tot / CN Wad, Total Phosphorus	Multilab	ST-16 NP-2 South NP-2 West NP-2 East NP-1 Dogleg SPL	Monthly during open water
		NP2 Winter	Monthly during winter
CN Free	SGS	ST-16 NP-2 South NP-2 West NP-2 East NP-1 Dogleg SPL	Monthly during open water
		NP2 Winter	Monthly during water
CN Wad	Assay Lab	ST-16 NP-2 South	2x/week initially and 1x/week after 1 month

SCHEDULE 2

Mill Seepage Monitoring Program

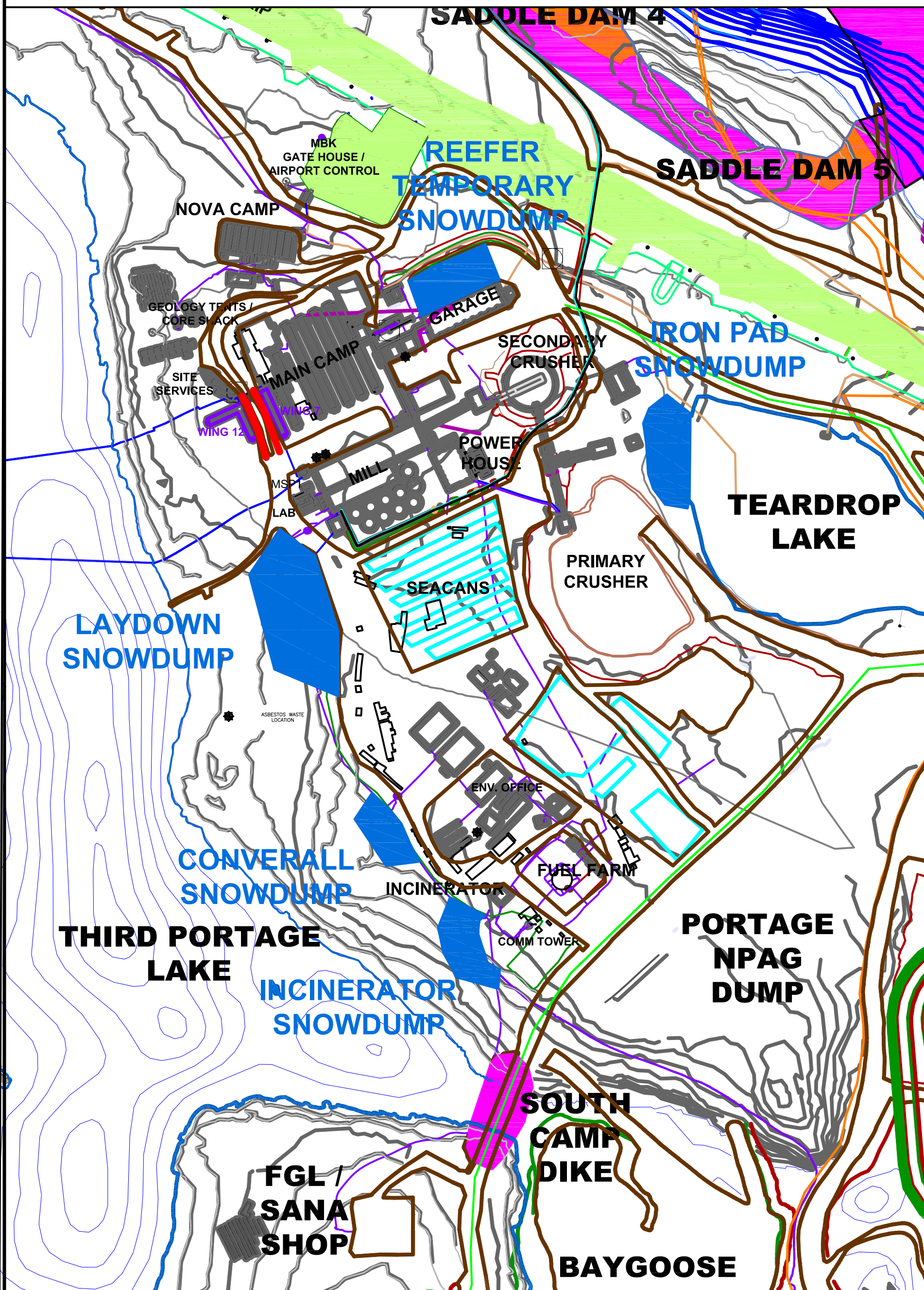
Mill Seepage Monitoring Program (May/early June - as soon as water present until freeze up)			
Parameters	**Laboratory**	**Station**	**Frequency**
CN Total Cu Fe	Multilab	Trench Original Sump MW 4-5-6-7-8	Monthly
CN Free	SGS	Trench Original Sump MW 4-5-6-7-8 TPL-Assay	Monthly
pH, Conductivity, Turbidity, Colour, Hardness, Bromide, Thiosulfate, Fluoride, Thiosulphate, Thiocyanate, Alkalinity, Bicarbonate Alkalinity, Carbonate Alkalinity, Ammonia-nitrogen, Total Ammonia, Nitrite, Nitrate, Reactive silica, TDS, Chloride, Sulfate, Ortho-Phosphate, DOC, TOC, TSS, Dissolved Oxygen (DO), Total Kjeldahl Nitrogen (TKN), Ca, Mg, Na, K, Dissolved and total metal: Al, Ag, As, Sb, Ba, Be, B, Cd, Cu, Cr, Co, Fe, Pb, Li, Mn, Hg, Mo, Ni, Se, Sr, Tl, Sn, Ti, Te, U, V, Zn, and Chlorophyll A (Lake site), CN tot / CN Wad, Total Phosphorus	Multilab	TPL-Assay	Monthly

APPENDIX 3

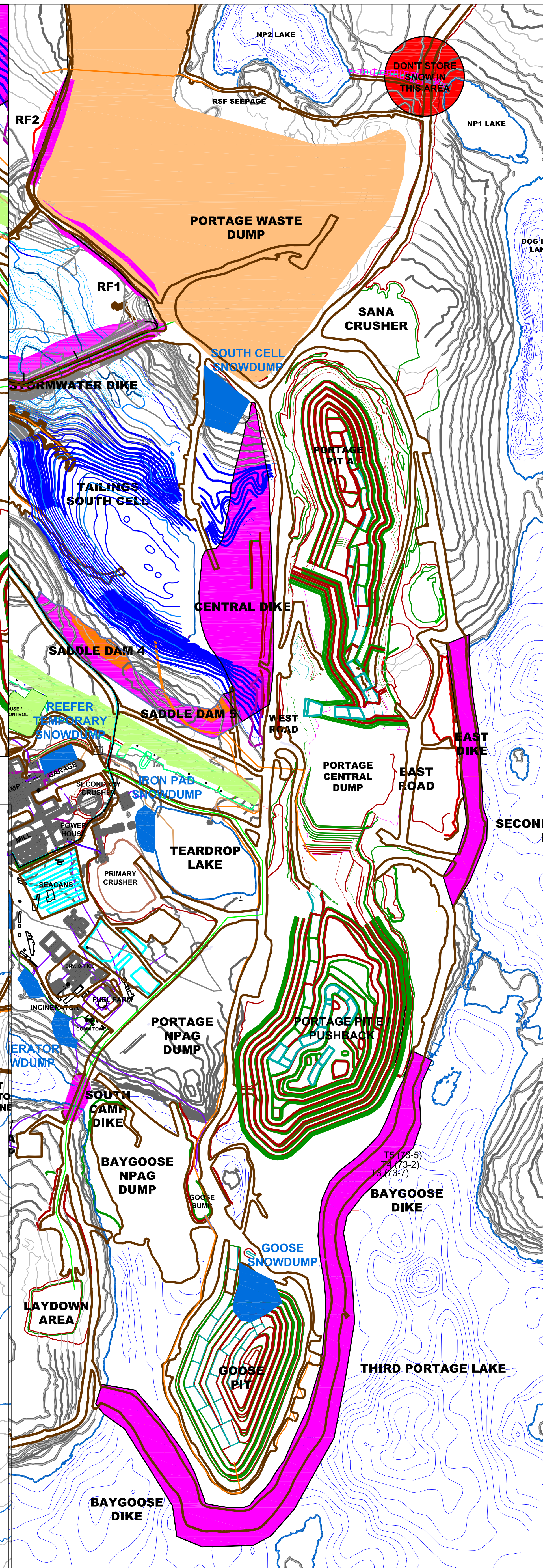
2016 Snow management

FORMAT ANSI B–PORTRAIT

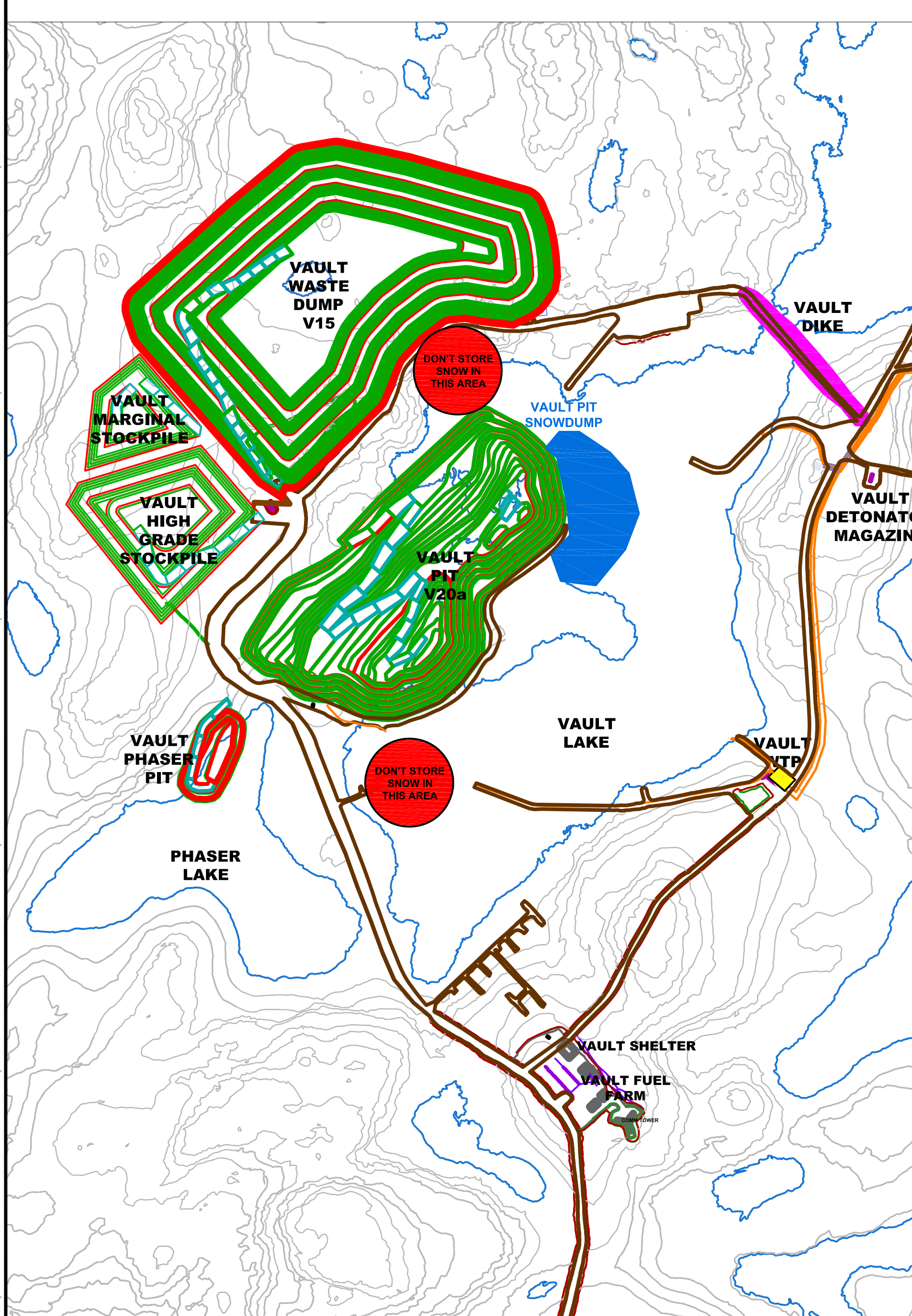
MBK CAMP SNOW MANAGEMENT



PORTAGE PIT SNOW MANAGEMENT



VAULT PIT SNOW MANAGEMENT



REV	DESCRIPTION	DATE	BY
	REVISIONS		

AGNICO EAGLE
MEADOWBANK

DRAWN BY	M GROLEAU	DATE	2015–10–20
CHECKED BY			
APPROVED BY			
PROJECT NO.			
DATE			

TITLE
AGNICO–EAGLE – MEADOWBANK DIVISION
MEADOWBANK SNOMANAGEMENT
WINTER 2015–2016

SCALE	FILE		
N.T.S.	.DWG		
DRAWING NO.		REVISION	SHEET 1 / 1

X:\Dewatering\2015\Snow management\Snow management.dwg, 20 Oct 2015

APPENDIX E – 2015 AMMONIA MANAGEMENT PLAN

MEADOWBANK GOLD MINE

AMMONIA MANAGEMENT PLAN

MARCH 2016

EXECUTIVE SUMMARY

AEM is committed to continue the sample monitoring program, which includes monitoring for Ammonia in all mine pit sumps, seeps, etc., in accordance with the site Water License, implement a comprehensive, regular inspection program related to explosives management within the mine pits, conduct regular inspections at the explosives manufacturing facility (Dyno Nobel) to ensure all explosive products are stored in locked, sealed containers prior to use and continue to perform continuous review of analysis results such that mitigation measures can be implemented when increasing trends of ammonia are determined. It is important to note that AEM has not exceeded any ammonia discharge criteria (Water License or MMER) to date.

This technical note provides guidance for monitoring ammonia levels at the mine site, as part of the conditions applying to waste disposal and management listed in the water license for this water quality parameter.

DOCUMENT CONTROL

Revision				Pages Revised	Remarks
#	Prep.	Rev.	Date		
00	SNC		February 2013	All	
01	AEM	1	March 2016	13	Table 1 update
				16	Add section 6
				Appendix 1	Add Memorandum to address comments made during water license renewal process.

Prepared By:

Environmental Department

Approved by:

Environmental Department

TABLE OF CONTENTS

List of Appendix

1 INTRODUCTION

The previous version of the Water Management Plan (WMP) for the Mine was presented in 2009 (Doc. 833), updating the first edition of the WMP, support document (Doc. 500) to the Type-A Water License Application for the Mine. The WMP was then updated in 2011 (Doc. 1270). This technical note was produced as an appendix to the 2015 WMP update and covers the ammonia management plan for the mine site. The Ammonia Management Plan is being updated at this time in response to concerns raised during the Water License renewal process (January, 2015 - NWB Technical Meetings – Baker Lake) and that were re-stated in December 2015 as part of the management plan updates process. These concerns were in regards to ammonia loading to mining infrastructure, i.e., the Tailings Storage Facility (TSF) from cyanidation, the use and management of exposives and sewage management. In addition, there was a request for loading calculations of ammonia to the receiving environment. These comments are addressed in Appendix 1 Ammonia Memorandum – WQFU 2015. It should be noted that there is no further discharge of mine contact water to Third Portage Lake from the Portage Attenuation Pond. The onsite CREMP program takes into account the overall ammonia levels in Third Portage Lake and to date AEM has not reached any level of concern (no trigger levels have been reached for ammonia).

As a result of these concerns AEM is committed to continue the sample monitoring program, which includes monitoring for Ammonia in all mine pit sumps, seeps, etc., in accordance with the site Water License, implement a comprehensive, regular inspection program related to explosives management within the mine pits, conduct regular inspections at the explosives manufacturing facility (Dyno Nobel) to ensure all explosive products are stored in locked, sealed containers prior to use and continue to perform continuous review of analysis results such that mitigation measures can be implemented when increasing trends of ammonia are determined. It is important to note that AEM has not exceeded any ammonia discharge criteria (Water License or MMER) to date.

This technical note provides guidance for monitoring ammonia levels at the mine site, as part of the conditions applying to waste disposal and management listed in the water license for this water quality parameter.

Ammonia is a naturally occurring nitrogen compound found in the environment. However, there are two sources at the mine site that can contribute to the mobilization of ammonia in the groundwater or surface runoff:

1. Blasting of ammonium-nitrate (AN) explosives is typically the primary source of ammonia in areas of mining operations. AN readily absorbs water and dissolves easily, thereby mobilizing ammonia in either groundwater or surface runoff.

2. In gold mine operations using a cyanidation process to extract the gold from the ore, the cyanide in solution is oxidized to cyanate (CNO^-) using a sulfur dioxide (SO_2) air process

before discharge to the Tailings Storage Facility. The cyanate can then hydrolyze to ammonia in the Tailings Storage Facility reclaim pond.

Ammonia dissolved in water exists in equilibrium of interchanging un-ionized (NH_3) and ionized (NH_4^+) forms. The equilibrium is influenced by pH, temperature, and ionic strength (salinity) where the amount of un-ionized ammonia is favoured as the pH becomes more basic or as the water temperature or salinity increases. Un-ionized ammonia can readily pass across the gill surface and enter into the bloodstream of fish, while ionized ammonia passes with greater difficulty. Once inside the fish, both forms of ammonia can cause toxic effects (CCME, 2010). Furthermore, it should be noted that ammonia oxidizes to nitrite (NO_2) and nitrate (NO_3), the former being particularly toxic to fish and humans. Both nitrite and nitrate are regulated by the CMME for the Protection of Aquatic Life.

This ammonia management plan (AMP) proposes monitoring of blasting practices for the assessment of explosive quantity used and blast performance, and monitoring of water quality to determine ammonia levels in waters within the mine site. The monitoring results can be used to review and adjust blasting practices or water management if ammonia levels need to be reduced.

In addition to ammonia, monitoring of nitrate and nitrite is also considered in the AMP, as both water quality parameters are signature compounds of AN explosives. NO_3 is listed with a discharge level threshold in the conditions applying to waste disposal and management in the water license (NWB 2015).

2 EXPLOSIVE MANAGEMENT AND BLASTING PRACTICES

2.1 SITE DESCRIPTION

2.1.1 Explosive Storage

Storage of explosive products will be located at the mine site emulsion plant area. The explosive products arrive by barge at the Baker Lake marshalling area. They are then transported by ground to the emulsion plant located at the Meadowbank mine site.

The emulsion plant area is located approximately four kilometers north of the mine plant and camp site, and is accessible from the All Weather Access Road (AWAR). This area consists of an emulsion plant for the preparation of bulk emulsion explosives, two buildings for the storage of AN, and four explosive magazines along the access road to the plant.

Explosive products at the storage facilities are packed in sea containers, which limit the possibility of spillage. The products are only removed from these containers prior to use at the mine site emulsion plant area. Surface areas are graded to collect water runoff within the storage facilities.

2.1.2 Roads

The AWAR is a restricted access road constructed and operated by AEM for ground transportation between the Meadowbank mine site and Baker Lake. This road is used to transport explosive products from the Baker Lake site facilities to the emulsion plant area at the mine site. In preparation for blasting operations, explosive products are transported from the emulsion plant area to the appropriate blasting locations via local site roads and the Vault Haul Road.

Spillage control protocols, procedures and handling of spilled material, and explosive management for both storage and transport have been established by Dyno Nobel Inc. (Dyno) and are provided in Appendix 4. Explosive products and spills on the AWAR are also referenced in the Meadowbank Spill Contingency Plan.

2.1.3 Pits

The development sequence of the mine site is provided in Section 3 of the 2014 Mine Waste Rock and Tailings Management Plan. Explosives are used for the excavation of waste rock and mining of the ore at the Portage, Goose and Vault pits.

2.2 AMMONIA PATHWAYS

Ammonia not fully detonated within the in-pit blasting operations mobilizes through several pathways on the mine site. Water from drainage runoff is the primary mechanism of mobilization for ammonia residuals remaining within the pits. This water is collected at pit sumps and then has been pumped to the Portage Attenuation Pond, which became the South Cell TSF Reclaim Pond on November 2014. Blasting residuals are also expected to be attached to waste rock and ore materials, which are transported from the open pits to their respective storage and processing facilities. Residuals from waste rock may be washed off by precipitation and be ultimately conveyed to the South Cell TSF (former Attenuation Pond), or the Vault Attenuation Pond. Residuals from the ore may be carried in the tailings to the Tailings Storage Facility. All of these pathways (mine sumps, Vault Attenuation, South Cell TSF are monitored in accordance with the Water License).

2.3 EXPLOSIVES AND BLASTING

Based on experience at other open pit mines in the Canadian Arctic, the largest potential source of ammonia in mine water will be from explosive residue from blasting. Depending on the wetness of the site, water may leach explosives from blastholes prior to the blast. Other forms of ammonia released from AN are explosives flowing into cracks and fissures in the rock and not detonating, or leading to an incomplete detonation of the explosive column and misfired blastholes. An AN based emulsion is used as a blasting agent at the Meadowbank site. This material is designed to repel water thus minimizing the potential for ammonia to impact mine water.

Blasting operations on site include monitoring of explosive quantities and blast design, procedures and practices. Combined with water monitoring, the compilation of these data is used to assess blasting performance. The results of this assessment are used to adjust blasting practices as needed to:

a) Optimize the use of explosives; and

b) Increase the completion and efficiency of explosive detonations.

Any modifications to blast design are intended to decrease the amount of ammonia that may become available for mobilization in mine water.

This section summarizes the explosive products and blasting design parameters, procedures and practices employed at Meadowbank. Associated monitoring is also discussed.

2.3.1 Explosive Products

Explosive products used at the mine site include bulk explosives (bulk emulsion), packaged explosives, cast boosters, detonating cords, non-electric delay detonators and non-electric lead lines. The material safety data sheets (MSDS) for these products are provided in Appendix 5. Of these products, the greatest potential for water contamination comes from the bulk explosives. Presently, Meadowbank uses emulsion as the primary bulk explosive for its blasting operations.

Bulk emulsions typically contain some or all of the following components:

- Ammonium, sodium and/or calcium nitrate;
- Fuel and/or mineral oil;
- Methylamine nitrate;

- Emulsifiers; and
- Ethylene glycol.

Although bulk emulsions are water resistant, contaminants can be leached from the product if it is left in contact with standing or flowing water for extended periods of time. The performance of the explosive, and hence the potential for post-blast contaminations, deteriorates with the length of time that the emulsion remains in the blasthole after it has been loaded (i.e., sleep time). Blast procedures currently in use are designed to minimize sleep time so that standing or flowing water is not in contact with the bulk emulsion for extended periods of time.

2.3.2 Procedures and Practices

Quality control procedures are in place to verify AN content in bulk explosives. Quality control procedures for the emulsion occur at the plant and density tests are done at the blast site (on the trucks). Loading procedures specify that blastholes be loaded with emulsion from the bottom of the blastholes to provide a continuous explosive column. Details on the explosive quality control and loading procedures have been established by Dyno and are provided in Appendix 3.

The primary factors that may reduce the amount of ammonia available for mobilization in

mine water are:

- Explosives handling
- Completeness of detonation

Bulk emulsion spillage during blasthole loading could (as bulk emulsion is resistant to water) be a source of ammonia that could be carried by water collected in the pits. Spillage control protocols, procedures and handling of spilled material, and explosive management for storage and transport, as well as the emergency response plan, have been established by Dyno and are provided in Appendix 3 and 4.

Incomplete detonation results in higher ammonia residue on the blasted rock. Evidence of incomplete detonation is often observed as an orange fume after a blast and sometimes an orange pigment on the blasted rock. Explosives that have failed to detonate may be observed in the muckpile. Muckpiles are routinely inspected by Meadowbank staff for signs of incomplete detonation.

2.4 MONITORING

Monitoring of explosive handling and blasting is as follows:

a) Explosive quantities: Records of explosive quantities used for in-pit blasting are kept for each blasting event and will be conserved throughout the mine life. Furthermore, a record of blast location (i.e., pit and elevation), blast date, and bulk explosive type and name used (emulsion, with the corresponding ratio of AN over emulsion) is kept for all events.

b) Design parameters: Blast design parameters, as well as changes in the blast design parameters from the standard are recorded and dated.

c) Loading instructions: Loading instruction forms are completed for each blast event and provide a record of the as-loaded parameters for all blastholes in the blast pattern including:
    - Hole depth
    - Collar height
    - Priming (single or double)
    - Other observations made by the blast crew (e.g., wetness of holes, use of liners, collapsing holes or difficulty loading)

d) Video footage: Videos are taken of each blast. This practice provides a visual, qualitative record of the results of each blast and provides insight into potential problems such as incomplete detonation (e.g. orange fumes) and misfires, as well as areas of poor muckpile heave and forward movement.

e) Blast audits: Blast audits are conducted on a monthly basis to ensure that best practices are being followed in the field (audits may be adjusted to a lesser frequency if low ammonia levels are consistently observed, or conversely may be adjusted to a higher frequency if high ammonia levels are consistently observed).

