Tantalum Mining Corporation of Canada – Bernic Lake Mine

Cesium Processing Facility Residue Reprocessing Project (2023)

Date:

April 12, 2023

Tantalum Mining Corporation of Canada, Limited
Bernic Lake
Box 2000
Lac du Bonnet, Manitoba
MB R0E 1A0
Canada

April 12, 2023

Ms. Jennifer Winsor
Environmental Approvals Branch
Department of Sustainable Development
1007 Century Street
Winnipeg, MB.
R3H 0W4

Re: Tantalum Mining Corporation of Canada Bernic Lake Mine – Cesium Processing Facility Residue Reprocessing Project (2023)

Dear Ms. Winsor:

Tantalum Mining Corporation of Canada (TANCO) is submitting this report describing proposed alterations to the manner in which cesium products are manufactured at the Cesium Processing Facility (CPF) at the Bernic Lake Mine (BLM) so that Environmental Approvals Branch can determine the most appropriate approvals pathway for the proposed changes at the Facility. The proposed alterations include upgrading some CPF equipment and the flow path in the processing circuit which will improve the efficiency of the chemical process used to extract cesium from the raw materials. This in turn will allow for multiple types of cesium-bearing raw materials to be utilized in the plant because of improved cesium recovery rates. Potential raw materials for the upgraded processing circuit would include conventional tailings from the East and West TMA, low-grade ore and CPF residue currently dry-stacked on top of conventional tailings in the East TMA.

The processing of cesium-bearing ore is already allowed within current conditions of the Mine's *Environment Act* Licence (EAL; No. 973). This report only includes an assessment of the potential environmental effects associated with the upgrades to equipment and processes in the CPF and reprocessing CPF residue stored in the East TMA. It does not include an assessment of reprocessing of conventional tailings from either TMA at this time as there is sufficient material in the CPF residue stockpile to support production under forecasted production rates for the next 20 – 30 years of operations, if necessary.

Please find enclosed, the information required for the alteration regulatory process that details TANCO's proposed alterations. Please note that all infrastructure upgrades will be contained within the footprint of the CPF and that the waste stream generated from reprocessing of CPF residue will have chemical characteristics very similar to the current waste stream. Therefore, it is anticipated that the potential environmental effects from these alterations will be insignificant.

If you have any questions, or require further information on the report, please do not hesitate to contact me.

Tantalum Mining Corporation of Canada, Limited
Bernic Lake
Box 2000
Lac du Bonnet, Manitoba
MB R0E 1A0
Canada

Sincerely,

Date: April 12, 2023

Joey Champagne
Facility General Manager
Tantalum Mining Corporation of Canada Limited

TANCO Bernic Lake Mine
Cesium Processing Facility Residue Reprocessing Project (2023)

Prepared and reviewed by:

Date: April 12, 2023

Jerry White, B. Sc., M.Sc.
Environmental Specialist
Tantalum Mining Corporation of Canada

Prepared and reviewed by:

Date: April 12, 2023

Daniel Whynot, B.Sc., M.Sc.
Laboratory/Quality Manager
Tantalum Mining Corporation of Canada

Executive Summary

This report is intended to notify the Director of proposed upgrades to the manner in which cesium-bearing materials are processed in the CPF at the TANCO Mine in Bernic Lake, Manitoba as required under the Environment Act (S.14(1)). This document also contains sufficient information for the Director to determine the significance of the environmental effects associated with these proposed alterations to determine the appropriate approval process (minor or major) for the alteration.

Cesium products remain in high demand globally. In order to meet this demand, the TANCO BLM continuously works on innovations to improve its ability to extract cesium from this valuable and unique resource found at the Facility. Recent technological advances made by the Research and Development Department at the BLM have identified changes in infrastructure and process flow within the CPF that allows for improved recovery rates from cesium-bearing materials. In order to bring these advancements to reality, a number of components in the existing processing circuit require repurposing or replacing along with the addition of a new filter press, piping and pumps which will allow for a change in process that will maximize cesium recovery rates.

