

## ENVIRONMENTAL EVALUATION – DEWATERING OF J4 AND 87 PITS SUMMARY



November 2019

## **Troilus Gold Corp.**

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# **1. INTRODUCTION AND APPLICANT IDENTIFICATION**

This document is a summary of the impact study for the dewatering of the J4 and 87 pits. The information necessary for a good understanding of the project and the integral issues are part of this document. The full impact study includes 12 chapters and 11 appendices, to support the explanations of the text.

Troilus Gold is a company registered in January 2018 whose objective is the development of resources on the site of the former Troilus mine. In 2018, Troilus Gold acquired the rights to First Quantum Minerals' property, and therefore the related restoration obligations.

The Troilus mine operated from November 1996 to April 2009. The mine produced more than two million ounces of gold and nearly 70,000 tonnes of copper. Following the completion of the mining operations, the concentrator continued to process low grade ore until June 2010. At the end of operations, the site has been restored from 2011 to 2019.

As part of the advanced exploration work, Troilus Gold wants to obtain better access to the deposit to continue its exploration work from the walls and floor of the pits.

## **1.1 Identification of Applicant**

| Head Office:               | Chibougamau Office :         |
|----------------------------|------------------------------|
| Troilus Gold               | Troilus Gold                 |
| 36 Lombard Street          | 334, 3ième Rue               |
| Toronto (Ontario), M5C 2X3 | Chibougamau (Québec) G8P 1N5 |
| Tel : 581-481-8557         | Tel : 418 770-5990           |

The applicant for the application is Troilus Gold from the Chibougamau Office. Mrs. Jacqueline Leroux is the signatory authorized to file this application. Mrs. Leroux's contact information is:

Jacqueline.leroux@troilusgold.com Director of Environnement 418-770-5990

Any request for information or questions relating to this application should be addressed to Mrs. Leroux.

## 1.2 Consultants participation in the Impact Study

The production of the impact study was made possible thanks to the collaboration of several experts in different fields. Here are their names and areas of expertise for this document:

Ann Lamontagne of Lamont inc. was responsible for the methodology, impact analysis, and report production and chapter coordination.

DDM is responsible for some of the characterization of fish habitats on the receiving watercourse, the assessment of changes in fish habitat components, the estimation of maximum pumping rates, and the production of fish habitat maps.

 $MH_2O$  firm studied the water regime of the watercourse.

The firm Polygeo coordinated field studies to document the geomorphological context and the identification of sensitive areas.

The Desfor Group is responsible for the characterization of vegetation and wetlands and Wachiih has characterized a portion of the receiving stream from the proposed effluent.

The Troilus Gold team took over the community consultations and project description.

# 2. PROJECT LOCATION

The former Troilus mine, located in the Evans-Frotet greenstone belt, is approximately 51 ° 00 'north latitude and 74 ° 28' west longitude, about 175 km north of Chibougamau. Figure 2.1 shows the location plan of the site. Access to the mine site is provided by a road section of approximately 44 km in length, starting at KP 108 on Route du Nord, and oriented in a north-easterly direction.

The former mine site occupies land, in unorganized territory, described as Lot 1 of the cadastre of the Rupert River Basin, registration division of Lac St-Jean-Ouest.

The site is located on the territory of the community of Mistassini on Category III lands. The families who are directly affected by the mine-site project are the Awashish, Petawabano and Neeposh families.

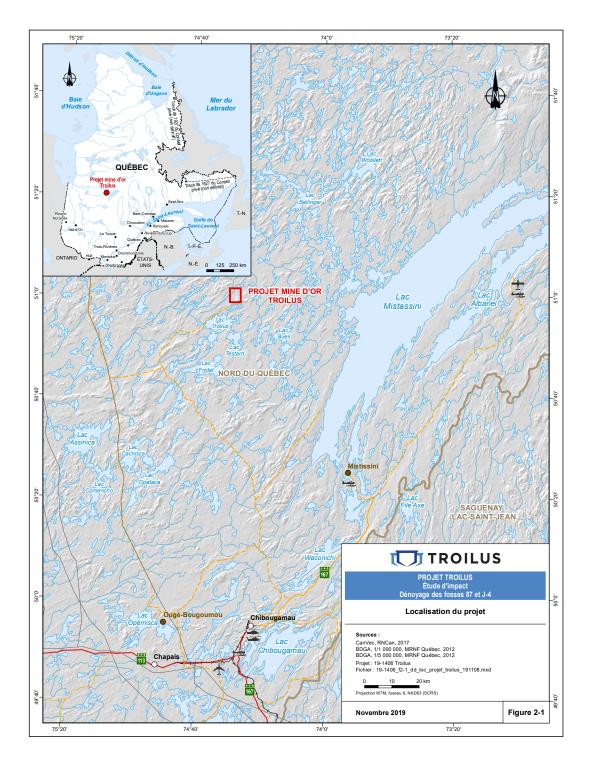


Figure 2.1 Troilus Gold property location

# 3. ANALYSIS OF PROJECT ALTERNATIVES

## 3.1 Project justification

As part of the exploration work, Troilus Gold wishes to have better access to the deposit in order to further evaluate the gold potential of the property. Indeed, the discovery of a new deep mineralized zone in the winter of 2019, along the east wall of the J4 pit, suggests that this zone could continue to the surface.

The dewatering of the J4 and 87 pits will allow the installation of diamond drills on the benches to drill to the east (N123 °) at an angle of 45 °. The proposed program is 4 drill holes as shown in Figure 3.1. Drilling may also be done from the floor of the pits.

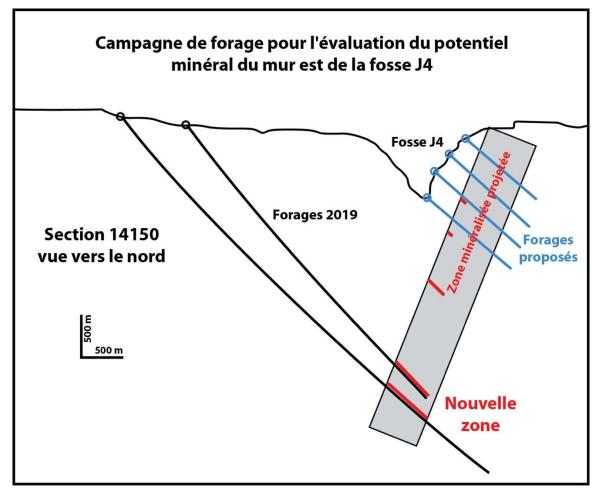


Figure 3.1 Diagram of proposed drill holes

## 3.2 Alternatives to dewatering

The alternative to dewatering the pits would be drilling from the surface of the water in winter on the ice above the pits. For obvious reasons of risks and health and safety, this option is not ideal and has not been retained. The only way to intercept potential areas along the wall is to drill from benches on the east side.