An additional monitoring technique commonly used is the measurement of the Velocity of Detonation (VOD), which has been shown to be directly related to the volumetric fraction of the explosive that has been consumed. This technique will be implemented if poor or incomplete detonation is consistently suspected.

3 MILL EFFLUENT

3.1 SITE DESCRIPTION

The mill effluent consists of tailings produced at the mill that is pumped as slurry and deposited in the Tailings Storage Facility (TSF) where the tailings particles are allowed to settle and consolidate. The reclaim water is pumped back to the mill for re-use. Prior to discharge of the mill effluent to the TSF, the effluent is sent to the cyanide destruction process. The cyanide destruction process at Meadowbank uses the sulfur dioxide (SO_2) and air process to oxidize weak acid dissociable cyanide (CN-WAD) to a less toxic form: cyanate (CNO^-) based on the following reactions:

$$SO_2 + O_2 + H_2O + \text{CN-WAD} \rightarrow CNO^- + H_2SO_4$$

The process can also use sodium metabisulfite ($Na_2S_2O_5$) instead of sulfur dioxide in case there are operating issues with the dosing of sulfur dioxide gas in the process. This ensures that chemicals required for the cyanide destruction process (either SO_2 or $Na_2S_2O_5$) are always available.

3.2 AMMONIA PATHWAY

Cyanate produced from the oxidation of CN-WAD can readily hydrolyze to ammonia (NH_3) and carbon dioxide (CO_2) based on the following reaction:

$$CNO^- + H^+ + H_2O \rightarrow NH_3 + CO_2$$

Thus, the mill effluent provides an ammonia loading to the TSF reclaim water.

During the operation of the TSF, the reclaim water will be pumped to the mill for re-use in a closed loop system. Consequently, there will be no discharge of reclaim water to the environment during this period. Furthermore, it is expected that the ammonia concentration will gradually increase in the TSF reclaim pond over time, even though (1) there may be some slight attenuation of ammonia due to microbial/algae activity in the summer and (2) ammonia may oxidize to nitrite and nitrate, particularly near the top of the pond where oxygen is most present.

The Water Quality Forecasting – Update based on the 2014 Water Management Plan Report (SNC, 625618-0000-40ER-0001) provides a forecast of the concentration for ammonia in the TSF reclaim pond during the life of the mine. Furthermore, the report provides a forecast of the ammonia concentration in the Portage and Goose Island Pit once flooding activities has started.

3.3 MONITORING

Concentrations of ammonia, nitrate and nitrite are parameters that are monitored on a monthly basis as part of this sampling campaign of the TSF reclaim water at station ST-21.

In the Water Quality Forecasting – Update based on the 2014 Water Management Plan Report (SNC, 625618-0000-40ER-0001), a maximum ammonia concentration in the TSF reclaim water is evaluated in order to meet the CCME guidelines for the Protection of Aquatic Life in the Portage and Goose Island Pits once flooding activities are completed. If this concentration is exceeded before the end of the flooding operation, measures could be undertaken to lower the ammonia concentration, as well as nitrate and nitrite if required, in the TSF reclaim pond prior to the transfer of TSF reclaim water to the pits.

Ammonia treatment technologies that could be further investigated, if the need arises, include:

i) Biological nitrification / denitrification during the summer months.

ii) In-situ volatilization of ammonia during the summer months.

iii) Ammonia removal by snow making.

4 WATER MANAGEMENT

Water quantity and quality monitoring assist in the monitoring of ammonia loadings from explosive residuals, as well as ammonia concentration found in the Tailings Storage Facility reclaim pond. The Meadowbank water quality and flow monitoring plan (AEM 2015) and water license (NWB 2015) includes monitoring stations that are used for the monitoring of ammonia loadings. The stations that specifically monitor for ammonia are listed in Table 1 and are shown in the Figures in Appendix 2.

Table 1 Water Monitoring Station Included under the Meadowbank Water License

Station	Description	Phase	Parameters	Frequency
ST-9	Portage Attenuation Pond prior to discharge through Third Portage Lake Outfall Diffuser	Early operation	Ammonia, nitrite, nitrate	Prior to discharge and Weekly during discharge
			Water Volume	Daily during periods of discharge
ST-10	Vault Attenuation Pond prior to discharge through Wally Lake Outfall Diffuser	Late operation	Ammonia, nitrite, nitrate	Prior to discharge and Weekly during discharge
			Water Volume	Daily during periods of discharge
ST-16	Portage Rock Storage Facility	Late operation	Ammonia	Monthly during open water
		Closure	Ammonia, nitrite, nitrate	Bi-annually during open water
ST-17	North Portage Pit Sump	Operation	Ammonia	Monthly during open water
			Nitrite, nitrate	Bi-annually during open water
			Water Volume	Daily during periods of discharge
	Portage Pit Lake	Late operation	Ammonia, nitrite, nitrate	Monthly during open water
		Closure	Ammonia, nitrite, nitrate	Bi-annually during

				open water
ST-19	South Portage Pit Sump	Early operations	Ammonia	Monthly during open water
			Nitrite, nitrate	Bi-annually during open water
			Water Volume	Daily during periods of discharge
	Third Portage Pit Lake	Late operations	Ammonia, nitrite, nitrate	Monthly during open water
ST-20	Goose Island Pit Sump	Early operations	Ammonia	Monthly during open water
			Nitrite, nitrate	Bi-annually during open water
			Water Volume	Daily during periods of discharge
	Goose Island Pit Lake	Late operations	Ammonia, nitrite, nitrate	Monthly during open water
		Closure	Ammonia, nitrite, nitrate	Bi-annually during open water
ST-21	Tailings Reclaim Pond	Early (North Cell) and late (South Cell) operation	Ammonia, nitrite, nitrate	Monthly during open water
ST-23	Vault Pit Sump	Late operations	Ammonia	Monthly during open water
			Nitrite, nitrate	Bi-annually during open water
			Water Volume	Daily during periods of discharge
ST-24	Vault Rock Storage Facility	Late operation	Ammonia	Monthly during open water
			Nitrite, nitrate	Bi-annually during open water
		Closure	Ammonia, nitrite, nitrate	Monthly during open water

ST-25	Vault Attenuation Pond	Late operation	Ammonia	Monthly during open water
			Nitrite, nitrate	Bi-annually during open water

In addition to the monitoring listed in Table 1, the following actions are undertaken as part of the AMP:

- If runoff or seepage is detected at the rock storage facility, water samples collected at the Portage or Vault Rock Storage Facility during late operation will also be analyzed for nitrate and nitrite to complete the suite of signature compounds found in explosive residuals.
- Tailings slurry volumes and density from the mill pumping facility to the TSF are recorded on a monthly basis.
- The records of water volumes pumped from the Portage Pit sumps include the destination: South Cell TSF (former Attenuation Pond).
- The records of water volumes pumped from the Portage or Vault Attenuation Pond will include the destination: Third Portage Lake, Wally Lake or other future destination.

Sampling frequency at the pit sump will also be increased if high variability is identified in observed constituent concentrations as a result of the blasting schedule.

5 REPORTING

Reporting of ammonia concentrations at the sampling stations listed in Table 1 is included as part of the requirement of the water license (NWB 2015). The reporting frequency is provided in AEM (2009b), and includes:

- Brief monthly reports of the compiled water quality monitoring results, sent to the Nunavut Water Board (NWB), the INAC Water License Inspector and to the Kivalliq Inuit Association (KIA); and
- An annual report submitted to the NWB, KIA, INAC, Nunavut Impact Review Board, Government of Nunavut, and other interested parties. This report summarizes monitoring results for each sampling station, annual seep water chemistry results, annual groundwater monitoring results, receiving water monitoring results, spills and any accidental releases, measured flow volumes, effluent volumes and loadings, and results of QA/QC analytical data.

Mine operation personnel reviews on a monthly basis the data gathered from the sampling stations in Table 1 and from the monitoring action proposed under the AMP. If the data indicates that further studies and/or significant changes to the water management infrastructure are required to assess or control ammonia concentrations, AEM will notify the Nunavut Water Board as early as practical. Results of these further studies and/or changes to the AMP monitoring actions will be transmitted to the Nunavut Water Board for review.

6 INSPECTION

On a weekly basis, the environment department will conduct inspection in the blasting area to ensure that the Dyno Nobel loading procedures are being implemented (this will minimize blasting residues). In addition inspections will be undertaken at explosive product storage facilities (Dyno Nobel) to ensure that explosives products are stored in sealed containers and there is no spillage. If any non-conformities are observed follow up action will be undertaken andcorrective measure will be put in place. See Appendix 6 for copy of the AMP inspection form.

7 REVIEW OF AMMONIA MANAGEMENT PLAN

Review of the results of the site water quality and AMP monitoring during the year may provide new information, and/or indications that changes to the AMP are necessary. When revisions are warranted, an updated AMP will be submitted to the Nunavut Water Board for review.

8 REFERENCES

AEM (2016), Meadowbank water quality and flow monitoring plan. March 2016.

CCME (2010), Canadian Water Quality Guidelines for the Protection of Aquatic Life, Ammonia.

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SLI (2012). Water Quality Forecasting for the Portage Area 2012-2025. Agnico-Eagle Mines. Document No. 610756-0000-40ER-0002, Rev. 01. March 2013

APPENDIX 1

Ammonia Memorandum – WQFU 2015

SNC·LAVALIN

SNC-LAVALIN INC.

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MEMORANDUM

Certifiée ISO 9001

TO :	Érika Voyer, Meadowbank Mine, Agnico-Eagle	**DATE :**	March 21, 2016
C.C. :	Kevin Buck, Michel Groleau, Pier-Éric McDonald		
FROM :	Geneviève Beaudoin-Lebeuf, Anh-Long Nguyen SNC-Lavalin	**REF. :**	635062-0000-40ER-0002
SUBJECT :	Ammonia Memorandum - WQFU 2015		

1.0 INTRODUCTION

This memo will address the ammonia loading in the Portage and Vault areas of Meadowbank Mine. Any information related to the assumptions and data referenced in this technical memo can be found in the Water Quality Forecasting Update 2015 Technical Report, which is also appended to the Water Management Plan 2015.

This technical memo will discuss the following elements:

- Current ammonia loading in the pits of the Portage area, and the approximate loading in the pits at closure when the dykes between Third Portage Lake and the pits will be breached;
- Current ammonia loading discharged to the environment in the Vault area, forecasted loading discharged to Wally Lake and ammonia loading remaining in the Vault Attenuation Pond at closure;
- Management of the potential sources at both sites;

2.0 AMMONIA LOADING

2.1 Portage Area of Meadowbank

Surface runoff, treated sewage and reclaim water in the Portage area of Meadowbank are currently collected in South Cell TSF Attenuation Pond. At closure, the water collected in the South Cell TSF will be transferred to Portage Pit each summer. Portage and Goose Pit will then be mixed once the water elevation passes 131 masl. From 2029, the dike between Goose Pit and Third Portage Lake may be breached once the water quality in the pits meets CCME guidelines. The CCME guideline for ammonia for the protection of aquatic life is 0.85 mg N (Nitrogen)/L with a water pH of 8 and a temperature of 10°C.

To compute the actual loading discharged in 2015, the ammonia concentrations from the data collected are compiled and an average concentration per month is obtained. The average concentrations are multiplied by the volume of water discharged each month to find approximate monthly loadings.

In November 2015, there was approximately 430 kg N (i.e. 520 kg as NH_3 (ammonia)) present in Portage Pit. At closure, the model forecasted loading is expected to be approximately 63,440 kg N (i.e. 77,034 kg as NH_3) in this pit, assuming no natural degradation or treatment of ammonia. For Goose Pit, in August 2015, approximately 165 kg as N (200 kg as NH_3) was found and approximately 3,320 kg N (i.e. 4,030 kg as NH_3) are forecasted in the pit in 2029. In total, 66,760 kg N (81,065 kg as NH_3) will be released into the environment. The

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forecasted concentration at closure for the mixed pits is approximately 1.5 mg N/L. It is slightly above the CCME guidelines for ammonia if we assumed a pH of 8.0 and a water temperature of 10 deg-C. However, if the final pH of the water is between 7 and 7.5, than the forecasted concentration of ammonia is below the CCME guidelines.

2.2 Vault Area of Meadowbank

Water from the pits and ponds in the mining infrastructure at Vault are currently collected in the Vault Attenuation Pond, directed to the water treatment plant (WTP) and then discharged to Wally Lake. The water treatment plant is designed to reduce only the concentration of total suspended solids. Therefore, it is assumed that the WTP will not reduce significantly the concentration of ammonia in the water pumped from the Vault Attenuation pond. Water discharge to Wally Lake (and treatment if required) is performed each summer from 2013 until 2018.

For 2015, approximately 1,080 kg N (i.e 1,310 kg as NH_3) was discharged to Wally Lake. The average concentration for July, August and September 2015 measured in the final effluent ranged from 1.0 to 1.3 mg N/L.

AEM is required to meet the criteria for discharge to Wally Lake as stated in the Type A Water License which is 20 mg N/L. No exceedance occurred and is foreseen with the current Vault water quality forecasting model.

The same method was use to forecast the ammonia loading discharged from summer 2014 until 2018, with the help of the water balance. Approximately 12,600 kg as N (15,300 kg as NH_3) is forecasted to be discharged to Wally Lake during this period.

The area will also be flooded. Since Vault Pit water will be discharged at the end of operation into the Vault Attenuation Pond, and then reflooded with runoff and water from Wally Lake, the concentration of contaminants is assumed to be nil at closure. The forecasted concentration of ammonia remaining in the Vault Attenuation Pond at closure is 0.4 mg N/L and approximately 1,200 kg as N (1,450 kg as NH_3) is forecasted to remain in the Vault Attenuation Pond when flooded, assuming that mass is conserved and no natural degradation is occurring.

3.0 MANAGEMENT OF POTENTIAL SOURCES OF AMMONIA

Ammonia is a naturally occurring nitrogen compound found in the environment. However, three anthropogenic sources at Meadowbank mine site can contribute to the mobilization of ammonia in the groundwater or surface runoff: (1) explosives; (2) treated sewage effluent; (3) cyanate hydrolysis. In the Vault area, the only source of ammonia comes from the use of explosives.

3.1 Explosives

Ammonium Nitrate (AN) explosives are used in the Portage area and Vault area of Meadowbank during the development of the pits. Presently, explosive is primarily used in the development of the Vault Pit.

When the explosion is not complete, it results in ammonia residues on the blasted rock. Pit runoff dissolves the residual AN. The pit runoff is then transferred to the South Cell TSF Reclaim Pond at Portage and at the Vault Attenuation Pond at Vault. The waste rock and ore material containing ammonia residues are then transported to either the Waste Rock Storage Facility or processed with the ore at the mill. The following is conducted on site to limit dispersion of ammonia:

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- Explosive products at the storage facilities are packed in sea containers, which limit the possibility of spillage.
- AN explosives are only removed from these containers prior to use at the mine site emulsion plant area, located 4 km north of the Portage area.
- Surface areas are graded to collect water runoff within the storage facilities such that it is contained in sumps and either pumped to the Vault Attenuation Pond or the South Cell TSF for the Portage Area.
- Ensure that complete explosions occur through proper blasting procedures.

3.2 Sewage Treatment Plant

The treated effluent from the sewage treatment plant that is discharged to Stormwater Management Pond is another source of ammonia at the Portage area. From 2014 to 2018, each summer, water is transferred from Stormwater Management Pond to South Cell TSF. In 2015, the ammonia concentration measured in Stormwater Management Pond was approximately 9.6 mg N/L, which is approximately 10 times lower than the ammonia concentration measured in the mill effluent, the primary source of ammonia reporting to the South Cell.

3.3 Cyanate Hydrolysis

In order to extract gold from the ore, a cyanidation process is used. The cyanide in solution is oxidized to cyanate (CNO-) with sulfur dioxide (SO2) air process before being discharged to the Tailings Storage Facility (TSF). The cyanate is then hydrolyzed to ammonia in the TSF Reclaim Pond. The average ammonia concentration measured in the mill effluent in 2015 is 127.3 mg N/L.

Since the same reclaim water is circulating in a closed loop from the TSF Reclaim Pond to the mill and back, the ammonia concentration will gradually build-up over time, even if there is some ammonia attenuation due to microbial/algae activity in the summer months.

4.0 AMMONIA REMOVAL

If ammonia levels in the discharge water in the Vault Area or if ammonia levels are forecasted to exceed the CCME guidelines for the Protection of Aquatic Life during the reflooding of the Portage and Goose Pits, AEM will consider treatment.

For the Vault area, no treatment is expected since the ammonia concentration in the Vault Attenuation Pond at closure is forecasted to be below the CCME guideline.

For the Portage area at Meadowbank, after reflooding of the Portage and Goose Pits, the forecasted ammonia concentration is close to the CCME guideline, depending on the water temperature and pH considered. Ammonia concentration in the Reclaim water in the South Cell TSF should naturally degrade over the summer months. However, if elevated ammonia concentration continues to persist, more active treatment solutions could be implemented, such as.

- Mechanical aerations could be installed in either the South Cell TSF Reclaim Pond, or in Portage pit;
- The Reclaim Water in the South Cell TSF can be treated “in-situ” by either stripping or biological treatment process;
- Alternative treatment technology like snow making could be considered.

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5.0 CONCLUSION

The updated model for the Water Quality Forecasting Update 2015 estimates that approximately 12,300 kg as N of ammonia (15,300 kg as NH_3) will be discharged to Wally Lake during the life of mine of the Vault area, while approximately 1,200 kg as N of ammonia (1,450 kg as NH_3) will remain in the Vault Attenuation Pond .

For the Portage area at Meadowbank, approximately 66,760 kg N (81,065 kg as NH_3) will also be present in Goose and Portage pits when they will be flooded in 2029 with Third Portage Lake water. According to the current model, once the pits are flooded, the forecasted concentration for ammonia is slightly higher than the CCME guidelines for the Protection of Aquatic Life depending on the water temperature and pH considered.

Note that these quantities of ammonia loading are estimated assuming a conservation of mass of ammonia over time and does not account for potential reduction due to natural biodegradation and volatilization process.

For the Vault area, the main source of ammonia is from the use of explosives in the development of the Vault Pit.

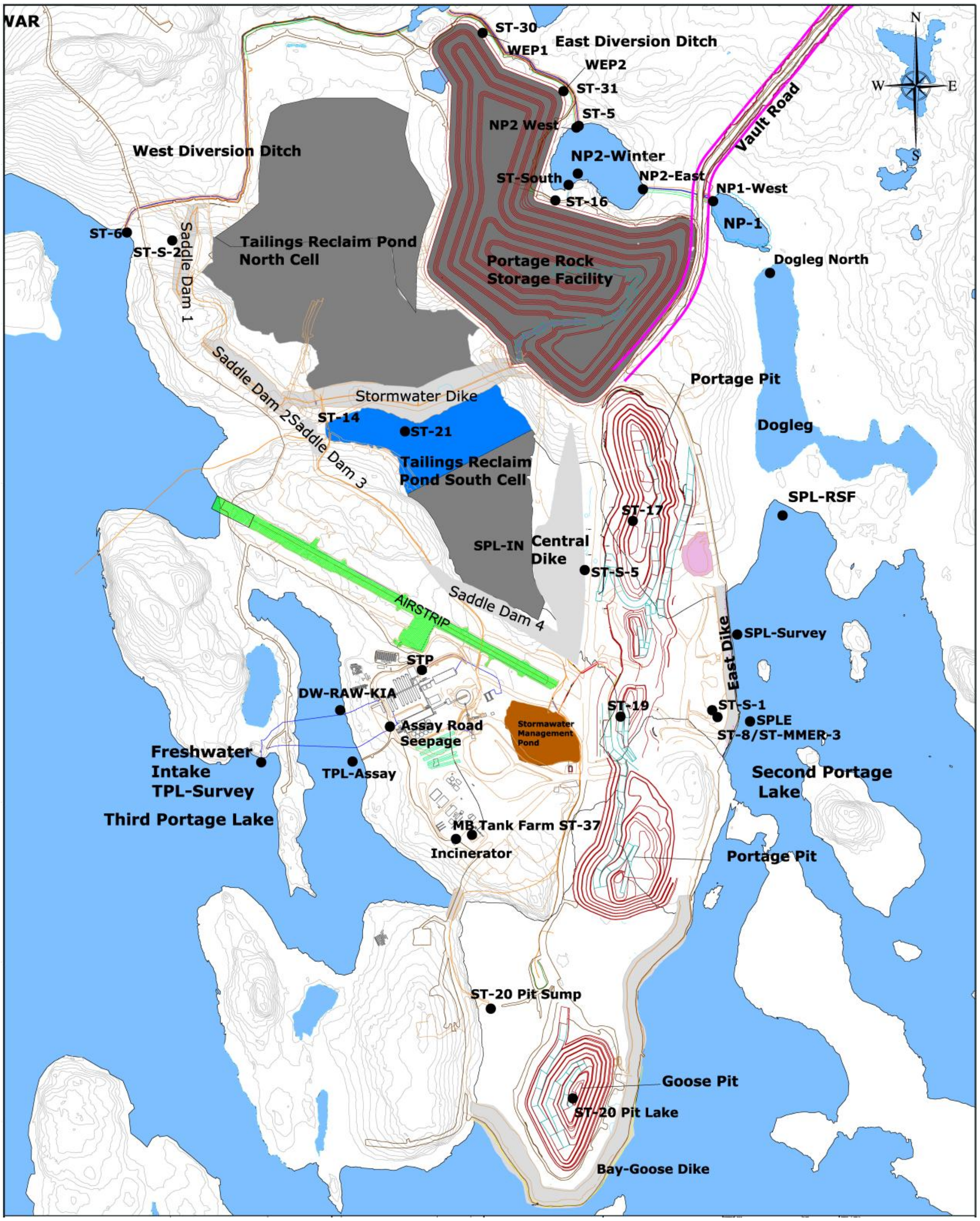
For the Portage area, the mains source of ammonia is from the cyanate hydrolysis to ammonia found in the reclaim water from the mill. There is also a small loading to the South Cell TSF from the treated sewage effluent contained in Stormwater Management Pond which is discharged twice yearly to the South Cell TSF.

For the Vault area, no treatment for ammonia is recommended since at this time, the level of ammonia discharged to Wally Lake is well within the Type A Water License criteria.

For the Portage area at Meadowbank, further monitoring of the level of ammonia in the Reclaim Pond is recommended. Using this data, the forecasted ammonia concentration in Portage and Goose pits will be re-evaluated next year. If the forecasted concentration for ammonia at closure is well below the CCME guideline for the Protection of Aquatic Life, then no additional treatment will be required.

APPENDIX 2

ENVIRONMENT FIELD STATIONS – MINE SITE VIEW


VAR
ST-30
WEP1
East Diversion Ditch
WEP2
ST-31
ST-5
NP2 West
Vault Road
West Diversion Ditch
NP2-Winter
ST-South
NP2-East
NP1-West
ST-16
NP-1
ST-6
ST-S-2
Saddle Dam 1
Tailings Reclaim Pond North Cell
Portage Rock Storage Facility
Dogleg North
Saddle Dam 2
Saddle Dam 3
Stormwater Dike
Portage Pit
ST-14
ST-21
Dogleg
Tailings Reclaim Pond South Cell
SPL-RSF
ST-17
SPL-IN
Central Dike
ST-S-5
Saddle Dam 4
AIRSTRIP
SPL-Survey
East Dike
STP
DW-RAW-KIA
ST-19
ST-S-1
SPLE
ST-8/ST-MMER-3
Assay Road Seepage
Stormwater Management Pond
Freshwater Intake
TPL-Survey
TPL-Assay
Second Portage Lake
Third Portage Lake
MB Tank Farm ST-37
Incinerator
Portage Pit
ST-20 Pit Sump
Goose Pit
ST-20 Pit Lake
Bay-Goose Dike
N
W
E
S

APPENDIX 3

SPILL CONTROL AND LOADING PROCEDURE PLAN

Dyno Spill Control and Loading Procedure Plan

1) All trucks are washed inside shop to contain any residue that may have contacted trucks. The water from the washing of the trucks and or the shop floors themselves is then picked up by the AEM e vacuum and disposed of in the onsite Stormwater Management Pond.