It is because of this improvement in the cesium recovery rate and current market conditions, that it is now also feasible for TANCO BLM to reprocess the residue from the CPF stockpiled in the East TMA to recover 75% of the remaining 1.6% cesium oxide contained in the material.

Both of the proposed alterations will result in a better use of the resource making sure to extract as much of the cesium oxide as possible from any future ore processing and from additional recovery from the waste of ore that has already been processed. The alterations to equipment and the processing circuit in the CPF will occur entirely within the current footprint of the CPF. Effects associated with reprocessing of the residue stockpile will occur entirely within the boundaries of the East TMA and pose no additional risk to the environment. The waste material generated from processing of ore and the CPF residue in the upgraded circuit will have almost identical characteristics as the waste material that has been generated by the process since 2001. The Containment Cell Management Strategy and the groundwater monitoring plan completed at the Mine have been effective in monitoring leakage from the Containment Cells and tracking the migration of the leachate from the residue pile. These two programs will continue to monitor conditions once the alterations are implemented to detect any changes in the East TMA.

Environmental effects associated with the physical environment, emissions, water resources and ecological aspects remain virtually unchanged as the proposed changes are contained within the current footprint of the BLM and current measures used at the facility are sufficient to mitigate any additional environmental effects. A decrease in environmental effects will be realized with regard to water usage as the alteration to the processing circuit utilizes far less water than the current processing method. The water used for processing will remain in a closed-circuit for use within the facility and therefore, will not result in any additional water transferred into the West TMA. No water will be utilized to transfer residue from the stockpile in the East TMA back into the CPF as dry material will be excavated and transferred by haul truck to the Facility and not slurried and transferred by pipeline. Effluent quality will continue to be

monitored to ensure it remains within regulatory limits outlined in the *Metal and Diamond Mining Effluent Regulations* (Government of Canada 2002) and the Mine's current *Environmental Act* Licence through treatment in the Tailings Management Area at the facility.

The proposed alterations to the processing circuit in the CPF at the TANCO Bernic Lake Mine are believed to be minor in nature because the potential negative environmental effects resulting from the alteration are expected to be insignificant when compared to pre-alteration conditions.

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1. Introduction

1.1 Objectives

TANCO's vision is to be a prosperous mining, milling and chemical processing facility through the development of our people, our resources and our community. Site objectives focus on strategic priorities of building strong foundations, striving for operational excellence and development of our site resources. As the North American market demand for cesium products continues to grow, TANCO continues to explore ways to maximize returns from its resources and increase sustainability. TANCO believes improving recovery rates from pollucite ore to be processed in the future and recovering additional cesium from material thought as waste provides a unique opportunity for growth and development that aligns with our company's vision and site objectives.

This Notice of Alteration (NoA) is intended to notify the Director of proposed alterations to *Environmental Act* Licence No. 973 for the TANCO BLM Mine as required under the *Environment Act* (S.14(1); Government of Manitoba 2012). This report provides details regarding upgrading equipment within the current boundaries of the CPF and the Mine's plan to reprocess CPF residue currently dry-stacked on top of old tantalum and spodumene tailings in the East TMA (Figure 3-1). This document also describes any potential environmental effects that are anticipated in relation to the proposed changes in comparison to pre-alteration levels.

This report provides supporting information which describes the physical changes at the Mine and changes to process including the type and quantity of raw materials (ore and process water), chemical reagents and processing waste as a result of the installation of the new processing circuit. It also quantifies the anticipated change in environmental effects from the Mine as compared to pre-alteration levels which includes an environmental assessment resulting from the alteration on the receiving environment.

1.2 Proposed Alterations

The proposed changes include upgrading a number of components in the existing processing circuit along with the addition of some new assets. The proposed changes to the processing circuits will allow for modifications to the processing of ore which in turn will increase the recovery rates for cesium in raw materials

The upgrades to equipment and process in the CPF will also allow TANCO to reprocess CPF residue currently stored in the East TMA. This will greatly improve efficiencies at the BLM providing the Mine with the ability to recover cesium from material that would otherwise be considered as waste material due to its low-grade extending total returns from the ore body.

