Marathon Palladium Project -

Supplementary Reviews of Company Responses in Recent Information Requests (IRs)

prepared for:

Citizens for Responsible Industry in Northwestern Ontario
Northwatch

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TABLE OF CONTENTS

Summary of This Review

One major concern for a proposed minesite is its capacity for on-site water contamination and, in turn, off-site water contamination caused by contaminated water leaving the site. The on-site water contamination is sometimes called "metal leaching and acid rock drainage (ML-ARD)" and "geochemical source terms". If on-site contamination is underestimated, then all off-site contamination and environmental impacts, like terrestrial vegetation and dust inhalation, are also underestimated. This is the case for the Marathon Palladium and Copper Project.

The Government of Ontario continues to allow Generation PGM and its consultants to submit major new or revised information on the Marathon Project long after the EIS/EA Addendum had been submitted in 2021. This ongoing *ad hoc* approach allows the company and its consultants to revise the predicted environmental impacts at any time, based on concerns as they receive them from stakeholders.

For example, the government's Requests for Information (IRs) submitted late last year asked important questions for clarifications to better understand statements in the EIS/EA Addendum. The company's responses in the IRs for the Marathon Project contain critical new or revised environmental information that has not been presented before, not even in the Addendum.

This will likely occur during the upcoming hearings too. Concerned citizens and stakeholders will continue to be rapidly exposed to major Project revisions without clear explanations of what has changed, why it has changed, and what the new implications are for the surrounding land, water, and air. This provides a strong, biased advantage to Generation PGM and its consultants to deflect or ignore valid concerns, but only in the rare cases when there are sufficient time and notice to raise concerns in the first place.

This review is a supplementary document to previously submitted documents from CRINO on predicted water contamination and ML-ARD if mining were to start at the Marathon Project. This supplementary document should not be read as a stand-alone review or it might be misunderstood. It must be read in conjunction with:

1) Review of the Marathon PGM-Cu Project - Review of Environmental Geochemistry, dated October 2012 (nearly 10 years ago).
2) Marathon Palladium Project EIS Addendum - Review of Predicted Water Contamination and ML-ARD, dated July 2021.

Both documents have been submitted to government.

Ontario Regulation 240/00 on "Mine Development and Closure under Part VII of the Act" formally states in part:

"Objective

56. The objective of this Part of the Code is to determine the potential for significant metal leaching (ML) or acid rock drainage (ARD) and, if necessary, to ensure the development and implementation of effective prevention, mitigation and monitoring strategies."

This supplementary review continues to show that the Marathon EA, EIS, Addendum, and IR responses fail, under Regulation 240/00, *"to determine the potential for significant metal leaching (ML) or acid rock drainage (ARD)"* reliably. This is due to the consecutive, time-and-again, major underestimations of ML-ARD potential of mine rock, tailings, and mine waste.

Additionally, there are incomplete descriptions of "water treatment" that:

(1) are designed to treat a water-quality problem that remarkably has not been predicted for the Marathon Project, but should have been and is a major omission, and

(2) are not designed to treat dissolved contamination that is already predicted for the Marathon Project.

Thus, the Marathon EA, EIS, Addendum, and IR responses also fail to *"ensure the development and implementation of effective prevention, mitigation and monitoring strategies"* reliably under Regulation 240/00.

The Government of Ontario should understand the large and currently underestimated environmental risk that the Marathon Project poses to surrounding water quality and sediment quality.

This can lead to disastrous problems for water quality and the surrounding environment and can lead to expensive liability for the Government and people of Ontario.

The Marathon Project should be stopped until reasonable and realistic estimates are made of ML-ARD and of costs for dissolved-contaminant water treatment. If not stopped now, until Regulation 240/00 is met for ML-ARD under Regulation 240/00, the initial financial security could be grossly underestimated by many tens of millions, to hundreds of millions, of dollars. This could lead to another provincial environmental liability costing tens to hundreds of millions of dollars, like the Steep Rock minesite.

1. INTRODUCTION

One major concern for a proposed minesite is its capacity for on-site water contamination and, in turn, off-site water contamination caused by contaminated water leaving the site. The on-site water contamination is sometimes called "metal leaching and acid rock drainage (ML-ARD)" and "geochemical source terms". If on-site contamination is underestimated, then all off-site contamination and environmental impacts, like terrestrial vegetation and dust inhalation, are also underestimated. This is the case for the Marathon Palladium and Copper Project.

ML-ARD and its resulting adverse environmental impacts are serious concerns in Ontario. Ontario Regulation 240/00 on "Mine Development and Closure under Part VII of the Act" formally states in part:

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> *56. The objective of this Part of the Code is to determine the potential for significant metal leaching (ML) or acid rock drainage (ARD) and, if necessary, to ensure the development and implementation of effective prevention, mitigation and monitoring strategies."*

This review is a supplementary document to previously submitted documents from CRINO on predicted water contamination and ML-ARD if mining were to start at the Marathon Project. This supplementary document should not be read as a stand-alone review or it might be misunderstood. It must be read in conjunction with:

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Both these previous documents have been submitted to government in the past.

The Government of Ontario continues to allow Generation PGM and its consultants to submit major new or revised information on the Marathon Project long after the EIS/EA Addendum had been submitted in 2021. This ongoing *ad hoc* approach allows the company and its consultants to revise the predicted environmental impacts at any time, based on concerns as they receive them from stakeholders.

For example, the government's Requests for Information (IRs) submitted last year, after the Addendum, asked important questions. The company's responses in the IRs for the Marathon Project contained critical revised environmental information that had not been presented before, not even in the Addendum.

This will also likely occur during the upcoming hearings too. Concerned citizens and stakeholders will continue to be rapidly exposed to major Project revisions without clear explanations of what has changed, why it has changed, and what the new implications are for the surrounding land, water, and air. This provides a strong, biased advantage to Generation PGM and its consultants to deflect or ignore valid concerns, but only in the rare cases when there are sufficient time and notice to raise concerns in the first place.

2. IR2-3 Water Treatment, prepared June 11, 2021

Concern 2.1: Generation PGM misunderstands the site-specific nature of water treatment at the Marathon Palladium Project

As explained in CRINO's *Marathon Palladium Project EIS Addendum - Review of Predicted Water Contamination and ML-ARD* dated July 2021, documents for the Marathon Palladium Project are confusing, ambiguous and contradictory when it comes to treatment of contaminated water on the proposed minesite. This contaminated site water is often referred to as "ML-ARD" such as in Ontario Regulation 240/00.

The ML portion represents water contamination that can occur at any pH and can involve one or more of the dozens of natural elements at toxic levels. As a result, treatment of ML-ARD is not a simple "off-the-shelf" system. Instead, the Project's water treatment plant (WTP):

- will be custom designed for the site,
- will be designed to treat specific elements of concern and may not successfully treat unexpected elements,
- will have a specific flow rate above which it fails to properly treat water,
- will have specified maximum inflow concentrations above which it fails to lower them sufficiently,
- will have maximum allowable outflow concentrations above which the water cannot be discharged to the environment, and
- will typically cost up to tens of millions of dollars to build and up to millions of dollars each year to operate.

Generation PGM does not understand the customized nature of water treatment. In IR2-3, it states, "However, in the event that commissioning of the WTP is delayed, a portable WTP would be leased from a water treatment provider and operated until the WTP is commissioned." Thus, Generation PGM (1) either fails to understand the site-specific nature of water treatment, which should be alarming, (2) or believes water treatment is only something simple like the addition of flocculent to reduce the particles suspended in the already-contaminated water, which is also alarming.

Concern 2.2: The proposed flocculation for treatment of contaminated water would not change the predicted water contamination by dissolved contaminants

Contamination in water is usually divided into two basic types.

- "Suspended contaminants" occur as particles carried along by water. These can be the major form of water contamination in surface waters or in waters draining through mine wastes and coarse-rock fills such as proposed at the Marathon Project for some creek channels. They can make water appear "dirty".
- "Dissolved contaminants" are so small, as small as atoms, that they remain dispersed throughout the water. They are more difficult to remove from water than suspended contaminants and can exist even in "clear" water.

Predictions of water quality at the Marathon Project in Appendix D11 of the EIS were only for dissolved elements. Company responses in the IRs still focus only on dissolved contaminants.

The EIS/EA and several Information Responses (IRs) mention water treatment for the Marathon Palladium and Copper Project. The intent is to assure people that if water contamination occurs (actually, when it occurs) that the contamination can be easily treated.

IR2-3 reassuringly states, "However, in the event that commissioning of the WTP is delayed, a portable WTP would be leased from a water treatment provider and operated until the WTP is commissioned." This implies water treatment is an "off the shelf" process. This is wrong as explained above in Section 2.1 of this review. The Canadian mining industry has shown for decades that full-scale water-treatment plants for dissolved contaminants are very sensitive to variations in site-specific contaminants and concentrations. They are not "off the shelf" but instead custom designed.

Why would Generation PGM and their consultants say water treatment is relatively easy and simple? It is because the water treatment they talk about involves "flocculation".

Here is the problem. For the Marathon Project, suspended contaminants have not been predicted as part of on-site ML-ARD and surrounding water contamination. They should indeed be predicted because Marathon surface-water contamination will include suspended contaminants and are a required part of many water-quality guidelines like federal CCME guidelines. Nevertheless, suspended contamination was not predicted at the Marathon Project and yet treatment is proposed for these suspended contaminants.

On the other hand, dissolved contaminants will also require water treatment at the Marathon Project, even more so as I have explained already in my reviews since 2012. However, water treatment for dissolved contaminants is not proposed, designed, and costed for the Marathon Project.

This is very strange.

A suspended-contaminant problem that is not predicted at the Marathon Project, but should be predicted under water-quality guidelines and environmental protection, has water treatment planned for it including an option that "would be leased from a water treatment provider".

On the other hand, dissolved-contaminant problems that are predicted for the Marathon Project, and could be 10 to 100 times worse than predicted, do not have water treatment planned for them.

Based on water-treatment experience at mining sites around Canada for decades, there are reasons why dissolved-contaminant treatment, sorely needed at the Marathon Project, is not discussed.

Here are the reasons.

1) Dissolved-contaminant treatment must be custom designed for the minesite, the predicted rate of flow, the number of contaminants, and the predicted aqueous concentrations (see Section 2.1

of this review). The relatively simple flocculation of suspended particles, as currently proposed, is not nearly as sensitive.

2) Dissolved treatment plants typically have a specific flow rate above which they fail to properly treat water.

3) Dissolved treatment plants typically have maximum inflow contaminant concentrations above which they fail to lower them sufficiently. Please note that dissolved contaminant concentrations at the Marathon Project have likely been underestimated by 10 to 100 times based on "scaling factors".

4) Dissolved treatment plants typically have maximum allowable outflow concentrations above which the water is still contaminated, cannot be discharged to the environment, and require storage until re-treated. These maximum concentrations are typically called "WTP effluent water-quality objectives", which I could not find for the Marathon Project. I believe this is because 100% instantaneous dilution in Hare Lake and the Pic River are incorrectly assumed. As a result, effluent water-quality objectives and predictions for total effluent concentrations are apparently ignored by the Marathon Project.

5) Dissolved treatment plants typically cost up to tens of millions of dollars to build and up to millions of dollars each year to operate. They often have to be substantially rebuilt or renovated about every 10-20 years at a cost similar to the original build cost.

6) If the flow, the number of dissolved contaminants, and/or the aqueous dissolved concentrations turn out to be significantly different from predicted levels, then major changes at large expense are needed. Such changes could take many months to implement and to optimize at great cost, during which serious environmental contamination would occur such as in groundwater, Hare Lake, or the Pic River.

7) Such a site-specific treatment plant for the underpredicted dissolved contaminants has not been designed, detailed, or costed for the Marathon Project at any time in its proposed construction, operation, or closure.

Thus, proposed water treatment by flocculation of suspended solids would have little to no effect on the dissolved concentrations, which means water treatment would not reduce the toxic dissolved levels.

Concern 2.3: The "good" Type 1 rock would also release contaminated water, although likely less than the severe Type 2 rock

IR2-3 says "The open pits will be developed starting in Year -2 to provide rockfill (Type 1 non-potentially acid generating waste rock) to construct the mine infrastructure, WMP and PSMF embankments." At the Marathon Palladium Project, there are two types of rock from the pits: Type 2 acid-releasing contaminant-releasing rock and Type 1 non-acid contamination-releasing rock.

Thus, both types will release contamination, but Type 2 is predicted to release higher levels.

Unfortunately, even after a decade of warnings, Generation PGM has consistently chosen to underestimate the contamination that will come from Type 1 rock by relying on tiny laboratory tests to incorrectly predict contamination and reducing the prediction even further with "scaling factors". Therefore, in effect, here is what this quotation in IR2-3 should actually say: *The open pits will be developed starting in Year -2 to provide rockfill (Type 1 ML-and-contaminating waste rock hopefully with no additional acidity) to construct the mine infrastructure, WMP and PSMF embankments*.

Notice that the mine would use contaminating mine rock around the site for construction, even for water-retaining structures. It is important to understand this.

Concern 2.4: Important considerations for water treatment currently missing for the proposed Project

All of the above bullets and issues on water treatment are still missing from Generation PGM documents. For example, there should be "trigger inflow and outflow concentrations" established so that any influent or effluent concentrations above the triggers will signal failure of water treatment.

If the Project were being built and aqueous concentrations in stored ponds then exceeded maximum inflow values to treatment, then this would trigger a major and expensive redesign and an expanded water treatment system. This should actually be expected because Generation PGM has ignored for a decade the importance of typically conducted larger-scale on-site testing of its rock and tailings. This is regularly done at many proposed minesites throughout Canada, and this is the first one I have seen in years ignoring this critical testing.

Instead, Generation PGM has relied on tiny laboratory controlled tests to predict how bad water quality will be (and obviously saying it will be minor from the tiny tests). There are no on-site tests, such as using existing drill core, to test this belief and it has been wrong in the past at other sites. Generation PGM says that these larger-scale tests will be started only when the mine is started. This is too late because there will already be full-scale minesite components contaminating surface water and groundwaters.

In IR2-3, there are generic statements that some unspecified type of water treatment plant might be built before start-up if the Project is approved. If there are water-quality problems during construction, the contaminated water would be stored in various ponds and cells. However, if the contaminant concentrations are higher than expected, and there is good reason to expect this, then a huge, second water treatment plant would have to be built quickly to "catch up" with the water accumulating in the ponds and cells before they overtop or spill into the environment (discussed further in Sections 2.5 and 7 of this review).

Also, I have not seen any confirmation that all ponds and cells will have geomembrane liners so that there would be no leakage of contaminated water into the underlying groundwater system. Thus, leakage of contaminated water into underlying groundwater should be expected.

Concern 2.5: Major environmental risk of holding contaminated water on site during proposed construction

Generation PGM's assurances that all contaminated water can be held in ponds and cells are based on "median climatic conditions". Thus, prayers for no wet years would become important during construction. Even if median climatic conditions would occur, there would still be **billions** (10^9) of liters (L) of contaminated water stored on site during construction.

Generation PGM explains,

> "In the event that wetter than median climatic conditions occur during this period, the Stormwater Management (SWM) pond would be utilized to provide storage of additional contact water until the WTP is commissioned or a portable WTP is brought to site and operated."

Thus, even more contaminated water (billions more L) would be stockpiled on site during construction. It is an error to believe a portable generic treatment plant for suspended particles could simply be located and brought to site to meet all dissolved and total environmental water-quality criteria. It is also an error that a portable generic treatment plant for suspended solids would quickly treat these enormous volumes to water-quality criteria.

There is a massive environmental risk in the ongoing underestimation of contamination severity and the proposed potential stored volume of contaminated water more than a billion liters. This could result in uncontrolled releases of toxicity during construction into the surrounding water courses, groundwaters, and soils, as explained in Section 7.1 of this review.

Concern 2.6: The proposed fate of contaminated water at the end of operation

The final paragraph of IR2-3 says,

> "Following the end of operations, during the active closure phase of the Project, contact water from the site will be transferred to the open pits for a period of five years. It is expected that treatment of contact water transferred to the open pits will not be required during this time and that the WTP will be decommissioned and removed during the active closure phase. Water transfer to the open pits would cease once reclamation activities are complete and suitable water quality is demonstrated, at which point discharge will be directed to local subwatersheds. This will be clearly defined in the Closure Plan to be filed for the Project, pursuant to Part VII of the Mining Act and O. Regulation 240/00 (as amended)."

Notice in this quoted paragraph that the treated contaminated water would simply be transferred to the open pits untreated for five years. There is no further explanation of where this contaminated water goes as the pits (1) continue to fill with contaminated water caused by the contaminating pit walls and (2) eventually release this contaminated water into the surrounding groundwater system (in less than ~17-30 years) and to the land surface as they overtop (in ~17-30 years). The contaminated water will simply be released to "local subwatersheds" after closure which is environmentally unacceptable. No Closure Plan currently exists to monitor and prevent this

contamination by dissolved and suspended solids.

Also, no minesite with contaminated water has had the contamination stop immediately after mining ceases. It is a wishful dream that does not occur. Instead, the contamination of water after closure often continues for decades, centuries, or even millennia. It is not possible to say how long the contamination of water would continue at the Marathon Palladium Project because only tiny laboratory tests were used to predict the underestimated minimal contamination in the first place.

Concern 2.7: Repeated concerns of CRINO on proposed water contamination and treatment throughout construction, operation, and closure

As stated in CRINO's July 2021 review:
"Without this critical but missing information on water treatment, there is no way to know:

(1) if Part 7 of Ontario Regulation 240/00 can be met reliably,
(2) if the Addendum is sufficiently protective of the surrounding environment, and
(3) how many tens to hundreds of millions of dollars will be needed in initial financial security if the Project is allowed to proceed."