2) A.N. Prill is brought to the Emulsion Plant site in 20 ft Seacans and is stored in the Seacans on the A.N. Pad for the site till it is needed. It is then taken out of the Seacan /s and brought into the Plant for use. Sometimes enough product for the next batch is stored outside to speed up Batching time when it is necessary. A.N. Prill is not left outside if weather looks like it is going to be damp or raining to prevent the leaching of Prill through the Tote bags and on to the ground surface.

3) Any A.N. spills that occur are promptly cleaned up and disposed of in 1 of 2 ways:
   i. Any contaminated prill is put into containment barrels or buckets inside Plant, depending on amount, and put into the next Ansol batch to be made.
   ii. Any contaminated Prill is put in Barrels or Buckets (depending on amount) and then transferred from barrels to buckets for the Emulsion Truck Operators to take to the Blast Pattern and placed into the boreholes after they have been loaded (disposal via blast).

   Any spills that are too difficult (some of our drummed Products) to take care of in this manner are placed in Metal Drums or HAZMAT bins etc. with absorbing materials, sealed and sent to AEM HAZMAT AREA (for shipment south).

4) Emulsion waste (with contaminants) is also either contained in drums or bins until it can be transferred into buckets and taken to Blast patterns and placed into boreholes for disposal (disposal via blasting).
   Any non contaminated Emulsion is put back through the system and on to Trucks.
   When Trucks need to be de-contaminated or process lines of trucks or plant need to be cleaned out, the excess water is strained through a Sack (this allows the water to go through, but contains the Emulsion) to minimize nitrites in our plant sump containment.

5) When an Emulsion Truck has completed loading on a blast pattern the remaining emulsion is flushed out of the loading hose by running water through the hose (water holding tank on trucks) until water discharges out the end of the hose into the borehole.
   This does not completely remove all of the Emulsion out of the Hose; there is still a residue amount left in the hose. Thus, when the Truck operator starts up on the next blast pattern, the hose is put into the borehole and the Operator primes the hose and all the residue Emulsion is contained in borehole and disposed of when hole/s are blasted.

APPENDIX 4

DYNO NOBEL EMERGENCY RESPONSE PLAN – MAGAZINE, PLANT AND WORK SITE

DYNO
Dyno Nobel
Groundbreaking Performance

EMERGENCY RESPONSE PLAN

QAAQTUQ

Agnico Eagle Meadowbank (Baker Lake) Nunavut

For Dyno Nobel Canada Inc.

Magazine, Plant and Work Sites

This Emergency Response Plan (ERP) addresses incidents and potential incidents involving the manufacturing, handling and storage of explosives and related products in Dyno Nobel Canada Inc.' magazines, plants and worksites. This ERP has been developed for Dyno Nobel Canada Inc. and all of it's wholly-owned subsidiaries (DNX Drilling). Actions detailed within this plan are compulsory, under the approval and authorization of DNCI's Regional Operations Managers.

"This document, as presented on Dyno Nobel's database, is a controlled document and represents the version currently in effect. All printed copies are uncontrolled documents and may not be current".

Note: Information provided within this document may be privileged and is not intended for general distribution.

Original Date of Publication: 15 October 2003, as amended site specific, December 19, 2011

Publication/ Amendment Date	Changes To Prior Edition	Pg.
15 Oct 03	**New document**	All
26 Apr 04	**Amendment # 1**	
	Renumbering of Appendices 6 – 13	App. 7 – 14
	Miscellaneous Typos & Amendment Dates	All
17 March 08	**Amendment #2**	
	Updated Contact information	
	Addition of definitions	
	Included Calling and responding emergency procedures	
	Addition Duties of Key personnel	
	Addition of response to Natural disasters	
	Addition of visitor and contractors access control -	
	Replaced the Appendices and renumbering	
	Included a Emergency Report form	
	Addition of Nitric acid, Aluminum and Diethylene glycol and CFE	
	Addition of alternate methods of communication	
	Addition of Reportable Substance list	
	Miscellaneous Typos & Amendment Dates	All
August 18, 2010	**Amendment #3**	
	Updated Scope and ERP Outline	
	Added Sign-off sheet for Annual Fire Department Review	
	Added Appendix for Employee Training sign-off	
	Updated Reporting Incidents Flowchart	
	Updated procedure for Raw Material Truck Spills	
	Updated Bomb Threat Checklist	
September 29, 2011	Amendment #4	
	Updated contacts and phone numbers	
November 15, 2011	Amendment #5	
	Amended Appendix 8	
	Addition of Appendix 10	

Table of Contents

1.0 SCOPE

This document provides a Work Site Emergency Response Plan covering fire/explosion, spills, security breach, bomb threat, evacuation and prescribed actions that employees must take to ensure employee and public safety in the event of an emergency. The general reference to DNCI's "Work Sites" throughout this document includes magazines, plants and miscellaneous work locations.

The Emergency Response Plan appearing on Dyno Nobel Canada Inc.' database is a controlled document. Uncontrolled copies of this ERP are provided to customers and associates who own the land on which DNCI's worksite is located, plus applicable municipal and regulatory authorities. As well, uncontrolled copies are issued to all Company employees and are placed in all central offices and Company delivery vehicles.

2.0 RELATED DOCUMENTS

The following documents also relate to emergency situations that can arise and should be held at each Work Site:

- Federal, Provincial and Municipal regulations, standards and guidelines
- Corporate Policies plus MSA Standards & Procedures
- Standard Operating Procedures (SOP's)
- Dyno Nobel General and Specialized Work Rules
- Material Safety Data Sheets
- Prime Contractor's / Customer's ERP
- Transportation ERAP #2-1037
- Crisis Communication Plan

3.0 ERP OUTLINE

3.1 The following materials are covered by this ERP:
Fuel Oil
ATF Hydraulic Fluid
Ammonium Nitrate Prills and Solution
Sodium Nitrite
Sodium Thiocyanate
ANFO
Emulsion

Packaged Explosives
Detonators
Acetic acid
Diethylene glycol
Aluminum
Enviro CFE

3.2 The following situations are addressed in this ERP:

- Fire / Explosion
- Storage Tank Failure
- Spills from Product Delivery Trucks
- Spills from Raw Material Delivery Trucks
- Process Spills
- Shut down due to weather, floods, lightning, fires, explosions and other threats to the security and operation of DNCI's facilities, equipment and material.
- Bomb Threats
- Quantities of spills and reportable to Dyno Nobel and authorities

3.3 This ERP covers:

Preparation	Reporting
Training	Waste Disposal Permits
Lines of Authority	Containment
Notification	Inspection
Decontamination	Maintenance

3.4 The following definitions apply to this plan:

<u>DNCI Corporate contact :</u> A DNCI corporate employee who is assigned to receive Emergency Calls at all times from the answering service.

<u>ER Advisor:</u> Emergency Response Advisor (ERA), who will normally be the applicable General Manager, Area Manager, or Technical Advisor who will liaise with First Responders.

<u>OSC:</u> (DNCI) On Scene Coordinator, the Senior DNCI employee at an incident site who manages and controls DNCI resources in support of First Responders and incident recovery.

ERT: Emergency Response Team, DNCI personnel dispatched to an incident site to assist First Responders and conduct incident recovery under the direction of the OSC.

4.0 PREPARATION AND PLANNING

4.1 In order to provide competent emergency response at Dyno Nobel Canada Inc.' magazines, plants and worksites, first responders (local fire departments and mine rescue personnel) must be thoroughly briefed on an annual basis of the potential hazards involved in a Dyno Nobel Canada Inc. worksite fire. To this end, Work Site Supervisors must take fire department plus mine safety and security representatives on an annual magazine / plant tour to view:

Explosives Storage Areas	Evacuation (Meeting) Area
Bulk Emulsion Equipment	Communications Equipment
ANFO Blending Area	Facility Layout
Fire Fighting Equipment Sites	(Waste) Burn Facilities

A record of each explosives worksite tour and the names of the first responder representatives attending are to be documented and kept on file.

Annual Fire Department Review Form (Appendix 9)

4.2 All DNCI employees shall review this ERP on an annual basis and participate in ERP drills / exercises when scheduled.

4.3 All worksite accidents involving fire, explosion, reportable spills/emissions, breaches of security and bomb threats are to be reported to applicable authorities and senior management. As per incident reporting procedure

4. 4 Spill procedures for each of the materials listed in section 3.1 are outlined in Table 6-3. All procedures specify: Method of Cleanup, Method of Disposal and Protective Clothing. Based on the procedures presented in Table 6-3, worksite supervisors must ensure that adequate clean-up equipment and materials are readily available and in good condition.

4.5 Worksite information for each of DNCI's facilities is contained in the attached appendices. The ERP is revised whenever significant changes are made.

4.6 Current Material Safety Data Sheets (MSDS) are to be kept at each Work Site for all hazardous materials that are stored and handled at the Work Site. Copies of current product MSDS' are also made available to customers and landowners. Obsolete MSDS' will be replaced as new ones are issued.

4.7 Each Work Site will hold and maintain in good repair, appropriate fire fighting and spill control equipment for potential emergencies. Fire extinguishers, hoses and other fire fighting equipment are to be visually inspected on a monthly basis to ensure Magazine, Plant, Work Site and delivery vehicle readiness.

5.0 TRAINING

5.1 All employees will complete training on the contents of this Plan during their "new hire" orientation and review the plan annually.

5.2 A trained person is considered to have reviewed all related documents (Section 2.0), to have been instructed on the use of related equipment and procedures, and to have discussed with their Supervisor or trainer, questions and issues of concern.

5.3 Training records, including certificates for training completed, are to be kept onsite in the Employee's Training Record.

5.4 The Magazine, Plant or Work Site Supervisor/Manager will certify their employees as having received training by signing the training form. In signing the training form, the Supervisor / Manager will have satisfied themselves that trained employees are able to:

- Recognize fire and explosive hazards for the materials and processes to which they are exposed /involved with;
- Competently use Fire Fighting / Fire Protection Equipment (Note: employees should receive refresher training in the use of fire extinguishers at least every three years)
- Competently use applicable personal protective equipment (PPE) when handling hazardous substances;
- Recognize and be familiar with substances which become hazardous wastes when spilled; and

- Follow SOP's and use established work practices to minimize the potential for fires, explosions, environmental releases and other accidents.
- Worksite Managers / Supervisors will ensure that all contractors receive a worksite orientation before commencing work or being left unaccompanied in the worksite. Following the orientation process, the contractors will be required to sign off on the Contractor Checklist acknowledging training in the applicable areas including the site emergency response plan.
- All Plant & Magazine sites will have in place, a continuous (24 hour) access control system to control the entrance, presence and exit of visitor and contractors and their equipment and materials
- Employees must be trained on Reportable Quantities to the Government in the unlikely event of a spill.
- All employees are aware of evacuation routes, muster point location, and all-clear notice procedure.
- New/Transferred employee or Annual Refresher sign-off form located in Appendix 8

6.0 EMERGENCY PROCEDURES AND LINES OF AUTHORITY

6.1 <u>GENERAL</u>

Reporting Incidents Flow Chart (continued on next page)

Table 6-1
Emergency Response Flow Chart

Reporting Incidents

Property Loss/Fly Rock/Environmental Spill/Injury

Immediately

Operator

Step 1
Remain Calm

Step 2
Tell your supervisor immediately*

Step 2.5
Fill preliminary incident report & fax it immediately* to Supervisor & HSE Professional

Step 3.0
Is there an Injury?

Step 3.5
If Yes, Get Management Kit & Start that process!

SUPERVISOR or SITE MANAGER

Step 3
***Contact Your Operations Manager**
Operations Manager: Randy Armella
Cell: 780 865-6580
Alternate: Willard Pierce
Cell : 403 836-9029

Step 4
***Contact HSE Professional**
HSE Professional : Seamus Kilcommons
Cell: 403 815-4066
Alternate: Hubert Fafard
418 570-9257

Within 24 hours

Supervisor or Site Manager

Recordable/Potentially Recordable Incident?

NO

If No, Do Not Call Incident

Recordable Incidents or Potential Recordable Incidents

- Transportation Emergency Response
- Damage more than $20,000
- Blasting or Fly rock Incident

Yes, Not Sure?

↓

Contact Incident Report Line
1- 888-547-3966
(1-888-KIS-DYNO)
Press: "1 " and report: Actual or Potential MTIs, RWIs, LTIs, Transportation Emergency, Blasting or Fly Rock Incidents, Environmental Spills, Property Damage over $20,000

Within 72 hours → **Supervisor or Manager**

Complete ICARUS Report & Submit to HSE Professional & Operations Manager

Complete Investigation and RCA with Help of HSE Professional

SITE SUPERVISOR/DELAGATE
EXPERIENCING EMERGENCY / POTENTIAL EMERGENCY

- **CALL FOR EMERGENCY ASSISTANCE**
  In the event of an emergency, accidental release or imminent accidental release involving explosives, eliminate potential sources of detonation where possible (eg. turn off the ignition of a vehicle), call **911** (or the local police number) for immediate assistance, **call the site Supervisor/ Area Manager** and initiate the site's Emergency Response Plan. If normal phone systems are down other methods of communication can include two way radios, satellite phones, pager, e mail and vehicle satellite tracking systems.

- **WARN PUBLIC WITHIN EVACUATION DISTANCES IF RISK OF DETONATION**
  Should there be explosive detonations, or the risk of detonations due to the presence of fire or other detonating factors, advise the First Responders (or anyone within the immediate vicinity if First Responders are not at the scene) of the risk and applicable safety distances per Table 6-4, page 17 (liaise with Emergency Response Advisor (ERA) if time permits). Help organize perimeter guards to prevent people from entering the evacuation zone.
  Note: See ERP, page 17 Table 6-4 for Evacuation Procedures.

- **ASSIST LOCAL AUTHORITIES**
  Assist First Responders and Local Authorities in eliminating the emergency situation, and liaise with DNCI's On-Call Employee / ERA until relieved by the Company's Emergency Response Team (ERT).

TO RESPOND TO AN EMERGENCY CALL

DNCI Corporate contact instructions:

Upon receiving a call for emergency response assistance, keep a log of all subsequent communications and actions, and do the following:

1. Immediately obtain the name and callback number of the caller, in case the telephone line is lost.

2. Obtain information as fully and accurately as possible following the emergency report form (see appendix 1).

3. Call an ER Advisor for the applicable Region (see appendix 2) and report the emergency situation. In turn, the ER Advisor will phone the emergency scene caller, establish ongoing contact, assess the emergency, determine what Company resources and/or contracted emergency response services are required and organize an Emergency Response Team – ERT to proceed to the emergency scene if required.

4. Assist the Emergency Response Advisor (ERA).

5. Liaise with Company Executive / Senior Managers.

Emergency Response Advisor (ERA) instructions:

1.Call the Branch/Plant Supervisor nearest the emergency scene plus provincial & federal authorities (see applicable appendix to Annex D) to advise them of the situation and the need for an emergency response.

2. Designate, assemble and dispatch an Emergency Response Team (ERT), made up of Groups 1 & 2 personnel (see ERAP pg. 16 and Annex D) under the leadership of an On Scene Coordinator (OSC), if required.

3. Authorize the dispatching of additional resources, communications, transportation and contracted services as necessary.

4. Contact and instruct the designated Emergency Response Team (ERT) to proceed to the emergency scene with the required vehicles and equipment.

5. Liaise with the Person in Charge of the Emergency) and/or Local Authorities to obtain a situation update.

6.Advise Local Authorities as appropriate, regarding the properties, hazards and handling procedures for the explosives involved in the emergency. In particular, advise the Local Authorities of appropriate evacuation distances per Table 6-4 pg. 17.

7. Continue to consult with the Local Authorities as appropriate, plus the Company's On-Scene Coordinator (OSC), to stabilize and eliminate the emergency.

8. Refer to **Regional Manager** *Tom Medak or Cory Redwood .(see appendix2))* for any media requests in accordance to the Crisis Communication Plan (CCP). Media contacts shall be through Regional Manager designated for the area.

9. Contact the explosives supplier and / or transporter (if other than DNCI) to advise them of the emergency and to request their assistance if/as required.

ON-SCENE CO-ORDINATOR (OSC)

- The On-Scene Coordinator (OSC) is the Company's representative and local authority in charge of all company actions and resources at the emergency scene. Once the OSC arrives at the emergency scene, the ERA will transfer communication with First Responders/Local Authorities to the OSC. In turn, the OSC will liaise with the ER Advisor as required. Throughout the Company's emergency response, the OSC will ensure that First Responders and Company personnel (employees and contractors) observe all safety and regulatory standards and procedures.
- The OSC may revise / adjust the composition of the Emergency Response Team (ERT) and supporting resources as required. The OSC may, in consultation with the ER Advisor, contract commercial services to assist in addressing and resolving the emergency situation.

- The OSC will oversee the Company's local involvement with emergency services, government (municipal & provincial) and public interests until the emergency is fully resolved. Post-emergency activities (clean-up, restoration, etc.) under the direction of the Environment Manager may be delegated to an appropriate Branch, Plant or Area Manager. **EMERGENCY RESPONSE TEAM (ERT)**

- Selected emergency response personnel will take their direction to assemble and proceed to the emergency scene from the ERA or their representative. Team members will immediately report to the On-Scene-Coordinator.

- The primary role of the ERT is to provide a competent and trained / certified workforce plus specialized equipment and material to assist First Responders / Local Authorities in the stabilizing and elimination of an 'explosives emergency', and to retrieve / recover, repackage and remove to safe and secure storage, non-detonated explosives.

- While at the emergency scene, ERT members will take their direction from the Company's OSC and remain available until released by the OSC.

NOTE:

ONLY INDIVIDUALS WHO HAVE RECEIVED TRAINING AS REQUIRED UNDER THE TRANSPORTATION OF DANGEROUS GOODS (CLEAR LANGUAGE) REGULATIONS, OR WHO ARE WORKING UNDER THE DIRECT AND CONTINUOUS SUPERVISION OF AN EMPLOYEE WHO HAS BEEN TRAINED FOR CLASS 1 DANGEROUS GOODS UNDER TDG, MAY PARTICIPATE IN SITE CLEAN-UP ACTIVITIES SUCH AS PICKING UP, REPACKAGING AND TRANSPORTING EXPLOSIVE MATERIAL.

6.1.1 In any emergency the Work Site Supervisor/Manager or their delegate must take certain actions, including the following:

- Call local fire/emergency authorities (at mine sites, also call Mine Fire, Safety and Security if different and give relevant information).
- Account for all employees and visitors. Arrange for Rescue of anyone who may be trapped, without endangering oneself or others.
- Notify Dyno Nobel Canada Inc. ERA's so that necessary arrangements can be made for technical / administrative support, including accident reporting and investigation plus continued/alternate production. The following information should be provided and refer to appendix 1:

What Occurred	Time of Occurrence
Action Taken	People Contacted
Status of Situation	Anticipated Follow-up

6.2 FIRE & EXPLOSIVES

6.2.1. There are three categories of fire that may involve explosives:

I. Fires Directly Involving Class 1 Explosives and Blasting Agents

- **DO NOT FIGHT THE FIRE.** Instruct all fire fighters on the scene not to fight fire with explosives.

- Shut off power at main breakers if possible. At mine sites, call Mine Security or Fire/Rescue. At all other DNCI locations call local Fire/Rescue personnel.
- Evacuate all personnel from the Work Site to the safe meeting place as outlined in the Work Site Appendix.
- Set up a communications base at the meeting place and guard
- against anyone entering the area.

II. **Fires Involving Components For Manufacture of Blasting Agents**

Bulk blasting agents may be in the form of emulsion or ANFO. ANFO is a mixture of prilled ammonium nitrate and fuel oil.

Under conditions of large mass, intense heat, confined dust / vapor buildup, and the right mixture combination of the basic ingredients, emulsion and ANFO will explode. The probability of explosion with ammonium nitrate (AN) alone is very small, but increases when under intense heat and confinement. Table 6-1 includes recommended fire fighting procedures for each of these substances.

III. **Fires Involving Dyno Nobel Canada Inc. Trucks**

In cases where the Dyno Nobel Canada Inc. delivery trucks are in a building that is on fire, if there is no explosives and safe to do so, may be moved provided access to the truck and exit from the building is not barred by flames or smoke, with available fire extinguishers with caution only if the fire is small and not in the storage compartment.

Fires on re-pump or other bulk explosive delivery vehicles shall not be fought if the fire involves the explosives compartment. Fire fighting measures should be taken immediately to prevent any fire such as a tire, electrical or cab fire from reaching the explosives compartment.

Fires on other transport vehicles may be fought with caution. Fires that cannot be controlled sufficiently to avoid involvement of the vehicle's fuel compartment shall be left and personnel evacuated to a safe distance.

6.2.2. When a fire is small and does not involve any explosive agents, it may be fought with plant extinguishing equipment. If the fire is widespread and intense, all personnel, including visitors and contractors should be evacuated to the meeting area outside the main gate.

Table 6 - 2
FIRE FIGHTING INFORMATION

MATERIAL	RECOMMENDED FIRE-FIGHTING METHODS	SPECIAL CONSIDERATION
Ammonium Nitrate Prill – Odorless white to light tan crystaline solid	Use flooding amounts of water in early stages of fire. Keep upwind. AN is an oxidizing agent which supports combustion and is an explosive hazard if heated under confinement that allows high-pressure buildup. Ensure good ventilation and remove combustible materials if it can be safely done. Evacuate to designated area if fire cannot be controlled.	Toxic oxides of nitrogen are given off during combustion. Fire fighters require self-contained positive pressure breathing apparatus. Avoid contaminating with organic materials. Many powdered metals such as Al, Sb, Si, Cd, Cr, Co, Cu, Fe, Pb, Mg, Mn, Ni, Sn, Zn and brass react violently and explosively with fused AN below 200°C Sensitivity to detonation increases when heated.
Ammonium Nitrate Solution- Colorless/Odourless Liquid – white paste like solid when cooled	Use flooding amounts of water in early stages of fire. Cool containing vellels with with flooding quantities of water until after fire is out	Material will not burn, but thermal decomposition may result in flammable/toxic gases being formed. These products are nitrogen oxides and ammonia. (NO, NO_2 NH_3). Product may form explosive mixtures when contaminated and comes in contact with organic materials. Explosive when exposed to heat or flame under confinement. Avoid temperatures over 210°C (410°F) A self contained breathing apparatus should be used to avoid inhalation of toxic fumes
Acetic Acid – Colourless liquid with a pungent odour	Use dry chemicals, CO_2, Alcohol foam or water spray	Isolate and restrict area access, stay upwind. Water run-off and vapour cloud may be corrosive.
Sodium Thiocyanate – White solid - odourless	Use extinguishing media most appropriate for the surrounding fire	Wear self contained breathing apparatus – MSHA/NIOSH approved or equivalent, and full protective gear. During a fire, irritating or highly toxic gases may be generated by thermal decomposition or combustion.
Sodium Nitrite – Oxydizing agent - white to light yellow crystals- faint odour	Flammability class – not regulated. Flood with water only – Isolate materials not involved in the fire and cool containers with flooding quantities of water until well after the fire is out.	Self contained apparatus should be worn in a fire involving Sodium Nitite.Thermal decomposition will cause reddish brown nitrogen oxides to be released.
Fuel Oil (No. 2 diesel) Dyed or pale yellow liquid with petroleum odor; and/or ATF Fluid	Use water spray to cool fire-exposed surfaces and to protect personnel. Shut off fuel from fire. Use foam, dry chemical or water spray to extinguish fire. Avoid spraying water directly into storage container due to danger of boil-over.	Avoid strong oxidizing agents.

Explosive emulsions, ANFO, packaged explosives and firing devices.	**Fire involving explosive materials must never be fought. Evacuate the incident scene. Do not confine (ventilate to prevent / reduce pressure build-up if safe to do so).**	Explosion hazard.
Enviro CFE	Dry chemical, foam, water spray (fog). Use water spray to cool exposed surfaces and containers	OIL FLOATS ON WATER. Do not use direct or heavy water stream to fight fire. Use organic vapour respirator or self-contained breathing apparatus to fight fire.

