

March 17, 2022

Attention: Ms. Debra Sikora

Review Panel Chair
Marathon Palladium Project
Impact Assessment Agency of Canada
marathonminereview-examenminemarathon@iaac-aeic.gc.ca

Dear Ms. Sikora,

Reference: Marathon Palladium Project (Ref. Number 54755) – Undertaking #1

I am writing in response to Undertaking 1 from the Panel session held on March 16, 2022.

With respect to Undertaking #1, we enclose the attached information regarding the project components and VECs that considered the larger volume of concentrate (magnetite and vanadium) that would be generated in the event that a magnetic separation circuit is implemented.

Thank you for your consideration of this additional information.

Regards,

Generation PGM

<Original signed by>

Drew Anwyll, P. Eng
Chief Operating Officer
Generation PGM Inc.

<contact information
removed>

Cc. Laurie Bruce, Joint Review Panel Member (by email)
Gay Drescher, Joint Review Panel Member (by email)
Jason Patchell, Panel Manager (by email)

Undertaking 1: Implications of Magnetic Separation in the Effects Assessment

Panel Information Session: March 16, 2022

Undertaking Request # 1

That Generation PGM put together, possibly in table form, a list of all project components and all the VECs that were considered for the larger volume of concentrate (being magnetite and vanadium). If you could give some consideration to any implications for the PSMF in the event of moving forward with the magnetic separation circuit, and whether any project components would change if vanadium / magnetite concentrate were to be produced.

PGM Response

This information is provided in response to the request from the Panel for further information on the implications to the effects assessment of including a magnetic separator in the project design and corresponding concentrate of vanadium and magnetite in the mining process. This response builds on our earlier response to Information Request 1-3 (CIAR #749).

In Section 1.5.4.2 and 1.5.4.3 of the EIS Addendum, and further in response to IR1-3, GenPGM noted that magnetic separation may be incorporated into the design of the process plant as a way to improve marketability of the concentrate. The use of a magnetic separator would increase vanadium and magnetite levels within the concentrate, thereby improving the marketability and volume of the concentrate leaving the site. To address this possibility, magnetic separation processes were considered and remain part of the environmental assessment in the event that the economics of those options become more favourable in the near future.

Project Components

In most cases, there would be no measurable change to the predicted environmental effects of the Project with or without magnetic separation. With the exception of the following, no other changes to the Project components would be anticipated if magnetic separation were to produce a vanadium-magnetite concentrate:

- Process Plant - Low intensity magnetic separation may be applied on the flotation tailings to produce a bi-product magnetite-vanadium concentrate. As the magnetite and vanadium are contained in the currently defined ore tonnage, there would be no change to the plant capacity (ie, no new material would be going into the plant nor into the PSMF). The design of the process plant will be confirmed during detailed design, and the incorporation of magnetic separation will be confirmed based on market conditions. In any case, the metallurgical process and products that require management with or without the magnetic separation do not pose a greater risk to the environment or to people.
- Concentrate Handling and Storage - The Concentrate Storage Building includes adequate capacity to allow additional storage of concentrate to mitigate any potential delays that could arise in concentrate transport. Concentrate will be loaded into transport trucks in the Process Plant to ensure that dust generated during loading is contained and to facilitate clean-up of material.
- Concentrate Transportation - It is estimated that about 10 truckloads of PGM-copper concentrate will be transported off-site on a daily basis. In the event that a vanadium-magnetite concentrate were to be produced, up to an additional estimated 30 truckloads of concentrate may leave the site on a daily basis. The increased number of truck movements were conservatively considered in the EIS Addendum.

The description and design of these Project components considered the larger volume of concentrate in the effects assessment to address the potential for the implementation of magnetic separation.

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In regard to the Process Solids Management facility (PSMF), no change to the design of the PSMF would be required with or without the magnetic separation circuit. The implementation of magnetic separation would result in a nominal reduction (i.e., less than 2%) in the volume of Type 1 process solids being directed to the PSMF, as the additional concentrate stream would be diverted away from the PSMF.

If magnetic separation becomes feasible, there would be no measurable change to the water quality predictions. Magnetite, an iron oxide mineral, is chemically stable with a very low solubility in water. Magnetite and vanadium do not influence the environmental nature or characterization of process solids or associated water quality. Applying magnetic separation would simply remove magnetite and vanadium from the process solids and process water, thereby reducing iron and vanadium mass loadings to the PSMF. The process solids that were subjected to chemical characterization and testing included the vanadium-bearing magnetite and, therefore, the presence of the magnetite is accounted for in the chemical source terms and water quality predictions associated with the PSMF.