## 3.3 **Pumping Flowrates**

For the dewatering of the pits, the pumping rate has been subject to a study of alternatives. Two regimes were considered. A variable flow regime allowing a constant flow in the stream during the dewatering period and a fixed flow regime to represent seasonal flow variations in the stream. Modeling has been done at some critical sections to evaluate the maximum stream flow at these locations. A constant flow of pumping would increase the intensity of spring floods and floods during extreme rain events which is undesirable for the stability of the stream and spawning grounds.

Therefore, it was decided that pumping would be variable flow so as not to exceed the capacity of habitats to withstand flow velocities and thus limit the impacts on the banks.

## 3.4 Selected solutions and subsequent steps to dewatering

Dewatering the pits is the safest way to continue exploration work. Once the pits are empty, exploration activities can begin

## 4. DESCRIPTION OF RECEIVEING ENVIRONMENT

## 4.1 Description of the site targeted for the project

The mine site has already been in operation and was the subject of an impact study in 1993. Sectorial studies, restoration plans, design reports, etc. were filed to the authorities between 1993 and the closure of the mine site. Some information on the natural environment has been derived from these studies while others come from more recent data. Only the components related to the issues below are retained for a more complete description :

- Conservation and protection of surface and underground water resources (quantity and quality);
- The preservation of the integrity of the hydrographic network and its processes;
- Maintaining the quantity of flora and fauna habitats and their quality.

And these issues affect the following components:

Biophysical environment:

- Hydrogeology
- Hydrology
- Surface water quality
- Soils
- Fish and its habitat
- Vegetation and wetlands

#### Surface water quality

During the operation, stations were sampled regularly as part of the EEM follow-up of the Metal Mining Effluent Regulations (MMER) and provincial monitoring. Figure 4.1 shows the location of sampling stations and release points when the mine was in operation.

The monitoring of effluent water quality and the unnamed stream as well as in Lake A located downstream from the project made it possible to demonstrate that the mine met the requirements of the criteria for rejection of the Directive. 019 and the Metal Mining Effluent Regulations during the years of operation. The details of the effects on the receiving environment are presented in Genivar's ESI reports published in 2009 and 2010.



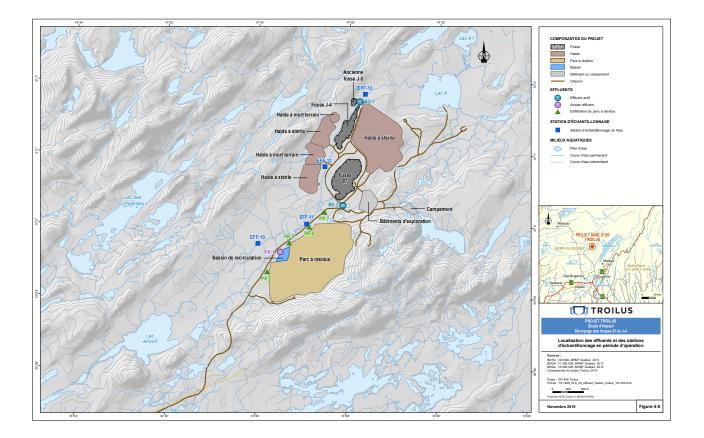


Figure 4.1Location of sampling points when the mine was in opération



Recently, Troilus undertook a site characterization study to define the baseline in the event that the mine site will goes back into operation. Sampling was carried out at various places on the property, in particular at the points shown in Figure 4.2. Thus, points E1 to E7 were sampled monthly and the parameters analyzed and the results are presented in Appendix G. In the case of dewatering of pits, it is sampling point E2 which is located closest to the point of release that will be used to evaluate the effects of adding contaminants to the receiving environment.

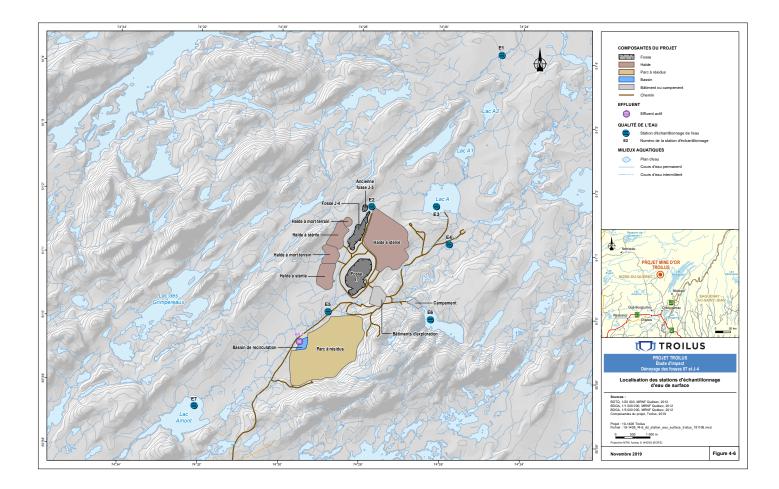


Figure 4.2Location of sampling stations for surface water, summer and fall 2019



### Geomorphology of unnamed stream and Lakes A, A1 and A2

PolyGéo has been mandated to perform photo-interpretation of surface materials along the banks of the unnamed stream and the three lakes that cross its path before it is discharged into a larger river about 14 km downstream of the mine site. The report is provided in Appendix H of the impact study.

#### Hydrogeology

Information on hydrogeology was taken from Schedule 2 of the 2009 Genivar Restoration Plan. The report is presented in Appendix I of the EIS. At this time, a review of the conditions before and during the operation was conducted to estimate the filling time of the pits at the end of the dewatering period.

#### 4.1.2 Biological Environment

Only the components that are likely to be modified by the dewatering of the pits have been the subject of specific inventories in the years 2018 and 2019. These are vegetation and wetlands and fish and their habitats.

#### Vegetation

The description of the vegetation and wetlands is largely based on the results of the 3D photointerpretation and the floristic inventory conducted by Wachiih in the study area. The vegetation inventory, conducted during the week of July 7, 2019, was concentrated mainly along the tributary of Lake A and on the edge of this body of water.

A total of four sampling stations were conducted in the study area using the most representative observation points possible in the area, two of which in the riparian zone of the tributary of Lake A and two adjacent to this body of water.