2. Physical Alterations

The proposed upgrades to the cesium processing circuit will entirely occur within the footprint of the CPF (Figure 3-1; Figure 3-2; Figure 3-3). Installation of the new assets will be consistent with regulations prescribed by the Office of the Fire Commissioner and the Rural Municipality of Alexander and follow the National Building Code of Canada (2015). The upgrades include the following alterations described in Table 2-1.

Table 2-1 Proposed CPF equipment upgrades.

Equipment Type	Asset ID.	Upgrade	Details
Tank	R-01	Repurpose	Install new conveyance system to transport raw materials into the digester.
Tank	T-04	Repurpose	New lining, heating and agitation.
Tank	T-30	Replace	New vessel with lining, cooling and agitation.
Tank	T-11	Replace	New vessel with lining, heating and agitation.
Tank	T-22	Repurpose	Install ventilation.
Tank	T-12	Repurpose	New lining and agitation.
Filter	F-01	Replace	Install two (2) – plate filter presses.
Filter	F-01	Replace	Install Cesium Alum Filter Press.
Piping/Pumps	Multiple	Replace	New infrastructure for handling acidic solutions.
General	Multiple	Replace	Alterations to heating/cooling and agitation systems.

A staging area for the residue excavated from the East TMA may be required in close proximity to the CPF (Figure 3-1). The infrastructure may consist of a slab-on-grade pad with a seepage collection system or a liquid-tight storage bin. The design of the storage area has not been finalized but the proposed design will ensure that the short-term storage of residue will not pose any potential risk to the environment. Environmental Approvals Branch will be provided details of the staging area for review when they become available.

3. Process Alterations

3.1 Process Flow

There will be only slight modifications to the existing processing flow through the CPF (Figure 3-4).

Digestion Process

Sulphuric acid and recycled water will continued to be metered into the Digester, R-01, and heated to 100°C using steam sparger. Once the temperature is reached, 50,000 kg of raw cesium-bearing material

Figure 3-1 Location of Cesium Processing Facility at the TANCO Bernic Lake Mine.