The Government of Ontario should understand the large, and currently underestimated, environmental risk and cost that the Marathon Palladium Project poses to surrounding water quality and sediment quality, during construction, during operation, and after closure. This is discussed further in Chapters 7 and 8 of this review.

3. IR4-5 MRSA and Pit Lake Discharge to Pic River, prepared August 2021

Concern 3.1: Proposed environmental release of contaminated water from the proposed Marathon Palladium Project with no details on toxic mixing zones and usage of dilution

One of the comments in IR4-5 says,

> "GenPGM plans to place coarse rock into the streambed (Figures 9.7-11 and 9.7-13). Seepage from the MRSA will be collected into ponds and transferred to the Water Management Pond for treatment, but these ponds will be decommissioned after closure and MRSA [Mine Rock Storage Area] seepage will flow to the Pic River."

Please note that, because Generation PGM conducted water-contamination and ML-ARD testing only on tiny samples in a laboratory, the "good" Type 1 rock will also likely release serious and toxic contaminated water, worse than currently predicted.

As the quoted comment in IR4-5 shows, this Type 1 rock would be placed into streambeds and thus release contaminated water in the streambed and to the underlying groundwater. Downstream surficial catch basins can only capture the shallowest portion of this contamination. After closure, the contaminated water from the MRSA and filled-in creek bed will simply flow into the Pic River.

Whether one accepts the abnormally low predicted contamination release by Marathon Project rock from the tiny laboratory tests, the fact remains that contaminated water will still flow into the Pic River. If there is sufficient dilution in the river far downstream, then eventually the contaminated "plume" released in the river will be fully mixed and diluted. Until then, there will be a toxic "mixing zone" along the Pic River, as well as at the outfall in Hare Lake.

I have seen no details or modelling, which are standard and important for sites requesting contaminant mixing zones in Canadian rivers and lakes. Notice that this entire issue of a toxic mixing zone is ignored by Generation PGM, and only full immediate downstream dilution is considered, when it says, "These predictions indicated that water quality in the Pic River would meet relevant water quality objectives for the protection of aquatic life."

The same point above about a toxic mixing zone applies to any discharge of site water, from rock or tailings or the pits, as surface water or groundwater, into Hare Lake or the Pic River.

Table 1 of IR4-5 shows the predicted and underestimated "long-term" (and not the higher short-term) dissolved contaminant concentrations in the open pits. Even with the enormous underestimation of contamination by tiny laboratory tests, further reduced mathematically by Generation PGM through erroneous use of "scaling factors", even then Table 1 shows contaminated water with elevated elements such as arsenic, chromium, copper, and selenium in the "long term" post closure.

Therefore, it is critical to understand, if approved, there would be extensive and persistent contaminated water across the Marathon Palladium site, from construction and long into the future, flowing into the surrounding surface and subsurface environments including the Pic River and Hare

Lake. Interestingly, important water-quality parameters like pH and dissolved iron are missing from the predictions, which indicates substantially uncertainty in the overall predictions.

Generation PGM has refused for a decade to conduct the larger-scale on-site tests that predict better the aqueous contaminant concentrations. Instead, Generation PGM continues to underestimate the full-scale contamination by using tiny laboratory tests which then are mathematically manipulated even orders of magnitude lower by incomplete "scaling factors". All we can tell now is that site water will likely be much more contaminated than currently predicted, and even then Table 1 of IR4-5 shows that in the "long term", after closure, the site surface waters and groundwater are still significantly contaminated.

Concern 3.2: Incorrect assumption of full catchment by shallow surficial catch basins

In IR4-5, Generation PGM somehow misses a major hydrogeologic fact. It states,

> "The MRSA will be predominantly founded on bedrock along the east side of the open pits with the Stream 2 and Stream 3 drainages. The topography withing the MRSA footprint provides for topographic containment of precipitation that percolates through the mine rock and reports to the base of the MRSA as seepage . . . "

The remainder of the paragraph discusses how the MRSA seepage will be captured by surficial shallow collection ponds. As hydrogeologists can confirm, the "bedrock" under the MRSA location and the entire site is fractured rock. Such rock can allow water to move downward and then travel long distances laterally. Such deeper seepage is not captured by surficial collection ponds, as unreliably predicted by inappropriate modelling of this complex fractured rock as a "porous medium" (like sand and silt) where groundwater can move in all directions.

Thus, while this quoted paragraph implies there will be no escape of fugitive contaminated water during operation, there indeed will be. That is not included in predictions of off-site contamination around the Marathon Project.

4. IR4-6 Scaling Factors and Water Quality Model (MineMod)

Concern 4.1: Generation PGM and its consultants are still erroneously underestimating full-scale water contamination by using "scaling factors" and tiny laboratory tests

In IR4-6, Generation PGM responds to the criticism that predicted water contamination is grossly underestimated by using scaling factors. Their responses are flawed and erroneous and unprovable.

For example, they say:

> "Scaling factors are typically applied within water quality predictions to correct laboratory humidity cell test results for both ambient temperature of mine rock piles at field conditions and its particle size distribution . . . It is noted that the selection of these scaling factors was based on scientific evidence . . . "

That is categorically wrong and misleading.

If the scaling factors are so "typically applied" and have "scientific evidence", then Generation PGM and its consultants should be able to produce dozens of published case studies from minesites around the world. These published papers would show that their selective subset of scaling factors reasonably predicted full-scale contamination at minesites elsewhere.

I already know for a fact that Generation PGM and its consultants cannot do this. In fact, there are only about a handful of such case studies, and I wrote about half of them. My case studies show that Generation PGM strongly underestimated contamination at the Marathon Project by selecting scaling factors only less than 1.0 while ignoring those greater than 1.0.

Furthermore, Generation PGM and its consultants showed their misunderstanding of scaling factors and how they applied their selective subset incorrectly. They state,

> "This [temperature] scaling factor was applied to the lab humidity test results, obtained at 20°C, to reflect the ambient field temperature conditions of the mine rock pile."

As most Canadians know, down in the ground the temperature can be warmer than the air, which is most clearly seen during the winter. Therefore, the "20°C" is not the "ambient field temperature conditions of the mine rock pile" as they incorrectly stated, but of the ambient air and the outermost surface of the rock piles. The internal temperature down in the ground can be much higher and likely will be. However, as with other missing parameters like pH, I could not find any predicted internal temperatures for the Marathon Project. They likely do not exist, which is why Generation PGM is trying to make us accept air temperatures.

Thus, since Generation PGM and its consultants do not understand the scaling factor for in-ground temperature, then we can suspect they do not understand the other scaling factors. This may also explain why many other scaling factors (especially all those greater than 1.0) are ignored.

The misunderstanding continues in IR4-6 by stating, "Therefore, it is important to characterize the grain size distribution of material used in humidity cell tests and the particle or fragment size

distribution of mine rock that will be produced during mining." Yes, particle size is important for interpreting the tiny humidity-cell tests, but in most cases it is unimportant for full-scale predictions of contamination from minesite components.

Does anyone else believe that Generation PGM can reliably take highly diluted results from 1-kg controlled laboratory testing, reduce it further by about 100 times using scaling factors, and then call that a prediction for 100,000,000,000 times more rock under natural conditions? Generation PGM has refused for a decade to conduct the typical larger-scale on-site testing many other proposed sites in Canada do regularly. Even pipeline projects have conducted these larger-scale tests. Generation PGM has refused to run these tests for a decade.

Instead, Generation PGM now offers to start the larger-scale on-site tests only after mining has started. However, after mining starts, these tests become irrelevant because there will already be full-scale minesite components for monitoring. This is the first mining project in Canada that I have seen in years that did not conduct the all-important larger-scale on-site tests. It is now clear on how the lack of these typical and common on-site tests have compromised the predictions of environmental contamination.

Concern 4.2: Generation PGM and its consultants do not understand model verification and validation

Generation PGM and its consultants were asked to provide external peer-reviewed confirmation and verification, as well as publications, showing that their confidential, internal, "trust-us" model called MineMod was reasonably accurate and had no significant programming errors. They failed to provide such external peer-reviewed or published confirmation in IR4-6.

Instead, there is a misdirected approach in IR4-6 of "it may be beneficial and more helpful to develop and facilitate a modelling workshop whereby more detailed and focused questions can be answered." This is not an issue of whether a potentially flawed model can provide inaccurate answers - we already know it can. The issue is whether the MineMod model has been externally peer reviewed and externally validated. It has not. This is not addressed by a "modelling workshop".

Section 2 of IR4-6 further emphasizes the importance of this by describing all the complex inputs, assumptions, and outputs from the model. "The model outputs include in excess of 20 million discrete data records for water quality alone." How do we know how many of these 20 million values were calculated correctly by the model? We don't.

In response to a comment in IR4-6, Generation PGM replies,

> "Calibration of a water quality model refers to the process of comparing the resultant predictions to historical water quality data to confirm that the model setup and selected parameter values effectively represent the site and accurately represent the site hydrology and geochemistry. This process is typically completed using historical data, as available from previous years of operations and that matches the time period over which the model is applied."

That makes sense, although calibration of a flawed and erroneous model will not lead to reasonable predictions. Was calibration done for the Marathon Palladium Project as the quotation explains? No.

> "In absence of operational monitoring data, the model has been developed with a conservative approach in order to evaluate the predicted water quality during and post operations."

So the correct approach to model calibration was recognized, but information was assumed based on an ambiguous trust-us approach that someone considered "conservative". Maybe it was not conservative at all, like the scaling factors also discussed in IR4-6.

5. IR5-16 Metal Leaching under Neutral Conditions

Although only two pages long, the responses by Generation PGM and its consultants in IR5-16 are loaded with errors. As explained in detail in CRINO's review of October 2012 and July 2021, there are many simple explanations and illustrations that show how wrong they are.

The following figure is one that simply illustrates how contaminant concentrations were predicted for the Marathon Palladium Project (the leftmost column). Generation PGM and its consultants used 1 kilogram of sample for the controlled laboratory test. They used a high dilution factor likely around 100 times more dilute than site conditions and, unlike on-site reality, allowed the leach water to pass through only 1 kg. In reality, as each liter of water flows further into rock and tailings, under naturally variable conditions, each kg releases additional contamination to the water (the rightmost column in the figure). As a result, contaminant concentrations can increase enormously higher than the current predictions for the Marathon Project.

It does not stop there. The results of the diluted 1 kg samples were then reduced by up to 100 times lower than measured in the testwork! Yet this remarkable underestimation of contaminant concentrations is said to be "conservatism" in IR5-16. It is by far the opposite.

This further reduction after the diluted laboratory testwork was done by the incorrect usage of a few "scaling factors" (see also Chapter 4 of this review) which rarely apply to full-scale predictions. If such scaling factors were so important and applicable to full-scale predictions, then Generation PGM and its consultants should be able to show at least a few dozens published studies from around the world showing how their restrictive subset of scaling factors successfully predicted full-scale minesite contamination.

I know they cannot do that. There are only about a handful of such studies, and I wrote some of them.

Therefore, I know that contaminant concentrations have been grossly underestimated for the Marathon Palladium Project. This could have been resolved years ago by running larger-scale on-site tests typical at mining projects in Canada and even used by pipeline projects. However, Generation PGM has refused for a decade to run them and argues the left side of the figure below, reduced even lower by scaling factors, is "conservatism". It is strongly the opposite.

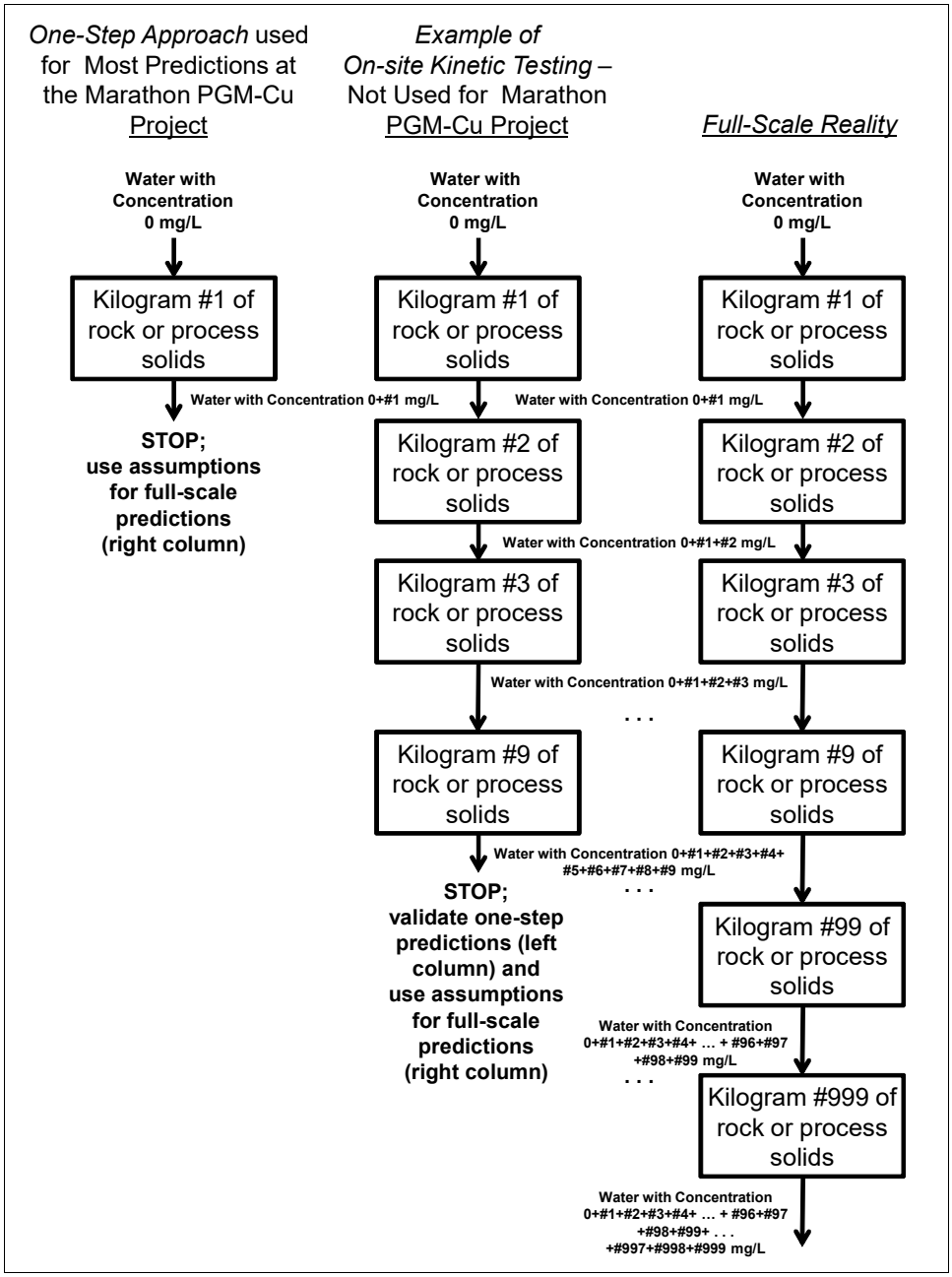


Figure 1. The right side shows reality of water flowing through mine waste and thus consecutively accumulating high contaminant levels. The left side is the approach used for the Marathon Palladium Project EA and EIS Addendum, which allows a relatively large amount of diluting water to contact only a very small amount of mine waste. As a result, full-scale water contamination and ML-ARD are likely grossly underestimated. The 2021 Marathon Addendum and IR5-16 did not correct this problem, but instead attempted to validate it with erroneous statements.

IR5-16 also erroneously claims conformity with the MEND (2009) federal ML-ARD Prediction Manual, which it should follow to meet Regulation 240/00. However, this is another error that Generation PGM and its consultants have continued to say for at least 10 years.

ML-ARD predictions for the Marathon Palladium Project followed a few guidelines in that Manual, but there is no admission by them that many major guidelines were ignored, as pointed out in detail in my previous reviews.

For example, Marathon samples were only partially dissolved to show that their contaminant levels were less than totally-dissolved crustal levels. Of course that would suggest Marathon rock and tailing do not contain much contamination, but it is a deceptive gross underestimation of contamination at the Marathon Project.

To be clear and accurate, current ML-ARD predictions for the Marathon Palladium Project do not conform to the federal ML-ARD Prediction Manual.

IR5-16 also states, "Field test cells will be developed using representative run of mine materials for Type I rock, as these materials become available during operations." This is a worthless and too-late offer from Generation PGM. These larger-scale on-site field tests (see the middle column of the figure above) should have been started a decade ago when their critical importance was pointed out.

The on-site tests would have provided the critical test of whether the 1-kg laboratory controlled cells could reliably predict water contamination from hundreds of kilogram or broken drill core or rock on site under naturally variable conditions. Instead, Generation PGM expects us to believe that 1 kg controlled lab tests will accurately predict more than 100,000,000,000 kilograms of mine wastes under natural conditions. Common sense tells us this is not reasonable.

Instead, the offer from Generation PGM is now to start the on-site tests after mining starts. That is worthless now, because there would already be monitoring data for the full-scale minesite components. And the shock from "unexpected" contaminant levels that cannot be treated correctly would already be underway at the Marathon Project.

That is why these larger-scale on-site tests are regularly run before the start of mining and when a project is seeking approvals. They "bridge the gap" between 1-kg controlled lab cells and 100,000,000,000 kg under uncontrolled natural conditions. It is too late for the Marathon Palladium Project.