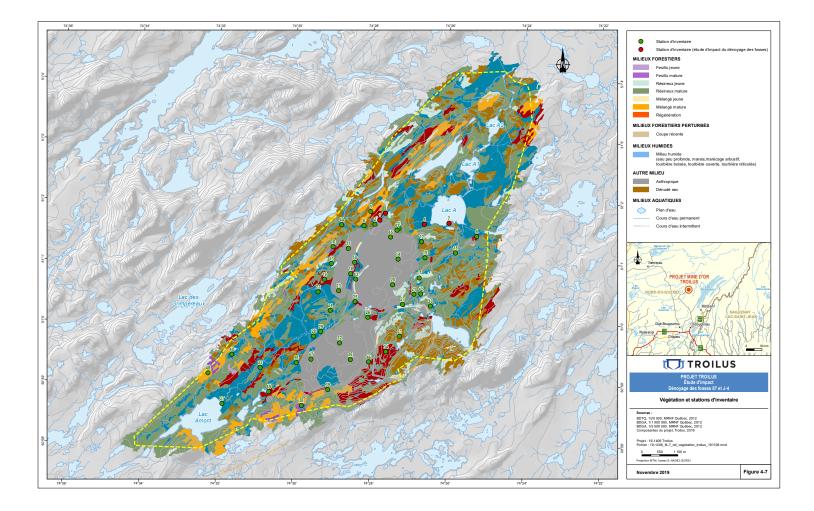


Figure 4.3Vegetation map near the unnamed stream



#### Wetlands

A first validation of the presence of wetlands in the study area was carried out using georeferenced aerial photographs (3D photo-interpretation) to which information from the wetland mapping database was combined - MELCC (2018). The presence of wetlands was subsequently validated along the tributary of Lake A and at the edge of this body of water during the surveys of early July 2019.



Figure 4.4 Open peat bog along Lake A



## Figure 4.5 Typical woodland bog

## **Riparian environments**

Riparian vegetation in the upstream portion (upright and riprap) of the tributary of Lake A is shrubby. It consists mainly of rough alder about 3 m high.



Figure 4.6 Riparian végétation of Lake A tributary, upstream of J4 pit (alder)



Figure 4.7Riparian vegetation of Lake A tributary (halfway between J4 and Lake<br/>A) consists of black spruce, tamarack, rough alder and bog-myrtle





Figure 4.8 Riparian vegetation at the mouth of Lake A tributary (tamarack, rough alder and bog-myrtle)



Figure 4.9 Tree vegetation predominantly ericaceous on a dry site on the south shore of Lake A



#### Precarious status floristic species

After validation, the MELCC does not list any occurrence of flora species in a precarious status in or near the study area (CDPNQ, 2019) and no rare plant was observed during the July 2019 floristic inventories.

#### Ichtyofauna

In 2018, Wachiih proceeded to characterize the unnamed stream from the mine site to approximately 11 km further downstream. The sectorial study reports are provided in Appendix C and D of the impact study.

In each of the watercourses characterized, there are potential or confirmed spawning grounds. Spawning grounds are identified from the quality of the substrates. Of the 14 spawning sites identified by a substrate (Wachiih), 3 were confirmed by the tallyman, Mr. Kenny Awashish. These sensitive habitats have been taken into account in the dewatering water discharge scenarios.



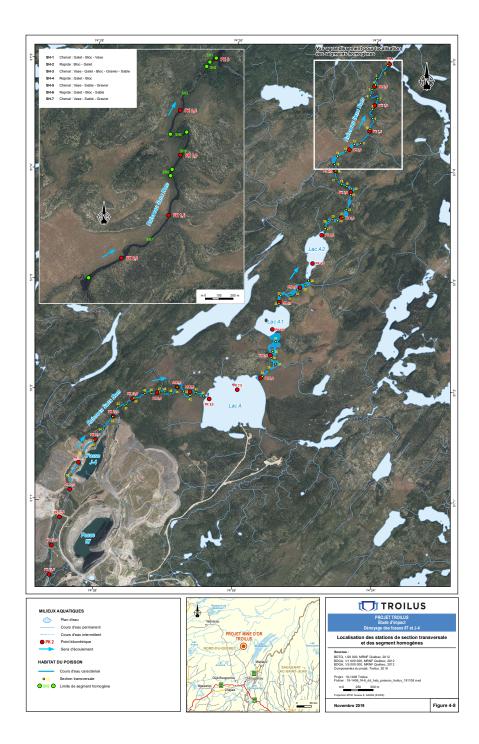


Figure 4.10 Location of homogenous segments (DDM, Appendix D of impact study)

### 4.1.3 Human Environment

#### Land Use (Genivar, 2009)

The area in question is located largely on public lands and in James Bay agreement territory.

With the exception of the southern portion and an easterly portion that overlaps with the Mistissini Category II lands, the area is located in two wildlife sanctuaries, Albanel-Mistissini-Waconichi and Assinica lakes.

In April 2017, the management of the territory was finally entirely entrusted to the Cree Nation of Mistissini via the Nibiischii Corporation, an outfitter with no exclusive right to operate on lakes Troilus and Frotet.

#### **Cree Consultation**

Troilus Gold has opened a local office in Mistissini and Chibougamau to ensure seamless communication between the company and stakeholders. Troilus Gold holds regular briefing activities in Mistissini and with elected representatives of local communities.



## 5. PROJECT PRESENTATION

## 5.1 Liability

According to the EQA, Article 153, the pit dewatering project could be included in the category of projects that are compulsorily subject to the impact assessment and review procedure. Following the analysis of the project description, the evaluation committee (COMEV) decided to subject the project to the environmental impact assessment and review procedure.

## 5.2 Implementation Schedule

The preparation work required for dewatering the pits will begin as soon as the permits are obtained. The preparation work should last no more than 3 months and then the pumping would begin at this time. It is expected that a delay of approximately 1 to 2 years would be required to empty both pits.

## 5.3 **Project Description**

The project involves emptying pits 87 and J4 of their water and discharging the water into the unnamed stream located west of the pits.

#### 5.3.1 Pit Geometry

Pits 87 and J4 are located approximately 500 m apart. The geometric parameters are presented in Table 5.1.

#### Table 5.1 Pits geometric parameters (Genivar, 2009)

|                    | J4 PIt                 | 87 Pit                 |
|--------------------|------------------------|------------------------|
| Area               | 226 255 m <sup>2</sup> | 558 850 m <sup>2</sup> |
| Maximum depth      | 130 m                  | 320 m                  |
| Top Dimension      | 1 245 m x 305 m        | 1 150 m x 625 m        |
| Base Dimension     | 150 m x 70 m           | 400 m x 45 m           |
| Height of benches  | 10 m                   | 10 m                   |
| Angle of the walls | 52 à 55 deg            | 52 à 55 deg            |

#### 5.3.2 Water volume in the pits

It is possible to estimate the current water volume by taking into account the water elevation measured in 2018.

### Table 5.2 Water volume d'eau in the pits in September 2018

|                           | Fosse J4 | Fosse 87 |
|---------------------------|----------|----------|
| Water level (m)           | 360      | 263      |
| Volume (Mm <sup>3</sup> ) | 8,748    | 17,606   |

## 5.3.3 Receiving Capacity of unnamed stream

The proposed Troilus dewatering approach is to optimize the ability of the unnamed stream to receive water while preserving the issues presented in the MELCC application dated July 3, 2019.

Based on the results obtained, it was estimated that the unnamed stream would be capable of passing a very high flow rate to about 5 m<sup>3</sup>/s before experiencing erosion problems (Appendix H). It is the substrates associated with spawning grounds for brook trout that limit the flow because of the speed and depth of the water that would be reached in some places. The flow would be of the order of 3.5 m<sup>3</sup>/s in the most critical sections. When pumping begins, Troilus will monitor several downstream areas to ensure that adequate water levels are maintained.