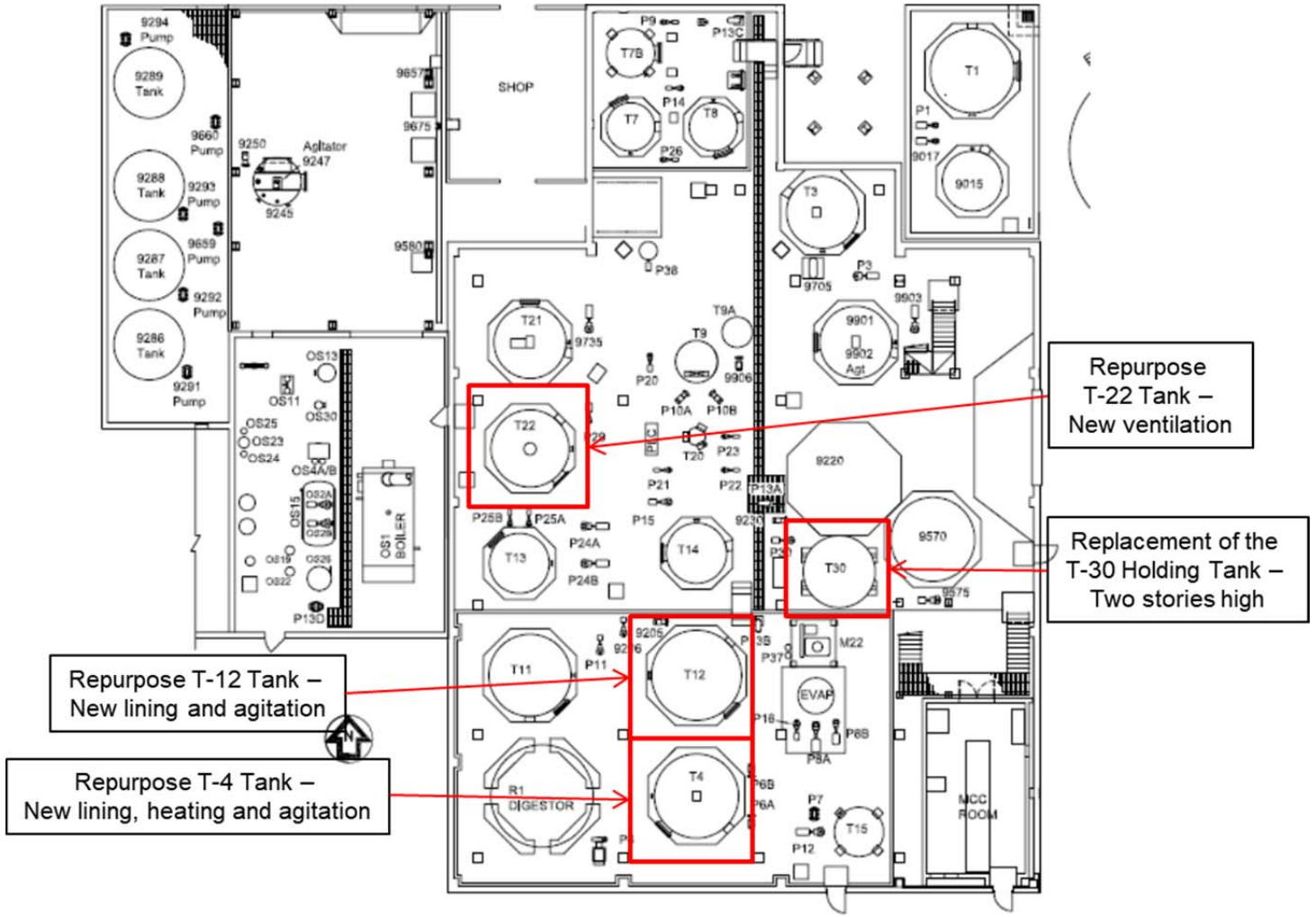


Figure 3-2 Proposed alterations to the CPF first floor.