Table 6 - 3

CONTROL MEASURES FOR FIRE

MATERIAL	RECOMMENDED FIRE-FIGHTING METHODS	SPECIAL CONSIDERATION
Acetic acid	Small fire: type ABC dry chemical or CO_2 fire extinguisher. Large fire: water fog or foam.	May react violently with oxidizers and nitric acid. May react with aluminum powder and give off highly flammable hydrogen gas.
Aluminum	Small fire: type D fire extinguisher, dry sand. **Never use water**.	May react with oxidizers (nitrate and perchlorate) and acids. Avoid contact with water. Highly flammable hydrogen gas may be released.
Diethylene glycol	Small fire: type ABC dry chemical or CO_2 fire extinguisher. Large fire: water fog.	Keep away from oxidizers (nitrates and perchlorate). Explosion hazard if heated under confinement.

EVACUATION PROCEDURES

Advise the first emergency responders at the scene (police or fire) of the need to evacuate using the guidance in the Emergency Response Plan. Employees at the scene should assist local emergency services to the best of their ability to accomplish this. For incidents within a worksite such as a mine, quarry or construction operation, in most cases access is radio controlled. The quickest way of alerting people, therefore, is by site radio. Clearly state your location, situation and call for assistance in evacuating the area.

DO NOT FIGHT EXPLOSIVES FIRES. EVACUATE THE AREA AND LET THE FIRE BURN ITSELF OUT.

THE MINIMUM EVACUATION DISTANCE IS AS OUTLINED IN TABLE 6-4 (Pg. 17) FOR ALL DIRECTIONS (which is based on a higher traffic / risk / population density within the area, without benefit of protective features such as berms and hills. (**Transport Canada requires 1,600 meters for situations that involve high-risk surroundings**) upon determining actual quantity of explosives refer to Table 6-4 as per ERD quantity of distances.

Table 6 - 4
EVACUATION DISTANCES
Based On Amount of Explosives Present

Explosive Quantity		**Metric Distance**		**English Distance**
250 kg		70 Meters		230 Feet
500 kg		100 Meters		320 Feet
1,000 kg		150 Meters		500 Feet
2,000 kg		240 Meters		800 Feet
5,000 kg		400 Meters		1,300 Feet
7,000 kg		450 Meters		1,450 Feet
10,000 kg		480 Meters		1,550 Feet
20,000 kg		700 Meters		2,300 Feet
40,000 kg		800 Meters		2,640 Feet
60,000 kg		870 Meters		2,860 Feet
80,000 kg		960 Meters		3,150 Feet
100,000 kg		1040 Meters		3,420 Feet
120,000 kg		1100 Meters		3,610 Feet
>120,000 kg		1600 Meters		5,250 Feet

6.3 ENVIRONMENTAL RELEASES

6.3.1 Procedure For Fuel Oil Storage Tank Failure

- Assess the magnitude of the leak.
- If the leak is slow and the source can be determined, take the appropriate action to prevent further leakage.
- Transfer fuel from storage tank into drums if necessary.
- Collect spilled material, including contaminated soil, with absorbent pads or inert solid absorbent and store in drums labeled for disposal.
- If the leak is large and further leakage cannot be prevented, allow the dyke to fill. Transfer to drums, label for reuse or disposal, and store.
- Inspect empty tank to identify failure/cause of leak and repair tank.

6.3.2 Procedure For Raw Material Truck Spills

- Identify the material involved, assess the magnitude of the spill or leak and assist the driver to take appropriate action to stop the leak, taking care to prevent run off and/or entry into any water course or drainage system near the spill site.
- For AN prill, shovel spilled material into drums, label for reuse or disposal, and store. Use a non-sparking shovel to transfer spilled material into lined drums.
- For spilled fuel, contain by dyking with earth. Collect spilled fuel with absorbent pads or solid inert absorbent, transfer into drums, label and store for disposal.
- Remove contaminated soil for disposal in conformance with Environment Canada standards.

6.3.3 Procedure For Process Spills

- Identify the material involved and assess the magnitude of the spill or leak, taking care to prevent run off and/or entry into any watercourse or drainage system near the spill site.
- For AN prill, shovel spilled material into drums, label for reuse or disposal, and store.
- For spilled fuel, contain by dyking with earth. Collect with absorbent pads or solid inert absorbent, transfer into drums, label, and store for disposal.
- In the case of leaking bags of ANFO, sweep or shovel the spilled material into a clean drum or other suitable container, label for reuse or disposal, and store.
- Remove contaminated soil for disposal in conformance with Environment Canada standards.

- Have any process equipment (pumps, process lines, parts, gauges, etc.) involved in a leak or spill inspected and repaired or replaced. Re-inspect and test if necessary after repair is affected.

6.3.4 <u>**Procedure For Emulsion Tank Failure**</u>

- Assess the magnitude of the leak.
- If the leak is slow and the source can be determined, take the appropriate action to prevent further leakage.
- Transfer remaining emulsion from leaking storage tank into another storage tank, a tanker trailer if available, or into drums as necessary.
- Collect spilled material using double diaphragm pump(s) and store in labeled drums for reuse or disposal at the mine.
- If the leak is large and further leakage cannot be prevented, allow the room to fill. Transfer to drums, label for reuse or disposal, and store.
- Inspect empty tank to identify failure/cause of leak and repair or replace the tank

6.3.5 <u>**Procedure For Fire**</u>

- In the event of a raw material or product fire, take care to protect all persons from exposure to smoke and gaseous emissions from the fire.
- Potential toxic gaseous emissions from fires involving explosive materials include:

    Oxides of Nitrogen
    Carbon Monoxide
    Cyanide Gas

- All fires must be reported to local authorities and Mine Site Security as soon as possible.
- Self contained breathing apparatus is required for fighting a fire in the plant.
- Follow procedures outlined above for any spills and leaks resulting from fire when it is safe to do so

Table 6 – 5
ENVIRONMENTAL RELEASE PROCEDURES

MATERIAL	SPILL AND LEAK PROCEDURES	WASTE DISPOSAL
Ammonium Nitrate Prill (odorless white to light tan crystalline solid)	Remove source of heat and ignition. Sweep or shovel spill into a clean, non-combustible container. Wash remaining trace residues with water. Wear rubber gloves and safety glasses to minimize contact with skin and eyes.	Re-use if possible or give it to a farmer as a fertilizer. If not possible, dispose of as-is in approved. Remove as much as possible the spilled material as a solid.
Ammonium Nitrate Solution- Colorless/Odourless Liquid – white paste like solid when cooled	Small spill - Dike and contain spilled material. Ensure spilled material does not enter sewers, wells or water courses. Allow to solidify. Use appropriate tools to place in container for disposal. Larger spill - Dike and contain spilled material. Ensure spilled material does not enter sewers, wells or water courses. Notify downstream water users. Allow to solidify. Use appropriate tools to place in container for disposal.	Call for assistance for disposal. Ensure disposal complies with regulatory requirements and regulations.
Fuel Oil (dyed or pale yellow liquid with petroleum odor)	Eliminate any source of ignition. Prevent spills from entering watercourses or drainage systems. Contain with sand or earth. Recover with pump or inert absorbent material into clean container. Wear safety glasses and rubber gloves to prevent contact with the eyes and skin.	Dispose of recovered material in approved landfill or other waste disposal facility.
ANFO (Ammonium Nitrate Fuel Oil)	This material is an explosive. Remove all sources of heat and ignition. Transfer into clean plastic container with a plastic shovel. Label drums. Wear rubber gloves.	Recycle product, if possible. If not practical, explode it inside a borehole or burn it in an authorized burning ground.
Emulsion	This product is a blasting agent. Remove all sources of heat and ignition. Prevent spills from entering watercourses or drainage systems. If large amount of emulsion is involved, contain spill with earth or sand found locally. Recover spilled material with a diaphragm pump. Use of a diaphragm pump also requires an air compressor. Limitation of the pump suction is approximately 2.5 meters, pump discharge is approximately 8 meters. Use a screening device on pump suction hose. Out of area spills will require taking two pumps and extra hose. Transfer the product into a tanker trailer or clean 200 liter drums. If small amount of emulsion is involved, transfer material into a clean plastic container with a plastic shovel. Label tanker trailer or drums. Wear rubber gloves and rubber boots.	Recycle product, if possible. If not practical, explode it inside a borehole or if large amount is involved, demulsify it with liquid detergent.

Enviro CFE	Eliminate any source of ignition. Prevent spills from entering watercourses or drainage systems. Contain with sand or earth. Recover with pump or inert absorbent material into clean container. Wear safety glasses and rubber gloves to prevent contact with the eyes and skin.	Dispose of recovered material in approved landfill or other waste disposal facility.
Sodium Thiocyanate – White solid - odourless	Ensure adequate ventilation whe handling Sodium Thiocyanate. Keep containers closed when not in use. Wear appropriate PPE – eye protection, gloves and appropriate clothing to prevent skin exposure.	Vacuum or sweep up material and place into a suitable disposal container. Avoid run off into storm sewers and ditches which lead to waterways. Not regulated as a hazardous material. Chemical waste generators must consult appropriate hazardous waste regulations to ensure complete and accurate classification.
Sodium Nitrite – Oxydizing agent - white to light yellow crystals- faint odour	In the event of a spill or leak, contact the vendor (403-263-8660) for advice. Wear respirator, protective clothing and gloves. Vacuuming is the recommended method to clean up spills. Do **not** sweep or use compressed air for clean up. Recover spilled material on non-combustible material, such as vermiculite. Use non-sparking tools and place in covered containers for disposal. Any recovered material mau be used for it's intended purpose , depending on contamination.	Dispose of the waste material at an approved hazardous waste treatment/disposal facility.
Acetic Acid – Colourless liquid with a pungent odour	Wear appropriate PPE – evacuate downind areas as required to prevent exposure and to allow fumes and vapours to dissipate. Prevent entry into sewers or streams. Dike if needed. Eliminate all sources of ignition. Neutralize the residue with sodium carbonate or crushed limestone. Absorb win an inert dry material and place in an appropriate container for disposal. Flush area with water to remove trace residue.	Waste disposal must be done in accordance with provincial and federal regulations. Empty containers must be recycled or disposed of through an approved waste management facility.

6.4 SECURITY

6.4.1. In the event of a breach of security at a Dyno Nobel Canada Inc. Work Site, a call is to be made to the RCMP / local Police Department at the discretion of the Supervisor/Manager, or their delegate. In the case of a breach of security, Dyno Nobel Canada Inc.' HSE, Regulatory Affairs and Executive / Senior Management shall also be informed immediately and provided with the same information as outlined in Section 6.1

6.4.2. Any person(s) apprehended during the course of a serious security breach shall be detained until the Police arrive (note: employees are not to put themselves at undue risk by attempting to apprehend or restrain a potentially violent person).

6.5 BOMB THREAT

6.5.1. The safety of employees and the public is of primary concern. A person receiving a bomb threat over the telephone should attempt to remain calm and keep the caller talking by asking the questions listed in Table 6-6 (ERP pg. 20). Recording (writing) as much information about the caller and their comments is also very important for future reference. If possible, alert a co-worker to the situation while talking to the caller.

6.5.2. The police / mine security should be advised of the bomb threat as soon as possible. Unless there is good reason to the contrary, all personnel should evacuate the Work Site and await the arrival of the police / first responders at the designated meeting area. Suspicious objects should be reported but not tampered with and other people should be prevented from entering the Work Site until the local authority has authorized a return to the Work Site. Employees should be prepared to assist local authorities in their search / inspection of the Work Site as necessary.

Table 6 - 6
CONVERSATION GUIDELINES IN THE EVENT OF RECEIVING A BOMB THREAT

See Appendix 7

6.6 LINES OF AUTHORITY

6.6.1 Based upon the information available at the time of the incident, the Work Site Supervisor/Manager, in consultation with others (such as DNCI Senior Management, Mine/local authorities and/or Dyno Nobel advisors), will evaluate the incident and proceed with appropriate steps to implement this ERP. A decision on when to return to the scene of a serious incident will be made in like fashion, subject to approval by public authorities overseeing the incident.

6.6.2 The Work Site Supervisor/Manager will have overall responsibility for the implementation of this ERP and the supervision of all Company activities. Public authorities and the site owner have ultimate authority regarding the resumption of normal production activities.

7.0 NOTIFICATION AND REPORTING

7.1 Any incident that activates this ERP shall be documented on the DYNO Incident (Cintellate) Report. The Corporate Emergency Response Advisor must also be notified and in turn will advise the:

HSE Manager	Vice President Operations
Area Manager	

It is the responsibility of the HSE Manager or his delegate to report the incident to DYNO's HSE Management Team. A major incident involving a fire with emissions and/or a hazardous material spill shall be reported to a provincial Environment Officer under the direction of the Environmental Manager. Major incidents shall also be reported to the Chief Inspector, Explosives Branch, Natural Resources Canada; a Provincial/Territorial Safety Officer; and as applicable, an Emergency Measures Official.

Any incident which involves a spill at a Mine Site shall be immediately reported to the Mine Site Environmental Representative, and followed up with a copy of the incident report when complete.

7.2 Spills and Releases – Reportable and Significant Classifications

1) Determine if the spill/release is reportable

All environmental incidents are to be input into Cintellate. Reportable spills/releases are not only input into Cintellate, but the investigation and corrective action sections of Cintellate must be completed. To assist in determining if a spill/release is reportable, a listing of common materials with assigned reportable quantities is referenced (see Appendix 5, Reportable Substance List). The reportable quantities utilize the most stringent "reportable quantity" in Canada. Even if the spill/released material is recovered, the media impacted by the spill/release may be reportable to authorities (e.g., a portion of a spill reaching a source of drinking water or wetland). In addition, a spill/release is reportable if the amount equals or exceeds the Dyno Nobel Default Threshold.

2) Determine if the spill/release is significant

- Significant spills/releases are disclosed in the company's annual report. Significant spills/releases trigger time-critical internal actions as required by the company's procedures (crisis communication, internal investigation, etc)

The following table is provided to assist in making these determinations:

Reporting of Environmental Spills

Is the spill reportable?

- Yes if above a Reportable Quantity
- Yes if oil sheen is visible or sludge/emulsion is deposited beneath water surface
- Yes if water quality standards are exceeded
- Yes if from a UST exceeding 25 gallons or result in a sheen

Is the spill significant?

- Yes if authorities implement a national contingency plan
- Yes if "sensitive" environmental features have been impacted
- Yes if neighbors are evacuated
- Yes if authorities and/or neighbors file complaints and/or demand response activities
- Yes if financial impact is >US$100K
- Yes if media coverage is adverse.

7.3 Internal investigation reports will include:

- Name, work address, and phone number of the investigating (reporting) individual
- Identification and quantity of the released substance
- Time, duration, and location of the release
- Nature and quantity of injuries, property damage, production loss, administrative penalty and/or legal liability
- Precautions taken during the incident
- Relevant environmental conditions
- Corrective actions taken at the time of the incident
- Recommended corrective actions to prevent future occurrence

7.4 Senior Management shall be immediately informed by telephone of any major incident that requires Government notification as per Dyno Nobel's reporting procedures.

7.5 Major incidents involving explosive material shall also be reported to the Chief Inspector, Explosives Branch, and Natural Resources Canada by the applicable Regulatory Affairs Coordinator.

Table 7 – 1
REPORTABLE SUBSTANCE QUANTITY LIST

Material Released	Reportable to Authorities		Dyno Nobel Default Threshold (Proposed)
	If Recovered	If Unrecoverable/ Abandoned / Disposed	
AN Solution	Not Reportable if it can be used as a product	45 Kg (100 lbs) as released oxidizer (not media specific)	225 Kg (500 lbs)
	44 Kg (100 lbs) for ammonia if released into water	45 Kg (100 lbs) for ammonia if released into water	
	Report if released to Drinking Water (DW std at 10mg/L-N)	Report if released to Drinking Water (DW std at 10mg/L-N)	
	Report if released to aquatic ecosystem (NH3 toxic to fish)	Report if released to aquatic ecosystem (NH3 toxic to fish)	
AN Prill	Not Reportable if it can be used as a product	45 Kg (100 lbs) as released oxidizer (not media specific)	225 Kg (500 lbs)
	45 Kg (100 lbs) for ammonia if released into water	45 Kg (100 lbs) for ammonia if released into water	
	Report if released to Drinking Water (DW std at 10mg/L-N)	Report if released to Drinking Water (DW std at 10mg/L-N)	
	Report if released to aquatic ecosystem (NH3 toxic to fish)	Report if released to aquatic ecosystem (NH3 toxic to fish)	
SN Prill	Not Reportable if it can be used as a product	45 Kg (100 lbs) as released oxidizer (not media specific)	225 Kg (500 lbs)
	Report if released to Drinking Water (DW std at 10mg/L-N)	Report if released to Drinking Water (DW std at 10mg/L-N)	
Acetic Acid	453 Kg (1,000 lbs)	454 Kg (1,000 lbs)	225 Kg (500 lbs)
	Report if released to Drinking Water (DW std at 10mg/L-N)	Report if released to Drinking Water (DW std at 10mg/L-N)	
Sodium Nitrite	45 Kg (100 lbs)	45 Kg (100 lbs)	225 Kg (500 lbs)
	Report if released to Drinking Water (DW std at 1mg/L-N)	Report if released to Drinking Water (DW std at 1mg/L-N)	
Fuel Oil	Reportable if sheen on surface of pond, stream, etc. or sludge within such	Reportable if sheen on surface of pond, stream, etc. or sludge within such	225 Kg (500 lbs); 261 L (69 gallons)
	State Regulations - Varies from Any Amount to specific Trigger Amounts	State Regulations - Varies from All Spills to specific Trigger Amounts	
	95 L (25 gallons) from UST	96 L (25 gallons) from UST	
Mineral Oil	Reportable if sheen on surface of pond, stream, etc. or sludge within such	Reportable if sheen on surface of pond, stream, etc. or sludge within such	225 Kg (500 lbs); 261 L (69 gallons)

	State Regulations - Varies from Any Amount to specific Trigger Amounts	State Regulations - Varies from All Spills to specific Trigger Amounts	
	95 L (25 gallons) from UST	96 L (25 gallons) from UST	
Emulsifier Agents	Reportable if sheen on surface of pond, stream, etc. or sludge within such	Reportable if sheen on surface of pond, stream, etc. or sludge within such	225 Kg (500 lbs); 261 L (69 gallons)
	State Regulations - Varies from Any Amount to specific Trigger Amounts	State Regulations - Varies from All Spills to specific Trigger Amounts	
Granular Aluminum	Not Reportable	Not Reportable	225 Kg (500 lbs)
ANFO	Not Reportable if it can be used as a product	45 Kg (100 lbs) as released oxidizer (not media specific)	225 Kg (500 lbs)
	45 Kg (100 lbs) for ammonia if released into water	45 Kg (100 lbs) for ammonia if released into water	
	Report if released to Drinking Water (DW std at 10mg/L-N)	Report if released to Drinking Water (DW std at 10mg/L-N)	
	Report if released to aquatic ecosystem (NH3 toxic to fish)	Report if released to aquatic ecosystem (NH3 toxic to fish)	
	Reportable if sheen on surface of pond, stream, etc.	Reportable if sheen on surface of pond, stream, etc.	
Emulsion	Not Reportable if it can be used as a product	45 Kg (100 lbs) as released oxidizer (not media specific)	225 Kg (500 lbs)
	44 Kg (100 lbs) for ammonia if released into water	45 Kg (100 lbs) for ammonia if released into water	
	Report if released to Drinking Water (DW std at 10mg/L-N)	Report if released to Drinking Water (DW std at 10mg/L-N)	
	Report if released to aquatic ecosystem (NH3 toxic to fish)	Report if released to aquatic ecosystem (NH3 toxic to fish)	
	Reportable if sheen on surface of pond, stream, etc. or sludge within such	Reportable if sheen on surface of pond, stream, etc. or sludge within such	
Ethylene Glycol	2250 Kg (5000 lbs)	2250 Kg (5000 lbs)	225 Kg (500 lbs)
Sodium Thiocyanate	45 Kg (100 lbs)	45 Kg (100 lbs)	225 Kg (500 lbs)
	Report if released to Drinking Water (DW std at 1mg/L-N)	Report if released to Drinking Water (DW std at 1mg/L-N)	

8.0 DECONTAMINATION

8.1 DNCI's Standard Operating Procedures and safety rules establish work practices that minimize employees' direct and indirect contact with hazardous substances.

8.2 Equipment, rubber boots, gloves and clothes that have been contaminated can be washed with soap and water. Wash water should be collected and disposed of in an approved manner with other contaminated material.

9.0 WORKSITE CLOSURE / SHUT DOWN

9.1 <u>**Plant Shutdown**</u> **(use appropriate lock-out/tag-out procedures)**

- In the event that a plant is shut down due to weather, flood, or other adverse situation, the Plant Manager / Supervisor or his delegate will ensure that all non-essential power is shut off. The Plant Manager / Supervisor will secure all valves and flow devices so as to prevent accidental opening.
- The Plant Manager / Supervisor shall determine if any raw material or raw material storage will be contaminated or at risk of fire/explosion, and take steps to move the material or isolate it from the contamination / hazard source.
- If the power and/or gas will create a dangerous situation the Plant Manager / Supervisor will cut the outside supply of power, thereby isolating all plant equipment.
- The Plant Manager /Supervisor will advise local Mine authorities of the plant shutdown and preventative actions taken.
- All sensitive documents must be secured.

9.2 <u>**Magazine Closure**</u> **(use appropriate lock-out/tag-out procedures)**

- In the event that a magazine is closed due to weather, flood, or other adverse situation, the Supervisor/Manager or his delegate will ensure that all non-essential power is shut off. Also, the Supervisor/Manager will ensure that all magazines and compound gates are locked before leaving the site.
- The Supervisor/Manager shall determine if any products or raw materials will be contaminated and take steps to move the material or isolate it from the contamination source.
- If power and/or gas will create a dangerous situation the Supervisor/Manager will cut the outside supply of power, thereby isolating all magazine equipment.

10. RESPONSE TO NATURAL DISASTER

Hurricanes, tornadoes, floods, slides, forest fires, and earthquakes, have the ability to damage or destroy everything in their path. Yet much of the damage or destruction associated with such phenomena is the result of some secondary event, e.g. fallen power lines, ruptured tanks valves, pipes etc. If reasonable warning of an approaching disaster is received, efforts can be made to minimize damage by taking specific preventative measures. These measures are outlined in the following procedures.

1. Consult the Site Supervisor for guidance and proceed according to his direction. **SEE SITE SPECIFIC POTENTIAL HAZARDS APPENDIX 10**
2. If so directed, notify key personnel regarding the action being taken.
3. Collect important files, records and papers for safekeeping.
4. Open main electrical breaker to cut off all power to the site. (The main breaker is marked for easy identification).
5. Secure all buildings and equipment and lock the site gate.
6. Evacuate the site taking mobile equipment to safety.
7. Post Guards on site access routes to monitor the activities of unauthorized personnel.
8. A report of the incident must be submitted to the Area Manager within 24 hours.

10.1 PREVENTIVE MEASURES

10.2 Waste Disposal Permits

If nitrate waste is generated, a disposal permit must be obtained and kept up to date if the product will be disposed of off-site, or in mine tailings. Permits to dispose of other collected waste in the event of spills or leaks (such as described in Section 6.3) must also be obtained in consultation with mine / provincial environmental representatives

10.3 Liquid Containment

All fuel / oil storage tanks must be dyked according to the provisions of Federal and/or Provincial regulations (eg. National Fire Code, Environmental Protection Act), or have a double-walled tank.

A plan must be in place and materials on hand to create a dyke in the event of a large fuel or solution leak or spill or other emergency spill situation.

10.4 Inspection

All site emergency storage areas and equipment must be inspected monthly by qualified personnel, monthly for physical condition and serviceability, and the results recorded according to quality and safety standard operating procedures.

All recommendations/orders made by NRC Explosives Branch inspectors, Fire Marshals and insurance inspectors must be responded to and acted upon accordingly. Copies of their reports are to be forwarded to DNCI's HSE representative for the region.

10.5 **Maintenance**
All preventive and breakdown maintenance must be carried out and recorded in accordance with standard operating procedures.

11.0 WORK SITE START UP (Restoration of Business)

11.1 Before startup, the condition prompting the shutdown / closure must be over / corrected (i.e. flood, fire, explosion or blizzard).

11.2 All decontamination procedures must be followed and the site cleared and cleaned of any environmental waste hazards.

11.3 All repairs to plant equipment involving safety shutdowns and essential operating machinery must be completed.

11.4 All electrical circuits, plumbing and piping must be tested.

11.5 The Work Site Supervisor / Manager will ensure that all lockout and tag-out procedures have been followed and signed off.

11.6 The Work Site Supervisor / Manager will start up the facility by turning on individual switches to the components that have been shutdown.