## 5.3.4 Determination of flowrate

Pumping rates were estimated from several inputs:

- The annual rainfall is an average estimated from statistical data of the station of Chapais;
- Groundwater infiltration rate was calculated from theoretical considerations and field data from Genivar (2009);
- The flow of the unnamed stream is extrapolated for different conditions by transposition of watersheds;
- The volume of water in the pits is estimated from the storage curve;
- Flow velocities and water depths in the unnamed stream are estimated from a model that has not been calibrated and estimates an average velocity over a flow section.

Troilus Gold will implement follow-ups in the field to ensure that the issues defined by the department are met. Therefore, several scenarios are considered depending on the response of the receiving environment to the excess water that will be released. Examples of possibilities are:

• dewater pit J4 quickly (less than 2-3 months) with a high flow to avoid impacts of a longer duration. The flow should always ensure that the banks of the stream are not eroded and that the spawning grounds are conserved. Following dewatering of J4, a 6 to 8 month break could



allow the receiving environment to return to normal conditions and allow, for example, vegetation in wetlands to grow above water;

- Dewater pits J4 and 87 more slowly to prevent plants in wetlands from being fully submerged;
- Use a moderately high flow and avoid pumping in the winter if Lake A should not freeze sufficiently and affect traditional activities on the lake;
- Avoid dewatering between May and August so as not to affect the vegetation but to dewater with a high flow between September and December to resume the following year.

These are just examples of possible scenarios and at this point it is difficult to define which would reconcile the ability of the receiving environment to receive water while allowing users of the territory to enjoy their traditional activities. Troilus Gold commits to empty the pits with utmost respect for issues raised and stakeholders.

From the beginning of dewatering, daily inspections will be conducted along the unnamed stream primarily between the mine site and Lake A. The flow will be progressively increased depending on the response of the receiving environment. At first glance, the field surveys established a maximum water level of 350 m. Beyond that, the stream becomes too wide and floods too much territory mainly upstream of Lake A. When this rating has been reached, Troilus Gold will perform measurements of current speed and depth of water in different sections to calibrate the hydrological model.

### 5.3.5 Time required to dewater the pits

Table 5.3 shows the estimated times for three precipitation scenarios.

| Pit | Water Volume<br>(m <sup>3</sup> ) | Dry year<br>scenario<br>(months) | Average year<br>scenario<br>(months) | Wet year<br>scenario<br>(months) |
|-----|-----------------------------------|----------------------------------|--------------------------------------|----------------------------------|
| 87  | 17 606 273                        | 6                                | 8                                    | 10                               |
| J4  | 8 748 031                         | 2                                | 3                                    | 7                                |

#### Table 5.3 Estimated time to dewater the pits according to different scenarios

The J4 pit can be expected to empty over a period of between 2 and 7 months while the 87 pit could empty over a period of between 6 and 10 months. The pits will be emptied one after another starting with J4. It is estimated that dewatering could be spread over a period of up to 17 months while considering the many assumptions used in the estimation.

## 5.3.6 Water quality in the pits

Water samples were taken in the pits in the fall of 2018 to determine the concentration of the different parameters at different depths in the two pits. The characterization report prepared by the Wachiih is presented in Appendix K of the impact study.

The concentrations of all measured parameters are below the limits of Directive 019.

## 5.3.7 Pumping Systems, Treatment Plant and Discharge Point

The pumping rates were established considering the preservation of the stakes or issues as defined in the chapter on the impacts. Thus, it has been established that a flow rate of the order of 2.5 to 3.5 m3/s would be the maximum flow in the stream to be met at the point of discharge. The equipment will be mounted on a pumping platform that will be moved from one pit to another. Pit J4 will be emptied first, followed by 87 pit.

A total of six centrifugal pumps will be installed on the platform

Based on the results obtained from the sampling of the water quality of the pits, treatment of the water would not be necessary. However, to address any eventuality, the treatment plant will be installed and functional from the first day of dewatering.

The processing plant has 6 containers, including a container for power supply, one for controls, and one for the laboratory. The other three treat suspended solids (TSS), pH adjustment, metals and ammoniacal nitrogen. Processing containers contain sealed tanks for reagents, holding tanks, dosing pumps, etc.

Processing capacity of the plant is about 300 m<sup>3</sup>/hour. The reagents used, if required, would be: sodium hydroxide, sulfuric and phosphoric acids, polymer, magnesium oxide and ferric sulphate. The amount of these reagents to be used will be determined if treatment is required and will depend on the concentration of the parameters to be treated.

At the outlet of the pumps, it is planned to install a rip rap to prevent erosion.

The treatment unit will be located west of J4 pit, on a rock platform (green dot in Figure 5.1). One pipe will bring water to the discharge point (orange line) and the discharge point is shown in yellow in Figure 5.1.



# Figure 5.1 Water treatment plant location (green dot) and discharge point (yellow dot)

For the dewatering of pit 87, the barge and the pipe will be brought to the pit 87. The water treatment unit and the point of discharge will remain in the same place and the water will be pumped with a pipe shown in blue on Figure 5.2.



Figure 5.2 Water treatment plant location (green dot) and discharge point (yellow dot) and the discharge pipe from pit 87



## 5.4 Greenhouse gases

Since the pumping system will run on electricity as well as the water treatment plant, dewatering the pits will not produce greenhouse gases.

# 6. INFORMATION AND CONSULTATION ACTIVITIES

## 6.1 Targeted information and consultation activities carried out

Several information activities were conducted with elected officials, the community of Mistissini in general, and families potentially impacted and historically consulted as part of the Troilus project, namely the Awashish, Neeposh and Petawabano families.Targeted meetings have been held in the context of this impact study for dewatering pits. Table 6.1 presents the results of these targeted meetings.

| Title  | Location             | Date       | Stakeholders   | Troilus<br>Employees<br>present                      |
|--|----------------------|------------|--|--|
| Presentation and<br>consultation for<br>dewatering project | Mistissini           | 2019-10-10 | Thomas Neeposh, Chief of<br>Mistissini<br>Hubert Petawabano, Land and<br>environmental coordinator and<br>Tallyman<br>Tony Petawabano, Tallyman  | Jacqueline Leroux<br>Mathieu Michaud<br>John Matoush |
| Presentation and<br>consultation for<br>dewatering project | Troilus Mine<br>Site | 2019-10-30 | Kenny Awashish, Tallyman   | Mathieu Michaud                                      |
| Presentation and<br>consultation for<br>dewatering project | Mistissini           | 2019-11-01 | Pamela McLeod, Local<br>environnement administrator<br>Hubert Petawabano, Land and<br>environmental coordinator and<br>Tallyman<br>James Neeposh, Tallyman<br>Tony Petawabano, Tallyman<br>George Awashish, Tallyman | Mathieu Michaud<br>John Matoush                      |

### Table 6.1 Targeted meetings with stakeholders on the dewatering project.

The concerns and the responses provided during consultation are described below.:

- > Questions about the Authorization process for the dewatering Project.
  - Answer: COMEV has determined that an impact study will be required; the company intends to submit this study in November 2019. Subsequently, an authorization from the Ministry of the Regional Environment will be required before dewatering begins.
- > Question about the water volume in each pit and their overall volume capacity.