6. IR5-3 Water Quality Predictions and Monitoring

Concern 6.1: The amazing and unbelievable lack of water-quality effects anywhere around the Marathon Project at any time during operation and after closure

In IR5-3, Generation PGM and its consultants are told to provide predictions of pH and alkalinity in Hare Lake, Pic River, and Stream 106. Previous CRINO comments emphasized the importance of predicted pH and predicted alkalinity that protects against acidification. Past testwork for the Project showed there was little alkalinity (and hardness) produced even by "good" Type 1 rock, so waters at the Project can become acidic with relatively small addition of unexpected acidity.

In IR5-3, Tables 1, 2, 3, Updated 6-2, Updated 6-6, Updated, 6-7, Updated 6-8, and Updated 6-9 show overwhelmingly no changes for most elements from baseline conditions, or from operation to closure, at any time, anywhere, forever. Not only is this remarkable, it is also unbelievable. A large minesite that has virtually no effect on the surrounding water chemistry ever!

The explanations for these unreliable predictions of never-any-significant-effect likely lies in (1) the grossly underestimated dissolved concentrations predicted for the site water, (2) the ignored and unpredicted suspended concentrations that will raise total "unfiltered" concentrations even higher above the predicted dissolved levels, (3) the lack of consideration of toxic "mixing zones" as the contaminated site waters are discharged into water bodies (see the minimal proposed monitoring in Figure 1 of Attachment A of IR5-3), and (4) the usage of an unverified "trust-us" model for predictions. These were all discussed in more detail in the preceding chapters of this review.

The ML-ARD studies to predict site-water contamination at the Marathon Project have focussed only on "dissolved concentrations", and not on "suspended concentrations" and "total concentrations" that are dissolved plus suspended.

Suspended concentrations were not predicted, yet amazingly the proposed water treatment is only for suspended particles that were not even included in site-water contamination in the first place. This is why the currently proposed water treatment would not be effective on the predicted contaminant concentrations.

Furthermore, many provincial water-quality objectives and CCME values are for total concentrations (such as shown in its Attachment A for surface water quality in IR1-4). However, Generation PGM has underestimated these total values by predicting only the dissolved portion, and even then grossly underestimating the dissolved portion. No wonder an unbelievable lack of significant impacts is erroneously predicted for the Marathon Project.

Concern 6.2: Erroneous statements about the environmental effects and impacts of reagents

IR5-3 also addresses why artificial chemicals and reagents were not included and predicted. Here are the two reasons offered:

> "While there would be the expectation that some quantity of the mill reagents will pass through the mill and into the waste stream (i.e., process solids), (1) such quantities are expected to be small (reagent amendment rates in the mill are carefully determined so as to maximize mineral recovery while minimizing the amendment rate), and (2) the reagents are expected to be bound to mineral particles in the waste stream and generally not available as soluble products in the liquid phase. "

Please note that first reason, in effect, says "we thought the reagent concentrations would be small so we did not predict them" which says nothing reliable. The correct answer should be: we included and predicted them and they were predicted to be low.

Also note the flawed argument: "reagent amendment rates in the mill are carefully determined so as to maximize mineral recovery while minimizing the amendment rate". While that is true, it says nothing about how much reagent comes out as waste. It only says the reagent amount is optimized to be minimal while obtaining maximum recovery, but the amount going to waste could still be 50% or more of the addition.

Finally, the second reason we are told to not worry about reagents is they would be "bound to mineral particles". First, lime is one of the proposed reagents and it is an error that it would be expected to be "bound to mineral particles". This shows the response in IR5-3 for reagents is wrong and unreliable. Second, any reagents "bound to mineral particles in the waste stream" are then exposed to natural environmental conditions and processes not experienced inside the engineered process plant or in 1-kg laboratory-controlled tests. Even simple biological activity in the discharged "waste stream" could lead to the progressive release of the "bound" reagents, such as through enzymatic activity, or the creation of byproducts and degradation products, which are not even mentioned by Generation PGM and its consultants.

7. One of Many Potentially Disastrous Environmental Scenarios from the Company's Responses in the IRs

Due to all these underestimations, errors, and assumptions, it is easy to envision many environmentally disastrous scenarios that can easily arise if the Marathon Project proceeds.

7.1 A Plausible and Reasonable Example of an Environmentally Disastrous Event at the Marathon Project

Here is one disastrous scenario that can be easily envisioned at the Marathon Project.

In IR2-3 (see Chapter 2 of this review), Generation PGM and its consultants present a planned scenario during construction if approved.

- The water-treatment plant (WTP) and its Hare Lake discharge pipeline (apparently using 100% dilution at the discharge) will be operating in Year 1.
- However, during construction (Year -2 and Year -1), contaminated "contact" water would be collected in the Water Management Pond.
- Contaminated water during construction can also be stored in Cell 1 of the Process Solids (Tailings) Management Facility.
- Additional contaminated water during construction can be stored in the initial open pits, effectively blocking any mining and revenue generation until removed and treated.
- Finally, if there are wetter-than-median conditions (~50% probability), then the Stormwater Management Pond will store even more contaminated water "until the WTP is commissioned or a portable WTP is brought to site and operated."

This scenario sounds reasonable. However, there are several critical parts not given in IR2-3 so this is only part of the story.

Here are the missing parts of the planned scenario that show this plan can lead to disastrous problems for water quality and the surrounding environment and lead to expensive liability for the Government and people of Ontario.

1) Even under "median" climatic conditions, there would be billions (10^9) liters (L) of contaminated water stored on site during construction awaiting treatment. Under wetter conditions (~50% probability), there would billions more liters of contaminated water stored on site awaiting treatment.
2) I could find no confirmation that all these storage facilities will have impermeable geomembrane liners that would prevent the stored contaminated water from flowing downward into the underlying groundwater system and heading for the surrounding environment.
3) Whether the treatment plant is commissioned after construction or a portable treatment plant is used during construction, they are only designed to treat suspended particles and not several dissolved contaminants.

4) These treatment plants could take years to remove contamination from all the billions of liters of contaminated water in storage. During that time, even more contaminated rainfall and water will continue to accumulate on the site. It could become a losing battle.
5) The contaminated water in the pits and the lack of sufficient contaminated-water storage elsewhere could prevent mining and revenue generation until sufficient dissolved contaminants were treated.
6) With no income and no mining, Generation PGM would immediately be facing tens of millions of dollars in "unexpected" additional costs to build a treatment plant to remove "unexpected" dissolved contaminants. This treatment plant would likely take at least a year to design, obtain parts, build, optimize, and commission. Meanwhile, more contaminated water would continue to accumulate and require storage.
7) If the available storage is exceeded, untreated contaminated water would have to be released from the storage facilities into the surrounding environment to protect the geotechnical integrity of the storage facilities.
8) If Generation PGM cannot afford the "unexpected" up-front cost of tens of millions of dollars, and a year or more delay before mining could start, then Generation PGM could declare bankruptcy.
9) In the case of bankruptcy, the Government and people of Ontario will become responsible for major water treatment at yet another minesite in the province. Until sufficient water treatment capacity were built by the government, contaminated water would continue to flow into surrounding surface waters and groundwaters including the Pic River.
10) Right now, the way to ensure this disastrous scenario cannot happen requires one or both of the following:
    a) Generation PGM designs and builds, before construction, a water-treatment plant for dissolved contaminants at safe and conservative high concentrations and high flows. Thus, relatively little contaminated water has to be stored on site or leak into the underlying groundwater system. This treatment plant could cost tens of millions of dollars before mine construction, cost a million dollars or more each year to operate, and may exceed available financing of Generation PGM.
    b) The Government of Ontario collects a financial security bond before construction for tens of millions of dollars for dissolved-contaminant water treatment and is prepared to quickly build a safe water-treatment plant quickly. Such a bond may exceed available financing of Generation PGM.

7.2 A Selection of Other Plausible Environmentally Disastrous Scenarios

There are many such disastrous scenarios that can be easily envisioned at the Marathon Project. As additional example, these following quotations by Generation PGM should give reasons to be concerned.

"GenPGM plans to place coarse rock into the streambed (Figures 9.7-11 and 9.7-13). Seepage from

the MRSA will be collected into ponds and transferred to the Water Management Pond for treatment, but these ponds will be decommissioned after closure and MRSA [Mine Rock Storage Area] seepage will flow to the Pic River."

And,

"Following the end of operations, during the active closure phase of the Project, contact water from the site will be transferred to the open pits for a period of five years. It is expected that treatment of contact water transferred to the open pits will not be required during this time and that the WTP will be decommissioned and removed during the active closure phase. Water transfer to the open pits would cease once reclamation activities are complete and suitable water quality is demonstrated, at which point discharge will be directed to local subwatersheds."

8. Current Options to Minimize Environmentally Disastrous Scenarios

The Marathon Project should be stopped until reasonable and realistic estimates are made of ML-ARD and water contamination, and of reasonable costs for dissolved-contaminant water treatment.

If not stopped now, until Regulation 240/00 is met for ML-ARD, the initial financial security could be grossly underestimated by tens of millions, to hundreds of millions, of dollars.

This could lead to another provincial environmental liability costing tens to hundreds of millions of dollars, like the Steep Rock minesite.

MAPPING THE CUMULATIVE EFFECTS ON LAKE SUPERIOR'S NORTH SHORE

A Map Reflecting the Cumulative Effects of Generation PGM's Marathon Palladium Project, Prepared for CRINO

Research: Sara Libman, Libman Law LLP

Map Design: Jonathan Kelly

Table of Contents

Preamble

The Citizens for Responsible Industry in Northwestern Ontario (CRINO) supports responsible industrial development and natural resource extraction activities within Northwestern Ontario. CRINO works to ensure that any projects being approved within the Lake Superior watershed are carefully assessed to ensure that there are no significant impacts to air quality, aquatic habitats, climate change, terrestrial habitats, and water quality along Lake Superior's North Shore.

According to the WWF's Watershed Reports, the **Northeastern portion of Lake Superior's watershed** (which encompasses the Town of Marathon) is in "fair" overall health. However, water quality in this watershed is "poor", and threats are ranked overall as "high": pollution is "very high" risk; habitat fragmentation is "high" risk; and overuse of water is "very high" risk. Additionally, the **Northwestern portion of Lake Superior's watershed** (which encompasses the City of Thunder Bay) is assessed with "very high" risk threats, such as: pollution is "very high" risk; habitat fragmentation is "high" risk; overuse of water is "very high" risk; alteration of flows is "very high" risk; and climate change is "moderate" risk. For this watershed to improve its overall health, careful assessment and monitoring of cumulative effects is necessary.

Assessing Cumulative Effects involves the examination of the environmental effects (including those arising from malfunctions and accidents) that are likely to result from a project in combination with other physical activities that have or will be carried out. Cumulative Effects may be additive (which is the sum of 2 or more effects); synergistic (which is result of the interaction between 2 or more effects, when the resultant combination is greater or different than the simple addition of the effects); compensatory (which is when effects from 2 or more activities "offset" each other); or masking (which is when one effect makes another effect undetectable, i.e., "masking it"). Therefore, the purpose of assessing cumulative effects is to *"…examine a project's aggregate, as opposed to individual, effects."* A small scale environmental effect from a mining project can still cumulatively impact the quality of the air, land, and water within an ecosystem and/or community.

CRINO developed this map to assist the Joint Review Panel in assessing how the Generation PGM Marathon Palladium Project may cumulatively affect the Lake Superior's North Shore. This map arose from concern that the mining proponent's scoping of cumulative effects in the Environmental Impact Statement was too narrow, as it did not consider Lake Superior's watershed as a whole. There are a variety of environmentally intensive projects that have been or will be operating throughout the watershed, and these projects all need to be considered when assessing the Marathon Palladium Project's presence on the shores of Lake Superior.

With the recent signing of the 2021 Canada-Ontario Great Lakes Agreement, there is a recognition by both levels of government that "*…restoration and enhancement of Great Lakes water quality and ecosystem health cannot be achieved by addressing individual threats in isolation, but rather depend upon the application of an ecosystem approach that addresses individually and cumulatively all sources of stress to the Great Lakes*." Therefore, a broader lens is needed for assessing the cumulative effects of the Marathon Palladium Project on the northern portion of Lake Superior's watershed to protect air quality, water quality, and habitat within the region.

GENERATION PGM MARATHON PALLADIUM PROJECT AND CUMULATIVE EFFECTS ON THE NORTH SHORE

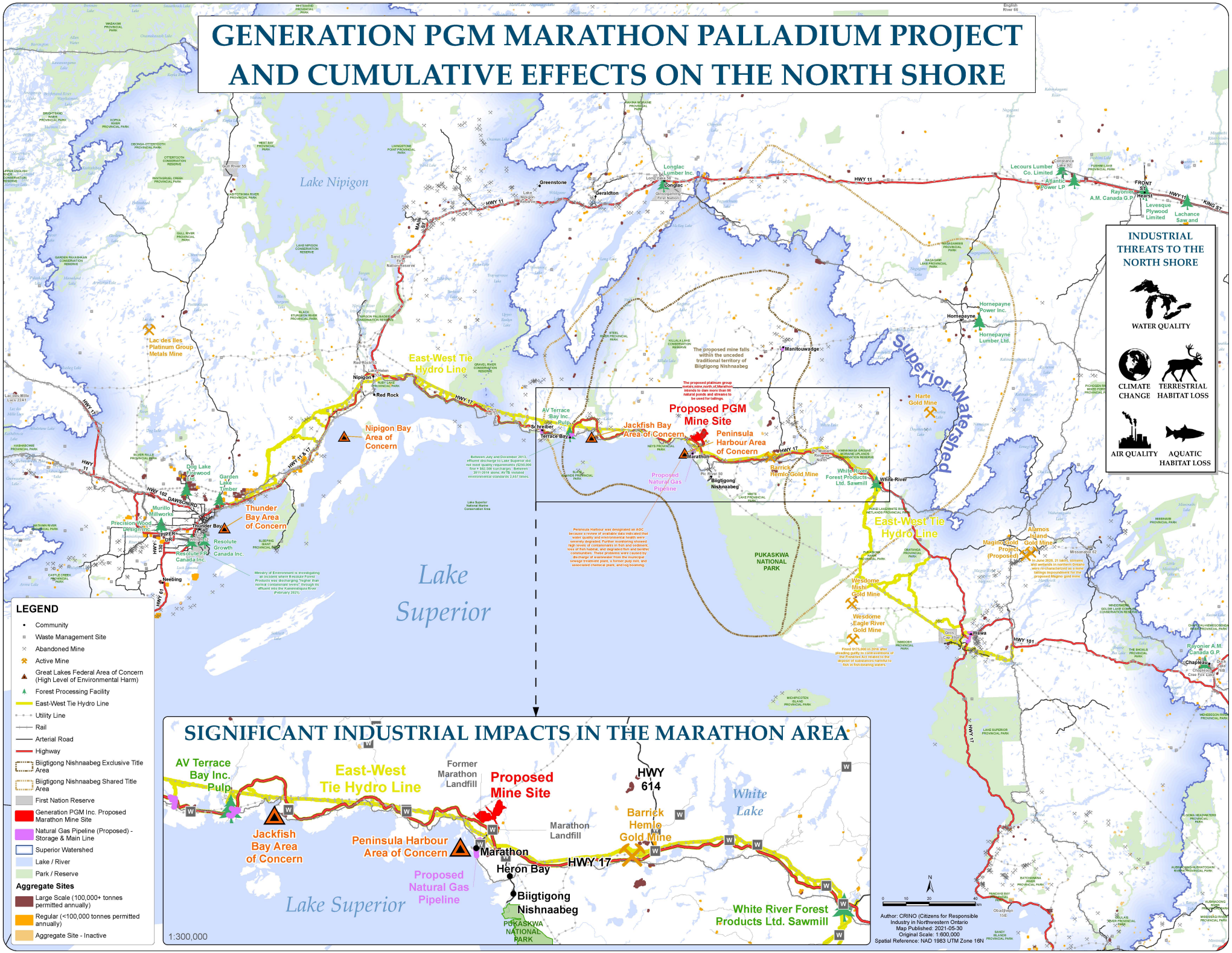
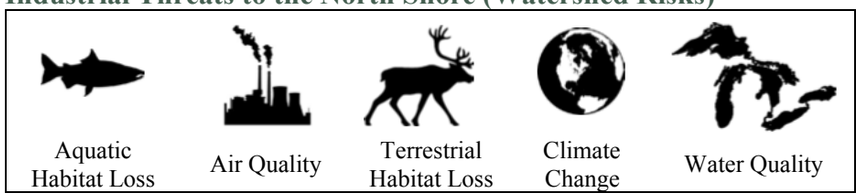


Table 1: Industrial Sites Located Within Lake Superior's North Shore Watershed

Industrial Threats to the North Shore (Watershed Risks)



PROJECT NAME	LOCATION IN WATERSHED	TYPE OF INDUSTRY	INCLUDED IN PROPONENT'S CUMULATIVE IMPACTS MAP?	OPERATING TIMELINE OF PROJECT	WATERSHED RISKS	NOTES ABOUT SITE'S OPERATIONS	ENVIRONMENTAL ENFORCEMENT AND/OR FINES?
Geco Mine	North of Manitouwadge, ON	Base-metal mine	Y	Inactive		"an estimated 90 cubic feet per minute of water discharge will require long term treatment, at substantial cost, into perpetuity."	
Wilroy Mine	North of Manitouwadge, ON	Base-metal mine	Y	Inactive		"An estimated 90 cubic feet per minute of water discharge will require long term treatment, at substantial cost, into perpetuity."	
Winston Lake Mine	North of Schreiber, ON	Copper/Zinc mine	Y	May be subject to redevelopment as ***Superior Lake Zinc Project*** (currently in exploration phase) Mine life of new project estimated to be 9 years		Currently on site: Tailings management facility and freshwater dam. For future project: Environmental Compliance Approval (ECA) for any discharges to air or water, with the latter including potentially separate approvals and treatment processes for industrial wastewater and domestic sewage generated from the mine operations.	
Golden Giant Mine, (part of Barrick Hemlo Gold Mine Camp)	40 km east of Marathon, ON	Gold Mine	Y	Ceased production in 2014.	 *	Currently in Remediation Phase. Water treatment and tailings management required in perpetuity.	