11.7 Operational checks will be done to ensure that all equipment is functioning at safe working pressures and voltage.

11.8 The Work Site Supervisor / Manager will give the verbal "all clear" before workers will be allowed to return to work.

11.9 The Work Site Supervisor / Manager or one of their delegates will cancel / remove all roadblocks, terminate evacuation activities, and notify employees to return to normal activities.

APPENDIX 1

Basic Investigation Report

(Factual Report not prepared Under Legal Professional Privilege)

Incident Title	
Incident No.	
Incident Date	
Site	
Department / Location	
Report Author	
Report Date	
Investigation Manager	
Investigation Team Members	
Report Distribution	

Who was involved? **name, job, title**
When did it happen? **date & exact time**
Where did it happen? **The exact location**
What was the person doing at the time? **What product or equipment was involved**
What went wrong? **Not your opinion, only factual information. Eg: an operator fell off a ladder, the hose broke; spill / quantity**
What happened? **Describe the sequence and timing of events**
Immediate Control Actions **What first aid treatment was given and or actions taken (valve turned off, electricity isolated) immediately after the incident to make the situation safe**
Interim Control Action **The interim corrective actions to prevent re-occurrence**

5-Why Analysis - Consolidate the information above into a flow chart Double click on chart to enter visio and update as required

Contributing factors **What factors combined to make the situation unsafe – in descending order of importance**
Root Cause **What were the root causes identified in the 5Why analysis – in descending order of importance**

Corrective Action	**Who**	Due Date

Comments

APPENDIX 2

DNCI Corporate contact

Name	Position	Cell number
Benoit Choquette	Environmental Manager - Canada	(514) 246-6285
Seamus Kilcommons	H&S Manager Western Canada	(403) 815-4066
Tim Marles	H&S Advisor Artic	(403) 723-7540
Willard Pierce	Regional Manager West/ Central Canada	(403) 836-9029
Hubert Fafard	H&S Manager Eastern Canada	(418) 570-9257
Greg Brown	Sales Manager Western	(403) 512-5127
Ralph Olson	Operations Manager of Western Canada	(250) 713-8720
Randy Armella	Bulk Operations Manager	(780) 865-6580
Rick Chopp	H&S Manager – Central Canada	(705) 498-2855
Pierre St Georges	Regulatory Affairs Coordinator	(613) 677-1051
Cory Redwood	General Manager Western Canada	(867) 444-8533

APPENDIX 3

DNCI Emergency Response Advisors (ERA) per area

Name	Position	Cell number	Area (West, Central or East)
Tom Medak	Mgr, Bulk operations	(403) 818-4434	West / Arctic
Dennis Wall & Doug Robertson	Meadowbank Operations Supervisors	(867) 793-4610 opt 2 ext 6804 Cell (867) 222-3930	Arctic
Seamus Kilcommons	H&S Manager Western Canda	(403) 815-4066	West
Tim Marles	H&S Advisor Arctic	(403) 723-7540 office	Artic
Tyrone McClean	Operations manager, Manitoba and Saskatchewan	(204) 687-0046	Central
Corey Rachuk	Plant Supervisor – Flin Flon	(204) 687-0028	Central
Joss Forget	Operations Manager Northern Ontario	(705) 471- 8745	East
David Roy	Manager Plant operations	(418) 570-5604	East
Francois Lambert	Operations Manager	(514) 212-3490	East
Daniel Roy	Dyno Consult , Ste-Sophie	(514) 213-5889	East

APPENDIX 4
SITE: QAAQTUQ / Meadowbank Operations

MANAGEMENT AND WORK SITE CONTACT LIST

NAME	TITLE	BUSINESS PHONE	2 WAY RADIO	CELL PHONE
Dennis Wall	Site Supervisor	(867)793-4610 opt#2 ext 6804		(867) 222-3930
Doug Robertson	Site Supervisor	((867)793-4610 opt#2 ext 6804		(867) 222-3930
Tom Medak	Bulk Manager	(403) 236-9160		(403) 818-4434
Tim Marles	H&S Advisor Arctic	403 723-7540		TBA
Seamus Kilcommons	H&S Manager	(403) 236-9160		(403) 815-4066
Benoit Choquette	Environmental Manager	(450) 818-7176		(514) 249-6285
Pierre St George	Regulatory Affairs Coordinator	(613) 632-5844		(613) 677-1051

Agnico-Eagle Mines Ltd. – Meadowbank WORK SITE CONTACT LIST

NAME	TITLE	BUSINESS PHONE	2 WAY RADIO	CELL PHONE
Meadowbank Mine		(867)793-4610		
Julie Belanger	Agnico-Eagle	(867)793-4610 ext 6721		

EXTERNAL CONTACT NUMBERS

ORGANIZATION/CONTACT	LOCATION	PHONE NUMBER
NT Oil & Chemical Spills	Iqaluit, NU	(867) 979-8130
Environment Canada, NT	Yellowknife, NT	(867) 669-4700
NRC / Explosives Branch	Ottawa	(613) 995-5555
RCMP	Baker Lake, NU	(867) 793-1111 or (867)-793-0123
RCMP 'G' Division	Yellowknife, NT	(867)669-5100

APPENDIX 5

Area Office Address:	**Type of Facility:**
Agnico-Eagle Mines Ltd. - Meadowbank	Bulk Explosives Site

PO BOX 540
Baker Lake, Nunavut
X0C 0A0

Customer/Client Information:
Customer: Agnico-Eagle
Contact:
Title:

Evacuation and Emergency Meeting Place Upon Evacuation:
As identified on site orientation forms (Designated Muster Points)

Emergency Shutdown switch location:

"ONLY A CERTIFIED PERSONELLE ARE TO ACTIVATE THIS SWITCH"

Magazine and Plant Site Address:	**NRC License:**

Agnico-Eagle Meadowbank Mine

Site Plan and Evacuation Route:
Posted in site offices – site specific orientations required

Site Rescue Plans:
Site Supervisor or designate to conduct review of attendance sheet. If employees, visitors or contractors are unaccounted for, Site Supervisor will advise mine LPO of unaccounted persons and last known location. Site Supervisor shall attend last known location with mine rescue team and jointly determine potential hazards of re-entering area to locate unaccounted for persons. Site Supervisor and Rescue team entering the evacuated area must don all required PPE due to unknown potential dangers that may have come about. Proper fire retardant suits, SCBA and/or other PPE as determine by the site to protect rescuers from becoming overcome by physical, chemical or other hazards. If determined safe to enter site and/ or buildings, a counter clockwise sweep of the area is to be conducted.

Medical Emergencies: In the unlikely event of a medical emergency, the site shall ensure that it is compliant to OH&S Code. As per legislation requirements, the site shall have adequate first aiders and equipment to attend to individuals as required.

All incidents, first aid/ medical treatment/property damage/near miss or other, shall be in compliance with HSE MS Standard 9.2, which meets or exceeds legislative requirments.

Site First Aiders:	LOCATION	PHONE NUMBER
TBA		
Security (Mine Emergency Services –fire, EMS)		

Emergency Equipment On Hand:
Fire Extinguishers, Spill Kits, First Aid Kits, non-sparking shovels as outlined in site plan.

Delivery Vehicles:

Unit #	Vehicle	(EVC/ETP) TC Permit #	Carrying Capacity (80% of Max.)

APPENDIX 6
BOMB THREAT CHECKLIST

Exact time of call:
Exact words of caller:
QUESTIONS TO ASK
1- When is bomb going to explode?
2- Where is the bomb?
3- What does it look like?
4- What kind of bomb is it?
5-What will cause it to explode?
6- Did you place the bomb?
7- Why?
8- Where are you calling from?
9- What is your address?
10- What is your name?

CALLER'S VOICE (circle)

1-	Calm	Slow	Crying	Slurred
2-	Stutter	Deep	Loud	Broken
3-	Giggling	Accent	Angry	Rapid
4-	Stressed	Nasal	Lisp	Excited
5-	Disguised	Sincere	Squeaky	Normal

If voice is familiar, whom did it sound like?	
Were there any background noises?	
Remarks:	
Person receiving call:	Telephone number call received at:
Date:	Report call immediately to:

APPENDIX 7

Dyno Nobel Inc.
JOB-SPECIFIC ORIENTATION CHECKLIST

(Modify as needed to meet site-specific needs)
Employee Name: Job Title:
Location: Hire Date:

CHECK COMPLETED ITEMS. FOR ALL ITEMS THAT ARE NOT APPLICABLE, ENTER "NA" ON THE LINE RETURN COMPLETED AND SIGNED CHECKLIST TO APPROPRIATE HR REPRESENTATIVE

1. JOB SPECIFIC ORIENTATION TO DNA WORK SITE(S)

a. ____ DN Safety & Quality Policy
b. ____ General Safety Rules
c. ____ Site Specific Safety Rules and Instructions
d. ____ Products and Services
e. ____ Tour of Site
f. ____ Rest Rooms, Lockers, Eating Areas
g. ____ Dress and Uniform Standards
h. ____ Personal Protective Equipment
i. ____ First Aid Procedures
j. ____ How to Report Near-Misses and Accidents
k. ____ Workers' Compensation and Return to Work
l. ____ Smoking Policy and Designated Areas
m. ____ Drug and Alcohol Policy
n. ____ Site Emergency and Evacuation Plans
o. ____ Fire Extinguishers
p. ____ DN Crisis Communication Plan
q. ____ Parking and Traffic Plan
r. ____ Security Issues
s. ____ Electrical Hazards
t. ____ Review Job Description
u. ____ Take 5 Program
v. ____ Site Specific SOPs

2. OCCUPATIONAL HEALTH AND SAFETY ACT - REGULATION (OHSA)

a. ____ Mobile Equipment (Forklifts/Bobcats)
b. ____ Review Site MSDS
c. ____ Confined Spaces
d. ____ Lockout/Tagout
e. ____ DNA Hearing Conservation
f. ____ Bloodborne Pathogens
g. ____ Worker's Rights

3. ENVIRONMENT CANADA

a. ____ Spill/Release Reporting
b. ____ Proper disposal of Waste
c. ____ Waste Minimization/Pollution Prevention
d. ____ Used Oil Management
e. ____ Drum/Container Management

4. TRANSPORTATION CANADA (TDG)

a. ____ Road Test
b. ____ TDG Transportation
c. ____ TDG Hours of Service Policy
d. ____ Pre and Post Inspections

5. NATURAL RESOURCES CANADA, EXPLOSIVES SAFETY AND SECURITY BRANCH

a. ____ Site Security Plans / Key Policy
b. ____ Magazine Rules
c. ____ Inventory Accuracy
d. ____ Guidelines for bulk explosive facilities

6. QUESTIONS AND SUMMARY

_
__
_ Ask employee if there are any questions or areas of employment not clearly understood. Advise employee what's next.
Comments
: ____

__________________________________ ____________ ________________________________ _____________ Employee
Signature Date Trainer/Supervisor Signature Date

Job Specific Orientation Page 1 of 1 Canadian Standard Revised 12/17/09

APPENDIX 8

ANNUAL FIRE DEPARTMENT REVIEW FORM

Information to be released to Emergency Services

From: Local Emergency Services

Subject: Emergency Response Plan for ______________________________.

The following is a copy of the Emergency Response Plan that has been prepared by Dyno Nobel Inc. Has been received from _________________ operations. The ERP has been discussed and being kept on file for future reference. If questions arise, we have been given the contact information for the __________________________ operations staff.

Signed:_______________________________________

Position:______________________________________

Date:____

EMERGENCY RESPONSE REPORT/DEBRIEF TEMPLATE (found in NEXUS Std 9.1)

Site:... **Date**: .... **Drill or Actual Event** (circle)

Emergency Call placed with: Mine Emergency ☐ 911 ☐

Supervisor/Manager Advised: ☐

Incident Details:

Sequence of Events

Time	Activity	By

Gaps Identified:

	Details of Gaps Identified	*Action Required
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		

A report should be raised in SHAERS/ICARUS listing all gaps identified and action required.

Fax completed form to Health & Safety Advisor for your site

APPENDIX 9
Transportation of Dangerous Goods Regulation
Class Quantity Emission Limit

1	Any quantity that could pose a danger to public safety or 50 kg
2	Any quantity that could pose a danger to public safety or any sustained release of 10 minutes or more
3	200 L
4	25 kg
5.1	50 kg or 50 L
5.2	1 kg or 1 L
6.1	5 kg or 5 L
6.2	Any quantity that could pose a danger to public safety or 1 kg or 1 L
7	Any quantity that could pose a danger to public safety. An emission level greater than the level established in section 20 of the *Packaging and Transport of Nuclear Substances Regulations*
8	5 kg or 5 L
9	25 kg or 25 L

Table identified in Section 8.1(1) of Part 8 of the Transportation of Dangerous Goods Regulation Class Quantity Emission Limit

APPENDIX 10

Emergency Risk Assessment

Site Emergency Response Plan should be based upon a risk assessment of all types of probable emergencies and regulatory impact (as found in NEXUS Std 9.1)

Location Date Analysis Completed Completed by:

Emergency Type	Scenario(s)	Safeguards	Historical Frequency	Future Risk Potential	Loss Severity Rate	Probable Emergency 8+ to be in plan	Regulatory Notifications	Actions / Remarks
Bomb Threat								
Chemical Spill/Release								
Security								
Explosion								
Fire								
Loss/Theft of Explosives								
Equipment								
Process Loss/Interruption								
Catastrophic Injury/Illness								
Trespassing/Vandalism								
Extreme Temperatures								
Earthquake								
Hurricane								
Tornado								
Severe Flooding								
OFF SITE								
Blast Site Incident								
Fire (Forest/Brush)								
Neighboring Facility Incident								
Transportation Vehicle Accident								
Transportation Fire/Explosion Incident								
Transportation Chemical Spill								
Transportation Vehicle Breakdown								

Emergency Assessment Score Information **- Use to evaluate Emergency Type level of risk**

Historical Frequency	Score	Future Risk Potential	Score	Loss Severity Rate	Score	Probability Total A & B (8+) to be in plan
Several Time per Year	5	Several Time per Year	5	Catastrophic	5	
One Time per Year	4	One Time per Year	4	Major/Critical	4	12 or higher
Once Every 3-5 Years	3	Once Every 3-5 Years	3	Serious	3	8-11
Less than Once Every 10 Yrs	2	Less than Once Every 10 Yrs	2	Negligible- No Loss	2	Less and 8
Very Unlikely to Happen Ever	1	Very Unlikely to Happen Ever	1	No Loss Occurrence	1	

APPENDIX 5

MSDS FOR BULK EMULATION AND PRESPLIT

1. MSDS – Dyno Gold Lite Bulk Emulsion

2. MSDS – Detagel Presplit

Material Safety Data Sheet

Dyno Nobel Inc.
2650 Decker Lake Boulevard, Suite 300
Salt Lake City, Utah 84119
Phone: 801-364-4800 Fax: 801-321-6703
E-Mail: dnna.hse@am.dynonobel.com
FOR 24 HOUR EMERGENCY, CALL CHEMTREC (USA) 800-424-9300
CANUTEC (CANADA) 613-996-6666

MSDS # 1052
Date [redacted]

Supercedes
MSDS # 1052 03/21/05
Added Dyno® RG3

SECTION I - PRODUCT IDENTIFICATION

Trade Name(s):
DYNO GOLD® C, DYNOGOLD® C EXTRA
DYNO GOLD® C LITE, DYNO GOLD® C LITE SUPER
DYNO GOLD® CS LITE
DYNO GOLD®, DYNO GOLD® LITE
DYNO GOLD® B, DYNO GOLD® B LITE
HD
1116, 1126P, 1136P, 1146P
IREMEX 362, IREMEX 562, IREMEX 762, IREMEX 764
RJ5
RG1-A
RUG-1 (Canada Only)
DX 5007; DX 5010
DX 5013; DX 5013G; DX 5013 PB
TITAN®XL1000
TITAN® 1000, TITAN® 1000 G, TITAN® PB 1000
DYNO® RG3

Product Class: Bulk Emulsion

Product Appearance & Odor: Translucent to opaque, viscous liquid. May be silvery in color. May have fuel odor.

DOT Hazard Shipping Description:
As Transported:
Oxidizing Liquid, n.o.s. (Ammonium Nitrate) 5.1 UN3139 II
After Blending with Density Control Agent On-site:
Explosive, Blasting, Type E 1.5D UN0332 II

NFPA Hazard Classification: Not Applicable (See Section IV - Special Fire Fighting Procedures)

SECTION II - HAZARDOUS INGREDIENTS

Ingredients:	CAS#	% (Range)	ACGIH TLV-TWA
Ammonium Nitrate	6484-52-2	30-80	No Value Established
Sodium Nitrate[1*]	7631-99-4	0-15	No Value Established
Calcium Nitrate	10124-37-5	0-35	No Value Established
Fuel Oil	68476-34-6	0-10	100 ppm
Mineral Oil	64742-35-4	0-7	5 mg/m^3
Aluminum *	7429-90-5	0-5	10 mg/m^3

Material Safety Data Sheet

[1] Our source of Sodium Nitrate (Chilean) may contain perchlorate ion, which occurs naturally. Although Dyno Nobel does not analyze for the presence of perchlorate anion, based on published studies, the products listed above may contain between 0 and 300 ppm perchlorate.
* The hazardous ingredients marked with an asterisk are not found in the majority of listed products.

Ingredients, other than those mentioned above, as used in this product are not hazardous as defined under current Department of Labor regulations, or are present in deminimus concentrations (less than 0.1% for carcinogens, less than 1.0% for other hazardous materials).

SECTION III - PHYSICAL DATA

Boiling Point: Not Applicable
Vapor Density: (Air = 1) Not Applicable
Percent Volatile by Volume: <30

Evaporation Rate (Butyl Acetate = 1): <1

Vapor Pressure: Not Applicable
Density: 0.8 - 1.5 g/cc
Solubility in Water: Nitrate salts are completely soluble, but emulsion dissolution is very slow.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: Not Applicable
Flammable Limits: Not Applicable
Extinguishing Media: (See Special Fire Fighting Procedures Section)
Special Fire Fighting Procedures: Do not attempt to fight fires involving explosive materials or emulsion explosive precursors. Evacuate all personnel to a predetermined safe location, no less than 2,500 feet in all directions.
Unusual Fire and Explosion Hazards: May explode or detonate under fire conditions. Burning material may produce toxic vapors.

SECTION V - HEALTH HAZARD DATA

Effects of Overexposure

Eyes: Can cause irritation, redness and tearing.
Skin: Prolonged contact may cause irritation.
Ingestion: Large amounts may be harmful if swallowed.
Inhalation: May cause dizziness, nausea or intestinal upset.
Systemic or Other Effects: *Perchlorate*: Perchlorate can potentially inhibit iodide uptake by the thyroid and result in a decrease in thyroid hormone. The National Academy of Sciences (NAS) has reviewed the toxicity of perchlorate and has concluded that even the most sensitive populations could ingest up to 0.7 microgram perchlorate per kilogram of body weight per day without adversely affecting health. The USEPA must establish a maximum contaminant level (MCL) for perchlorate in drinking water by 2007, and this study by NAS may result in a recommendation of about 20 ppb for the MCL.

Emergency and First Aid Procedures

Eyes: Irrigate with running water for at least fifteen minutes. If irritation persists, seek medical attention.
Skin: Remove contaminated clothing. Wash with soap and water.
Ingestion: Seek medical attention.
Inhalation: Remove to fresh air. If irritation persists, seek medical attention.
Special Considerations: None.

SECTION VI - REACTIVITY DATA

Stability: Stable under normal conditions. May explode when subjected to fire, supersonic shock or high-energy projectile impact, especially when confined or in large quantities.
Conditions to Avoid: Keep away from heat, flame, ignition sources and strong shock.
Materials to Avoid (Incompatibility): Corrosives (strong acids and strong bases or alkalis).
Hazardous Decomposition Products: Nitrogen Oxides (NO_X), Carbon Monoxide (CO)
Hazardous Polymerization: Will not occur.

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Protect from all ignition sources. In case of fire evacuate area not less than 2,500 feet in all directions. Notify authorities in accordance with emergency response procedures. Only personnel trained in emergency response should respond. If no fire danger is present, and product is undamaged and/or uncontaminated, repackage product in original packaging or other clean DOT approved container. Ensure that a complete account of product has been made and is verified. Follow applicable Federal, State and local spill reporting requirements.
Waste Disposal Method: Disposal must comply with Federal, State and local regulations. If product becomes a waste, it is potentially regulated as a hazardous waste as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR, part 261. Review disposal requirements with a person knowledgeable with applicable environmental law (RCRA) before disposing of any explosive material.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Ventilation: Not required for normal handling.
Respiratory Protection: None normally required.
Protective Clothing: Gloves and work clothing that reduce skin contact are suggested.
Eye Protection: Safety glasses are recommended.
Other Precautions Required: None.

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in handling and storage: Store in cool, dry, well-ventilated location. Store in compliance with Federal, State and local regulations. Keep away from heat, flame, ignition sources and strong shock.
Precautions to be taken during use: Avoid breathing the fumes or gases from detonation of explosives. Use accepted safe industry practices when using explosive materials. Unintended detonation of explosives or explosive devices can cause serious injury or death.
Other Precautions: It is recommended that users of explosives material be familiar with the Institute of Makers of Explosives Safety Library publications.

SECTION X - SPECIAL INFORMATION

The reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372 may become applicable if the physical state of this product is changed to an aqueous solution. If an aqueous solution of this product is manufactured, processed, or otherwise used, the nitrate compounds category and ammonia listings of the previously referenced regulation should be reviewed.

Material Safety Data Sheet

Disclaimer

Dyno Nobel Inc. and its subsidiaries disclaim any warranties with respect to this product, the safety or suitability thereof, the information contained herein, or the results to be obtained, whether express or implied, INCLUDING WITHOUT LIMITATION, ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE AND/OR OTHER WARRANTY. The information contained herein is provided for reference purposes only and is intended only for persons having relevant technical skills. Because conditions and manner of use are outside of our control, the user is responsible for determining the conditions of safe use of the product. Buyers and users assume all risk, responsibility and liability whatsoever from any and all injuries (including death), losses, or damages to persons or property arising from the use of this product or information. Under no circumstances shall either Dyno Nobel Inc. or any of its subsidiaries be liable for special, consequential or incidental damages or for anticipated loss of profits.

Detagel Presplit

Material Safety Data Sheet

5700 N. Portland, Suite 301 / Oklahoma City, OK 73112 / Phone: (405) 947-0765 / Fax: (405) 947-0768

SECTION 1 - PRODUCT INFORMATION

TRADE NAME:	Presplit
SYNONYM:	NA
CHEMICAL FAMILY:	Watergel Slurry High Explosive
FORMULA:	Mixture
CAS NUMBER:	None
UN/NA NUMBER:	UN0241
DOT HAZARD CLASS:	Explosive, Blasting, Type E, Class 1.1 D

SECTION 2 - HEALTH ALERT

DANGER - If misused or disposed of improperly, material could explode and cause death or serious injury.
DO NOT HANDLE WHEN IN DOUBT!!
See section VIII - Personal Protection
CHEM-TEL, INC. (800) 255-3924.

SECTION 3 - HEALTH HAZARD INFORMATION

EYE: May cause moderate irritation.
SKIN: May cause moderate irritation characterized my redness and/or rash.
INHALATION: Inhalation of decomposed products may irritate the respiratory tract. Prolonged exposure to these fumes may result in respiratory difficulties (shortness of breath, etc.) and possibly more severe toxic effects.
INGESTION: Swallowing large quantities may cause toxicity characterized by dizziness, bluish skin coloration, methemoglobinemia, unconsciousness, abdominal spasms, nausea, and pain.

SECTION 4 - EMERGENCY AND FIRST AID PROCEDURES

EYE CONTACT: Flush with large amounts of water. Seek medical aid.
SKIN CONTACT :Remove contaminated clothing. Wash skin thoroughly with soap and water.
INHALATION: Remove from exposure. If breathing stops or is difficult, administer artificial respiration or oxygen. Seek medical aid.
INGESTION: Give 8-16 oz. of milk or water. Induce vomiting. Seek medical aid.

SECTION 5 - RECOMMENDED OCCUPATIONAL EXPOSURE LIMIT/ HAZARDOUS INGREDIENTS
EXPOSURE LIMIT (PRODUCT): None required for product. *React to form Hexaminedinitrate

HAZARDOUS INGREDIENTS:	PERCENT	EXPOSURE LIMIT	PPM	MG/M3
Ammonium Nitrate	<65%	NONE		
Sodium Nitrate	<20%	NONE		
Sodium Perchlorate	<7%	NONE		
Nitric Acid*	<5%	ACGIH - TLV	2	5
Hexamine*	<15%	NONE		
Aluminum	<7%	ACGIH - TLV		
Pentaerythritol Tetranitrate	<2%	NONE		

NOTE: All ingredients are present in a gelled slurry matrix and individual hazard may not be present in this formulation.