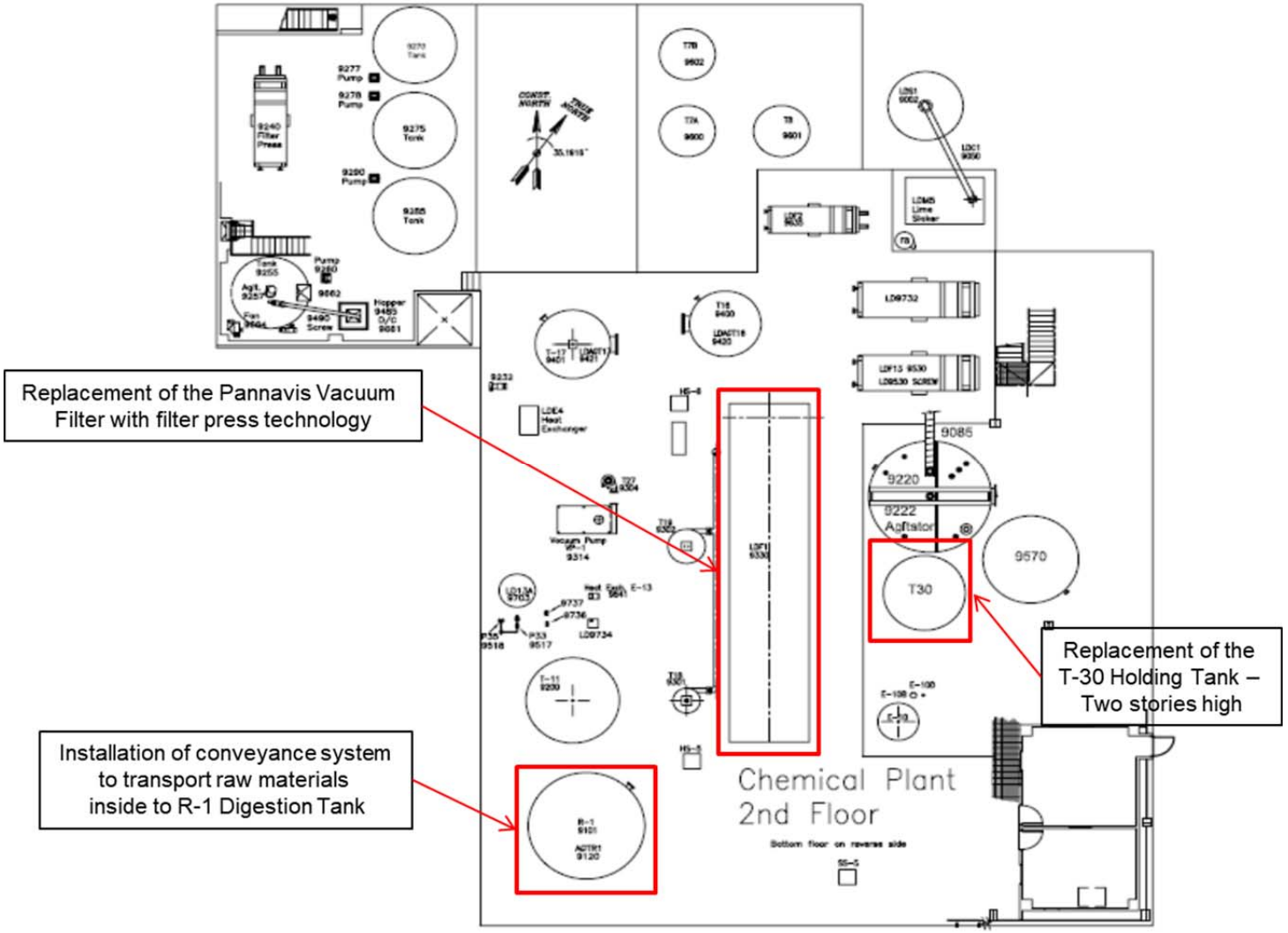


Figure 3-3 Proposed alterations to the CPF second floor.