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David Bell Mine (part of Barrick Hemlo Gold Mine Camp)	40 km east of Marathon, ON	Gold Mine	Y	Ceased Production in 2010.		Currently in Remediation Phase. Water treatment and tailings management required in perpetuity.	
Williams Mine (part of Barrick Hemlo Gold Mine Camp)	40 km east of Marathon, ON	Gold Mine	Y	Expected to operate until 2031		Underground mining operation only. Treated surface water discharge into the Black River, a tributary of the Pic River, and enters the Pic River approximately 18 km downstream of the Proponent's Site Study Area.	
Harte Gold Sugar Zone Mine	30 km northeast of White River, ON	Gold Mine	Y	Estimated 13 Years (2019-2032, at current production levels)		The Operation adjoins the Dayohessarah Lake watershed, a valued recreational lake. As such, emphasis has been placed on controlling discharges of water, fugitive dust and noise to avoid potential negative effects on Dayohessarah Lake and its watershed. <u>RE: Potential Impacts Due to Effluent Discharge:</u> Effluent discharged from the Operation will report to Gagegenha Lake. Gagegenha Lake drains via Gagegenha Creek, which subsequently joins with Dayohessarah Creek. Dayohessarah Creek then flows north and joins the Strickland River, which later joins the Shabotik River before it enters White Lake to the southwest. White Lake drains to White River, which flows to Lake Superior.	

Wesdome Eagle River Gold Mine	100 km Southeast of Marathon, ON	Gold Mine	Y	In Production since 1995.		**<u>Effluent Management (2015-2019) According to 2019 Sustainability Report</u>** (*there were 4 exceedances in accordance with regulatory requirements)*: **2015:** The Eagle River Mine effluent discharge just about exceeded, on one occasion, the daily limit of 0.20 mg/L for the parameter of un-ionized ammonia with a value of 0.22 mg/L. **2018:** The Eagle River Mine effluent discharge exceeded the daily limit of 30mg/L for the parameter of Total Suspended Solids on two different days (May 6 and May 8). These exceedances were attributed to insufficient flocculant addition rates and corrective actions were quickly implemented. However, the monthly average TSS concentration was 12 mg/L and did not exceed the regulatory monthly average limit of 15mg/L. On April 30, 2018, a controlled discharge from the Miron Creek Tailings Management Area Polishing Pond commenced as per the Amended Environmental Compliance Approval. The discharge concluded on May 18, 2018. During the discharge period, three exceedances occurred above the acute lethality limit of 50% for *Daphnia magna:* 70% on April 30, 100% on May 2, and 100% on May 3. The occurrences were monitored throughout the process and there was no mortality of rainbow trout detected. **2019:** The Tailings Management Area effluent discharge from the Polishing Pond exceeded the monthly average limit of 15 mg/L for the parameter of Total Suspended Solids with an average of 16 mg/L once in September. This exceedance was believed to be caused by an algae bloom and was not believed to have any negative effect on the natural environment because acute toxicity samples were taken during this time had 0% mortality for Daphnia Magna and rainbow trout.	February 22, 2016: fined $175,000 after pleading guilty to contraventions of the Fisheries Act related to the deposit of substances harmful to fish in fish-bearing waters. Ordered to pay an additional $175,000 related to provincial offences, following charges laid by the Ontario Ministry of the Environment and Climate Change.
Wesdome Mishi Gold Mine	100 km southeast of Marathon, ON	Open Pit Gold Mine	Y	In Production since 2002. After intermittent use, this site was mined out in 2020. Plans to		2013: An amendment to Environmental Compliance Approval Number 7270-8KZKVW was issued for Mishi Pit mine water treatment and discharge works, located 52 kilometres south on Paint Lake Road from Highway	

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				use the pit as water storage as a part of the water management process.		17, in the Unsurveyed District of Thunder Bay, Ontario. The approved sewage works consist of the collection and transmission of seepage and precipitation/runoff from Mishi Pit into a 41,325 cubic metre settling pond for treatment, discharging under seasonal regime via a ditch eventually to Macassa Creek.	
AV Terrace Bay Inc.	Terrace Bay, ON (approx. 100 km west of the Proponent's Site Study Area)	Forest Processing Facility	Y	Pulp mill production restored in 2012 when purchased by Aditya Birla Group.		Treated effluent from the mill discharges to Blackbird Creek that enters Lake Superior in Jackfish Bay (AOC)	Between July and December 2013, effluent discharge to Lake Superior did not meet quality requirements: $250,00 + $62,500 surcharge. Has violated environmental standards 2457 times between 2011-2014.

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East- West Tie Transmission Line	450 km double-circuit 230 kV transmission line connecting the Lakehead Transfer Station in the Municipality of Shuniah near the city of Thunder Bay to the Wawa Transfer Station located east of the Municipality of Wawa. It will also connect to the Marathon Transformer Station.	Electricity Transmission Line	Y	Construction Timeline of 26 months (estimated completion early 2022)		The proposed project generally parallels the existing East-West Tie transmission corridor but avoids some sensitive features crossed by the existing line, including Pukaskwa National Park. The proposed right-of-way (cleared area) for the project is expected to be up to 64 m (210 ft) wide. Project's EA Report indicated significant effect on Woodland Caribou, and Little Brown Myotis.	

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Marathon Pulp Inc.	Marathon, ON	Former Forest Processing Facility (Pulp Mill). Town of Marathon has interest in redeveloping brownfield site for economic development.	Y	Mill closed in 2009		The order contains requirements that provide for the continuation and updating of this environmental work, and includes, but are not limited to, the following: 1. On-going long-term groundwater monitoring and sampling program at the property until such time the ministry determines it is no longer necessary. 2. An annual groundwater monitoring and sampling report that will interpret the results of the monitoring program and contain any recommended changes based on the results. 3. Registration of the order on title for the property and requirements that a copy of the order be provided to any future interested purchaser of the site to create awareness of ongoing site requirements until such a time that they are deemed no longer necessary by the ministry. 4. A requirement that financial assurance be provided to the ministry to ensure that long-term monitoring requirements are implemented. In accordance with ministry policies, the town will not be required to provide financial assurance; however, this requirement will be effective on any subsequent owner in the event of a sale of the site. The amount of financial assurance required will be determined in accordance with the ministry's guidelines for any remaining monitoring work at site.	**Order to Prevent Discharge of Contaminants:** On September 23, 2019 the MECP issued the Director's Order to the Town of Marathon to carry out ongoing site work at the former mill property in Marathon that will prevent, decrease or eliminate adverse effects, including the discharge of contaminants into the natural environment. The order is issued on consent of the town, waiving its right of appeal.
Town of Marathon Landfill	Marathon, ON	Municipal Waste Management Site	Y	Capacity for 100 years of waste disposal. Commissioned in 2015		The decomposition of organic waste in landfills produces a gas which is composed primarily of methane, a greenhouse gas contributing to climate change. Emissions from Canadian landfills account for 20% of national methane emissions. (Environment and Climate Change Canada).	

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Town of Marathon Waste Transfer Station	Marathon, ON	Municipal Waste Management Site	Y	Site of former Marathon Landfill, which closed in 2015		The Transfer Station is prohibited from accepting the following: i. liquid non-hazardous waste; ii. solid or liquid hazardous waste; iii. biomedical waste (excluding sharps and pharmaceuticals); iv. PCB waste; v. explosive waste; and vi. compressed gas cylinders with valves installed, excluding propane tanks, used for cooking.	
Marathon Mercury Disposal Site	Marathon, ON	Industrial Waste Management Site	N	Closed		Requires maintenance and monitoring of groundwater quality and heavy metal levels.	
Magino Gold Project	Dubreuilville, ON	Open-Pit Gold Mine	Y	Operate for approximately 12-15 years (mining occurring for approximately 10 years)		"On June 11, 2020, 21 lakes, streams and wetlands in northern Ontario were re-characterized as a mine tailings impoundment for the proposed Magino gold mine." "Magino is on the site of a former underground mine and is considered a "brownfield site." Around Wawa, the legacy of arsenic contamination from historic mines and mills continues to be a problem, and in the area near the Magino project there are ten abandoned mines". (MiningWatch.ca) Minister of Environment and Climate Change Canada Issued Environmental Assessment Decision Statement on January 24, 2019	

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Proposed Liquified Natural Gas (LNG) Pipeline	116.5 kilometres of natural gas pipelines in the Town of Marathon, Township of Manitouwadge, Township of Schreiber, Township of Terrace Bay and Municipality of Wawa.	Natural Gas	N	Proposed		Phase 1 of Project Approval approved by Ontario Energy Board February 27, 2020: see Decision and Order	
Resolute Growth Canada Inc.	Thunder Bay, ON	Forest Processing Facility	N	Ongoing for foreseeable future		Products: Lumber, wood pellets On July 16, 2020, the sawmill shipped its four billionth board foot of construction-grade lumber. Since 2003, wood produced in Thunder Bay has been providing solid foundations for homes, renovation projects and other structural applications.	
Resolute FP Canada Inc.	Thunder Bay, ON	Forest Processing Facility	N	Ongoing for foreseeable future		Products: market pulp (most commonly used material to make paper and tissue), newsprint "Our Thunder Bay pulp and paper mill responsibly sources wood fibre through certification to the Sustainable Forestry Initiative® (SFI®) standard as well as the Programme for the Endorsement of Forest Certification (PEFC) and Forest Stewardship Council® (FSC®) chain-of-custody standards."	Ministry of Environment investigating an incident where Resolute Forest Products was discharging "higher than normal contaminant levels" through its effluent into the Kaministiquia River (February 2021).
Murillo Millworks	Murillo, ON	Forest Processing Facility	N	Ongoing for foreseeable future		Small scale operation.	

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Precision Wood Design Inc.	Murillo, ON	Forest Processing Facility	N	Ongoing for foreseeable future		Small scale operation. 2011: will modernize and expand its sawmill and remanufacturing facility to produce framing stock, paneling, dimensional lumber, trim and mouldings, creating six new jobs and protecting four.	
Dog Lake Firewood Ltd.	District of Thunder Bay, ON	Forest Processing Facility	N	Ongoing for foreseeable future		Products: process and sell cut & split firewood.	
Garden Lake Timber	Shuniah, ON	Forest Processing Facility	N	Established in 1980		Family owned and operated business. Garden Lake Timber is a well-established supplier of Core Trays [for core and soil samples in mining] and Rack Systems with over 30 years' experience in manufacturing and supply for the Mining Industry of Northwestern Ontario.	
Lac des Iles Platinum Group Metals Mine	District of Thunder Bay, ON	Palladium Mine	N	Open-pit mining began in 1993. Mine life has been extended until 2027		The Lac Des Iles mine is an open-pit and underground operation located 85km from Thunder Bay in Ontario, Canada. The mine consists of the Roby zone and the offset zone and extends over 86.4km^2 of mineral claims and leases. 2015: "A potential catastrophe downstream from Lac Des Iles Mine has been averted, says a Ministry of the Environment and Climate Change official. New water quality tests show no damage to the aquatic environment after a tailings pond sinkhole caved in on June 4. Afraid the resulting flow would cause failure of another dam, the Ministry of the Environment allowed the mine to discharge tailings into the watershed. Had a second dam burst, MOE issues projects coordinator Lisa Brygidyr said a million cubic metres of contaminated water could have entered the environment." (TBNewsWatch).	

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Longlac Lumber Inc.	Longlac, ON	Forest Processing Facility	N	Ongoing for foreseeable future		Sawmill that produces SFP (spruce, pine, fir) lumber. In March 2019, Vice President of the company commented on an ERO posting for 10th Year Review of Ontario's Endangered Species Act: Discussion Paper: "Further, we remain extremely concerned about role of the Federal Government and potential negotiations with Ontario on Conservation Agreements. For example, a MNRF socio-economic analysis determined that up to 2800 jobs could be lost and 8 mills could close as a result of the province meeting the federal disturbance thresholds for caribou. It is our expectation that Ontario will consult with us well in advance of any draft and will not enter into a Conservation Agreement with the Federal Government that will result in lost jobs and lost opportunity. In order to avoid serious socio-economic impacts, we need permanent recognition that the CFSA is an equivalent process to the ESA, while developing workable species at risk policy, and sending a strong message to the Federal government that Ontario will manage our own resources."	

PROJECT NAME	LOCATION IN WATERSHED	TYPE OF INDUSTRY	INCLUDED IN PROPONENT'S CUMULATIVE IMPACTS MAP?	OPERATING TIMELINE OF PROJECT	WATERSHED RISKS	NOTES ABOUT SITE'S OPERATIONS	ENVIRONMENTAL ENFORCEMENT AND/OR FINES?
Lecours Lumber Co. Limited	Hearst, ON	Forest Processing Facility	N	Established in 1943; operations ongoing for foreseeable future		From company website: "The company presently owns and operates a modern sawmill and planing facilities located 37 km west of Hearst in Calstock, Ontario Canada. Our growth in production was through a series of acquisitions of other producers that took place in the 80's and 90's. The total annual softwood lumber capacity exceeds 100 million board feet which is shipped in Canada and the United States either by trucks or rail cars. Our current annual conifer supply commitments of approximately 476,000 cubic meters are secured under four separate long-term Sustainable Forest License agreements (SFL) with the Ontario Ministry of Natural Resources, the largest forest tenure being on the Hearst Forest SFL. Our overlapping agreement with the Hearst Forest Management Inc. grants us rights to an annual allowable cut (AAC) of 311,417 cubic meters of timber that is Forest Stewardship Council® (FSC®) certified."	
Atlantic Power LP (Calstock)	Hearst, ON	Forest Processing Facility [Biomass generation facility, combustion of wood waste)	N	Operations ongoing for foreseeable future		The Facility creates steam from the combustion of wood waste in a boiler and waste heat from TransCanada's nearby compressor station. Power is generated using one 41 megawatt (MW) Alstom steam turbine-driven generator. The wood waste is burned in a Foster Wheeler boiler with the flue gases from the boiler treated in a cyclone separator and an electrostatic precipitator that removes the majority of the unburned carbon and particulates before the gases enter the atmosphere. The Facility uses a cooling tower to condense process steam for reuse in the power generation cycle. Calstock has a maximum processing capacity of 320,000 GMT/yr. of wood waste. Residual wood ash from the Facility is disposed of in a dedicated ash landfill located on the eastern portion of the property.	

PROJECT NAME	LOCATION IN WATERSHED	TYPE OF INDUSTRY	INCLUDED IN PROPONENT'S CUMULATIVE IMPACTS MAP?	OPERATING TIMELINE OF PROJECT	WATERSHED RISKS	NOTES ABOUT SITE'S OPERATIONS	ENVIRONMENTAL ENFORCEMENT AND/OR FINES?
Rayonier A.M. Canada G.P.	Chapleau, ON	Forest Processing Facility	N	Operations ongoing for foreseeable future		Annual Softwood Production Capacity of 135 million board feet. Total annual production capacity of Biomass (may include blends of sawdust, shavings, and screen fines (negotiable)) is close to one million bdmt (bone dry metric tons). The Martel Forest and Algoma Forest supply conifer fibre to RYAM Lumber's sawmill in Chapleau.	
Levesque Plywood Limited	Hearst, ON	Forest Processing Facility	N	Operations ongoing for foreseeable future		Products: Panels, hardwood plywood, particleboard, plastic laminated	
Lachance Saw and Planer	Val Côté, ON	Forest Processing Facility	N	Operations ongoing for foreseeable future		Products: Custom lumber, mining boxes, flooring, siding, trims	

PROJECT NAME	LOCATION IN WATERSHED	TYPE OF INDUSTRY	INCLUDED IN PROPONENT'S CUMULATIVE IMPACTS MAP?	OPERATING TIMELINE OF PROJECT	WATERSHED RISKS	NOTES ABOUT SITE'S OPERATIONS	ENVIRONMENTAL ENFORCEMENT AND/OR FINES?
Hornepayne Power Inc.	Hornepayne, ON	Forest Processing Facility	N	In operation since 2014		The Cogeneration Plant is a biomass fuel-fired cogeneration facility located adjacent to the lumber manufacturing facilities of the Hornepayne Lumber Company. The facility has a total nameplate capacity of 15.0 MW, of which 8.0 MW is contracted to the Ontario Power Authority. In addition to electricity production, the plant provides steam to the mill for lumber drying and space heating purposes. The plant consumes 175,000 to 200,000 tonnes of sawmill wood by-products annually. The company harvests a mix of trees, approximately 50% of which is processed into manufactured lumber. The other 50% becomes by-product residuals and waste streams that are collectively called "residuals" and have significant value in their energy potential. While the power plant primarily uses hog fuel and dry shavings from our sawmill facilities, Hornepayne Power will continue to look to the most cost-efficient supply for operation. This may include lower-value residuals from nearby sawmill operations and potentially in-forest residues (tree tops, branches, and low-grade logs damaged by insects or disease,) left behind in the harvesting process.	
Hornepayne Lumber Ltd.	Hornepayne, ON	Forest Processing Facility	N	Operations ongoing for foreseeable future		The Hornepayne sawmill complex is located within the Nagagami Forest, a mixed wood site of nearly 4,500 square kilometers in the Boreal Forest Region. The company's objective is to produce approximately 100 million board feet of FSC certified Random Length.	