SECTION 6 - REACTIVITY DATA

CONDITIONS CONTRIBUTING TO INSTABILITY: Heat (confinement); Stacking (burning).
INCOMPATIBILITY: Can react violently or explode, with reducing agents and organic materials. Avoid amines, strong alkalies & acids. ***HAZARDOUS REACTION / DECOMPOSITION PRODUCTS:*** At high temperatures, especially >374 F, may emit severe toxic fumes of nitrogen oxides. ***CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION:*** Not applicable.

SECTION 7 - FIRE AND EXPLOSION HAZARD INFORMATION

FLASH POINT & METHOD: NA ***AUTO IGNITION TEMPERATURE:*** Explodes ***FLAMMABLE LIMITS (% BY VOLUME/AIR): LOWER:*** NA ***UPPER:*** NA ***EXTINGUISHING MEDIA:*** Water ***FIRE-FIGHTING PROCEDURES:*** When explosive is burning, ***EVACUATE AREA.*** Avoid breathing vapor. Don't disturb fire, as dusty cloud containing aluminum may form explosive mixture with air. ***FIRE & EXPLOSION HAZARDS:*** Dangerous when exposed to heat or flame. Can support combustion of other materials involved in a fire and is capable of undergoing detonation if heated to high temperatures, especially under confinement including being piled on itself in a burning fire. When heated to decomposition, highly toxic fumes may be emitted. Do not return to area of explosion until smoke and fumes have dissipated. Dry alkali or amine salts are explosive.

Detagel Presplit

Material Safety Data Sheet

SECTION 7 - FIRE AND EXPLOSION HAZARD INFORMATION (con't.)

Internally, product contains detonating cord, consisting of flexible cord with and explosive core of PETN (pentaerythritol tetranitrate) within a textile casing covered by a seamless polyethylene jacket. This portion, if removed from the cartridge, may explode when subjected to fire or shock. PETN crystals, if separated or spilled, are substantially more sensitive to initiation by impact and friction than other components of the product, and care should be taken to avoid shock, friction, and excessive heat.

SECTION 8 - PERSONAL PROTECTION INFORMATION

EYE PROTECTION: Safety goggles approved for the handling of explosives materials.
SKIN PROTECTION: Neoprene, natural rubber, polyethylene or polyvinyl chloride gloves. Use barrier creams, hand protection and protective clothing. ***RESPIRATORY PROTECTION:*** Not normally required. Mechanical filter or supplied air type respirator as required for concentrations exceeding the occupational exposure limit.
VENTILATION: Maintain adequate ventilation. Use local exhaust if needed.

SECTION 9 - PERSONAL HANDLING INSTRUCTIONS

HANDLING: Explosives should not be abandoned at any location for any reason. Do not handle during electrical storms.
STORAGE: Store in a cool, dry, well-ventilated area remote from operations. Storage area should be of non-combustible construction and in accordance with appropriate BATF regulations. Organic materials, flammable substances and finely divided metals should be stored separately. Flames, smoking and unauthorized personnel are prohibited where this product is used or stored. Protect against physical damage, static electricity and lightning.
WARNING: Use of this product by persons lacking adequate training, experience and supervision may result in death or serious injury. Obey all Federal, State, and local laws / regulations applicable to transportation, storage, handling, and use of explosives.
DISTANCE: Always stay from area of explosion or disposal sites. Stay behind suitable barriers.

SECTION 10 - SPILL & LEAK PROCEDURES

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED (IN ADDITION, SEE SECTION 8): Isolate area. Eliminate ALL sources of ignition. Avoid skin contact. Scrape up. Remove soiled clothing.
WASTE DISPOSAL - USE APPROPRIATE METHOD(S): Disposal of unexploded or deteriorated explosives material can be hazardous. Expert assistance is positively recommended in destroying explosives. Accidents can be prevented by thorough planning and handling in accordance with approved methods. Consult your supervisor, or the nearest SEC Regional Office for assistance. If improperly disposed of, material could explode and cause death or serious injury.

In all cases, follow facility emergency response procedures. Contact Facility Environmental Manager for assistance. Report any discharge of oil or hazardous substance that may enter surface waters to the National Response
Center (800) 424 - 8802.

Observe all applicable local, state, and federal environmental spill and water quality regulations.

SECTION 11 - PHYSICAL DATA

BOILING POINT: NA ***BULK DENSITY:*** 1.25 g/cc ***MELTING POINT:*** NA ***%VOLATILE BY VOLUME:*** NA
VAPOR PRESSURE: NA ***EVAPORATION RATE (ETHER=1):*** NA ***SOLUBILITY IN WATER:*** Negligible with short term exposure
APPEARANCE/ ODOR: Odorless ,gray/white gel packaged in polyethylene cartridges ***DECOMPOSITION POINT:*** 200 C

SECTION 12 - COMMENTS

This product is classified as a Class 1.1D High Explosive and must be stored in a high explosive magazine. Storage should be in a well constructed, well ventilated, dry structure located to conform with local, state, and federal regulations. The area surrounding an explosive magazine must be kept clear of combustible materials for a distance of 50 feet. Magazine floors and containers must be properly cleaned. Normal operating conditions are assumed unless otherwise stated. If any given information is not clear or does not apply to your situation, STOP, store the material suitably, and seek correct help from your supervisors, Institute of Makers of Explosives or Slurry Explosive Corporation.

Disposal sites must be clear of people at the time of disposal.

NOTICE: The data and recommendations presented herein are based upon data which are considered to be accurate. However, SEC makes no guarantee or warranty, either expressed or implied, of the accuracy or completeness of these data and recommendations. For more detailed information on the hazards of this product, contact the Regulatory Compliance Department at the address below:

Slurry Explosive Corporation
P. O. Box 348
Columbus, Kansas 66725
(620) 597-2552

Revised 6-2001

APPENDIX 6

EMULSION PLAN / BLAST AREA INSPECTION SHEET

Environmental Inspection Report for the Emulsion Plant Area and the Loading of Blast Holes

Date: **Inspected By:**

Location: Emulsion Plant

Weekly Inspection

In Compliance with	Subject	Conform	Non-conform	N/A	Comments
NWB Part B Item 15	Sign posted to inform of a waste disposal facility				
NWB Part D Item 29 MBK SCP NIRB Condition 26	Are there any visual spills?				
NWB Part F Item 19	All Hazardous Waste disposal is located 30m from the ordinary high water mark.				
NWB Part H Item 3	Resources in place to prevent any chemicals, petroleum products, or unauthorized Wastes from entering a water body.				
NWB Part H Item 4 Ammonia Management Plan	Is secondary containment for chemical storage provided.				
NWB Part I Item 9	Monitoring signs are posted in English, French, and Inuktitut.				
MBK SCP	Spill Kits Present				
NIRB Condition 26	Ensure that spills, if any, are cleaned up immediately and that the site is kept clean of debris, including wind-blown debris.				
NIRB Condition 25	Management and control waste in a manner that reduces or eliminates the attraction to carnivores and/or raptors.				

NIRB Condition 27 Ammonia Management Plan	Ensure the hazardous material are contained using environmentally protective methods based on practical best management practices				
	Are storage containers clearly labelled to identify Hazardous substance?				
Ammonia Management Plan	Are storage containers in good condition? Is there any visible damage or leaks? Can the doors be sealed shut?				
Ammonia Management Plan	Where necessary – Are containers with product stored in an upright position?				
Ammonia Management Plan	Do you see any potential environmental hazards posed by these HAZARDOUS containers/materials?				
BMP	Are there any additional environmental hazards/potential impacts that require attention?				
MINE ACT	Are there any Health and Safety issues that should be addressed to prevent injury to workers?				

Pit Location: **Blast Pattern#**

In Compliance with	Subject	Conform	Non-conform	N/A	Comments
NWB Part D Item 29 MBK SCP NIRB Condition 26	Are there any visual spills, including emulsion?				
Ammonia Management Plan	Is there presence of Emulsion outside of the holes that are being loaded?				
NWB Part F Item 19	All Hazardous Waste disposal is located 30m from the ordinary high water mark.				

NWB Part H Item 3	Resources in place to prevent any chemicals, petroleum products, or unauthorized Wastes from entering a water body.				
NWB Part H Item 4 Ammonia Management Plan	Is secondary containment for chemical storage provided?				
NIRB Condition 27 Ammonia Management Plan	Ensure the hazardous material are contained using environmentally protective methods based on practical best management practices				

Comments/Recommendations:

Environmental Personnel Name:
Signature: ____

Actions Corrected:
____
____
____
____
____

Site Service Supervisor Name: ____

Signature: ____

Picture 1:

Picture 2:

Picture 3:

APPENDIX F – TECHNICAL MEMORANDUM INVESTIGATION CENTRAL DIKE

Golder Associés

TECHNICAL MEMORANDUM

DATE November 5, 2015 **REFERENCE No.** 1529941 - Doc. No1528 Rev 0

CONFIDENTIAL

TO Ms. Julie Bélanger and Mr. Thomas Lepine
Agnico Eagle Mines Ltd

FROM Michael Angelopoulos, Yves Boulianne, and Paul M. Bedell **EMAIL** yboulianne@golder.com

RE : CENTRAL DIKE SEEPAGE MODELLING AND STABILITY ASSESSMENT, MEADOWBANK GOLD PROJECT

1.0 INTRODUCTION

As requested by Agnico Eagle Mines Ltd (AEM), Golder Associés Ltée (Golder) is pleased to submit this technical memorandum that summarizes the key results and recommendations for the mandate entitled "Central Dike Seepage Action Plan" awarded on August 7, 2015. The seepage modelling and stability assessment was undertaken to confirm the stability of the Central Dike after higher-than-expected seepage rates were identified by AEM in August 2015.

The work also provides an up-to-date evaluation of the potential seepage mechanisms resulting in the ponding observed at the downstream toe of the Central Dike and the potential impacts of seepage on the foundation and physical stability of the Central Dike for current, intermediate, and expected closure conditions. The work is based on the mandate requirements, as well as modifications to the mandate requirements, based on the outcomes of various phone meetings held between AEM and Golder that took place during the course of the project between August 10 and September 18, 2015.

This technical memorandum is a follow-up study of the preliminary work that was conducted by Golder in February 2015 and documented in "Central Dike Seepage Update and Design Assessment" issued to AEM by email on March 20, 2015 (Golder Associates Ltd., 2015). Based on the data available and the analysis conducted at the time, it was concluded that the pond at the downstream toe of the Central Dike was likely due to the combined effects of seepage through the till and fractures in the bedrock as well as the presence of an impermeable permafrost barrier along the western wall of the Portage Pit. Despite the ponding of water at the downstream toe of the dike, Golder determined the risk of internal erosion that could lead to destabilization of the foundation to be low for the seepage conditions modelled. It is to be noted that no seepage flow estimate was available at the time of this first assessment because of the frozen conditions of the downstream pond.

Since February 2015, AEM has collected additional data, including subsequent instrumentation responses to the South Cell and downstream water levels, water quality monitoring, and measured discharge rates at the downstream toe of the Central Dike from steady-state pumping tests. In addition, AEM carried out a geophysical survey in an attempt to identify concentrated flow path.

Based on the data collected following February 2015, Golder carried out a re-evaluation of the Central Dike seepage and assessed the stability of the structure. To assess the impact of a potential seepage on internal erosion of the foundation soils and the physical stability of the dike, Golder carried out a review of the geotechnical instrumentation data (thermistor cables and piezometers) as well as two-dimensional seepage modelling using SEEP/W (GEO-SLOPE International Ltd., 2010).

2.0 DESIGN BASIS PRÉCIS

The purpose of the Central Dike is to provide containment of tailings during operation and into the post-closure period. The Central Dike is also required to limit seepage to the Portage Pit such that mining operations are not adversely affected. The Central Dike is a zoned granular structure with an upstream linear low-density polyethylene (LLDPE) liner to reduce seepage through the structure. The proper management of tailings and water to develop long beaches and maintain the pond away from the structure are requirements of the design.

According to the design basis presented in the detailed design report for the Central Dike (Golder Associates Ltd., 2012), the seepage rate through the Central Dike was expected to increase over time from the start of operations to the end of operations in 2017. The calculated seepage rate ranged from approximately 40 to 100 m^3/hr; these seepage rates were determined to be manageable by AEM by pumping from the Portage Pit. The models used for the calculations included an unfrozen boundary condition at Portage Pit which, coupled with the high hydraulic conductivity of the upper bedrock, meant no ponding was therefore expected to occur at the downstream toe of the Central Dike. The effect of a grout curtain to reduce the seepage rate was analyzed at the time of the design. The presence of a grout curtain showed effectiveness only when extended all the way through the more permeable upper bedrock unit; this required its extension to about 50 m below the bedrock surface. Grouting was not performed as AEM committed to pumping from the Portage Pit based on the above-noted seepage rates.

Seepage mitigation measures in the design basis included a South Cell water and tailings management plan. To prevent damage to the LLDPE liner and to limit the quantity of water flowing through the structure and its foundation, the design included a minimum horizontal tailings beach length of 20 m and a minimum freeboard (vertical distance between tailings beach and South Cell water pond) of 0.5 m. In addition, a grout curtain was proposed as a remediation measure to limit the migration of tailings, if required, through the highly permeable upper bedrock unit towards the pit.

3.0 REVIEW OF COLLECTED INFORMATION

Golder reviewed the available information to assess the current conditions of the seepage in regard of its potential flow path and effects on the dike's stability. This section presents only selected information that is considered important for the seepage and stability assessment.

Field data

Following excavation of the key trench at the Central Dike, a layer of in situ till between the trench and the bedrock surface was left in place between Sta.0+720 to Sta.0+790 and Sta.0+510 to 0+635. Falling head hydraulic conductivity tests in four standpipe piezometers were carried out during the 2002 geotechnical investigations for the East Dike and the West Dike, as well as during the 2011 geotechnical investigation for the Central Dike. The hydraulic conductivity of the in situ till ranges from 2×10^{-5} m/s to 1×10^{-7} m/s at the area of the

Central Dike foundation and the aforementioned dewatering dikes. However, the presence of more permeable layers in the till unit is anticipated based on site-specific experience. The geologic rationale for the more permeable layers in the till unit is founded on two important pieces of evidence: 1) Observations at the Stormwater Dike, which is only 0.5 to 1.0 km to the west of the Central Dike, show the presence of granular channels (Figure 1); and 2) Borehole logs for 10-MB-TSF-361 (Golder Associates Ltd., 2010) show that layers of medium to coarse-grained sand 1-2 m thick with only a trace of fine-grained soils exist in the Central Dike area (Figure 2). A compilation of the hydraulic conductivity test results obtained from packer tests at different depths in the bedrock within the area of the Central Dike shows a cluster of hydraulic conductivity values around $1x10^{-5}$ m/s for the intervals tested between elevation 125 metres and 50 m. For the deeper test intervals (between elevation 50 m and 75 m), the hydraulic conductivity values decrease from $1x10^{-5}$ m/s to between $6x10^{-8}$ m/s and $3x10^{-9}$ m/s (between elevation 25 m and 75 m). At the time of the design, this information was used to divide the bedrock in upper and lower unit for seepage modelling.

Throughout the summer of 2015, field observations did not indicate signs of instability or potential active failure modes. To date, limited water inflow (no flow estimation available) has been noted to report to the Portage Pit by AEM along its west wall or pit bottom. However, water is ponding at the downstream toe of the dike between Sta.0+645 and the southern access road at Sta.0+840. The downstream pond of water is clear to slightly turbid but no sign of internal erosion of the till foundation has been observed during the summer of 2015.

Water Quality Monitoring

AEM has stated that water quality samples from the downstream pond show a chemical signature similar to that of the South Cell. Therefore, the downstream water is interpreted to originate from the South Cell. The downstream pond is generally clear to slightly turbid, but no sign of erosion of the till foundation has been observed. According to AEM, the slight turbidity only occurs from the north where the pond is in contact with soft lakebed sediment soil type. The slightly turbid conditions could be caused by wave action, because observations have shown that the downstream pond is clear on days with little to no wind. Therefore, the slight turbidity is not interpreted as being a sign of erosion of the Central Dike foundation.

Laboratory Data

Based on data provided by AEM to Golder, the hydraulic conductivity of the tailings ranged from $1.3x10^{-7}$ m/s to 2.4×10^{-7} m/s for the samples tested.

Instrumentation Data

A plan view of the Central Dike is shown in Figure 3 and vertical stratigraphic profiles for instrument locations 545-P1 and 650-P1 are shown in Figure 4.

There is little to no time delay in the piezometric responses to the South Cell pond for the bedrock and till units beneath the Central Dike and at the downstream toe. Examples of rapid piezometric responses at Station Sta.0+650 are shown in Figure 5. In addition, piezometer 545-P1-D (till), which was not responding to the South Cell water changes before September 2014, started to increase rapidly at this time (Figure 6). However, as the piezometric elevation of 545-P1-D approached the South Cell water level, its rate of change decreased. Furthermore, when the downstream pond started to be lowered in August 2015, the 545-P1-D showed an immediate reaction and lowered as well. However, during steady-state downstream pond conditions, 545-P1-D finally re-equilibrated with the South Cell water level within a few days.

Thermistor data indicate the presence of a low hydraulic conductivity permafrost barrier adjacent to the Portage Pit. In addition, the beads at 750-P1 demonstrate a correlation with the temperature of the water at the South Cell (Figure 7).

Measured Discharge Rate

AEM stated that the measured seepage rate was as high as 800 m^3/hr in August 2015 for upstream and downstream water levels of 121.5 m and 110.5 m, respectively. When the downstream water level increased to 111.5 m, the seepage rate decreased by approximately 10%.

Geophysical Survey

The geophysical survey carried out for AEM was performed by Willowstick Technologies. The survey identified two potential seep pathways. The primary seepage pathway is located between Sta.0+780 to 830 beneath the centreline of the Central Dike and seems to be within the shallow bedrock. The secondary seepage pathway is located between Sta.0+580 to 620 beneath the centreline of the dike and appears to be within deep bedrock. A limited summary of the geophysical survey, including select results, was provided to Golder following the completion of the seepage and stability assessment; no review or comments regarding the geophysical survey are presented herein.

4.0 SEEPAGE MODELLING

4.1 Model Overview

Seepage modelling was carried out to evaluate the seepage pathways, hydraulic gradients, and seepage velocities in the foundation soils for different conditions and the potential for soil erosion at the Central Dike. The principal objective of the modelling exercise was to assess the physical stability of the Central Dike for short-term, intermediate, and expected closure conditions. The primary mechanism for potential failure of the dike is considered to be piping of the till at the downstream toe; this is the key event assessed in the seepage models. An additional failure mechanism, shearing at the contact between the rockfill and foundation units, was also assessed.

Although the instrumentation data, boreholes logs, and site observations suggest seepage through the till foundation and bedrock at the Central Dike, the exact seepage network geometry, as well as the quantity of seepage through each stratigraphic unit, were not known at the start of the work. Modelling work established that defects in the cofferdam and LLDPE liner were likely not the causes for the high seepage rates observed at the Central Dike. Therefore, models were developed to assess the potential for internal erosion of the till foundation as this is considered to be the primary mode of failure to affect the stability of the Central Dike. In each model, a 2-m-thick, highly permeable granular layer with a hydraulic conductivity of $3x10^{-2}$ m/s is included in the middle of the in situ till unit. The 2-m thickness was based on the borehole observations of medium to coarse sand layers at 10-MB-TSF-361. The hydraulic conductivity selected is considered to be representative of a highly permeable granular layer.

The model is based on a west-east cross-section at Sta.0+650 (Figure 8). The thermistor cables along Sta.0+650 show a gradual transition from unfrozen conditions at the dike (650-P1) to permafrost bordering the east side of the West Road (650-P3). The presence of permafrost to the east (650-P3) prevents water flow into the pit and so the observed and preferred exit for water flowing downstream is the toe of the dike.

This technical memorandum presents the key modelling results which form the basis for Golder's recommendations; refer to Section 5.0. Accordingly, this technical memorandum presents only a subset of all the modelling work carried out. The models presented in this technical memorandum were run under steady-state conditions and the scenarios discussed in this report are summarized in Table 1.

Table 1: Scenarios for Seepage Analyses

Scenario Modelled	Operations Timeline	Maximum Tailings Elevation (m)	South Cell (Upstream) Water Table Elevation (m)	South Cell (Downstream) Water Table Elevation (m)	Comments
A	August 2015	119	121.5	110.5	Model calibration
B	September 2015	119	121.5	111.5	Model calibration
C	September 2015	119	121.5	115	
D	December 2015	122.3	122.8	115	Tailings configuration based on AEM deposition plan
E	June 2016	128.3	127.5	115	Tailings configuration based on AEM deposition plan
F	June 2016 (extension of inverse filter)	128.3	127.5	115	Tailings configuration based on AEM deposition plan
G	End of tailings deposition	150	150	110.5	No beach or freeboard in model

Note: The End of Tailings Deposition Scenario was run with a tailings elevation of 150 m because it is the current potential maximum elevation of the South Cell.

4.2 Model Results

To calibrate model Scenario A with the observed field conditions in August 2015, the hydraulic conductivity for the in situ foundation till was adjusted to $7x10^{-6}$ m/s and a hydraulic conductivity of $3.0x10^{-2}$ m/s was used for the highly permeable granular unit. To convert linear discharge outputs to three-dimensional discharge, a length of 300 m, based on the geometry of the Central Dike, was used.

The estimated discharge for model Scenario A is 840 m^3/hr, compared to the measured steady-state pumping rate of 800 m^3/hr for August 2015. For piezometers that did not show significant suction, the instrumentation data is superimposed on the model results in Figure 9. Although the predicted hydraulic head values can be 1 to 2 m greater than the observed data at 650-P1 and 650-P2, the relative drop in hydraulic head from upstream to downstream is generally well represented by the model (Figure 9).

For model Scenario B, the hydraulic head differential between the South Cell and downstream pond is 10 m, compared to 11 m for Scenario A. In addition, the modelled discharge at the toe of the dike for Scenario B is approximately 10% lower than Scenario A. In the field, AEM decreased the hydraulic head differential from 11 m to 10 m for the steady-state pumping tests. As a result, the seepage rate at the toe of the Central Dike also decreased by approximately 10%.

The seepage rates for the modelling scenarios are presented in Table 2. For the August 2015 conditions (Scenario A and a downstream pond elevation of 110.5 m), the modelled seepage rate is 840 m^3/hr. For a downstream pond elevation of 115 m in Scenario C, the modelled seepage rate is 530 m^3/hr. As the tailings deposition plan continues to develop and the South Cell water level increases, the seepage rates are affected. For December 2015 and June 2016, the modelled seepage rates are 465 and 650 m^3/hr, respectively. At the end of operations projected for August 2017, the modelled seepage rate is only 135 m^3/hr (Scenario G).

The hydraulic gradients at the top of the in situ till unit above the granular channel, as a function of distance from the dike centreline, are presented in Figure 10. The maximum hydraulic gradient at the downstream toe of the Central Dike for the whole in situ till unit is shown in Table 2. Therefore, there could be very small discrepancies between the hydraulic gradients shown in Figure 10 and Table 2.

For the August 2015 conditions in Scenario A (downstream pond elevation of 110.5 m), the maximum hydraulic gradient at the downstream toe is 1.7. For a downstream pond elevation of 115 m in Scenario C, the maximum hydraulic gradient at the downstream toe decreases to approximately 0.7. The maximum hydraulic gradient at the downstream toe of the Central Dike is expected to range between 0.6 and 0.8 between December 2015 and June 2016, if the downstream water level remains at 115 m. At the end of operations, projected for August 2017, the maximum hydraulic gradient at the downstream toe decreases to 0.2 (Scenario G).

If the inverse filter is extended from the downstream toe of the Central Dike to the West Road (Scenario F), the impact on the seepage rate and maximum hydraulic gradient at the downstream toe are negligible. Additional information regarding the extension of the inverse filter is presented in Section 4.3 and Section 5.0.

The maximum seepage velocities modelled are associated with Scenario A. The maximum seepage velocities at the toe of the Central Dike in the in situ till unit are on the order of 10^{-5} m/s. At the in situ till / granular layer contact, the maximum seepage velocities are on the order of 10^{-4} to 10^{-5} m/s.