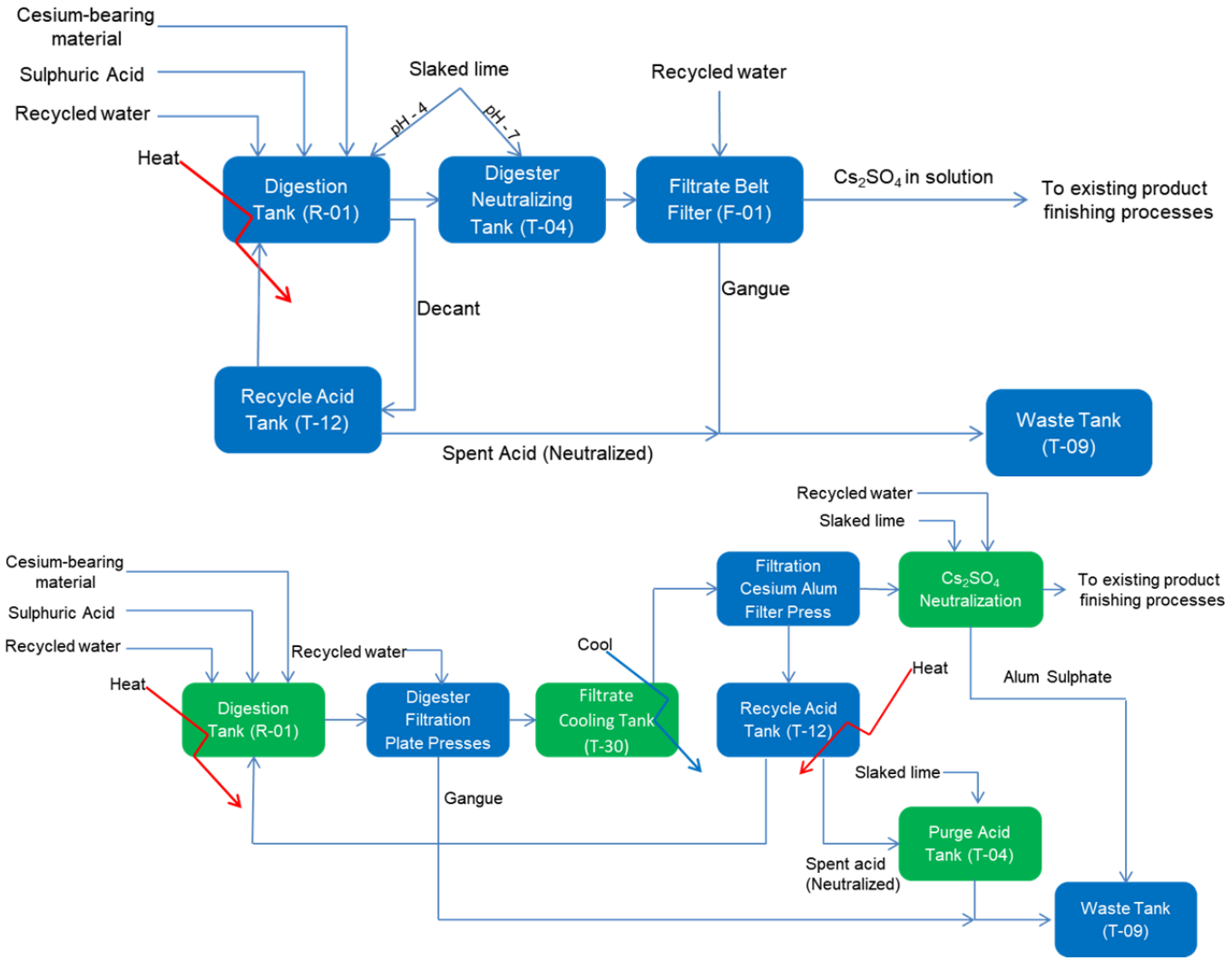


Figure 3-4 CPF equipment and process current configuration (top panel) and proposed alterations (bottom panel) block flow process diagram. Green represents existing equipment and processes, while, blue indicates altered equipment and processes.

is added to the Digester. There will be a new conveyor belt or auger added to the Digester Tank, R-01, to bring raw materials into the process. The solids and liquids will be agitated in order for the required chemical reactions to occur. Pollucite ore digestions will continue to occur under existing conditions of 45% acid concentration at 100°C for three (3) hours, while, CPF residue is expected to be digested at a 35% acid concentration at 100°C for three (3) hours.

Filtration

Currently, the mixture in the Digester Tank (R-1) is partially neutralized in the tank by adding slaked lime until a pH of 4 is reached. Then the mixture is transferred into the Digester Neutralizing Tank (T-04) where additional slaked lime is added until a pH of 7 is achieved. Once neutralized, the contents of the entire tank (liquids and solids) are transferred to the Belt Filter (F-01) where the material is washed with recycled water and the cesium sulphate in solution is collected and sent for product finishing. The solid waste material (Gangue) consisting of tailings and calcium sulphate are sent to Waste Tank T-09 prior being sent out to the Containment Cell in the east TMA.

In the upgraded processing circuit, once the reaction is complete in the digester, the hot slurry (@ 90°C) will be transferred via a new pump to two (2) new filter presses used in parallel that will remove the ore gangue from the hot acid mixture. Each filter press will be filled, washed with water and have air passed through the solids before they are discharged through a chute where the solids are neutralized with slaked lime before being transferred to the Waste Tank (T-09). Wash water used in this step is derived from recycled water brought back into the CPF from the Containment Cells. The two new filter presses require substantially less wash water (less than 10%; 10 m^3 compared to 150 m^3) as the older belt filter previously utilized in the processing circuit. The filtrate consisting of dissolved cesium alum and diluted sulfuric acid is then transferred to the Filtrate Cooling Tank (T-30).