PROJECT NAME	LOCATION IN WATERSHED	TYPE OF INDUSTRY	INCLUDED IN PROPONENT'S CUMULATIVE IMPACTS MAP?	OPERATING TIMELINE OF PROJECT	WATERSHED RISKS	NOTES ABOUT SITE'S OPERATIONS	ENVIRONMENTAL ENFORCEMENT AND/OR FINES?
Alamos Island Gold Mine	Dubreuilville, ON	Gold Mine	N	Anticipated mining operations until at least 2035		Island gold's water is from the Maskinonge Lake. Based on the results of field surveys conducted in 2015 and 2016, a total of 17 fish species are known to occur in the lakes and streams near the Project mine sites 2018: At Island Gold, three oil spills (a total of 1,083 litres spilled) were contained, cleaned and reported to authorities.	
Rayonier A.M. Canada G.P.	Cochrane, ON	Forest Processing Facility	N	Operations ongoing for foreseeable future		The Romeo Malette Forest and Abitibi River Forest supply conifer fibre to RYAM Lumber's sawmill in Cochrane. Annual Softwood Production Capacity of 160 million board feet. Total annual production capacity of Biomass (may include blends of sawdust, shavings, and screen fines (negotiable)) is close to one million bdmt (bone dry metric tons)	
Northern Empire Mill	Municipality of Greenstone	Former gold milling site; contains industrial sewage works servicing the site's tailings management area	N	Gold mining/milling was intermittent from 1930s-early 2000s. Currently non-operational, and undergoing monitoring/maintenance		Goldstone Resources Inc. owns a non-operational asset referred to as the Northern Empire Mill located in the Municipality of Greenstone. At the site there is an industrial sewage works servicing the site's tailings management area, which is governed by a ministry approval issued in July 2010.	April 26, 2021: Fined $5000 plus $1250 victim fine surcharge for failing to perform technical inspections of all containment dams and spillways associated with sewage works and preparing Containment Dams Reports as per ministry approval.

PROJECT NAME	LOCATION IN WATERSHED	TYPE OF INDUSTRY	INCLUDED IN PROPONENT'S CUMULATIVE IMPACTS MAP?	OPERATING TIMELINE OF PROJECT	WATERSHED RISKS	NOTES ABOUT SITE'S OPERATIONS	ENVIRONMENTAL ENFORCEMENT AND/OR FINES?
Aggregate Sites (Generally)	Throughout the North Shore of Lake Ontario	Aggregate Extraction	Y	Varies per project		Aggregate sites across the Thunder Bay District extract varying amounts of aggregate each year—some excavating less than 10,000 tonnes of aggregate per year, while others are permitted to extract over 100,000 tonnes of aggregates each year. Aggregate pits and quarries can result in streambeds and wetlands being altered both before and during extraction, as a drop in the water table means that these habitats will change or cease to exist. (Gravel Watch Ontario) During both the extraction period and post-extraction, "… the changed landscape can allow the infiltration of pollutants into groundwater which will have impacts on seeps, springs, and other outflows as well as downstream communities of plant, animal and human species." (Gravel Watch Ontario) In 2020, the Province of Ontario approved a number of changes to O. Reg 244/97 under the *Aggregate Resources Act* (ARA), including amendment which would "reduce red tape for the Aggregates industry." It is worth noting that "…. Many typical *ARA* licence conditions are generic boilerplate provisions that do not necessarily provide adequate site-specific protection of the environment or nearby residents." (CELA)	May 14, 2021: The Hockenhull Land and Cattle Company of Thunder Bay pleaded guilty to excavating Crown land [located near **Kashabowie Lake****], removing soil and aggregate and depositing a layer of fine stone or gravel on Crown land. The company pleaded guilty to charges under the Public Lands Act and was fined $5,000. It also pleaded guilty to charges under the Aggregate Resources Act and was fined $10,000.

Notes

* Industrial sites that are no longer operating, i.e., mines that are in the closure/remediation phase contribute to terrestrial habitat loss since the restoration of the mining site could take several decades to be restored to the habitat's original (or similar) state prior to the industry's operations. Furthermore, inactive industrial sites may still pose threats to water quality during the remediation phase.

** Kashabowie Lake is located on the west edge of the map, approximately 100 km away from the City of Thunder Bay (and is within the Lake Superior Watershed)

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Memorandum

TO: Citizens for Responsible Industry in Northwestern Ontario (CRINO)

FROM: Sara Libman

RE: Exploring Community Benefit Agreement Options With the Marathon Palladium Project

DATE: June 14, 2021

QUESTIONS ASKED

CRINO posed three main concerns surrounding the concept of a Community Benefit Agreement (**CBA**) to support the community members who will be impacted by the Marathon Palladium Project:

1. How effective are CBAs in terms of actually meeting the community's needs? *Do they actually benefit the community?*
2. Most CBAs traditionally concern First Nations communities. What would a CBA in this context look like, and who would be involved in developing it?
3. Who would represent civil society?

SHORT ANSWER

Effectiveness of CBAs

Strengths

- Having the right stakeholders at the table can ensure the community's concerns and priorities are addressed in the agreement.
    - A community coalition can set out socio-economic priorities (e.g., employment requirements, funding of education/childcare facilities), and environmental concerns.
- Agreements can hold not only mining proponents accountable, but also government bodies who are responsible for monitoring and enforcing environmental permits.
- Agreements can establish advisory boards, implement data & knowledge sharing, and encourage citizen science and community engagement with environmental monitoring.
- These Agreements can shape the mine's operations to work well-beyond the requirements of provincial or federal environmental standards (as seen with the Stillwater Good Neighbour Agreement).
- A CBA can strengthen the relationship with the community and the mining proponent by establishing lines of open communication, making suggestions for practices and

procedures, and through the desire to uphold each party's obligations under the Agreement.
- Communities can seek clauses in the agreement that would require the mining proponent to fund projects and reports that may arise under the Agreement. This is important for community groups that have little to no budget for any monitoring and advisory goals that are sought to ensure environmental compliance.
- Binding an Agreement to the mine project—and not the proponent itself—ensures the Agreement will be upheld for the mine's entirety, regardless of what company operates it.

Weaknesses

- These agreements are often complex, and can take a long time to negotiate.
- Without experience negotiators at the table, the agreement may not reflect the needs of the community. For example, the Impact Benefit Agreement signed by Attawapiskat First Nation and De Beers mining company resulted in very little monetary benefit through royalties for the First Nation community. The Agreement was large, complex, and beyond the scope of the band office to not only negotiate, but enforce after signing.
- An agreement will most likely prohibit litigation, and instead require disputes and disagreements related to the Agreement's clauses to be resolved through Arbitration. With arbitration, the decisions may not be available to the public if there are confidentiality clauses related to the arbitration process, and therefore the successes and weaknesses within the agreement may not be fully understood/known by outsiders looking in.
- Because a CBA has never been signed between a mining company and a Canadian community (i.e., non-Indigenous community), it is difficult to determine whether the mining proponent would be interested/willing to develop a CBA for the Marathon Palladium Project.
- If there are multiple community groups, having a unifying goal is key, otherwise a mining proponent may wear down community ties and use intimidating practices. This can be a problem for Indigenous communities negotiating Impact Benefit Agreements with a mining proponent—the company may use tactics to bend and break a community's relationship with other groups, which can help the company to shape and influence the agreements being signed with different communities. This can result in an Agreement that disproportionately benefits the mining proponent.
- Funding clauses can give a mining proponent unfair leverage over community groups, and can limit what a community group can actually accomplish due to financial constraints. Funding clauses need to be carefully drafted.
- An agreement may need to be amended or even re-negotiated if the mining proponent wishes to expand the mine's operations or construct a new mine in the area.

Creating a CBA that works for the community

Parties

- The CBA for Marathon may have a variety of signatories. CRINO needs to consider whether or not government bodies should be included.

    - Federal government bodies: Environment and Climate Change Canada; Impact Assessment Agency of Canada; and the Department of Fisheries and Oceans.
    - Ontario government bodies: Ministry of Environment, Conservation and Parks; and Ontario's Ministry of Energy, Northern Development and Mines
- Additionally, there may be a number of other communities and community groups, including Indigenous groups, that could be helpful in forming a grassroots coalition to represent the needs of the community within a CBA.

<u>The Agreement Itself</u>

- The Stillwater Good Neighbor Agreement has a number of useful clauses that CRINO may wish to see in a Community Benefit Agreement for Marathon, which would support stronger environmental monitoring and compliance, and increase transparency between the mining proponent and the community (these clauses are discussed later in this memo):
    - Funding Obligations
    - Oversight Committees
    - Responsible Mining Practices and Technology Committee
    - Environmental Audit Program for the East Boulder and Stillwater Mines
    - Reclamation Plan and Bond Evaluation
    - Comprehensive Surface Water, Groundwater, and Aquatic Resources Protection Program

The Analysis section below will discuss these concepts more in-depth. The establishment of a Community Benefit Agreement for the Marathon Palladium Project may not be easy to do, but it could set a new precedent for extractive resource operations in Canada, and improve environmental monitoring standards for these projects.

FACTUAL BACKGROUND

In terms of Community Benefit Agreements (**CBAs)** and Impact Benefit Agreements (**IBAs**) in Canada, these types of agreements are historically limited to two situations: CBAs being made to garner community support for an infrastructure project; and IBAs being signed between governments, project proponents (largely mining proponents) and First Nations/Métis/Inuit communities.

It is currently uncommon for communities (like Marathon) to have entered into CBAs with mining proponents, however the Marathon Palladium Project provides a unique opportunity to establish a precedent of Canadian communities collaborating with mining proponents, government and Indigenous groups on the environmental monitoring of a mining site. **Furthermore, with the right stakeholders at the table, a CBA for this mining project affords the opportunity for non-Indigenous communities and Indigenous communities to work together in protecting the land, and further reconciliation goals.**

This memorandum will consider what aspects of existing IBAs and CBAs have worked for signatory communities, and will provide recommendations to help CRINO advocate for an effective CBA within their community. This memorandum builds on the discussion of Independent Oversight Bodies and benefit agreements presented in my Report prepared for CRINO in related to the Marathon Palladium Project.

ANALYSIS

1. Effective CBAs & IBAs

A Community Benefits Agreement (CBA) can vastly vary from community to community, and may involve different stakeholders and parties, depending on the project. For example, there are **private CBAs** (signed between a developer and a community group or coalition—community driven); **public CBAs** (signed between governments/governmental agencies and a community group/coalition—common for infrastructure projects) and **hybrid CBAs** (multi-party agreements, where developers, government/government agencies, and community groups are parties).[1]

With the goals of CBAs being so unique and project specific, the following will provide an overview of some successful community agreements.

Canadian CBAs

In Ontario, the *Infrastructure for Jobs and Prosperity Act, 2015* encourages the consideration of using Community Benefit Agreements in infrastructure projects, as seen in section 3 of the Act (Infrastructure Planning Principles):

> "The Government, and every broader public sector entity, shall consider the following principles when making decisions respecting infrastructure: 13. Infrastructure planning and investment should promote community benefits, being the supplementary social and economic benefits arising from an infrastructure project that are intended to improve the well-being of a community affected by the project, such as local job creation and training opportunities (including for apprentices, within the meaning of section 9), improvement of public space within the community, and any specific benefits identified by the community."[2]

It is important to note that this Act does not affect mining operations; it governs infrastructure projects: "infrastructure" means the physical structures and associated facilities that form the foundation of development, and by or through which a public service is provided to Ontarians,

[1] Dina Graser, "Community Benefits and Tower Renewal", *Evergreen* (May 2016), online: https://www.evergreen.ca/downloads/pdfs/HousingActionLab/TowerRenewal_Report_FINAL.pdf at 7.
[2] *Infrastructure for Jobs and Prosperity Act, 2015*, SO 2015, c 15 at s 3, *emphasis added.*

such as highways, bridges, bicycle paths, drinking water systems, hospitals…."[3] While the notion of CBAs under this Act is very limited in scope, this provision provides the opportunity to consider CBAs that have been implemented in Ontario communities.

The Woodbine CBA

One such example is a CBA that was entered into between the City of Toronto and a consortium (One Toronto Gaming) charged with expanding gambling operations at the Woodbine Racetrack (2018).[4] This CBA covers the time that One Toronto Gaming will operate gaming at Woodbine Racetrack (approximately 20 years). The CBA establishes the Community Steering Committee (**CSC**) to monitor and support the CBA's successful implementation over the long term. The CSC consists of: the City of Toronto, and 1 representative from each of the following groups:

- Atkinson Foundation
- Casino Woodbine (Local Operator)
- Humber College
- Local Resident from Kingsview Village—the Westway Neighbourhood Action Planning Table
- Local Resident from North Etobicoke Resident Council
- One Toronto Gaming (CBA Signatory)
- Toronto Community Benefits Network
- United Way Greater Toronto.[5]

With poverty reduction being a focal-point in the City of Toronto, the CBA serves as a means of increasing the socio-economic benefits of the casino's expansion. For example, the CBA requires: "…40% of all new hires be residents of the local area, that 50% of the new jobs created will be full time, and that 10% of construction jobs employ apprentices and journeymen from the surrounding area."[6] This particular CBA is not geared towards environmental issues given the specifics of the project, but this agreement was shaped by the community's needs—i.e., employment security and economic growth. **In terms of who represents the local residents from Kingsview Village and North Etobicoke, the CBA does not have a requirement of who that person is—it is a decision made by the community groups. This is important in having an actual voice for each community, instead of a representative being delegated by the City.**

According to a progress report dated November 27, 2019, the commitments in the CBA are on track to being fulfilled: Between February 1, 2018 and August 1, 2019, 72 % of new hires

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[3] Ibid at s 2.
[4] Ryan Patrick Jones, "Council approves community benefits agreement for gambling expansion at Woodbine racetrack," *CBC News* (26 April 2018), online: https://www.cbc.ca/news/canada/toronto/council-approves-community-benefits-agreement-for-gambling-expansion-at-woodbine-racetrack-1.4637119
[5] City of Toronto, "Rexdale—Casino Woodbine Community Benefits Agreement Community Steering Committee: Terms of Reference", *Rexdale—Community Benefits Agreement—2019*, online: https://www.toronto.ca/legdocs/mmis/2019/ex/bgrd/backgroundfile-140695.pdf
[6] Jones, *supra* note 4.

were local and/or social hires, and 60% of total employees are full-time.[7] At the City's first CBA, it appears to be meeting the needs of the community, with One Toronto Gaming providing the City with the required $5 million contribution for a child care centre that will benefit both employees and local residents.[8]

IBAs in Canada

IBAs are often negotiated between resource proponents and Indigenous communities as a way to meet consultation and consent obligations, since extractive industries operate on the Traditional Territories of various Indigenous communities, and will likely impact Treaty Rights and Indigenous Rights, such as hunting, trapping, and fishing. These projects can also have societal and economic impacts (both positive and negative) on these communities. IBAs are becoming more common place—especially in the mining industry—and in fact, **the Northwest Territories will be requiring mining companies to enter benefit agreements with individual Indigenous governments through the *Mineral Resources Act* (this Act is not yet in force).**[9]

As of 2013, there were nearly 200 agreements signed between Indigenous communities and mining companies. These agreements include: Letters of Intent; Exploration Agreement, Cooperation Agreement, or Memorandum of Understanding; Impact and Benefits Agreements, Participation Agreement, and/or Socio-economic Agreements; Surface Lease Agreements; and other types of Agreements.[10] Since this data was collected, there have likely been additional agreements signed.

While IBAs have not been negotiated with Canadian communities for mining projects, there are a number of existing IBAs to review to see how effective these agreements actually are for communities being subjected to mining projects.

Generally, the contents of IBAs are confidential, as these contracts are between the mining company and specific Indigenous communities. As a result, it is difficult to gage how effective these IBAs are, and how they differ from community to community. It is also nearly impossible to know the parameters of the agreement, i.e., whether a community will be involved in environmental monitoring. However, there are some agreements from Northern Canada that are publicly available, such as the Diavik Diamond Mine agreements.

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[7] City of Toronto, "Progress on the Rexdale – Casino Woodbine Community Benefits Agreement – 2019 Update", *Executive Director, Social Development, Finance and Administration, City of Toronto* (27 November 2019), online: https://www.toronto.ca/legdocs/mmis/2019/ex/bgrd/backgroundfile-140670.pdf

[8] Ibid.