Effects on Valued Ecosystem Components

Based on the above, effects of these Project components on the various Valued Ecosystem Components (VECs) considered the larger volumes of concentrate that would be generated with magnetic separation. In this regard, a conservative approach was taken in the assessment where appropriate to provide flexibility during detailed design should the economics of either concept become viable in the future. In the event that the additional concentrate is not produced, potential effects of the Project would therefore be reduced relative to those predicted in the EIS, EIS Addendum and corresponding IR responses.

Table 1 identifies the VECs affected by the additional concentrate generated in the event that magnetic separation were to be included in the Project as considered in the effects assessment.

Table 1 Valued Ecosystem Components Affected by the Additional Concentrate

Valued Ecosystem Component	Effect of Magnetic Separation and Corresponding Magnetite-Vanadium Concentrate	How Addressed in the Effects Assessment
Atmospheric Environment	Transporting the additional concentrate requires a greater number of truck movements per day	Air Quality model predicting Project related atmospheric concentrations of CoPCs and GHG considered the additional truck movements associated with hauling the larger volume of concentrate (see Air Quality Updated Effects Assessment, EIS Addendum, Appendix D1)
Acoustic Environment	Transporting the additional concentrate requires a greater number of truck movements per day	Noise model predicting Project related noise considered the additional truck movements associated with hauling the larger volume of concentrate (see Noise Updated Effects Assessment, EIS Addendum, Appendix D2)

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Valued Ecosystem Component	Effect of Magnetic Separation and Corresponding Magnetite-Vanadium Concentrate	How Addressed in the Effects Assessment
Water Quality and Quantity	No measurable change to water quality. Implementation would involve simple magnetic separation, a physical extraction process, on the concentrate stream only. Magnetite and vanadium are chemically stable in their respective natural forms and do not influence the environmental nature or characterization of process solids or associated water quality. Further, no process water is involved or produced when creating the additional concentrate using magnetic separation.	<p>The water quality predictions conservatively assumed that magnetic separation is not occurring. Should magnetic separation be implemented, levels of vanadium and magnetite in the solid fraction of the process solids would be reduced. As a result, the current water quality assessment results bound this potential processing modification since the bench scale process solids that have been tested were not subjected to magnetic separation. For reference, the water quality analysis did not predict exceedances of relevant water quality objectives for these parameters (see Water Quality Assessment Update, EIS Addendum, Appendix D11)</p> <p>The magnetic separation process would have no effect on surface water quantity predictions.</p> <p>The magnetic separation process would have no effect on groundwater quantity or quality predictions.</p>
Fish and Fish Habitat	No measurable change to water quality (see above) and no interaction with fish habitat	No potential effect on fish and no potential direct or indirect effect on fish habitat
Terrain and Soil	No interaction with terrain and soil	No potential direct or indirect effect on terrain and soil
Vegetation	No interaction with vegetation	No potential direct or indirect effect on vegetation
Wildlife	No interaction with wildlife	No potential direct or indirect effect on wildlife
Species at Risk	No interaction with species at risk	No potential direct or indirect effect on species at risk
Socio-economic Environment	Transporting the additional concentrate requires a greater number of truck movements per day	Traffic predictions considered the additional truck movements associated with hauling the larger volume of concentrate (see Traffic Impact Study, EIS, Supporting Document 10)
Human Health	Increased emissions from a larger number of truck movements transporting the additional concentrate each day	Air Quality model predicting Project related atmospheric concentrations of CoPCs and GHG considered the additional truck movements associated with hauling the larger volume of concentrate (see Air Quality Updated Effects Assessment, EIS Addendum, Appendix D1)

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Valued Ecosystem Component	Effect of Magnetic Separation and Corresponding Magnetite-Vanadium Concentrate	How Addressed in the Effects Assessment
Physical and Cultural Heritage	No interaction with archaeological or built heritage resources	No potential direct or indirect effect on archaeological or built heritage resources
Indigenous Considerations	No interaction with indigenous communities or indigenous considerations	No potential direct or indirect effect on indigenous communities or indigenous considerations

In addition to the VECs, the effects assessment also considered the implications of the additional concentrate on risk of a haulage incident during concentrate transport off-site. As noted in response to IR1-3, the accidents and malfunctions assessment included in the EIS accounted for the additional concentrate transport traffic in the assessment of the risk of haul incidents during concentrate transport off-site (EIS, Section 6.3.2.5 Concentrate Haul Incident and 6.3.2.6 Concentrate Load Out Incident).

Without magnetic separation, and therefore without the vanadium and magnetite concentrate or additional trucks required to haul this material, the effects of the Project would be less than those predicted in the effects assessment.