- Answer: The water level in pit 87 is 200m to 300m. Taking into account the shape of the pit the approximate total water volume in pit 87 is estimated at 17-18 Millions of cubic meters. Pit 87 is filled to approximately to 1/3 of its capacity. The water level in pit J4 is 180m. Taking into account the shape of the pit the volume of water in pit J4 is estimated at 8-9 Mm3. Pit J4 has almost reached its maximum volume.
- > Question on the justification of dewatering the pits.
  - Answer: Dewatering is essential for the exploration and determination of the mineralized zone on the east side of pit J4 and 87 as well as reducing costs and increasing drilling accuracy under pits J4 and 87.
- > Comments on the possibility of restarting the operation.
  - Answer : There are still a lot of studies to be done such as the prefeasibility study, the feasibility study and the impact study on the effects on the environment. So far the results of the 2018 and 2019 drilling campaigns are promising.
- Comment on the possibility of using a submersible camera to observe the contaminant presence deep into the pits.
  - Answer: Contaminant concentrations can not be assessed in this way and the possibility that there is a layer of water or contaminants found in concentration visible to the naked eye is very low especially considering the results obtained during pit sampling campaign at different depths.
- > Comment on the sampling frequency of pits at depth.
  - Answer : Sampling at different depths took place once in both pits. The results were informative for the company and stakeholders and another such campaign is not planned. The surface water sampling of the 2 pits will continue to be performed as described in our overall CA. In addition, sampling during dewatering will be done internally daily and by an accredited laboratory weekly.
- > Comment on the possibility of following the displacement of fish.
  - Answer : Many inventories and characterization of the fish and their habitats occurred at the mine site. These studies will be the baseline for establishing whether the fish move during dewatering. The monitoring plan for the dewatering project is not yet final, but there will certainly be monitoring of the quantity and quality of the fish in the impacted environment.
- > Comment on the change of ice thickness on Lake A during winter.
  - Answer : The dewatering flow will be defined according to the capacity of the stream and Lake A at different times of the year.
- Comment on the concerns of traditional activities and movement on ice during dewatering
  - Answer : Safety measures and a follow-up program will be put in place to identify areas at risk on Lake A.

A communication plan has been agreed with members of the Mistissini community and includes the following elements:

- A monthly report on the activities of Troilus Gold,
- Information updates will take place, notably at Mistissini Annual General Meetings in February and August.
- Targeted meetings with representatives of the Cree Nation of Mistissini will take place, as part of the Pre-Development Agreement signed in 2018,
- Mistissini's stakeholders have access to the Mistissini office at all times.
- Stakeholders have access to the Chibougamau office at all times
- Meetings will be organized with the communities of Chibougamau and Chapais to inform stakeholders of the progress of Troilus Gold activities.

Note that this communication plan is evolving, with the needs of stakeholders and the progression of Troilus Gold's activities.

# 7. METHODOLOGY

## 7.1 Methodological approach

The methodology developed aims to achieve the objectives of the ministry by dealing with impact studies by assessing how the modifications of the components will have impacts on the issues identified for the project. As a result, the following key steps have been completed:

- Definition of the study area;
- Identification of the issues raised by the project;
- Identification of the physical, biological and human components related to the issues;
- Identification of project activities that may cause changes to the components;
- > Description of the physical, biological and human environments before the project is carried out
- Determination of changes to targeted components due to project activities;
- Identification of mitigation measures;
- Determination of impacts on the issues;
- Identification of compensation measures if required;
- > Development of monitoring and follow-up programs.

### 7.1.1 Study Zone

The area likely to be affected is the area that will be affected by the water table drawdown cone and the unnamed stream from the point of discharge to a distance estimated at approximately 12 km downstream of the point rejection. The lowering of the water table should not exceed a radius of 2.5 km from the pit walls. This value comes from the Genivar report (2009).

### 7.1.2 Identification of the stakes brought by the project

In the directive sent to Troilus Gold in July 2019, the MELCC identified three issues or stakes or issues on which the impact study should focus:

- Conservation and protection of surface and underground water resources (quantity and quality);
- Preservation of the integrity of the hydrographic network and its processes;
- Maintaining of the quantity of flora and fauna habitats and their quality.

## 7.1.3 Identification of physical, biological and human environments components related to the issues.

Based on the issues, the components of the physical, biological and human environments were identified and efforts focused on documenting the current status of these components to be able to assess changes in the components related to the activities of the dewatering project dewatering.

The component that have been identified are:

- 1) Physical Environment
  - a) Hydrogeological regime
  - b) Underground water quality
  - c) Surface water regime
  - d) Surface water quality
  - e) Soil
- 2) Biological Environement
  - a) Vegetation and Wetlands
  - b) Fish and habitats
- 3) Human Environement
  - a) Land use

## 7.1.4 Identification of project activities that may cause modifications to the components

Project activities that are likely to modify the components identified in the previous section are:

- 1. Installation of barge and pumps
- 2. Pumping water from pits
- 3. Discharge of water into the unnamed stream
- 4. Maintaining the pits once dry

In relation to the retained issues, it was only pumping water from the pits and the discharge in the unnamed stream that were used to evaluate the changes to the components.

### 7.1.5 Impacts of Component Changes on retained Issues

For each issue, an analysis grid was developed to highlight the project activities and the affected components related to the issue. The modification of this component was qualified according to the

method proposed in section 7.2. The modifications are evaluated taking into consideration the application of mitigation measures.

Following the assessment of the impact of the modification of the components, follow-up measures are proposed if possible to document the actual impacts.

# 7.2 Evaluation of the residual impact of a modification of a component on a retained issue.

After applying mitigation measures, the significance of the residual impact must be assessed. The significance of the impact is related to the changes experienced by the component. Different criteria are considered in the evaluation based on a procedure that includes the following elements:

- Ecosystemic Value ;
- Socio-Economic Value;
- Intensity or degree of disturbance ;
- Range ;
- Duration.

The significance of an impact of a change in a component of physical and biological environments depends on its value (sensitivity, uniqueness, rarity, reversibility) in the ecosystem and its social, cultural, economic and aesthetic value to communities.

For components of the human environment, the concerns of Aboriginal and non-Aboriginal communities influence the assessment of the significance of the impact. These may include health, safety or preservation of cultural and archaeological heritage.

## 8. DETERMINATION OF CHANGES IN TARGETED COMPONENTS DUE TO PROJECT ACTIVITIES

The dewatering of the pits will result in modifications to components of the physical, biological and human environments. For the physical environment, these are the components related to hydrogeology and hydrology, the quality of surface water and soil. For the biological environment, these are the components related to fish and their habitat, vegetation and wetlands. For the human environment, land use may be disrupted locally during dewatering activities. The following sections list the components and anticipated changes.