[9] Robert Hiltz, "CORRECTED: Northwest Territories' updated Mineral Resources Act will introduce obligatory benefit agreements, online staking," *CIM Magazine* (27 February 2019), online: https://magazine.cim.org/en/news/2019/impacts-and-benefits-agreements-to-become-mandatory-in-northwest-territories/

[10] Natural Resources Canada, "Agreements Between Mining Companies and Aboriginal Communities or Governments" *Minerals and Metals Sector, Natural Resources Canada* (2013), online: https://www.nrcan.gc.ca/sites/www.nrcan.gc.ca/files/mineralsmetals/files/pdf/abor-auto/aam-eac-e2013.pdf

Diavik Diamond Mine

The Diavik Diamond Mine in the Northwest Territories (**NWT**) was highlighted in Part 4 of my Report prepared for CRINO. This mining project in NWT had a number of agreements signed by the proponent and impact Indigenous communities. Through the signing of individual Participation Agreements with each of the five Indigenous groups, a Socio-Economic Monitoring Agreement was ratified in 1999, in which the mining company committed to providing training, employment, scholarship programs and business opportunities to the impacted communities. **In 2000, an Environmental Agreement was signed, establishing the Environmental Monitoring Advisory Board (EMAB). EMAB acts as a public watchdog to ensure the regulatory process and the Agreement are being adhered to.**

The EMAB, which consists of representatives from each Indigenous community; the Canadian, NWT and Nunavut governments; and Diavik Mine, makes recommendations on the mines' operations in relation to the environment. EMAB recently published the 2019-2020 Annual Report, which provides information about Diavik's Environmental Monitoring Programs and EMAB's recommendations. In the Annual Report, EMAB indicates **that "Diavik's responsiveness to EMAB recommendations last year has been good with respect to issues related to its water licence, including closure planning."[11] Additionally, the Annual Report indicates an ongoing concern with the lack of monitoring by Environment and Climate Change Canada (ECCC) and the Department of Fisheries and Oceans (DFO):**

> *Since 2015 EMAB has been expressing concern about the involvement of two key federal government departments in the review of monitoring reports and management plans related to Diavik's Water Licence…EMAB has recommended ECCC, and DFO in particular, be more active in making comments and recommendations. EMAB continues to be disappointed by DFO's lack of substantive comment on reports that bear on the health of fish and fish habitat.*[12]

In terms of Diavik's responses to EMAB's recommendations on wildlife monitoring, this has been less than satisfactory, with Diavik's responses have been very slow. For instance, it took the mining company 355 days (and two reminder letters) for Diavik to respond to EMAB's recommendations on the Wildlife Management Program—despite the Environmental Agreement requiring a response within 60 days. As a result, EMAB has developed a new tracking system for recommendations to ensure timely responses from Diavik.[13]

Aside from pointing out the proponent's shortfalls in communication, if EMAB wanted to take further measures to remedy issues with the proponent, the Environmental Agreement does contain Dispute Resolution provisions. First, if a dispute arises, the disputing parties must use all reasonable efforts, including mediation, to amicably resolve the dispute within 60 days. If

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[11] Environmental Monitoring Advisory Board, "EMAB Annual Report 2019-2020" (2021), online: https://emab.ca/sites/default/files/149986_emab_annual_report_2019-20_text_1.pdf at 56.
[12] Ibid.
[13] Ibid at 57-58.

the dispute is not resolved, then the disputing parties are to refer the dispute to binding arbitration. According to the Environmental Agreement, the arbitration must comply with the *Commercial Arbitration Act*, RSC 1985, c.17. If an arbitration award is made, a party is entitled under Article 35 of the *Commercial Arbitration Act* to submit a written application to a court to have the arbitration award enforced.

EMAB has initiated arbitration before (see below), in which the decision was favourable to the mining proponent. In terms of the issue with Diavik's slow responses to EMAB's recommendations, it appears that EMAB is presently trying to resolve that amicably through communicating and strategizing with the proponent to improve response time. Hopefully, EMAB will not have to escalate things to have this response delay resolved.

With the Annual Report being circulated to all Parties to the Environmental Agreement, as well as key leaders in the Affected Communities and throughout the NWT (as well as these reports being publicly available online), EMAB's Annual Report serves as a transparency and accountability tool. Overall, the EMAB has been effective in making recommendations that Diavik has followed to reduce environmental impacts in the area.

A key concern identified in the Annual Report is mercury levels in fish: "EMAB has been concerned about mercury levels in fish since 2012, when Diavik stopped scientific monitoring of mercury in lake trout…EMAB recommended lake trout be sampled every 3 years."[14] **Therefore, while EMAB can make recommendations to Diavik (and the government), it does not mean that those recommendations will be followed**.

One of the biggest issues with EMAB is its funding:

> EMAB negotiates its budget with Diavik every two years, for the following two years. At the end of the two-year period any surplus must be returned to Diavik, except as agreed between Diavik and EMAB. The Environmental Agreement says that EMAB will try to keep any increases to the rate of inflation. EMAB recommends a budget to Diavik that we both have to agree on. If there is no agreement Diavik submits its own proposed budget to the Minister and he can choose EMAB's or Diavik's. **EMAB and Diavik agreed on the last two 2-year budgets, but for the previous three budget periods EMAB and Diavik did not agree, and each time the Minister chose Diavik's budget. This has resulted in EMAB's budget being cut back from $726,000 in 2011 to $506,820 in 2019. To conduct any activities above and beyond those budgeted EMAB must submit a separate funding request to Diavik for approval.**[15]

[14] Environmental Monitoring Advisory Board, "Annual Report 2019-2020 Summary" (2021), online: https://emab.ca/sites/default/files/emab_annual_report_summary_201920.pdf
[15] Environmental Monitoring Advisory Board, *supra* note 11 at 61.

With the dependency on Diavik for budget, EMAB may be limited in work it can conduct, such as hiring specialists, conducting sampling, etc. to provide informed recommendations on environmental monitoring.

EMAB has been monitoring the Diavik Diamond Mine since 2001, has been largely effective in shaping the monitoring of the project, and addressing regulatory gaps, including wildlife management, air quality, and securities. With the mine beginning to wind-down, EMAB is focusing on the Closure Plan, to ensure that wildlife, water quality, and air quality will be adequately protected with remediation measures.

Attawapiskat First Nation and De Beers IBA

While IBAs are generally confidential, the effectiveness of these Agreements may make headlines if they are either largely successful, or largely problematic. In the case of Attawapiskat First Nation in Northern Ontario, the IBA signed with De Beers in relation to the Victor Diamond Mine has been controversial and highly criticized. The IBA was signed in 2005, and the Victor Diamond Mine (the first diamond mine in Ontario) began operations in 2008. Although the IBA has been kept confidential, its clauses likely include economic benefits, employment requirements, training/education benefits, and protection of traditional sites and burial grounds from mining activity.[16] Therefore, the main goals of the IBA are geared towards socio-economic benefits, and not necessarily environmental monitoring like agreements found in the 3 Territories.

One of the well-known critiques of the IBA that has been published in the media is how little the First Nation receives in terms of revenue from the mine. Of the approximate $400 million annual revenue of the mine, Attawapiskat First Nation receives roughly $2 million annually from De Beers as a royalty. This amounts to the royalty being about 0.5% of the mine's revenues.[17]

Another issue associated with the IBA is how daunting it is for a small, remote First Nation community to review, understand, and negotiate the agreement:

> The 198-page agreement is a dense read – so dense, in fact, that it has overwhelmed the community's small, rundown band office. There are a dizzying array of commitments: from environmental management committees and joint management

[16] "Priority Project on Sustainable Resource Development: Benefit Agreements in Canada's North" *Northern Development Minister's Forum* (August 2013), online: https://www.nadc.gov.ab.ca/Docs/benifit-agreements-2013.pdf at p 32-34.

[17] Jody Porter, "First Nations must 'learn from' De Beers deal", *CBC News* (13 February 2013), online: https://www.nadc.gov.ab.ca/Docs/benifit-agreements-2013.pdf

committees to employee advisory committees, wildlife management plans, mining monitors and human-resources inventories.[18]

Although De Beers had supplied the community with enough money to hire its own advisors for the negotiation,[19] if a band office is not equipped to monitor and uphold the IBA, then the effectiveness of the IBA becomes questionable. Theresa Hall, who was a former IBA co-ordinator noted: "We can sign the best agreement in the world, but if we don't have the people with the educational requirements, then it's false promises."[20]

CBAs Outside of Canada

Stillwater Good Neighbor Agreement

The Stillwater Good Neighbors' Agreement (**GNA**) from Montana, USA is a form of Community Benefits Agreement that is worth reviewing for its effectiveness. Also highlighted in Part 4 of the Report for CRINO, this agreement has a 20 year legacy, and is often cited as a robust Good Neighbor Agreement in the United States. In terms of effectiveness, the **Stillwater GNA**, which applies to Sibayne-Stillwater's two mining sites in Stillwater County and Sweet Grass County has been a successful tool for community members to ensure that water quality, road safety, and the land surrounding the mines are protected. In fact, **the GNA holds the mining operations to a higher environmental standard than State and Federal regulations require.**

The Northern Plains Council (one of the signatories to the GNA) note a number of the Agreement's successes, including:

- Regular reviews of water quality to maintain the health of the Stillwater River watershed;
- Traffic reduction; and
- Providing for the clean-up of mine waste and other industrial hazards.[21]

The GNA requires that the mining proponent "… fund an environmental audit, fish-monitoring program and groundwater study – as well as pay for a mining and water quality engineer handpicked by the councils."[22]

Additionally, through the GNA, the community groups expanded the existing Water Program through the development of Water Quality Adaptive Management Plans for each mine site.

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[18] Genesee Keevil, "In Attawapiskat, deep-rooted problems won't disappear in an instant", *Globe and Mail* (9 December 2011), online: https://www.theglobeandmail.com/news/national/in-attawapiskat-deep-rooted-problems-wont-disappear-in-an-instant/article4201581/

[19] Ibid.

[20] Ibid.

[21] Northern Plains Resource Council, "Stillwater Protective Association" *Northernplainscouncil.org* (2021), online: https://northernplains.org/our-local-groups/stillwater-protective-association/

[22] Ray Levy-Uyeda, "Can a mining company truly be a good neighbor?", *The Guardian* (2 September 2020), online: https://www.theguardian.com/environment/2020/sep/02/mining-corporation-montana-good-neighbour-agreement

These Adaptive Management Plans require groundwater monitoring wells to be located much closer to tailings impoundment than state and federal regulations require, meaning that any tailings leaks can be detected sooner, and therefore eliciting a quicker response to protect the watershed.[23] Therefore, this GNA has enabled the community to work with the Proponent to establish more robust monitoring tools and protocols.

By signing the GNA with Sibayne-Stillwater, the three Councils have given up their right to sue the mining company in relation to the operation of the two mining sites.[24] In the event of a dispute, e.g., if the mining company breaches the agreement, Appendix D of the GNA sets out the procedure to have the dispute resolved through arbitration. For arbitration, an arbitrator is selected by each signatory council and Sibayne-Stillwater, as well as one neutral arbitrator that is appointed by the other 4-selected arbitrators.

The GNA appears to be effective in meeting the community's needs, as there has not been any instances of arbitration during the Agreement's 20 year existence.

CBAs in the United States, Broadly

When exploring the use of CBAs across the United States, they are often utilized in large infrastructure projects. When community groups organize to negotiate these agreements, the most common goals sought in CBAs include the following, as noted in an article published by the American Bar Association in 2012:

Table II: Ranking of Community Goals in CBAs

1. Economic justice	15. Brownfield remediation
2. Local living wage jobs	16. Union construction jobs
3. Job training programs	17. Construction of parks/open space
4. Job training	18. Mitigation of traffic congestion
5. First source/targeted hiring	19. Affirmative action contracting
6. Displacement of residents	20. Restrictions of big box retail development
7. Racial equality	21. Space set asides for retail or commercial construction of community recreational facilities
8. Displacement of local businesses	22. Creating adequate parking
9. Design review	23. Green building requirements
10. Low income rental housing	24. Space set asides for child care centers
11. Affordable homeownership	25. Developer funding of community organizations
12. Community input on selection of tenants	
13. Neighborhood cleanup	
14. Space set asides for community or non-profit centers	

[25]

[23] Northern Plains Resource Council, "Water Quality Management Plans: Protecting Montana's Pristine Rivers" *Northernplains.org* (Dec 2020), online: https://northernplains.org/wp-content/uploads/2020/12/AMP_factsheet_FNL_2020-12-14.pdf

[24] Ray Levy-Uyeda *supra* note 22.

[25] Thomas A. Musill, "The Sleeping Giant: Community Benefit Agreements and Urban Development" (2012) 44: 4 *The Urban Lawyer* 827 at 846.

The over-arching goal of these community groups is to alleviate poverty, and examples of projects that draw interest in CBAs include: the Los Angeles International (**LAX**) Airport, and the Yankee Stadium. With the expansion of LAX, community members were successful in negotiating environmental mitigation, and employment-related benefits.[26] CBAs in the United States are typically negotiated by community coalitions and developers (which makes the LAX unique, since it was negotiated with a city entity—Los Angeles World Airports—and not a private developer. CBAs in the United States are not effective for all urban development projects:

> *CBA negotiations do not work well when the existing zoning comfortably accommodates a proposed project, when no public infrastructure improvements are needed, and when developers have all the necessary financing in hand.* ***Without the leverage afforded by public approval of zoning changes, financial subsidies, or infrastructure improvements, community coalitions have less opportunity to engage developers in a meaningful dialogue.***[27]

Despite some of these limitations, CBAs can be beneficial to not only the communities that pursue them, but to developers and city officials. CBAs enhance equity and quality of life in the neighbourhoods impacted by the development, which benefits the multi-million developments located adjacent to these neighbourhoods. They also boost economic development for the communities, which can roll over into benefiting local small businesses, and the broader economy. Thirdly, these CBAs enhance functionality of projects—they remove risk from the project, and diminish hostility and push-back from the impacted communities.[28]

Therefore, CBAs can be effective tools for helping low-income and/or racialized urban communities to benefit from projects, rather than be exploited by cities and developers for economic growth.

In Denver, a CBA was entered into in 2006 to address the demolition of an abandoned rubber plant located on a 50-acre brownfield site in downtown Denver. The demolition would make room for the construction of an 8 million square foot residential and retail centre.[29] Through a CBA, the community coalition not only negotiated socio-economic benefits, but established a Voluntary Clean-Up Advisory Board that, with the developer's help, "…tested neighborhoods adjacent to the factory for environmental contamination."[30] The Voluntary Clean-Up Advisory Board also advocated for communication and transparency between the community and the developer in regards to environmental clean-up. To fulfill this priority, the developer "…agreed

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[26] David A. Marcello, "Community Benefit Agreements: New Vehicle for Investment in America's Neighborhoods" (2007) 39:3 *The Urban Lawyer* 657 at 660.
[27] Ibid.
[28] Ibid at 667-668.
[29] Patricia E Salkin & Amy Lavine, "Negotiating for Social Justice and the Promise of Community Benefits Agreements: Case Studies of Current and Developing Agreements" (2008) 17: ½ *Journal of Affordable Housing & Community Development Law* 113 at 127.
[30] Ibid.

to make documents related to clean-up of the site available to the residents at a local library."[31]

2. Key Considerations for a Marathon CBA

When contemplating a Community Benefit Agreement for the Marathon Palladium Project, there are several questions to consider:

I) Who will be a party to the Agreement?
II) What are the priorities and goals of the Agreement?
III) How will the stakeholders secure autonomy?

The following analysis will break-down these questions, and will look to the Stillwater GNA as a guiding tool. As the Stillwater Protective Association (one of the Stillwater GNA signatories) indicates, the Stillwater GNA is "the only legally binding agreement between citizen groups and a hard-rock mining company in the world,"[32] and it is therefore an excellent template for CRINO to consider when contemplating the creation of a Community Benefit Agreement for the Marathon Palladium Project.

Who?

To ensure that a CBA properly reflects the needs of the community in relation to the mining project, it is crucial that all of the necessary parties are at the negotiation table. As seen with the Environmental Agreements signed by Indigenous communities in Northern Canada—like the Diavik Diamond Mine—parties may consist of multiple community members, the proponent, and government representatives.

Similarly, the negotiation of CBAs for infrastructure projects involve: "…a private or public development agent and a coalition of community-based groups. This coalition may include neighbourhood representatives, single-issue advocates, labour unions, social service agencies, religious congregations, faith-based groups and others."[33]

Creating a community coalition of community-based groups and/or individuals from the civil sector (e.g., university professors) could be useful for CRINO, as it can bring multiple perspectives, skills, and interests to the negotiation table. This could be a way for individuals with a technical/scientific background to be included in establishing a robust agreement.

Would the Agreement include provincial and/or federal government signatories? Some Agreements do not involve the government at all, as seen with the Stillwater GNA and thee Woodbine CBA (although the Woodbine CBA does include the City of Toronto—municipal

[31] Ibid.
[32] Northern Plains Resource Council *supra* note 21.
[33] Andrew Galley, "Community Benefits Agreements", *Atkinson Foundation* (2015), online: http://communitybenefitsagreements.ca

government—as a signatory). On the other hand, agreements like the Diavik Diamond Mine Environmental Agreement include government representatives to form an Environmental Monitoring Advisory Board (EMAB). Government inclusion can assist the community in holding government bodies accountable for their monitoring and enforcement duties related to the project's operations. As seen with the Diavik Environmental Agreement, The EMAB not only holds the government accountable, it also makes government shortfalls public to not only the impacted communities depending on environmental enforcement, but to the public at large—who can freely access EMAB's annual reports.

With the various types of agreements available for consideration, CRINO needs to consider who's voices could benefit the negotiation of this potential CBA. Would CRINO seek government involvement? If so, there are a number of government bodies to consider:

> Federally: Department of Fisheries and Oceans; Environment and Climate Change Canada; Impact Assessment Agency of Canada
>
> Provincially: Ministry of Energy, Northern Development and Mines; Ministry of Environment, Conservation and Parks

Returning to the notion of a community coalition, and relevant groups to join a CBA, there are a number of groups/organizations that may provide valuable insight:

- Environment North
- EcoSuperior
- Ontario Nature
- Lakehead University, especially through "InfoSuperior"

These different organizations may be interested in shaping the CBA to ensure there is transparency in mining practices occurring on Lake Superior, and that there is effective environmental monitoring and enforcement.

Finally, it is important to engage with local Indigenous communities. While a number of communities are in the process of entering Impact Benefit Agreements with the proponent, and may have an interest in the project going forward, there may be community members within these First Nations who wish to engage in monitoring of the mine's practices, and provide Traditional Knowledge to aid in protecting the environment from avoidable harm. To develop a CBA that encompasses the mining proponent, grassroots environmental groups, and Indigenous communities would be a progressive and inclusive approach to environmental monitoring and oversight.

What?

An essential question for CRINO to ask when contemplating a CBA is "*What are the priorities and goals for the agreement?"* This is a question that needs to be considered by any groups that want to take part in the CBA. This question also extends to, "*what are the priorities during the negotiation process*?".

How?