Table 2: Seepage Rate and Maximum Hydraulic Gradient at the Dike Toe vs. Time

Scenario Modelled	Operations Timeline	Linear Seepage Rate (m^3/hr)	Seepage Rate (m^3/hr)	Maximum Hydraulic Gradient at Dike Downstream Toe
A	August 2015	2.8	840	1.7
B	September 2015	2.6	780	1.4
C	September 2015	1.8	540	0.7
D	December 2015	1.5	450	0.6
E	June 2016	2.2	660	0.8
F	June 2016 (extension of inverse filter)	2.1	630	0.8
G	End of tailings deposition	0.4	120	0.2

Note: The linear seepage rates were multiplied by a length of 300 m to provide an estimated total discharge for the Central Dike.

4.3 Seepage Modelling Discussion

The critical hydraulic gradient for piping of the till and the downstream toe is 0.6, using a factor of safety of 2.0. For information on the geotechnical properties of the materials, refer to (Golder Associates Ltd., 2012). Regardless of the scenario modelled, the hydraulic gradients greater than 0.6 at the key trench (Figure 10) are not considered to be an issue due to the presence of the inverse filter and the overlying rockfill at this location.

At the downstream toe of the Central Dike, the models demonstrate that the hydraulic gradient in August 2015 (1.7) exceeds the critical threshold of 0.6 and needs to be decreased to reduce the risk of potential piping at the downstream toe of the Central Dike. The models show that raising the downstream pond to 115 m is effective at reducing the maximum hydraulic gradient to values ranging from 0.6 to 0.8 for the September 2015 to June 2016 timeline.

While the inclusion of an inverse filter has limited impact on the seepage rate and the maximum hydraulic gradient in the till unit (Scenario F), it is expected to prevent the migration of till at the downstream toe. Therefore, the inclusion of an inverse filter is also expected to prevent soil piping beneath the dike foundation. Based on the gradation of the inverse filter material, it is expected be internally stable and suitable for operations (Kenney & Lau, 1985).

Since the modelled seepage velocities for the in situ till / granular layer interface are in the order of 10^{-4} m/s to 10^{-5} m/s, shearing and contact erosion at the granular layer / in situ till interface are not expected to develop (Guidoux, Fauvre, Beguin, & Ho, 2010).

5.0 COMMENTARY AND RECOMMENDATIONS

Based on the assessment summarized above, the Central Dike is considered to be stable from a geotechnical point of view. Although seepage is expected, the seepage rate going forward will be lower than the maximum rate of 800 m^3/hr recorded in August 2015. Since AEM has already demonstrated its ability to manage the maximum seepage rate by actively pumping the downstream pond, no seepage reduction mitigation is required. However, the modelled hydraulic gradients at the downstream toe of the Central Dike as well as the piezometer results in the till are of concern. To reduce the risk of potential erosion of the till foundation, the following recommendations are provided:

1) Continue to develop and maintain tailings beaches adjacent to the Central Dike and to operate the reclaim pond towards the centre of the South Cell. These are the key recommendations.
2) To control the hydraulic gradient condition at the downstream toe of the dike:
    a. Reduce the hydraulic gradient by raising the downstream water level to 115 m and maintain that level until the tailings deposition is completed. However, this mitigation may impact the thermal conditions beneath the West Road and along the pit (see Item 4 below).
    b. Extend the inverse filter from the downstream toe of the Central Dike to the West Road.
3) Monitor with instruments any mitigation measures to control how the conditions evolve (e.g. geophysical target, thermal conditions along the Pits and beneath the West Road).
4) Regularly inspects the Central Dike to ensure that no adverse situation is in development.
5) Continue monitoring the quality of the water, especially the turbidity.

Should you have any questions, please contact the undersigned.

GOLDER ASSOCIÉS LTÉE

ORIGINAL SIGNED

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

MA/PB/YB/jlm

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6.0 REFERENCES

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Guidoux, C., Fauvre, Y.-H., Beguin, R., & Ho, C.-C. (2010). Contact Erosion at the Inteface between Granular Coarse Soil and Various Base Soils under Tangential Flow Condition. *Journal of Geotechnical and Geoenvironmental Engineering 136 (5)*, 741-750.

Kenney, T., & Lau, D. (1985). Internal Stability of Granular Filters. *Canadian Geotechnical Journal* 22, 215-225.

Figure 1: Granular channel observed in the in situ till of the Stormwater Dike foundation in 2009.

Figure 2: Transition from silt to medium to coarse-grained sand at 16.15 m depth (El. 102.32 m) at borehole 10-MB-TSF-361 (Golder Associates, 2010).

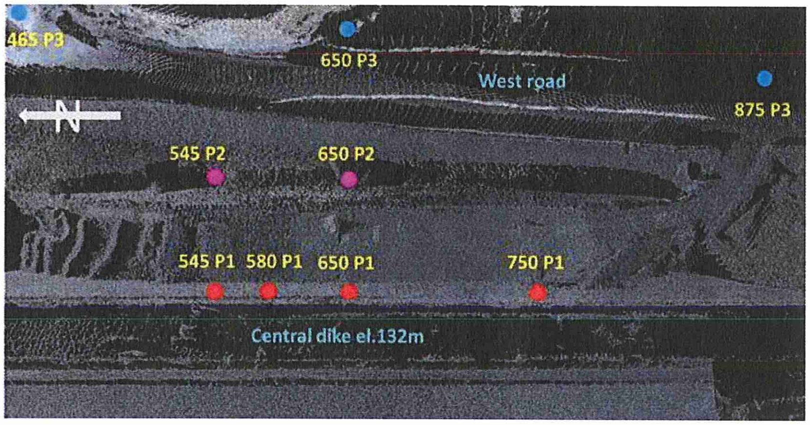

Figure 3: Plan view of the Central Dike piezometer and thermistor locations (Agnico Eagle Mines, 2015).

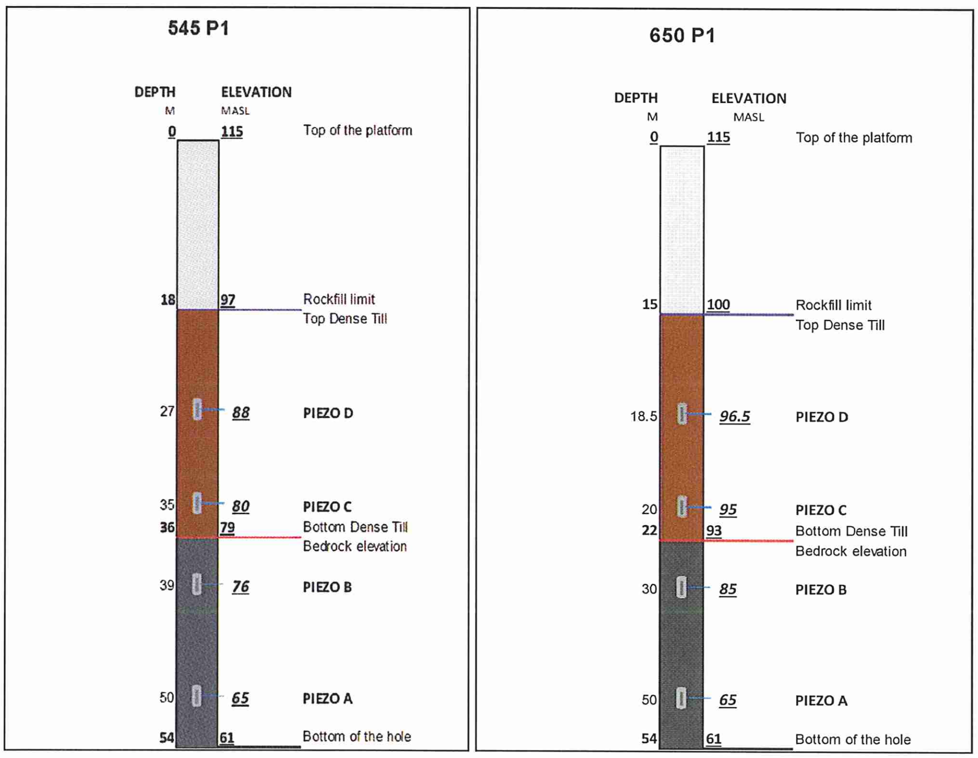

Figure 4: Stratigraphic profiles for piezometers 545-P1 and 650-P1 (Agnico Eagle Mines, 2015).

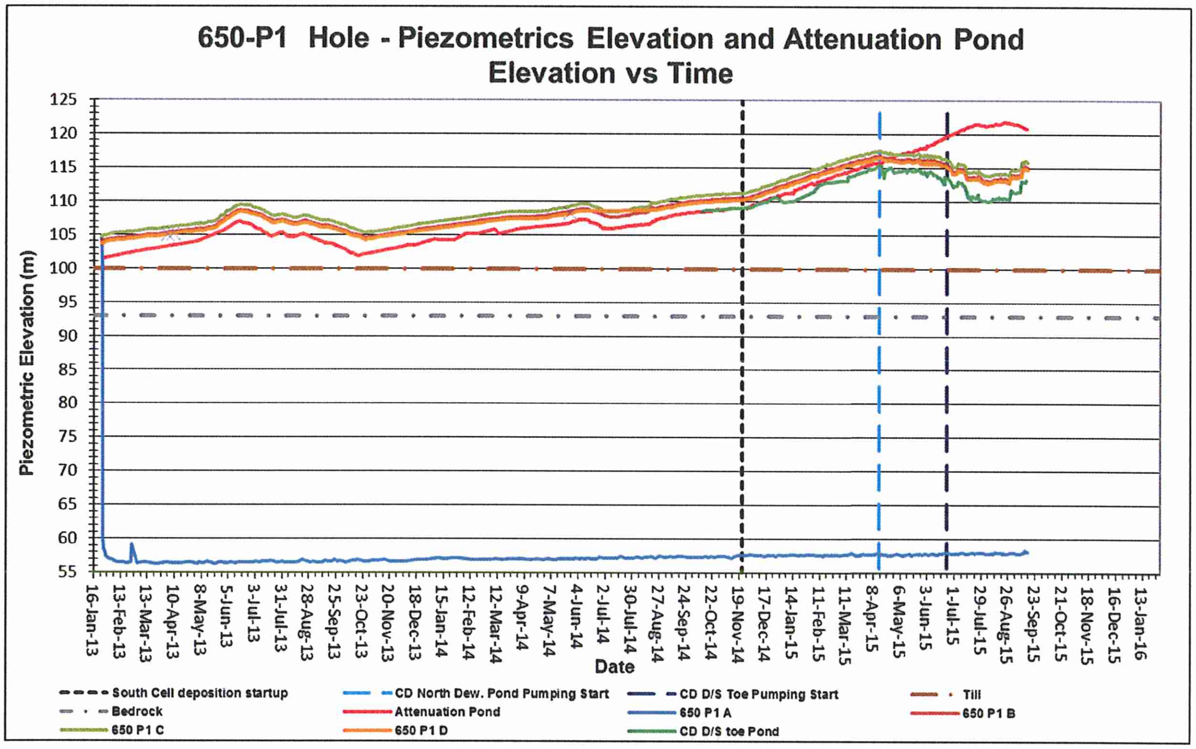

Figure 5: Hydraulic head versus time for piezometer 650-P1 (Agnico Eagle Mines, 2015).

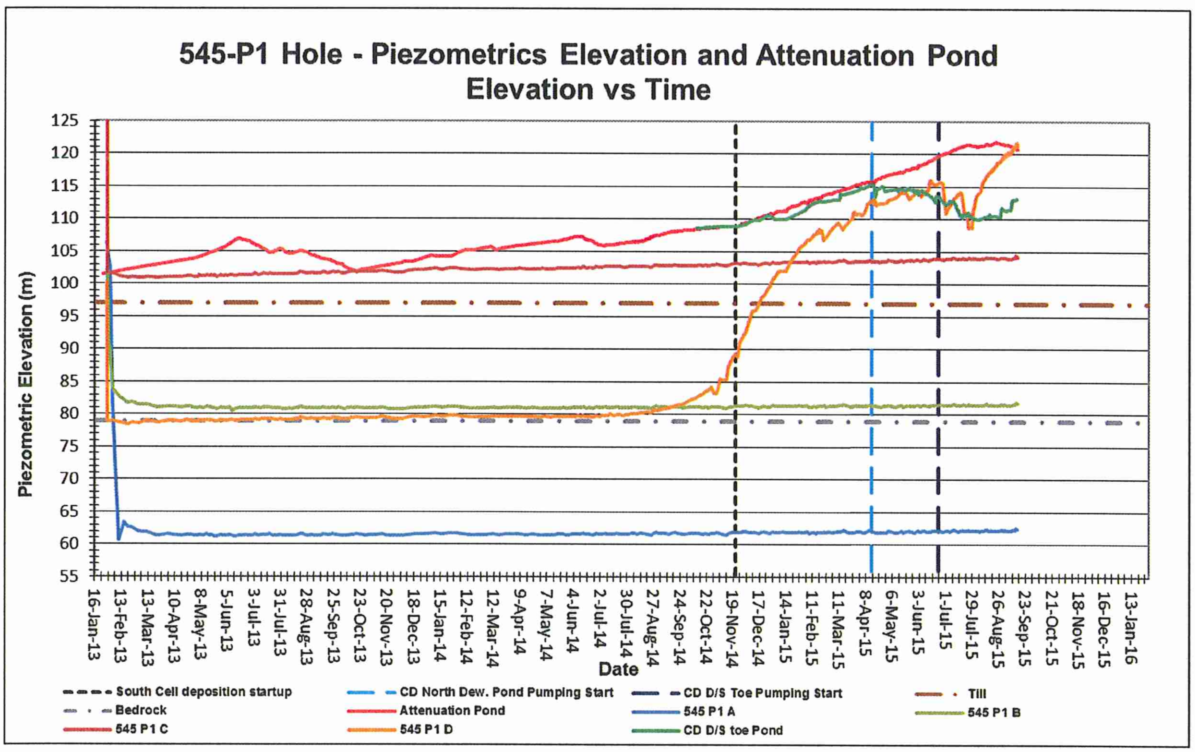

Figure 6: Hydraulic head versus time for piezometer 545-P1 (Agnico Eagle Mines, 2015).

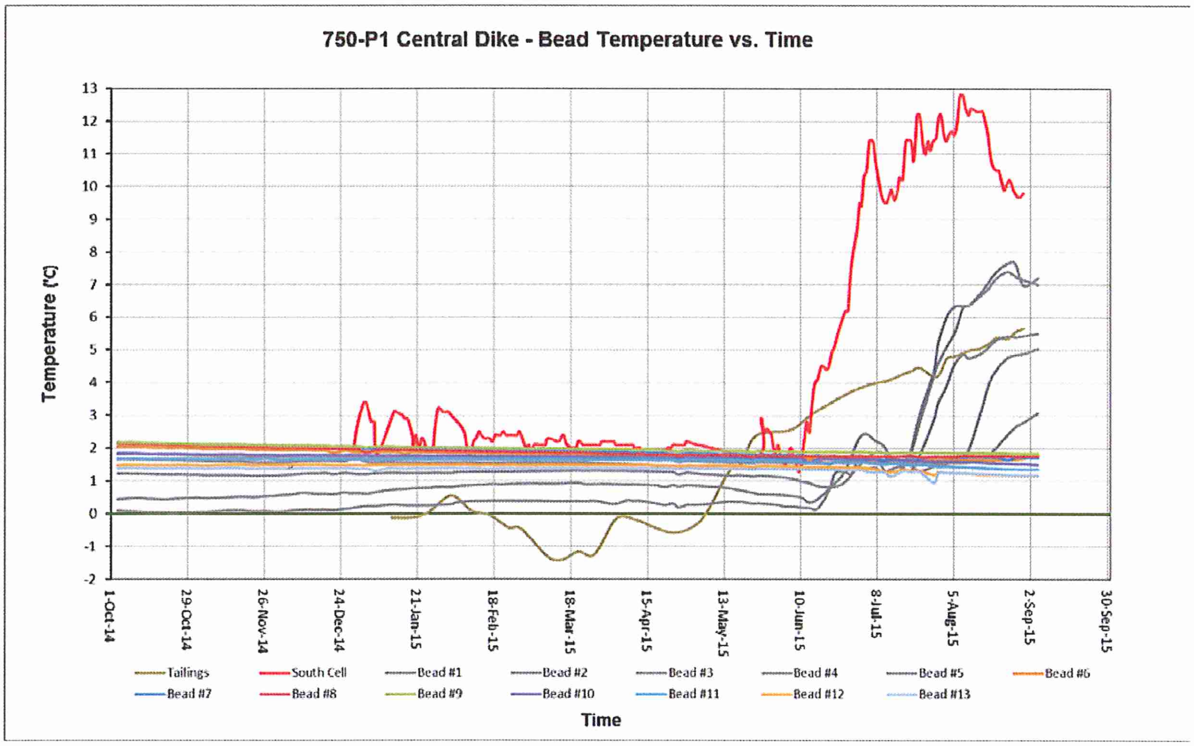

Figure 7: Bead temperature versus time for 750-P1 and the South Cell.

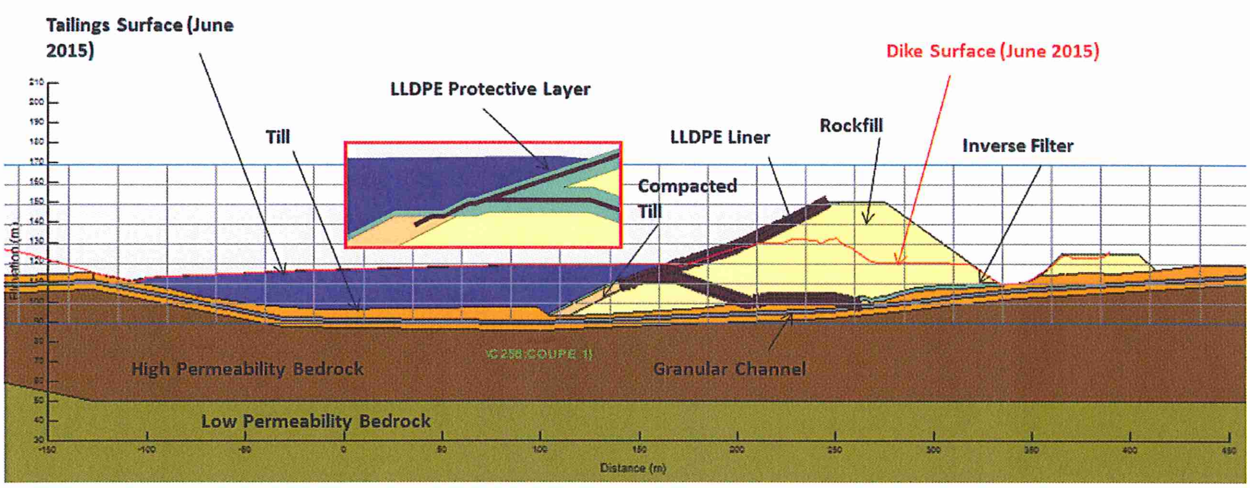

Figure 8: Seepage modelling cross-section at Station Sta.0+650.

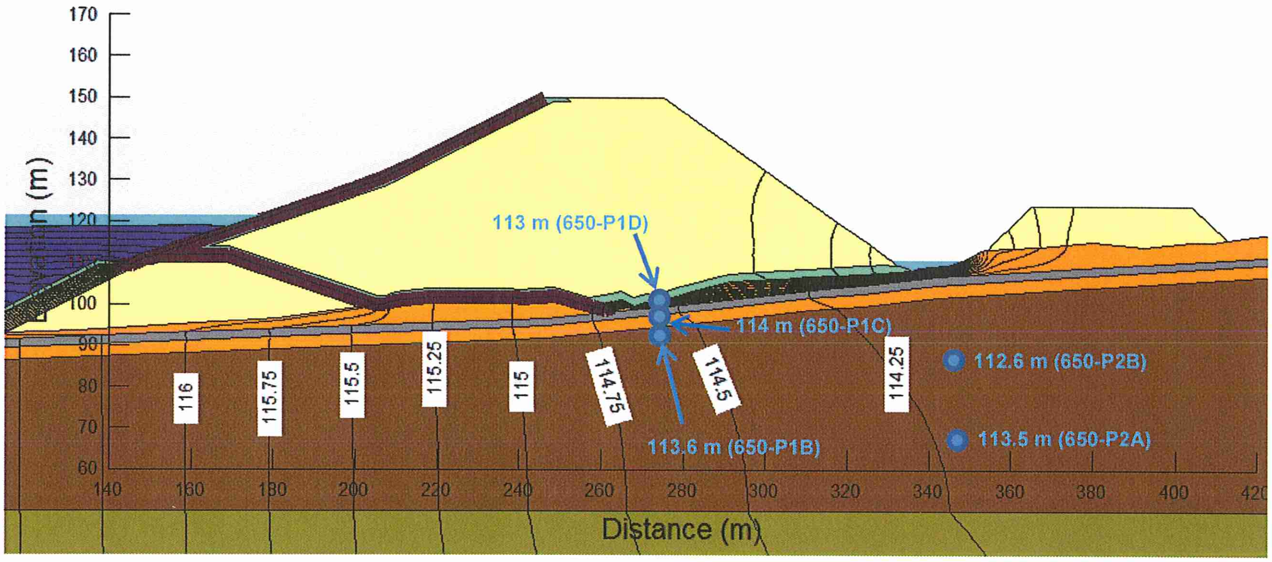

Figure 9: Steady-State Calibration Results for Model Scenario A (August 2015). The black contours represent the modelled hydraulic head values. The four piezometer instrument locations show approximate hydraulic head values for the first steady-state pumping test in August 2015.

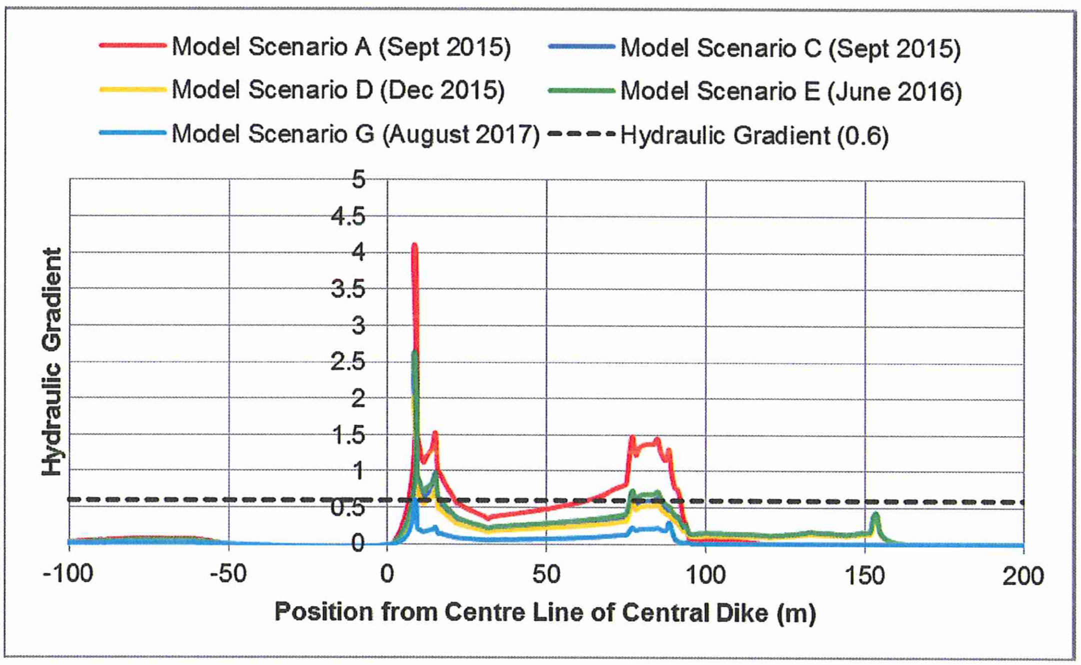

Figure 10: Modelled hydraulic gradients for the in situ till unit above the highly permeable granular layer.

APPENDIX G – CENTRAL DIKE SEEPAGE ASSESSMENT

SNC-LAVALIN INC.