### 8.1 Physical Environment

### Hydrogeology

During dewatering of the pit, the groundwater around the perimeter will undergo a drawdown (lowering of the groundwater level) locally. During the operation of the mine, the water levels were monitored and we can reasonably anticipate that the same drawdowns will be observed during the dewatering planned in 2020.

### Hydrology

Pit dewatering will have an impact on the flow of the unnamed stream and downstream bodies of water. The flow will be increased to a value of about 2.5 to 3.5 m3 / s. At this value, it is not expected that the stream will suffer from erosion problems so that the spawning grounds are negatively affected.

### Surface water quality

As for the quality of surface water, dewatering pits will bring elements into the unnamed stream. Since pit water concentrations are generally lower than measured concentrations while the mine was in operation, significant impacts on surface water quality are not anticipated.

### Soil

Dewatering activities will have little impact on soils. In fact, according to the speeds calculated from the flows in the stream, erosion zones are not expected.

### 8.2 Biological Environment

### Fish and habitat

Dewatering the pits will increase the flow of the unnamed stream. A total of 13 potential spawning grounds (of which 3 are confirmed) were identified during the field surveys. Simulations of flow rates

and speeds show that the more water pumped into the stream, the more length of the substrates present becomes interesting for spawning.

Increasing flow has a positive effect on potential spawning grounds by increasing the area where white-water species can spawn.

### Vegetation

The increase of the water level will be done in a way that does not affect the terrestrial vegetation. The watercourse will overflow the main channel during dewatering to spill into its floodplain. The water would only rise in wetlands.

### Wetlands

The unnamed stream is mostly lined with wetlands. During dewatering, the water level will increase. Some indicators of ecosystem health will be required to ensure the integrity of the ecosystem. Water level control measures will be put in place at the beginning of the pumping, by biology experts, to ensure that the functions of the environment are preserved and not to overgrow the vegetation for a long period of time.

### 8.3 Human Environment

### Land use

The Troilus mine site has always considered the hunting territories of the Awashish and Brien (M-34), Petawabano (M-40) and Neeposh (M39-A) families. Within each of these hunting grounds, there are camps that are used by family members at different times of the year (main camp, winter camp, hunting camp, etc.). The activities practiced are hunting, fishing and picking fruits and plants.

Aside from winter fishing on Lake A, the dewatering of pits should not influence these activities.

## 9. DETERMINATION OF IMPACTS ON THE RETAINED ISSUES

The three issues retained by the MELCC are:

- Conservation and protection of surface and underground water resources (quantity and quality);
- The preservation of the integrity of the hydrographic network and its processes;
- The maintenance of the quantity of flora and fauna habitats and their quality

# 9.1 Retained issue #1: Conservation and protection of surface and underground water resources (quantity and quality);

This issue concerns the conservation and protection of surface and underground water resources, both in terms of the quantity of water to be preserved and in terms of quality. It is important to ensure that the dewatering of the pits and the release into the environment will maintain the integrity of the water resource. Two activities will affect the components related to the issue: the pumping of groundwater and the discharge of this water into the unnamed stream. The modified components directly related to this issue are the hydrogeological regime, the hydrological regime, and the water quality of the unnamed stream.

### 9.1.1 Pumping water from the pits

The pumping of water in the pits will result in a drawdown of the water table in the area of influence of the pits. This area of influence will be the same as that present at the end of Troilus mine operations in 2009. The pumping will therefore affect the "hydrogeology" component, which is an identified component related to the first issue.

### Hydrogeology :

Pumping groundwater will lower the groundwater level around the pits and consequently change the pattern of groundwater flow locally. The element of conservation of the groundwater resource would therefore be affected.

The significance of the component was assessed as MEDIUM considering the role of groundwater recharge for water or wetlands. The socio-economic value was considered high since the groundwater supplied the industrial zone well, the exploration camp well and the wells of two users of the territory near Lake A. All these wells were in operation when the pits were dry.

The intensity of the impact is rated LOW on the component since the effects of pumping are local and are only felt in an area that is already affected by the presence of waste rock and a tailings pond and in the past existing wells were not affected.

Given the very local aspect of the observed changes, the extent of impact on the component is rated LOW.

The duration of the impact is considered HIGH since it will be felt as long as the pits are kept dry and past experience shows that it takes about 10 years to reach equilibrium conditions.

Given the environmental significance (low) of the component, the intensity (low) of the impact, the range (low) and the duration (high), the impact strength is LOW.

### 9.1.2 Discharge of water in unnamed stream

This activity involves the release of water into the unnamed stream near the J4 pit. A flow measurement station will be installed on the unnamed stream upstream of the discharge point so that it will never exceed the maximum flow expected to maintain the habitat. In addition, a water treatment plant will be available as needed.

Discharge of water into the stream will directly alter two components, the water regime and the water quality of the unnamed stream. These two components are related to Retained Issue # 1. Also, a change in the water regime can have an effect on the soil component.

### Hydrology

Hydrology is modified during dewatering as the flow will be increased to ensure a constant flow in the unnamed stream. Only the unnamed stream, which will see its flow increase and its water regime modified, will be affected by the discharge of water.

The importance of the component is HIGH given the role of rivers and lakes in preserving biodiversity. The socio-economic value was also considered high since surface water is very important for the local community.

The intensity of the impact is rated LOW on the component since the effects of the discharge are mitigated by the flow control that will not exceed the capacity of the unnamed stream.

Given the local aspect of the changes observed that could extend a few kilometers downstream of the discharge point, the extent of the impact on the component is considered MEDIUM.

The duration of the impact is considered LOW since it will be felt only during dewatering, which should not last more than 1 to 2 years.

Given the environmental importance of the (high) component, the intensity of the impact (low) and the extent (average) and the duration (low), the impact strength is LOW.

### Water Surface Quality

The water quality of the unnamed stream will be modified by the discharge of the water from the pits. The quality of the water in the pits meet the criteria of Directive 019 but exceeds certain criteria for the protection of aquatic life. Follow-ups during the dewatering will allow to measure the potential effect of dewatering and the experience in operation did not show any specific problems according to environment monitoring.

The importance of the component is HIGH given the importance of preserving water quality. The socio-economic value was also considered high since surface water is very important for the local community.

The intensity of the impact is rated LOW on the component since the effects of the discharge are mitigated by the establishment of a water treatment plan.

Given the local aspect of the changes observed that could extend a few kilometers downstream of the discharge point, the extent of the impact on the component is considered MEDIUM.

The duration of the impact is considered LOW since it will be felt only during dewatering, which should not last more than 1 to 2 years.

Given the environmental importance (high) of the component, the intensity (low) of the impact and range (medium) and the duration (low), the impact strength is LOW.

### Conclusion

The dewatering of the pits will be done in a way that respects the retained issue #1 and allows the conservation and protection of surface and underground water resources.