Yet another essential question for CRINO to resolve both before and during the negotiation of a CBA is "*how will stakeholders secure autonomy?*" Autonomy in the context of a CBA means that the community's signatories are able to fulfill their goals, such as environmental monitoring, without influence or control of other signatories, like the mining proponent. Acting independently from the mining proponent is essential to ensure there is an accurate account of the mine's environmental compliance and environmental shortfalls (if any), and that the community's representatives findings can be confident in the level of transparency and communication surrounding the mining project's operations.

Funding

While an Agreement may enable a community group to review the mining' proponent's environmental data (such as water quality testing results, for example) and take their own water samples, being able to interpret, understand, and respond to the available data will likely come at some cost. While a proponent will have large sums of money at its disposal, more than likely a community coalition will have limited budgets. As a result, the community may become dependent on the proponent to provide funding so that an Agreement's provisions can be met by both parties.

For example, the Diavik Diamond Mine's Environmental Monitoring Advisory Board (EMAB), which is intended to operate at an arm's length and independent from the Environmental Agreement's parties, must negotiate its budget with the proponent every two years, and has had problems in the past with having an adequate budget approved by the proponent. Having a budget essentially controlled by the proponent limits what the EMAB is able to do in terms of reviewing reports and compliance issues.

The Stillwater GNA also requires the mining proponent to fund programs and studies (see discussion of Stillwater GNA provisions). However, this funding is more of a re-imbursement obligation, rather than a budget negotiation every few years. Additionally, the community groups signed on to the Stillwater GNA are registered Not-for-Profit organizations (whereas the EMAB is a board created by the Environmental Agreement), meaning that they may have their own budgets to fund additional projects or concerns.

Decision-Making

In the event that a GNA creates an advisory board to look at environmental monitoring, it is likely that all parties will want a representative on the board. This is important in ensuring that all voices (including the proponent) are heard. It is important that there is a balance of the voices at the table, so that one party does not have veto powers over other parties. When designing provisions around the establishment of an advisory board, there must be careful consideration of members of the board, powers of the board, and goals of the board, if it to have an independent lens for environmental monitoring.

Sample Provisions from the Stillwater GNA

The Stillwater GNA has a number of goals that may be of interest to CRINO. For instance, the objectives of the GNA include [note: **SCM**= Stillwater Mining Company]:

a. To minimize any potential adverse impacts caused by SMC Mining Operations on the local communities, economies, and Environment.
b. To establish and maintain a mechanism of open lines of communication between the Parties to address Issues of Concern raised by Councils and the residents of the region impacted by SMC Mining Operations.
c. To provide Councils with the opportunity to Participate in SMC decisions that may impact the local communities, economies, or Environment. For the purposes of this Agreement, "Participate" means that SMC shall provide Councils with access to Information and notice of proposals and meetings before final decisions are made. The purpose of this access and notice is to provide Councils with the opportunity to provide meaningful input and advice to SMC decision-makers before final decisions are made. For Arbitrable Issues, this right to Participate includes a vote in the decision-making process, subject to the limitations set forth in Section 9.4 and Appendix D (Arbitration).
d. To bind SMC and SMC successors, partners, subsidiaries, affiliates, and assigns to this Agreement for the life of Mining Operations.
e. To minimize future litigation between Councils and SMC by utilizing the processes and mechanisms established by this Agreement to resolve disputes.[34]

As seen with the underlined portions of the above text, the goals of the GNA focused on reducing the mine's potential adverse effects on the community and environment, as well as ensuring that the community can provide input and advice to the mining company. It creates oversight committees, and implements water quality monitoring programs.

The Stillwater GNA is 94-pages long, and has been subject to amendments in 2004, 2005, and 2009 to reflect the accomplishments and developments that have occurred through the Agreement. The following sample of sections from the Stillwater GNA may be of interest to CRINO.

Section 4: Funding Obligations: there are three grassroots community organizations that are parties to the Stillwater GNA, which have limited budgets and limited expertise in mining practices. **As a result, this section of the Agreement requires that the mining company "…shall fund the development and maintenance of any programs, studies, plans, audits, or committees required by this Agreement."[35] This also includes reimbursing the Councils for Qualifying expenses, e.g., "Scientific and Technical Consultant Fees and Costs", and "Citizen Sampling" (which includes the costs of collecting, preserving, and analyzing any samples of the Environment taken during Citizen Sampling under Section 3.1 of Appendix L).[36]** This section also notes that any disputes over funding shall be resolved by the relevant Oversight

[34] "Good Neighbor Agreement Between Stillwater Mining Company and Northern Plains Resource Council, Cottonwood Resource Council, and Stillwater Protective Association", originally signed 8 May 2000, online: https://akmininginfo.files.wordpress.com/2012/09/stillwater-good-neighbor-agreement.pdf at section 1.0.
[35] Ibid at section 4.0.
[36] Ibid at section 4.3.2.

Committee, or through Arbitration (which is set out under Section 9.4 of the Agreement). Unless one of the Oversight Committees have resolved a dispute in regards to funding, there does not appear to have been any issues with the company's funding obligations over the past 20 years.

Section 7: Oversight Committees: this section establishes an Oversight Committee for the Stillwater Mine site and an Oversight Committee for the East Boulder Mine site. The Stillwater Oversight Committee consists of 2 individuals appointed by the mining company, and two individuals appointed collectively by the Northern Plains Resource Council and the Springwater Protective Association. The East Boulder Oversight Committee consists of 2 individuals appointed by the mining company, and two individuals appointed collectively by the Northern Plains Resource Council and the Cottonwood Resource Council.

With each Oversight Committee meeting at least twice a year, some objectives include: overseeing and implementing the GNA's terms and monitoring the mining companies' compliance with the Agreement; addressing Issues of Concern related to mining operations; providing a mechanism for maintaining open lines of communication between Councils, the affected local communities, and the mining company; and overseeing the development and implementation of all audits, plans, programs, studies, and monitoring required by this Agreement.[37]

Among other listed rights in section 7.6 of the Agreement, **these Oversight Committees have the right to conduct Citizen Sampling and observe all scheduled SMC Sampling and Monitoring Events, and enter mine premises and inspect mine facilities consistent with Section 10 ["Inspections"].**

Section 8: Responsible Mining Practices and Technology Committee: This Section establishes a Technology Committee of 6 individuals, consisting of 3 mining company representatives, and one representative for each of the 3 Councils. The Technology Committee has three listed objectives:

> 8.5.1 To identify new Technologies and/or Practices to eliminate and/or minimize potential adverse impacts on the Environment caused by SMC Mining Operations, to minimize the production of wastes created by SMC Mining Operations, and to eliminate and/or minimize potential safety risks associated with the disposal of wastes from SMC Mining Operations.
>
> 8.5.2 To provide an opportunity for Councils to Participate in and assist SMC in maintaining and improving a program for the research, development, and implementation of Economically Feasible Technologies and/or Practices identified under objective 8.5.1.
>
> 8.5.3 To oversee the implementation of any new Technologies and/or Practices contemplated in Section 8.5.1.[38]

[37] Ibid at section 7.5.
[38] Ibid at section 8.5.

Therefore, this section enables the community groups to be directly involved in improving the mine's operations to reduce environmental impacts.

Appendix I: Environmental Audit Program for the East Boulder and Stillwater Mines: The Audit Program seeks to audit the mining company's compliance with: federal and state environmental laws/regulations; the company's internal environmental policies and procedures; the GNA's terms, conditions and performance objectives; and evaluates the mining company's waste control, minimization and reduction practices.

In terms of frequency, "…audits may be called by the Councils and shall be refined to address specific issues as determined by the relevant oversight Committee and shall occur no more than once every five years."[39]

Appendix J: Reclamation Plan and Bond Evaluation: Section 1 of this Appendix states:

> The Responsible Mining Practices and Technology Committee shall conduct an evaluation of the SMC Reclamation Plan, Performance Bond, and interim reclamation plan for the Stillwater Mine and East Boulder Mine to coincide with every State of Montana review of such plans and bonds. Councils' consultants shall complete the evaluation, and SMC shall fund the evaluation up to $12,000 per evaluation.

According to the GNA, these evaluations are to be completed concurrent with the State of Montana bond reviews, or at a maximum once every 5 years.[40] This provision may be appealing to CRINO, since the financial assurance process in Ontario Mining is largely confidential between the mining proponent and the government. While it is difficult to determine if a mining proponent would be agreeable to this kind of provision, **it would increase transparency with the types and quantities of financial assurance being submitted for the closure/reclamation stage of the mine.**

Appendix L: Comprehensive Surface Water, Groundwater, and Aquatic Resources Protection Program: This Water Program provides an opportunity for the three Councils to Participate in the development and oversight of the mining company's Water Management Plans and, among other listed objectives: **"to adopt a proactive precautionary approach for the Water Management Plans at the East Boulder and Stillwater Mines."[41] This program also includes a Fisheries Study and Monitoring Plan, in which fish populations are studied every 5 years.**

At 13-pages in length, this Appendix in the Stillwater GNA sets out a plan for protecting water quality while engaging the community through use of Citizen Sampling of the Environment, and providing the three councils with access to a database consisting of all historic baseline data and all data derived from SMC Sampling and Monitoring Events.

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[39] Ibid at Appendix I, section 1.1.
[40] Ibid at Appendix J, section 1.2.
[41] Ibid at Appendix L, section 1.0.3.

CONCLUSION

The establishment of a Community Benefits Agreement in relation to the Marathon Palladium Project would be a unique contract in Canadian Mining Law, as there is not currently this type of agreement in force that involves local, non-Indigenous communities contracting with a mining proponent.

The process of negotiating an Agreement with a mining company is not a simple process. **It requires a clear vision of what the community's priorities are; unity and collaboration within the community groups that may be involved; and expertise is needed to guide the negotiation process. If a community group is not well-equipped to present their goals and priorities at the negotiation table, the end result may be an agreement that lacks teeth for improving environmental monitoring and consultation tools for the community.**

Key considerations for a group interested in a CBA include: who will be included as a party; what are the goals of the agreement; how would a monitoring/watch-dog board operate; and where does funding come from, and how much is provided?

When negotiating a CBA, it is important to have the Agreement be tied to the mining property, and not the mining proponent. Mining companies go bankrupt, or get purchased by other companies. By tying the agreement to the mining property, the provisions will apply during the entirety of the mine's production, regardless of who is operating it, and therefore guaranteeing adequate environmental standards.

While it is difficult to determine whether Generation PGM would be open to negotiating an agreement with a non-Indigenous community group, this type of CBA would benefit the proponent from a good publicity and transparency perspective, and would provide the opportunity to set a new standard for environmentally responsible mining practices in Ontario, and Canada.

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Dr. Kevin Morin is the President of Morwijk Enterprises Ltd. and the Minesite Drainage Assessment Group (MDAG).

EDUCATION

Ph.D., Hydrogeology, University of Waterloo, Canada. 1984. Advisor: Dr. John Cherry

M.Sc., Geology with Minors in Mathematics and Engineering,
University of North Dakota, USA. 1979. Advisor: Dr. Lee Clayton

B.Sc., Secondary Education with Certificates in Earth/Space and General Sciences,
Edinboro University of Pennsylvania, USA. 1977. Advisor: Dr. Jack Baker

EXPERIENCE

Kevin Morin has more than 42 years of experience in the fields of water contamination, contaminant migration, hydrogeology, geochemistry, environmental impact assessment, and computer modelling related to mining and industrial activity. He specializes in the design and implementation of field and laboratory studies, and in the development and utilization of conceptual and mathematical models, for the environmental and geological sciences.

This experience encompasses:
- hundreds of proposed, operating, and closed mining operations;
- dozens of other areal-infrastructure projects, like industrial sites, commercial/urban developments, hazardous-waste sites, water-reservoir projects; and
- linear-infrastructure projects including roads, railways, and pipelines.

These projects:
- are located on all continents of the world, except Antarctica,
- extend from south of the Tropic of Capricorn to north of the Arctic Circle,
- occur in widely diverse biogeoclimatic zones,
- experience annual precipitation from ~15 to 4000 mm/yr, and
- extend from elevations below sea level to above 4000 m.

Dr. Morin is an author or co-author of more than 97 publications in journals and proceedings, 50 Internet case studies, and five books on various aspects of geochemistry, contaminant migration, hydrogeology, waste management, and environmental protection.

He is co-author of the first textbook on drainage chemistry from various minesite components, entitled:

- *Environmental Geochemistry of Minesite Drainage: Practical Theory and Case Studies*

He is also the author of four other books:

- *Minesite-Drainage Chemistry: An Introduction*,
- *Wavelet Transforms of Drainage from Highly Reactive Geological Materials*,
- *Spectral Analysis of Drainage from Highly Reactive Geological Materials*, and
- *Searching for Latent Variables in Minesite Drainage Using Exploratory Factor Analysis.*

His professional positions in consulting, university, research, and regulatory enforcement provide a wide expertise in environmental geochemistry and environmental protection.

Dr. Morin is a registered Professional Geoscientist in the Canadian Province of British Columbia, and a Licensed Hydrogeologist in the U.S. State of Washington.

To distribute information on minesite drainage and on highly reactive geologic materials, Kevin Morin maintains the MDAG.com website for the Minesite Drainage Assessment Group.

PROFESSIONAL POSITIONS

1989 to date **Morwijk Enterprises Ltd. and MDAG, Surrey, British Columbia, Canada**

Position: President and Contaminant Hydrogeologist

Responsibilities include a wide range of research and field studies in various aspects of hydrogeology, geochemistry, and environmental impact. Projects include:

- assessments of drainage chemistry from open-pit and underground mine walls;
- field study and project management of a contaminated site with spilled metal concentrate;
- options and costs for water treatment;
- an integrated prediction of drainage chemistry from underground workings, waste-rock dumps, and a tailings impoundment;
- a field study of groundwater movement and acid generation in a large mine-rock dump;
- assessment, prediction, and control of acidic drainage and metal leaching from cuts and fills for highways and roads;
- data warehouses of past water-chemistry data spanning several decades and including thousands of water analyses;
- a hydrogeochemical study of acidic, radionuclide-bearing groundwater seeping from a uranium-tailings impoundment;
- court and other legal experience on acidic drainage and mine closure;
- a subsurface investigation of creosote and chlorophenol contamination at a wood-preservation facility;
- geochemical impact of an urban-water-supply-expansion project;
- the conceptual design of groundwater-control measures at a PCB-contaminated site;
- the creation of computer programs to predict migration of aqueous contaminants in groundwater systems;
- a review of techniques, costing, and scheduling of a U.S. EPA Superfund study (Remedial Investigation/Feasibility Study) of several copper-zinc tailings, beryllium dump, and smelter slag;
- and hydrogeological studies of a steel-production landfill and cyanide dump.

1987 to 1989 **NORECOL ENVIRONMENTAL CONSULTANTS LTD., Vancouver, Canada**

Position: Senior Hydrogeologist and Hydrogeochemist

Responsibilities involved task design/coordination and, as Manager of Research for Norecol's subsidiary (Canect Environmental Control Technologies Ltd.), research and development of new and innovative technologies for Norecol's mining and industrial clients. Project involvement included groundwater and contaminant migration studies at mining-waste and industrial-waste sites and the prediction and control of acidic drainage from mineral-resource activity.

1985 to 1987 **SASKATCHEWAN DEPARTMENT OF ENVIRONMENT, Prince Albert, Canada**

Position: Hydrogeologist and Environment Officer

Responsibilities entailed technical assessment and review of Environmental Impact Assessments and of construction/operation activities at uranium, gold, potash, lignite, and metal mines. Internal projects included detailed evaluations of historic water-quality data at Saskatchewan mines.

1984 **UNIVERSITY OF WATERLOO, Waterloo, Ontario, Canada**

Position: Research Associate

Responsibilities involved the expansion of the ADNEUT computer program for the simulation of long-term contaminant migration in acidic and pH-neutral seepage from tailings, the simulation of the development of present conditions at a tailings site, and the simulation of potential contaminant migration under a contract with Energy, Mines, and Resources Canada.

1979 to 1983 **UNIVERSITY OF WATERLOO, Waterloo, Ontario, Canada**

Position: Research Assistant

Responsibilities involved field studies and environmental impact assessment of uranium tailings impoundments and waste-rock piles, the environmental impact and geochemical controls on acid generation, the development, testing, and implementation of computer models to evaluate and simulate contaminant migration in groundwater systems, and the monitoring of a municipal landfill site.