360 St-Jacques street, 16th floor
Montreal (Qc)
Canada H2Y 1P5
Tel: (514)393-1000
Fax: (514)390-2765

MEMORANDUM

TO :	Michel Groleau; Pier-Éric McDonald, Meadowbank Mine, Agnico Eagle	**DATE :**	September 25th, 2015
C.C. :	Thomas Lépine, Érika Voyer		
FROM :	Anh-Long Nguyen, ing. & Geneviève Beaudoin-Lebeuf, ing.	**REF. :**	632112-0000-40ER-0001
SUBJECT :	Central Dike Downstream Investigation- High level water quality assessment (revision 00)		

Since December 2015, Agnico Eagle Mines' (AEM) Meadowbank Mine has been depositing tailings into the South Cell (formerly Attenuation Pond) as per their water management plan. As expected, the operating water level in the South Cell is currently higher than it was when the area was operating as an Attenuation Pond only. Due to the higher water level in the South Cell, higher seepage flows are being observed downstream of Central Dike located to the east of the South Cell Tailings Storage Facility (TSF). The water is accumulating at the base of Central Dike and being mixed with snowmelt runoff water and possible underground water resurgence. In order to compensate for this unexpected accumulation, AEM is presently recirculating the accumulated water downstream of Central Dike back to the South Cell Reclaim Pond to limit the volume of water accumulated at the base of Central Dike. Also, as part of the current water management plan, water accumulated in the South Cell Reclaim Pond is pumped back to the mill to be used as process water.

The water in the South Cell Reclaim Pond contains elevated concentration of copper, iron, cyanide, ammonia and nitrate. Based on the AEM Water Management Plan (WMP), all of the Reclaim Water is recirculated back to the mill and there is no discharge of reclaim water to the environment.

AEM is presently investigating different options to better manage the volume of water accumulating downstream of Central Dike and the accumulation of water in South Cell. One option under review is to transfer water accumulated downstream of Central Dike to the decommissioned Goose Pit.

SNC-Lavalin was therefore mandated by Agnico-Eagle to assess at a high level the water quality in Goose Pit if water is transferred, perform a water balance around South Cell Attenuation Pond and Central Dike Downstream Pond and complete a high level evaluation of contribution of contaminant loadings from South Cell to the body of water collected Downstream of Central Dike;

1.0 ASSESSMENT OF WATER QUALITY IN GOOSE PITS WITH DIFFERENT VOLUMES OF WATER FROM CENTRAL DIKE DOWNSTREAM POND

The first objective of this mandate was to assess the water quality of Goose Pit if water is transferred from the Central Dike Downstream Pond in the pit. Since at mine closure, the Dike between Goose Pit and Third Portage Lake will be breached, the water quality at Goose Pit must meet the CCME guidelines for the protection of aquatic life. This evaluation was conducted for five different cases, all associated to a certain volume of Central Dike Downstream Pond water: 50 000 m^3, 100 000 m^3, 150 000m^3, 200 000 m^3 and 282 000 m^3. The final water quality in Goose Pit was computed by using the updated water balance (Model Calibration 2015) and water quality for Central Dike Downstream Pond, Goose Pit and Third Portage Lake provided by AEM.

For this study, it was assumed that the water in Goose Pit at closure originates from the water currently in Goose Pit, the volume transferred from the Central Dike Downstream Pond and the runoff that will fill gradually the pit until the water elevation reaches 130 m. The assessment presented in this report does not take into account when the Portage pit will reach an elevation of 133m, and will be hydraulically connected to Goose Pit. Under this condition, it is assumed that both pits will be completed mixed together.

Since Third Portage Lake is not contaminated by any mining activities, its quality will represent the runoff filing Goose Pit over the years. The results of this assessment are shown in Table 1-1.

With regard to the water quality in the Central Dike Downstream Pond, of the 25 parameters monitored, 14 parameters currently do not meet the CCME guidelines.

However, for all cases evaluated for Goose Pit water quality at closure, only the total cyanide does not respect the guidelines. Copper is above CCME guidelines when 150 000 m^3, 200 000 m^3 and 282 000 m^3 is transferred to Goose Pit. Fluoride concentration is only 0.0005 mg/L above CCME guideline when transferring 282 000 m^3, indicating no major issues for this parameter. Cyanide should naturally degrade over the summer months and copper should precipitate out at geochemical steady state.

Therefore, even if case 5 is applied (i.e. transfer of 282 000 m^3 of water), all parameters monitored should meet the CCME guidelines by the time the Dike is breached in 2029. Please note that the dissolved fraction was used as the total concentration when comparing to CCME guidelines, since all solids in suspension will settle over the years in the pit. Also note that the total suspended solids were not monitored in the Central Dike Downstream Pond.

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Table 1-1: High Level Assessment of Projected Water Quality in Goose Pit based on Mass Balance of Water Transferred from Downstream of Central Dike to Goose Pit

Parameters	Units	Water quality Downstream of Central Dike (Feb to Aug 15)	Water quality Goose pit (Aug 9, 2015)	Water quality of runoff/ 3PL May to July 2015	Case 1	Case 2	Case 3	Case 4	Case 5	CCME Water Quality guidelines
Volume of water in Goose Pit at Closure					7 807 686	7 807 686	7 807 686	7 807 686	7 807 686	
Volume of water from runoff/3PL filling Goose Pit					7 521 108	7 471 108	7 421 108	7 371 108	7 289 108	
Current volume of water in Goose Pit					236 578	236 578	236 578	236 578	236 578	
Volume of water transfered from downstream of Central Dike into Goose Pit					**50 000**	**100 000**	**150 000**	**200 000**	**282 000**	
Alkalinity	mg CaCO3/L	209.00	75	9.10	12.377	13.657	14.937	16.217	18.317	n/a
Dissolved Aluminium (Al)	mg/L	0.50	0.006	0.0031	0.006	0.010	0.013	0.016	0.021	0.100
Dissolved Silver (Ag)	mg/L	0.00010	Not tested	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.00010
Dissolved Arsenic (As)	mg/L	0.01	0.0005	0.0005	0.0005	0.0006	0.0007	0.0008	0.0009	0.005
Ammonia Nitrogen	mg N/L	17.57	0.57	0.13	0.251	0.363	0.475	0.587	0.770	0.855
Dissolved Barium (Ba)	mg/L	0.03	0.0163	0.0037	0.004	0.004	0.005	0.005	0.005	n/a
Dissolved Cadmium (Cd)	mg/L	0.0002	0.00002	0.000005	0.000007	0.000008	0.000010	0.000011	0.000013	0.00004
Chloride (Cl)	mg/L	571.17	13.7	0.79	4.836	8.489	12.142	15.794	21.785	120.000
Dissolved Chromium (VI)	mg/L	0.0037	0.0006	0.0001	0.0001	0.0002	0.0002	0.0002	0.0002	0.0010
Dissolved Copper (Cu)	mg/L	0.27	0.0005	0.0005	0.0022	0.0039	**0.0056**	**0.0074**	**0.0102**	0.004
Hardness	mg CaCO3/L	1126.67	104	12.05	21.974	29.112	36.250	43.388	55.094	n/a
Dissolved Iron (Fe)	mg/L	2.23	0.01	0.01	0.024	0.038	0.053	0.067	0.090	0.300
Fluoride (F)	mg/L	0.96	0.55	0.08	0.099	0.105	0.110	0.116	**0.125**	0.120
Dissolved Manganese (Mn)	mg/L	3.69	0.0058	0.0015	0.025	0.049	0.073	0.096	0.135	n/a
Dissolved Mercury (Hg)	mg/L	0.00001	0.00006	0.000005	0.00001	0.00001	0.00001	0.00001	0.00001	0.00003
Dissolved Molybdenum (Mo)	mg/L	0.12	0.0148	0.0002	0.001	0.002	0.003	0.004	0.005	0.073
Ammonia	mg N/L	0.24	Not tested	0.02	0.019	0.021	0.022	0.024	0.026	10.300
Dissolved Nickel (Ni)	mg/L	0.25	0.0086	0.0006	0.002	0.004	0.006	0.007	0.010	0.025
Nitrate (NO3)	mg N/L	7.31	4.11	0.03	0.203	0.250	0.296	0.343	0.419	2.935
Dissolved Lead (Pb)	mg/L	0.0009	0.0003	0.00005	0.0001	0.0001	0.0001	0.0001	0.0001	0.001
Dissolved Selenium (Se)	mg/L	0.0200	0.0010	0.0001	0.0002	0.0003	0.0005	0.0006	0.0008	0.0010
Dissolved Sulphate (SO2-4)	mg SO4/L	1403.67	45.8	5.10	15.290	24.246	33.202	42.159	56.847	n/a
Dissolved Titanium (Ti)	mg/L	0.01	0.01	0.0003	0.001	0.001	0.001	0.001	0.001	n/a
Total Cyanide CNt	mg/L	0.7108	0.0050	0.001	**0.006**	**0.010**	**0.015**	**0.019**	**0.027**	0.0050
Dissolved Zinc (Zn)	mg/L	0.004	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.030

(yellow) Concentration higher than CCME guidelines

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2.0 WATER BALANCE

2.1 Water balance around South Cell Attenuation Pond and Central Dike Downstream Pond

The flowrate of the seepage going towards the Central Dike Downstream Pond is unknown, and was estimated by performing a water balance around South Cell Attenuation Pond. The values used in this water balance were taken from AEM updated water balance (Model Calibration 2015), except for the runoffs which were computed by SNC-Lavalin using the hydrological data and area of watersheds. The water balance was completed from January to August 2015.

After closing the water balance, except for the month of June, there was little difference between the volume transferred and the seepage through the Dike. The water balance for both ponds is shown in table 2-1

In the water balance around Central Dike Downstream Pond, the unknown flows are from the Central Dike seepage and from Underground Water. The seepage values found in the water balance around South Cell Attenuation Pond were then used to calculate the Underground water values and close the water balance around Central Dike Downstream Pond.

Some small negative values for the underground water are found in April and May, which could be within the margin of error. However, in July, the underground water volume is approximately -60 000 m^3, which is significant. This negative value from underground water indicates that there could be more water leaving the Central Dike Downstream pond than measured or that there could be an error in the volume evaluated in Downstream Pond for that period.

Beside this discrepancy, according to AEM, the water balance, and specifically the seepage values, reflects the situation at site.

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Table 2-2: Water balance around South Cell Attenuation Pond and Central Dike Downstream Pond

	SOUTH CELL WATER BALANCE																	
			INPUT									OUTPUT						
			Tailings			Non Contact Water							NCW	CW	CW	CW	NCW	
Month-Year	Volume of Reclaim Pond (South Cell) (end of month)	Elevation in Reclaim Pond (South Cell)	Mill Process Water	*SC Tailings water/ice entrampment (%)*	*Inflow to reclaim pond from tailings*	From North Cell	Tributary area runoff	Pumped from Portage Pit	Pumped from Goose Pit	Tear Drop Lake	From downstream pond	Seepage toward Downstream pond	To WTP	Reclaim water to mill	To Portage Pit	To Goose Pit	Transfer to North Cell	*Water Balance Check*
	m3	m	m3/mth		*m3/mth*	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	
	876 104																	
January-15	882 015	112.6	322 730	30.9%	223039	0	0	0	14 286		0	0	0	231 414	0	0	0	0
February-15	878 895	114.0	281 509	37.6%	175661	0	0	0	5 387		0	0	0	184 168	0	0	0	0
March-15	888 277	115.4	285 661	44.6%	158342	0	0	0	15 912		0	0	0	164 872	0	0	0	0
April-15	933 415	116.8	288 984	25.7%	214687	0	0	0	16 167		22 185	22 185	0	185 716	0	0	0	0
May-15	891 709	118.0	313 813	37.2%	197043	0	0	0	1 523		66 794	66 794	0	240 272	0	0	0	0
June-15	1 089 154	120.2	303 362	37.2%	190663	9 150	80 213	4 075	3 108	36 536	251 541	139 417	0	238 425	0	0	0	0
July-15	1 287 728	121.2	9 806	26.7%	7191	389 501	41 897	28 620	0		498 141	511 658	0	255 118	0	0	0	0
August-15	1 316 897	121.3	0	26.7%	0	238 024	4 847	43 930	0		577 530	575 581	0	259 582	0	0	0	0

	DOWNSTREAM POND OF CENTRAL DYKE							
			INPUT			OUTPUT		
			CW	NCW	NCW	CW	CW	
Month-Year	Volume of Downstream Pond	Elevation in Downstream Pond at end of month	Seepage from South Cell	Surface Water Runoff	Undeground Water	Transfer to South Cell	Transfer to Goose Pit	*Water Balance Check*
	m3	m	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	
	103 461	109.99						
January-15	129 245	111.40	0		25784	0	0	0
February-15	163 161	112.90	0		33916	0	0	0
March-15	207 974	114.50	0		44813	0	0	0
April-15	204 965	114.40	22185		-3009	22185	0	0
May-15	195 936	114.10	66794		-9028	66794	0	0
June-15	148 518	112.30	139417	16842	47864	251541	0	0
July-15	106 961	110.20	511658	8797	-63871	498141	0	0
August-15	129 245	111.41	575581	1018	23215	577530	0	0

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3.0 MASS BALANCE AROUND CENTRAL DIKE DOWNSTREAM POND

3.1 *Metal Mass balance*

A mass balance on metals was performed on the Central Dike Downstream Pond following the water balance closure to validate the solidity of the water balance and to verify if the water quality was degrading or improving when water is seeping through the Dike. The mass balance is presented in table 3-1.

Table 3-3: Mass balance around Central Dike Downstream Pond

		Water Quality			
Parameters	**Units**	**Downstream Pond July 6th 2015**	**Downstream Pond August 25th 2015**	**Seepage Water**	**South Cell August 25th 2015 For comparison**
Aluminium (Al)	mg/L	0.137	0.059	0.04699	0.046
Silver (Ag)	mg/L	0.0001	0.0000	-0.00002	0.0013
Arsenic (As)	mg/L	0.0000	0.0143	0.01756	0.0043
Barium (Ba)	mg/L	0.0305	0.0331	0.03498	0.0493
Cadmium (Cd)	mg/L	0.00000	0.00052	0.00064	0.00076
Chromium (VI)	mg/L	0.0000	0.0000	0.00000	0.0000
Copper (Cu)	mg/L	0.1076	0.0077	-0.01054	0.0853
Iron (Fe)	mg/L	0.4600	1.3600	1.58451	0.17
Manganese (Mn)	mg/L	1.4440	2.3170	2.57678	0.9211
Mercury (Hg)	mg/L	0.00000	0.00005	0.00006	0.00023
Molybdenum (Mo)	mg/L	0.0972	0.179	0.20174	0.2361
Nickel (Ni)	mg/L	0.0928	0.0430	0.03556	0.0683
Lead (Pb)	mg/L	0.0000	0.0003	0.00037	0.0000
Selenium (Se)	mg/L	0.0160	0.0280	0.03141	0.041
Thallium (Tl)	mg/L	0.0000	0.0000	0.00000	0.000
Total Cyanide CNt	mg/L	0.1920	0.1510	0.14974	0.000
Zinc (Zn)	mg/L	0.0000	0.0020	0.00246	0.000
	Concentration higher than South Cell				

It was decided to conduct the analysis around the month of August in order to eliminate the higher concentration in the free water portion due to the formation of an ice layer in the pond. Using the Central Dike Downstream Pond water quality at the beginning and end of the month, the seepage water quality for the end of the month was estimated. South Cell water quality was also presented in the table to compare with the estimated seepage water quality values.

The initial assumption was that seepage water, and therefore Central Dike Downstream Pond water had a better water quality than South Cell Attenuation Pond because of the dilution with runoff and underground water and also because of the possible entrapment of contaminants in the soil while seeping through the Dike. However, for 6 parameters, the concentration in seepage water is higher, especially for arsenic, iron, manganese, lead, total cyanide and zinc. Therefore, there could either be another source of contaminant going into Central Dike Downstream Pond or there could be an error in the evaluated volume in Downstream Pond.

To get more information on the seepage water quality, a chloride mass balance was performed on the Central Dike Downstream Pond since it does not degrade nor settle in the water over time.

3.2 Chloride Mass balance

A chloride mass balance around Central Dike Downstream Pond from January to July (no chloride concentration was available for August) was realized in order to project the expected chloride concentration in the Downstream Pond assuming that the seepage concentration is equal to the concentration measured in the South Cell Attenuation Pond. Figure 3-1 presents a comparison between the projected chloride concentration to the actual measured values in the Downstream Pond.

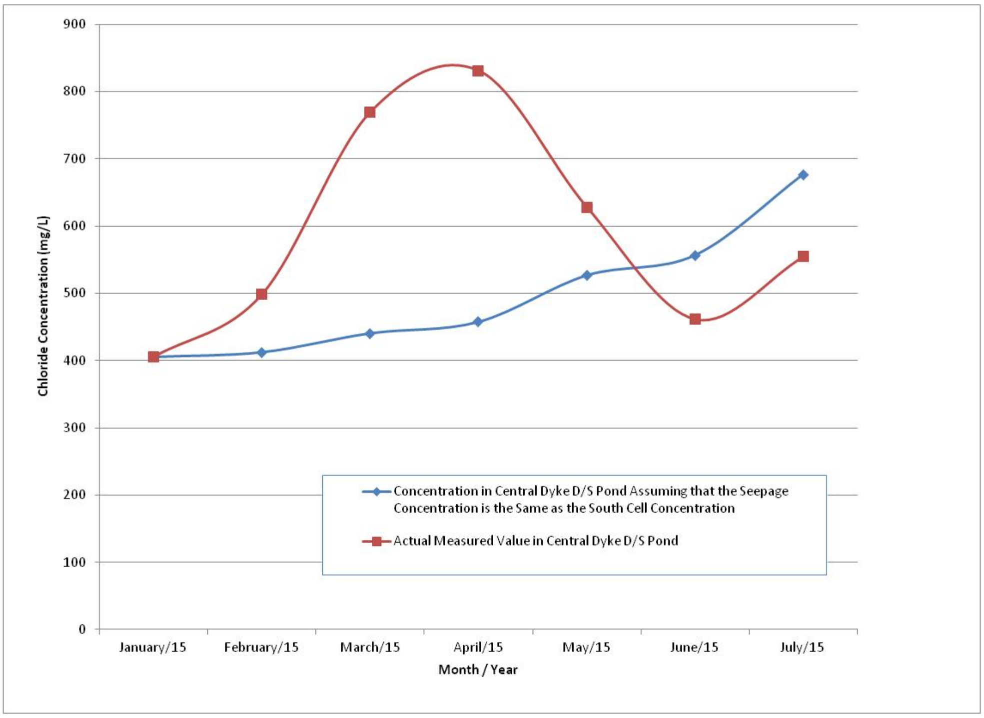

Figure 4-4: Chloride Mass balance around Central Dike Downstream Pond

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As shown in Figure 3-1, there is a large discrepancy between the actual values measured versus the projected values. The source of error could be from the volume measurement of Central Dike Downstream Pond or the effect of ice on the available free volume of water used to calculate the concentration of chloride in free water.

4.0 ADJUSTEMENT ON THE WATER BALANCE

After reviewing the initial water balance, a revised water balance was conducted to take into account the following parameters:

- During the month of January to March, water was observed accumulating in the Downstream Central Dike Pond. Since it is unlikely that this flow originated from underground source since the ground is frozen at the time, it was assume that the source of this water comes from the South Cell.

- The percentage of water/ice entrapment was adjusted in the water balance around the South Cell in order to adjust the calculated volume of seepage water reporting to the Downstream Pond so that the flows from the underground source approaches zero. In order words, it is assumed that the contribution from the underground water source to the volume in the Downstream Pond is negligible.

- In the original water balance, in the month of July, there was a negative value calculated for the underground water source to the Downstream Pond. The volumes of water available at the end of the month for July and August were revised so that the contribution of U/G water is negligible.

The revised water balance is presented in Table 4-1. This exercise demonstrates the water balance around the South Cell and Downstream Pond is sensitive to the estimated volumes used in the ponds and the values used for water/ice entrapment.

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Table 4-5: Adjusted water balance around South Cell Attenuation Pond and Central Dike Downstream Pond

	SOUTH CELL WATER BALANCE																		
			INPUT									OUTPUT							
			Tailings					Non Contact Water					NCW	CW	CW	CW	NCW		
Month-Year	Volume of Reclaim Pond (South Cell) (end of month)	Elevation in Reclaim Pond (South Cell)	Mill Process Water	*VALUE IN AEM WATER BALANCE SC Tailings water/ice entrampment (%)*	*ADJusTED SC Tailings water/ice entrampment (%)*	*Inflow to reclaim pond from tailings*	From North Cell	Tributary area runoff	Pumped from Portage Pit	Pumped from Goose Pit	Tear Drop Lake	From downstream pond	Seepage toward Downstream pond	To WTP	Reclaim water to mill	To Portage Pit	To Goose Pit	Transfer to North Cell	*Water Balance Check*
	m3	m	m3/mth			*m3/mth*	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	
	876 104																		
January-15	882 015	112.6	322 730	**30.9%**	22.9%	248823	0	0	0	14286		0	25 784	0	231414	0	0	0	*1*
February-15	878 895	114.0	281 509	**37.6%**	25.6%	209580	0	0	0	5387		0	33 916	0	184168	0	0	0	*3*
March-15	888 277	115.4	285 661	**44.6%**	28.9%	203162	0	0	0	15912		0	44 813	0	164872	0	0	0	*7*
April-15	933 415	116.8	288 984	**25.7%**	26.8%	211670	0	0	0	16167		22185	19 168	0	185716	0	0	0	*0*
May-15	891 709	118.0	313 813	**37.2%**	40.1%	188014	0	0	0	1523		66794	57 766	0	240272	0	0	0	*0*
June-15	1 089 154	120.2	303 362	**37.2%**	21.4%	238519	9 150	80213	4075	3108	36536	251541	187 272	0	238425	0	0	0	*0*
July-15	1 287 728	121.2	9 806	**26.7%**	26.7%	7191	389 501	41897	28620	0		498141	511 658	0	255118	0	0	0	*0*
August-15	1 316 897	121.3	0	**26.7%**	26.7%	0	238 024	4847	43930	0		577530	575 581	0	259582	0	0	0	*0*

	DOWNSTREAM POND OF CENTRAL DYKE							
			INPUT			OUTPUT		
			CW	NCW	NCW	CW	CW	
Month-Year	Volume of Downstream Pond	Elevation in Downstream Pond at end of month	Seepage from South Cell	Surface Water Runoff	Undeground Water	Transfer to South Cell	Transfer to Goose Pit	*Water Balance Check*
	m3	m	m3/mth	m3/mth	m3/mth	m3/mth	m3/mth	
	103 461	**109.99**						
January-15	129 245	111.40	25784		0	0	0	*0*
February-15	163 161	112.90	33916		0	0	0	*0*
March-15	207 974	114.50	44813		0	0	0	*0*
April-15	204 965	114.40	19168		8	22185	0	*0*
May-15	195 936	114.10	57766		0	66794	0	*0*
June-15	148 518	112.30	187272	16842	9	251541	0	*0*
July-15	170 832	110.20	511658	8797	0	498141	0	*0*
August-15	169 901	111.41	575581	1018	0	577530	0	*0*

5.0 CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

In conclusion, up to 282 000 m^3 could be transferred from Central Dike Downstream Pond to Goose Pit without significant impact on the water quality at closure within Goose Pit.

With regard to the water and mass balance around Central Dike Downstream Pond, it was found that there are many factors that influence the calculated volumes of seepage water reporting to the D/S Pond, such as:

- The estimated volumes of water measured in the ponds.
- The assumed values of water/ice entrapment.
- The estimate of the ice thickness and its impact of available free water during the winter months.
- The higher concentrations observed in the water body during the winter month due to the formation of ice and resulting reduction in available free volume.

With more information taken at site in the coming months, some source of error could be eliminated and a better water and mass balance could be developed.

5.2 Recommendations

In order to continue to improve the water balance and water quality forecasting around South Cell, Downstream Central Dyke and the seepage flow rates through Central Dyke, the following list of analysis is recommended to be performed in the following months:

- Provide a more accurate correlation between water level measurements and estimated volume of water in the Central Dike Downstream Pond.
- Provide more accurate information on the ice cover thickness in the South Cell and Downstream Pond, resulting in a better estimate of the free volume of water in the pond.
- Information on the ice cover in the Central Dike Downstream Pond
- Test on a monthly basis the following parameters in the Central Dike Downstream Pond:
    - pH, alkalinity, turbidity, hardness, TDS, TSS;
    - ammonia nitrogen, nitrate, nitrite;
    - chloride, fluoride, sulphate, and cyanide;
    - total metals, specifically: aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, zinc;
    - dissolved metals: aluminum, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, thallium, zinc;
    - CN WAD at assay lab once a week or once a month, depending in CN WAD is present Downstream of Central Dyke.