## Table 9.1 Structured Impact Matrix for retained Issue # 1 Conservation and Protection of Surface and<br/>Groundwater Resources (Quantity and Quality)

| Action<br>Impact Source   | Physical<br>Environment<br>component<br>concerned<br>Modification                             | Impact of modifications<br>Description   | Mitigation<br>Measures<br>Description | Residual<br>Impact<br>Description | Follow-up/monitoring  |
|---|---|--|---------------------------------------|-----------------------------------|---|
| <b>Pumping</b><br>Diminution of<br>water level in<br>the pits               | Hydrogeology<br>Drawdown of water<br>table<br>Change in flow<br>direction                     | <b>The pits will act as wells</b><br>Part of undergroud water will<br>be pumped and discharged at<br>surface | None                                  | Low                               | None  |
| Discharge in<br>unnamed<br>stream<br>Increase of<br>flowrate and<br>load in | <b>Hydrology</b><br><i>Modification of water</i><br><i>regime of unnamed</i><br><i>stream</i> | Flow of unnamed stream<br>will be constant<br>Volume will be adjusted<br>according to the seasons            | None                                  | Low                               | Flow measurement in<br>the unnamed stream<br>upstream of the<br>discharge point |
| contaminants  | Water quality<br>Increase in<br>contaminants  | Alteration of surface water<br>quality<br>Additional contaminants<br>could affect water quality              | Water<br>treatment<br>plant           | Low                               | Monitoring the water<br>quality in the unnamed<br>stream                        |

# 9.2 Retained Issue #2 : Preservation of the integrity of the hydrographic network and its processes

Table 9.2 presents the list of actions related to the components modified directly and indirectly. For each modified component, mitigation measures are presented to determine if the action may have a residual effect on the issue. If the application of the mitigation measures raises doubts about its effectiveness, a follow-up is put in place.

### 9.2.1 Pumping

Pumping water in the pits does not affect any component related to the Retained Issue #2.

### 9.2.2 Water discharge in unnamed stream

This activity involves the release of water into the unnamed stream downstream of J4 pit. A flow measurement station will be installed on the unnamed stream upstream of the discharge point so as to never exceed the maximum flow that will be specified at the time of dewatering using indicators as proposed in Section 10. A water treatment plant will be in operation to discharge water of a quality that will minimize the effects on the receiving environment.

Discharge of water into the stream will directly alter two components, namely the hydrology and water quality of the unnamed stream. These two components are related to Retained Issue # 2. In addition to modifying these two components, a change in the water regime can have an effect on the soil component.

### Hydrology

Hydrology is modified during dewatering as the flow will be increased to ensure a constant flow in the unnamed stream. Only the unnamed stream, which will see its flow increase and its water regime modified, will be affected by the discharge of water.

The importance of the component is HIGH given the role of rivers and lakes in preserving biodiversity. The socio-economic value was also considered high since surface water is very important for the local community.

The intensity of the impact is rated LOW on the component since the effects of the discharge are mitigated by the flow control that will not exceed the capacity of the unnamed stream.

Given the local aspect of the changes observed that could extend a few kilometers downstream of the discharge point, the extent of the impact on the component is considered MEDIUM.

The duration of the impact is considered LOW since it will be felt only during dewatering, which should not last more than 1 to 2 years.

Given the environmental importance of the (high) component, the intensity of the impact (low) and the extent (average) and the duration (low), the impact strength is LOW

### Soil

Given that there is no identified sensitive area and that current speeds will respect the values established to maintain the integrity of the stream, the modification of this component and the impact of Issue # 2 will be very small. This component is not of interest for preservation and is not exceptional or unique. The socio-economic value was considered low.

The intensity of the impact is considered LOW on the component since the pumped flows are below the values of the 2-year recurrence peak flows.

Given the local aspect of the changes observed but which could extend a few kilometers downstream of the discharge point, the extent of the impact on the component is considered MEDIUM.

The duration of the impact is considered LOW since it will be felt only during dewatering which should not last more than 1 to 2 years.

Given the environmental importance (low) of the component, the intensity (low) of the impact, the range (medium) and the duration (low), the strength of the impact is VERY LOW.

### Water surface quality

The water quality of the unnamed stream will be modified by the discharge of the water from the pits. It has been shown that although the water quality in the pits meets the criteria of Directive 019, it exceeds certain criteria for the protection of aquatic life. The presence of the treatment plant will ensure that water of adequate quality is discharged, thus allowing a LOW impact intensity on the receiving

The importance of the component is HIGH given the importance of preserving water quality. The socio-economic value was also considered high since surface water is very important for the local community.

Given the local aspect of the changes observed that could extend a few kilometers downstream of the discharge point, the range of the impact on the component is considered MEDIUM.

The duration of the impact is considered LOW since it will be felt only during dewatering, which should not last more than 1 to 2 years.

Given the environmental importance (high) of the component, the intensity (low) of the impact, the range (medium) and the duration (low), the impact force is LOW.

### Conclusion

The dewatering of the pits will be done in a way that respects the Retained issue #2 and allows the preservation of the integrity of the hydrographic network and its processes.



| Table 9.2 | Structured Impact Matrix for retained Issue # 2: Preservation of the integrity of the hydrographic network |
|-----------|--|
|           | and its processes  |

| Action<br>Impact Source   | Physical<br>Environment<br>Component<br>concerned<br>Direct<br>Modification                   | Impact of<br>modifications<br>Description  | Mitigation<br>measures<br>Description              | <b>Residual Impact</b><br>Description | Follow-<br>up/monitoring  |
|---|---|--|--|---------------------------------------|---|
| <b>Discharge in<br/>unnamed<br/>stream</b><br>Increase of<br>flowrate and | <b>Hydrology</b><br><i>Modification of</i><br><i>water regime un</i><br><i>unnamed stream</i> | No more low water<br>episodes during<br>dewatering   | None   | Low                                   | Flow measurement in<br>the unnamed stream<br>upstream of the<br>discharge point |
| load in<br>contaminants   | Soil<br>Potential<br>increase of<br>erosion   | Erosion and sanding<br>of banks<br>Increasing water<br>velocities can promote<br>shoreline erosion and<br>sediment transport<br>that will ensnare areas<br>with lower velocities | Limit flow rate<br>according to stream<br>capacity | Very Low                              | Monitoring the water<br>quality in unnamed<br>stream                            |
|   | Water Quality<br>Increase in<br>contaminants  | Degradation of<br>surface water quality  | Water treatment<br>plant                           | Low                                   | Monitoring the water<br>quality in unnamed<br>stream                            |

# 9.3 Retained issue #3 : Maintaining the quantity and quality of flora and fauna habitats

The third Retained Issue is: Maintaining the amount of plant and wildlife habitats and their quality. Two major activities are impact sources: pumping groundwater and discharging into the unnamed stream. For this issue, the components related to the biological environment will be studied in relation to the modifications made by the sources of impact. In this case, the sources of impact modify the components of the physical environment and this could lead to modifications on certain components of the biological environment.