RESPONSIBILITIES ON SELECTED PROJECTS

Minesite-Drainage Chemistry/Acidic Rock Drainage/Metal Leaching

- Assistance for creating a manual for sampling, data analysis, and interpretation for predicting minesite drainage for the Province of British Columbia
- Assessment and prediction of metal leaching and acid generation from existing mine workings, pits, and waste rock, and from future workings, rock, and tailings, at a 40-year-old polymetallic mine in British Columbia
- Inorganic assessment and project management for a Contaminated Sites investigation of former concentrate sheds
- Prediction of chemical concentrations from pit walls, a waste-rock dump, and a heap-leach pile at a proposed gold mine in Mexico, integrated with mine planning and closure
- Assessment and prediction of acidic drainage and metal leaching at quarries for industrial minerals
- Multi-catchment modelling of acidity concentrations and loadings for estimation of treatment-plant requirements and costs, including wet and dry years, at a minesite with strong ARD
- Participation in compilation of hundreds of thousands of historical water-chemistry analyses spanning three decades at several minesites
- Review and reinterpretation of data for a waste-rock dump with layers of acid-generating and acid-neutralizing rock at a closed gold mine in British Columbia
- Fast-track prediction of minesite-drainage chemistry based on existing information for a nickel-laterite deposit
- Assessment, prediction, and control of drainage chemistry from highway cuts and fills in British Columbia
- Invited presenter for a week-long series of lectures at minesites and meetings in Australia on the consequences of timely prediction and control of minesite drainage
- Assessment of water chemistry and evaluation of water-treatment options and controls at a minesite in the Caribbean
- Review and comment for a regulatory agency on the short-term and long-term consequences of proposed heap leaching at a minesite in Canada

- Conceptual design and assessment of closure options for a large underground base-metal mine in Peru
- Integrated assessment of metal leaching and current/future acidic drainage from tailings, waste rock, and mine walls for closure of a mine in central British Columbia
- Review of historical data, prediction of future water chemistry, and contribution to closure-plan designs for a metal mine in Quebec
- Technical assessment and field inspection for acidic drainage at a coal mine in British Columbia on behalf of a regulatory agency for public hearings and monitoring.
- Review and advice to First Nations on proposed mines within claimed territory
- Assessment and prediction of acid-drainage potential and water-quality impacts for closure plans at two metal mines in Ontario
- Compilation of long-term drainage-chemistry data at several international mines for an integrated database
- Case study of the construction, drainage chemistry, and dismantling of an acid-generating waste-rock dump for the Canadian Mine Environment Neutral Drainage (MEND) Program
- Interpretation of static and kinetic testwork for predicting aqueous metal concentrations at an diamond project in Canada
- Design and interpretation of 2000-sample ABA and kinetic databases for selection and refinement of acidic-drainage control at a gold-copper mine in Venezuela
- Coordination and interpretation of acid-drainage testwork for a proposed stratabound base-metal mine in northeastern British Columbia
- Detailed statistical evaluation and interpretation of a database containing nearly 60,000 analyses of metal-bearing water at eight stations collected as often as every four hours for three years
- Assessment of potential for future acidic drainage in a tailings impoundment closed for ten years in central British Columbia
- Investigation of acid-drainage potential and water-chemistry impacts at a closed mine in central British Columbia
- Coordination and review of static and kinetic testwork for a proposed mine in Chile
- Interpretation of static and kinetic testwork for assessing various closure options for a base-metal mine in Quebec

- Participation in a formal Risk Assessment on a proposed mine in northern British Columbia, focussing on water chemistry and acidic drainage

- Review of acid-drainage studies at a proposed minesite for the State of Oregon

- Voluntary Technical Advisor to the Canadian MEND Program, Prediction Committee

- Assessment of acid-drainage potential in coal tailings in Nova Scotia

- Supervision of an acid-drainage study at a temporarily closed gold mine in northwestern British Columbia.

- Assessment of the potential for acidic drainage to appear at a large pH-neutral base-metal mine in eastern British Columbia.

- Presentations and workshops on various topics related to water chemistry and environmental impacts, including aqueous speciation/mineral solubility, waste-rock dumps, and walls of open pits and underground workings

- Detailed summary of 15 years of on-site monitoring and predictive testwork at a copper mine in British Columbia

- Long-term, research-level monitoring and interpretation of water levels, temperatures, and pore-gas composition in an acid-generating waste-rock dump, British Columbia

- Design and coding of a custom database for acid-drainage data to be distributed internationally by the Mine Environment Neutral Drainage Program

- Evaluation of predictive testwork for acidic drainage at a copper mine in the Philippines

- Design and interpretation of several types of laboratory-based and in-field acid-drainage tests for several rock types at a proposed large gold mine in the Queen Charlotte Islands, British Columbia. Environment Canada stated that "... this work [on acid mine drainage] is state-of-the-art and is the most advanced conducted for a mine in British Columbia and, quite likely, in the world"

- Field study, data interpretation, computer-model creation, and literature review on acidic drainage and metal leaching from mine walls, focussing on an open pit in central British Columbia

- Evaluation of acid generation, metal leaching, and groundwater movement in acid-generating waste rock, underground workings, and pit walls in central Vancouver Island

- Participation in the creation of a technical guide for the prediction and control of acidic drainage, sponsored by the British Columbia Acid Mine Drainage Task Force and the federal Mine Environment Neutral Drainage Program

- Literature review of acidic drainage in northern permafrost environments
- Predictive program for a proposed massive-sulphide minesite in northern permafrost environments
- Review and recommendations for further work on a 80-year-old minesite in southeastern British Columbia
- Design and testing of practical environmental controls on acidic drainage for a proposed large gold mine on the Queen Charlotte Islands, British Columbia
- Senior reviewer for an assessment of potential acidic drainage from sulfide-bearing rock piles undergoing acidic leaching for copper recovery in British Columbia

Baseline Hydrogeology, Water Chemistry, and Geology

- Creation and application of a full-scale computer program to simulate water flow and quality in an integrated system comprised of a large lake, various surface flows, and groundwater flows at a proposed metal mine in northern British Columbia

- Design, installation, and sampling of a groundwater monitoring network with piezometers and underground stations at an existing precious/base-metal mine in central British Columbia

- Design, installation, and sampling of a groundwater monitoring network at a cranberry farm with flotation problems in southern British Columbia

- Creation of a three-dimensional model for flow and stratigraphy in and below a reclaimed mill-tailings impoundment in northern Ontario.

- Delineation of baseline hydrogeology for a major base-metal mine in British Columbia

- Design of a drilling and groundwater-monitoring program around an environmentally sensitive lake in an arid mining area of South America

- Drilling to define the stratigraphy for use in environmental protection at a proposed chemical manufacturing plant in central British Columbia

- Review of hydrogeologic data for baseline conditions at a proposed golf course in British Columbia

- Definition of geologic and mineralogic associations of rock types in a gold-enriched fault zone at a proposed gold mine on the Queen Charlotte Islands, British Columbia

- Interpretation of existing data and supervision of drilling in a bog for proposed urban development

- Delineation of the stratigraphy and its influence on contaminant migration in a groundwater plume from a uranium-tailings impoundment in northern Ontario

- Design and execution of a drilling program to define the stratigraphy and baseline hydrogeology of a proposed 25-square-mile lignite mine in western North Dakota

- Compilation and interpretation of historical hydrogeological data for a proposed deep-sea port and urban center in southern British Columbia

Contaminant Hydrogeology, Hydrogeochemistry, and Water Quality

- ❖ Supervision, in-field sampling, and interpretation of hydrogeologic and geochemical data at a contaminated site with inorganic and organic contaminants
- ❖ Design and execution of a subsurface investigation at burned-down sawmill with anti-sapstain chemicals on Vancouver Island, British Columbia
- ❖ Assessment of arsenic and lead contamination in water and soil in and around a small town in central British Columbia caused by historical mineral processing
- ❖ Compilation, interpretation, and predictive modelling of a 25-year water-quality database consisting of nearly 60,000 values with samples collected as often as every four hours
- ❖ Field assessment, modelling, and design of a pump-and-treat containment system for a contaminated site with pure-phase PAH compounds in groundwater near a marine harbor
- ❖ Supervision, quality-assurance review, and detailed interpretation of contaminant migration at a chemical and metal-refining facility in Alberta including contaminant-plume tracking and pump tests
- ❖ Investigation of the physical and chemical hydrogeology of contaminated sites with elevated concentrations of metals in soil and groundwater
- ❖ Field investigations, report review, and participation in legal prosecution for the federal departments of Environment Canada and Fisheries and Oceans
- ❖ Hydrogeologic investigation for contamination under a court warrant in a national park in southeastern British Columbia
- ❖ Expert testimony on groundwater movement and subsurface contaminant transport for a criminal prosecution under the federal Fisheries Act and British Columbia Waste Management Act
- ❖ Drilling, monitor-well installation, sampling, data interpretation, and computer modelling for remedial design at a former coal gasification facility and PCB waste depository on Vancouver Island
- ❖ Water-quality assessment and predictions for a base-metal mine in northwestern Ontario
- ❖ Design and supervision of installation of groundwater monitoring networks at sawmills with chlorophenol and dioxin contamination, Vancouver Island, British Columbia
- ❖ Review of existing data and design of subsurface investigation for an industrial park in eastern Washington

- Design, execution, and interpretation of a seepage-meter investigation of groundwater-surface water interaction in a fish-bearing creek near a wood-preservation facility in British Columbia

- Reviews and comments on numerous investigations of subsurface organic and inorganic contamination under contract to Environment Canada

- Field study, data interpretation, computer-model creation, and literature review for water quality from mines, funded by the Federal/British Columbia Mineral Development Agreement and the Mine Environment Neutral Drainage (MEND) Program

- Initial assessments and recommendations for two wood-waste leachate sites in southwestern British Columbia

- Evaluation of the hydrogeology of, and acid generation within, underground workings, an inactive pit, and a large acid-generating waste-rock dump in central Vancouver Island

- Delineation of the contaminant hydrogeology of an wood-preservation site using creosote and pentachlorophenol in southeastern British Columbia

- Water-quality predictions at a base-metal mine in central British Columbia

- Drilling, monitor-well installation, and assessment of contaminant migration at a former coal gasification facility in Vancouver, British Columbia

- Project Manager and Senior Scientist for the creation of an extensive manual guiding the collection of solid, liquid, and pore-gas samples in and around mine tailings area, sponsored by the MEND Program

- Sampling and interpretation on a yearly basis of a contaminant groundwater plume with high aqueous levels of radionuclides emanating from a uranium-tailings impoundment in northern Ontario, sponsored by the federal Department of Energy, Mines, and Resources

- Installation and sampling of a monitoring network in a leachate plume emanating from a municipal landfill in northern Ontario

- Collection and interpretation of hydrogeological data at a industrial landfill in Ontario

- Drilling and groundwater monitoring of buried fly-ash at lignite mines in western North Dakota, in association with the North Dakota Geological Survey

- Invited member of the technical review panel for a field study and associated computer simulation of contaminated, radionuclide-laden groundwater in northern Ontario, sponsored by the Atomic Energy Control Board of Canada

- Evaluation of groundwater and contaminant migration at a site contaminated by dense non-

aqueous hydrocarbons in western British Columbia

- ❖ Supervision and advice on drilling and sampling at an industrial site contaminated with pesticides and benzene-based compounds in southern British Columbia

- ❖ Interpretation of physical and chemical hydrogeologic data at a potash mine with subsurface brine contamination in southeastern Saskatchewan

Impact Assessment, Waste/Water Management for Control of Contamination, and Reclamation Planning

- Expert testimony and hydrogeological advice for a legal criminal prosecution under federal and provincial laws over improper placement of wood waste in southwestern British Columbia

- Design and execution of field and lab evaluations of metal contamination as part of a closure plan for a base-metal mine in central British Columbia

- Negotiations with regulatory agencies for acceptable remediation of a coal-tar site in Vancouver, British Columbia

- Assessment of water chemistry, catchment-specific modelling of water- and chemical-mass-balance loadings, and evaluation of water-treatment options and controls at a minesite in the Caribbean

- Evaluation of water-quality control options and their costs for a section of highway in British Columbia

- Field visits, inspections, sampling, and data interpretation at unreclaimed mineral-exploration site, leading to reclamation recommendations from the team

- Review and re-interpretation of hydrogeologic data to determine potential impacts of a wellfield on a nearby pond containing endangered species in Chile

- Estimation of groundwater impacts and resulting nearshore impacts from a refugee camp during the Gulf War

- Participation in formal Risk Assessments of active and proposed minesites in British Columbia, focussing on environmental chemistry

- Prediction and control of drainage chemistry from highway cuts and fills in British Columbia

- Geochemical effects of raising water-retaining dams with rock for an urban water supply

- Definition of environmentally acceptable waste management plans and simulations of water flow and quality in an integrated system comprised of a large lake, various surface flows and groundwater flow at a proposed metal mine in northern British Columbia

- Detailed literature review and recommendations on the environmental implications of retrieving surface-impounded mine tailings and placing them in underground mines for the Atomic Energy Control Board of Canada

- Technical assistance in a federal investigation on wood-waste leachate entering a fish-bearing stream in southwestern British Columbia

- Development of a phased remediation project for an industrial site contaminated by coal tar on Vancouver Island, British Columbia

- Design of a regulatory monitoring program and remedial plan at a PCB-contaminated site, Vancouver Island, British Columbia

- Development of intensive waste-management and reclamation criteria for stockpiles, a tailings impoundment, and a backfilled pit for acid-generating rock at a proposed large gold mine on the Queen Charlotte Islands, British Columbia

- Participation in a federal investigation of aquatic impacts near a pole-preservation facility in central British Columbia, leading to federal charges

- Review of physical and chemical hydrogeologic databases to define background concentrations and delineate contaminant migration at a potash mine in Saskatchewan

- Assessment of controls needed to meet provincial cyanide criteria in a lake system receiving tailings in northern Manitoba

- Design of preliminary water-management plans for control of groundwater and surface water during harvesting at a cranberry farm with flotation problems in southern British Columbia

- Design of remedial plans to interface with an integrated provincial, municipal, and private contamination problem in shallow groundwater, British Columbia

- Design of groundwater remediation procedures at a site contaminated by dense hydrocarbon compounds in British Columbia

- Review and comment on impact assessments and reclamation plans for mines and selected industrial projects in Saskatchewan to ensure acceptable environmental protection, as a member of the Saskatchewan Department of Environment

- Drilling and groundwater monitoring of reclaimed pits at lignite mines in western North Dakota, in association with the North Dakota Geological Survey

Industrial/Hazardous Waste Projects

- Coordinating hydrogeologist for remediation of an historical PCB disposal area, Vancouver Island, British Columbia
- Senior hydrogeologist for subsurface investigations of chlorophenol and dioxin contamination at two sawmills, Vancouver Island, British Columbia
- Control of drainage chemistry from highway cuts and fills in British Columbia
- Technical review of various proposed and existing industrial and residential projects in British Columbia and the Yukon on behalf of Environment Protection, Environment Canada
- Project manager and hydrogeologist for a regulation-based assessment of a contaminated site with inorganic and organic contaminants
- Hydrogeologist responsible for designing investigations of two wood-waste sites in southwestern British Columbia
- Coordinating hydrogeologist for the investigation and remediation of an urban coal-tar site on Vancouver Island, British Columbia
- Drilling supervision, sample logging and collection, data interpretation, and regulatory liaison for a wood-preservation operation in southwestern British Columbia
- Hydrogeologic review of a multi-phase subsurface investigation at a chemical/fertilizer plant in central Alberta
- Senior hydrogeologist for a detailed hydrogeologic investigation of a former coal gasification facility near False Creek, Vancouver, British Columbia
- Technical review of several environmental assessments of industrial sites on behalf of a federal regulatory agency
- Installation and sampling of a monitoring network in a leachate plume emanating from a municipal landfill in northern Ontario
- Technical review of techniques, costing, and scheduling of a U.S. EPA Superfund study of several copper-zinc tailings areas, a beryllium dump, and smelter slag in western Montana
- Collection and interpretation of hydrogeological data at a industrial landfill in southern Ontario
- Site reconnaissance and geochemical sampling at a cyanide dump in southern Ontario

Legal Investigations, Prosecutions, and Litigation

- Formal technical investigation of groundwater-borne organic contaminants to a fish-bearing stream, involving federal charges
- Expert Witness in criminal court proceedings on subsurface transport of metals in acidic groundwater under the federal Fisheries Act and provincial Waste Management Act
- Acid-Mine-Drainage and Mine-Closure Expert for a civil application and mediation on contested ownership of an abandoned mine with major closure liabilities
- Project Manager and Hydrogeologist for assessment of a site listed under the Contaminated Sites Regulations
- Collection of subsurface evidence under a search warrant for groundwater-borne organic and inorganic contaminants to a fish-bearing river in a national park, to support federal charges
- Testimony and cross-examination under oath before a territorial regulatory water board on behalf of Environment Canada, with cross-examination of other witnesses
- Expert testimony on minesite-drainage chemistry and remedial mined-rock covers during an appeal of a government permit

Computer Programming

- Creation of an object-oriented computer program to simulate acid generation, metal leaching, and water movement in open-pit and underground mines during operation and after decommissioning, including graphical output, through the Mine Environment Neutral Drainage Program
- Creation of an object-oriented computer program to simulate acid generation, metal leaching, and water movement through open-system and closed-system mine-rock dumps
- Design and coding of a flexible database with custom input screens and data management for international acid-drainage data, funded by the Federal/British Columbia Mineral Development Agreement
- Creation of a family of computer programs to simulate the migration of acidic drainage in groundwater systems, with support from the Canadian federal government
- Creation of a computer program to simulate cyanide complexation, volatilization, and degradation in the natural environment
- Review and presentation of comments on a major program for simulating acidic drainage in tailings

- ❖ Creation of a stand-alone speciation program to evaluate mercury complexation and precipitation-dissolution in acid-leach mill circuits and tailings impoundments

- ❖ Creation of a computer program to define the equilibrium speciation of radium, actinium, thorium, and uranium and to evaluate their potential for solid-liquid interaction

Lnear-infrastructure Projects including roads, railways, and pipelines

- ❖ Geochemical assistance on prediction and control of acid rock drainage, with follow-up monitoring, on the Inland Island Highway portion of the Vancouver Island Highway Project; summary published and presented at the 6th International Conference on Acid Rock Drainage in Australia, July 2003

- ❖ Field sampling, data interpretation, and preliminary costing of control strategies for acid rock drainage and metal leaching in a creek system, on behalf of the British Columbia Ministry of Transportation

- ❖ Sample analysis, interpretation, and predictions of acid rock drainage and metal leaching for proposed highway-related quarries

- ❖ Detailed review and comments on ambiguities in initial ARD characterization to prevent delays in ongoing highway construction

- ❖ Evaluation of water-contamination potential from proposed rock cuts along a railroad right-of-way

Water Reservoirs

- ❖ Field sampling, data interpretation, and recommendations for the major expansion of a city water reservoir in Canada

- ❖ Data review and interpretation of geochemical impacts of dam rock and historical mining within a proposed municipal water reservoir in Canada

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