### 9.3.1 Pumping

Pumping of groundwater does not modify any component related to this issue.

### 9.3.2 Discharge in unnamed stream

The discharge of water will alter two components of the physical environment: the water regime and the water quality. In both cases, we could observe a modification of the habitats of fish and fish habitat and also wetlands.

### Hydrology

The fact that the flow will increase in the stream will have consequences on two components related to the third issue:

<u>Wetland</u>: Increasing the flow will increase the water level in the unnamed stream and overflow into the flood plain. As a result, part of the wetlands could be flooded during dewatering months.

<u>Fish and fish habitat</u>: Increased flow may affect fish habitats if current speeds are too high. A study of maximum speeds was undertaken and the results showed that the amount of spawning grounds would increase by increasing flow in the stream. There will only be a positive effect on the number of potential spawning grounds as long as we remain at a flow rate of about 3.5 m/s for brook trout spawning grounds.

### Water quality

Water quality in the stream will be modified by dewatering the pits. Given that the water from the pit will be treated as needed, no significant change in this component is anticipated. The small change in this component could still result in a change in the fish and fish habitat component. The evaluation of the impact of this modification on the Retained Issue # 3 is defined as follows. The importance of the component is HIGH given the importance of fish and their habitats. The socio-economic value was also considered high since this component is very important for the local community.



The intensity of the impact is rated LOW on the component since the effects of the discharge are mitigated by the presence of a water treatment plant. Given the local aspect of the changes observed but which could extend a few kilometers downstream of the discharge point, the range of the impact on the component is considered MEDIUM. The duration of the impact is considered LOW since it will be felt only during dewatering which should not last more than 1 to 2 years.

Given the environmental importance (high) of the component, the intensity (low) of the impact, the range (medium) and the duration (low), the impact strength is LOW.

### Conclusion

Dewatering of the pits will be done in such a way as to respect this issue and to allow the maintenance of the quantity and quality of flora and fauna habitats.

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## Table 9.3Structured Impact Matrix for retained Issue # 3: Maintaining the quantity and quality of flora and fauna<br/>habitats

| Action<br>Impact<br>Source                                   | Physical<br>Environment<br>Component<br>concerned<br>Direct<br>Modification | Component<br>concerned<br>Indirect<br>Modification                         | Impact of<br>modifications<br><i>Description</i>   | Mitigation<br>measures<br>Description                           | Residual Impact<br>Description | Follow-<br>up/monitoring   |
|--|---|--|--|---|--------------------------------|--|
| Discharge<br>in unnamed<br>stream<br>Increase of<br>flowrate | <b>Hydrology</b><br><i>Modification of</i><br><i>water regime</i>           | Fish<br>Modification<br>of velocity and<br>depth of flow                   | Spawning areas<br>modification<br>Positive impact in<br>this case because<br>increased water<br>velocity and depth<br>increase the<br>potential surface of<br>spawning areas | Flowrate control  | Very Low                       | Measure of<br>velocity and depth<br>in critical<br>sections.                         |
|  | Water quality<br>Increase in  | Wetlands<br>Flooded areas<br>during<br>dewatering<br>Fish<br>Contamination | Vegetation<br>Modification<br>Possible change in<br>vegetation<br>Contamination of<br>fish tissue<br>Accumulation of   | Flowrate control<br>Installation of<br>water treatment<br>plant | Medium                         | Measure of level<br>of water in<br>specific sections<br>Water quality<br>monitoring. |
|  | contaminants  | of fish flesh  | <i>metals could modify</i><br><i>fish health.</i>  | piant   |                                |  |



### **10. MITIGATION MEASURES AND FOLLOW-UP**

### **10.1 Mitigation measures**

Here are the specific measures for dewatering activities:

- 1) Flow measurements upstream of the point of discharge on the unnamed stream and pumping control to never exceed a maximum flow rate of between 2.5 and 3.5 m3/s.
- 2) Treatment of pit water as required to lower contaminant concentrations to meet the criteria of Directive 019.
- 3) Supply of all equipment with electricity to limit the risk of spilling petroleum products, the emission of greenhouse gases and noise.
- 4) Installation of a rock energy dissipator at the discharge point to reduce the speed at the end of the pumping line and reduce the erosion potential.

#### **10.2** Follow-up and monitoring

To ensure the effectiveness of proposed mitigation measures, monitoring of the quality of surface water in the unnamed stream will be conducted. Also, piezometers around the site will continue to be sampled regularly and water levels will be measured.

#### **10.2.1** Flowrates in umnnamed stream

Upstream of the discharge point, a flow measurement station will be installed to ensure the capacity of the unnamed stream is respected.

#### **10.2.2 Presence of Fish**

During the targeted consultations, land users mentioned concerns about fish displacement. A followup will be done with the users of the territory to make sure that dewatering flows do not displace the fish populations.

#### 10.2.3 Ice cover on Lake A

During the targeted consultations, land users in the area raised concerns about the ice cover on Lake A. Troilus Gold will track ice cover by measuring thickness and reporting results to users in the area



to ensure the safety of travel on Lake A.

The dewatering flow could be adjusted as needed

### 10.2.4 Surface water

Discharged dewatering water will be considered as a final effluent; pH and flow will be measured continuously, and other parameters will be sampled at the frequency prescribed by Directive 019, and will be incorporated into the monitoring program already in place at the mine site. At a minimum, the following parameters will be analyzed: pH, MES, As, Cu, Fe, Ni, Pb, Zn and toxicity.

### 10.2.5 Underground water

Piezometers are already installed on the site and monitoring of groundwater quality has been going on for several years. This monitoring will continue during dewatering. The monitoring program will comply with the requirements of Directive 019 (sections 2.3.2 and 2.3.3) which dictate in particular the parameters to be analyzed, the frequency of sampling, the use and the selection of the alert threshold.

Sampling will be in accordance with the Sampling Guide for Environmental Analyzes (Booklet 3). The parameters to be analyzed are as follows:

- Dissolved metals: arsenic, copper, iron, nickel, lead, zinc, total cyanides,
- Hydrocarbons C<sub>10</sub>-C<sub>50</sub>
- pH, electrical conductivity (in situ)
- Major ions (Ca<sup>+2</sup>, HCO<sub>3</sub> —, K<sup>+</sup>, Mg<sup>+2</sup>, Na<sup>+</sup>, SO4<sup>-2</sup>)

Follow-up will be in accordance with the terms and conditions requested by the MELCC under the conditions of current authorizations.

## **11. CONCLUSIONS**

Dewatering 87 and J4 pits will allow Troilus Gold to reach drilling targets to continue exploration work on its property and confirm the presence of suspected mineralization along the east wall of 87 and J4 pits.

Dewatering activities will be carried out in such a way as to ensure the protection of the environment and more particularly in relation to the retained issues defined by the MELCC. As presented, the major concerns of the MELCC have been taken into consideration and the project will not harm the Environment.