It is these changes to the order in which the filtration process is completed that increases the overall efficiency of the cesium recovery process as substantially less cesium is lost during through neutralizing the mixture early and washing it on the belt filter. Although the order of processing steps will be changed, the reactants and chemical reactions remain the same and the new process will generate a waste material (residue) with the same chemical characteristics as the current waste except with lower cesium content.

Cesium Alum Processing

In the current processing circuit, there is no intermediate step in which cesium alum is one of the products and therefore, no requirement for the next two steps.

Cooling

In the upgraded processing circuit, the mixture is transferred into the Filtrate Cooling Tank (T-30) where it is cooled to 30°C by cooling coils within the tank causing the cesium alum to come out of solution to form a solid.

Cesium Alum Recovery

Solids and liquids in the Filtrate Cooling Tank (T-30) are transferred to the Cesium Alum Filter Press where the sulphuric acid is separated from the solid cesium alum crystals. The Cesium Alum Filter Press does not require the use of any wash water. The sulphuric acid from Cesium Alum Filter Press is sent to the Recycle Acid Tank where 2/3 of the acid is recycled back to the Digestion Tank (R-01) for reuse, while the other 1/3 sent to the Purge Acid Tank (T-04) where it is neutralized with slaked lime before being transferred to the Waste Tank (T-09) as a solid. Solids collected in the Waste Tank (T-09) from both the filtration process and the recycled acid tank are sent out to the Containment Cell in the East TMA where it will be de-watered, dry-stacked and stored in the TMA.

The cesium alum crystals from the Filter Press are transferred to another tank and neutralized with slaked lime converting cesium alum crystals to a cesium sulphate solution. The alum initially bonded to the cesium reacts to form an alum sulphate solid which is separated from the cesium sulphate solution. The cesium sulphate solution is then transferred to existing finishing processes to produce the various cesium products. The alum sulphate solids are combined with other solids in the Waste Tank (T-09), slurried and sent out the Containment Cell in the East TMA.

3.1 Raw Materials

The improvements proposed for the CPF will allow the facility to process multiple sources of cesium-bearing raw materials including high-grade pollucite ore, low-grade pollucite ore, conventional tailings from the East and West TMAs and CPF residue currently dry-stacked in the East TMA (Figure 3-5). The facility is currently licenced to process both high-grade and low-grade pollucite ore and although conventional spodumene and tantalum tailings do contain some cesium oxide, the BLM is only proposing the reprocessing of the CPF residue stockpiled in the East TMA in this NoA. The BLM wishes to pursue the remaining cesium oxide within the CPF residue as it is now feasible because of the research and development that has taken place at the mine which has resulted in new processing techniques in the CPF that allows for better recovery rates. The Mine also has only a minimal quantity of pollucite ore stockpiled at the surface that is currently available for processing while it continues to assess the feasibility of other projects that would allow access to additional reserves of high- and low-grade pollucite ore.

It is estimated that there is approximately 600,000 tonnes (`450,000 m^3) of residue stockpiled in the East TMA with a cesium oxide grade of 1.60% (Figure 3-6; Figure 3-7). This represents an additional 10,600 tonnes of cesium metal contained within the material that was up until now thought of as waste. TANCO is currently working with engineering consultants in developing a plan to manage the movement of the CPF residue within the current boundaries of the East TMA as licenced. The plan will involve excavation of the dry-stacked material and transporting it by haul truck to the CPF where it will be unloaded into a staging area that will actively manage any liquids separating from the residue and any liquids coming into contact with the residue to ensure no effluent from the waste is allowed to enter the environment. Water collected from the staging area will be transferred back to the cell for reuse. The material will be loaded into a hopper that

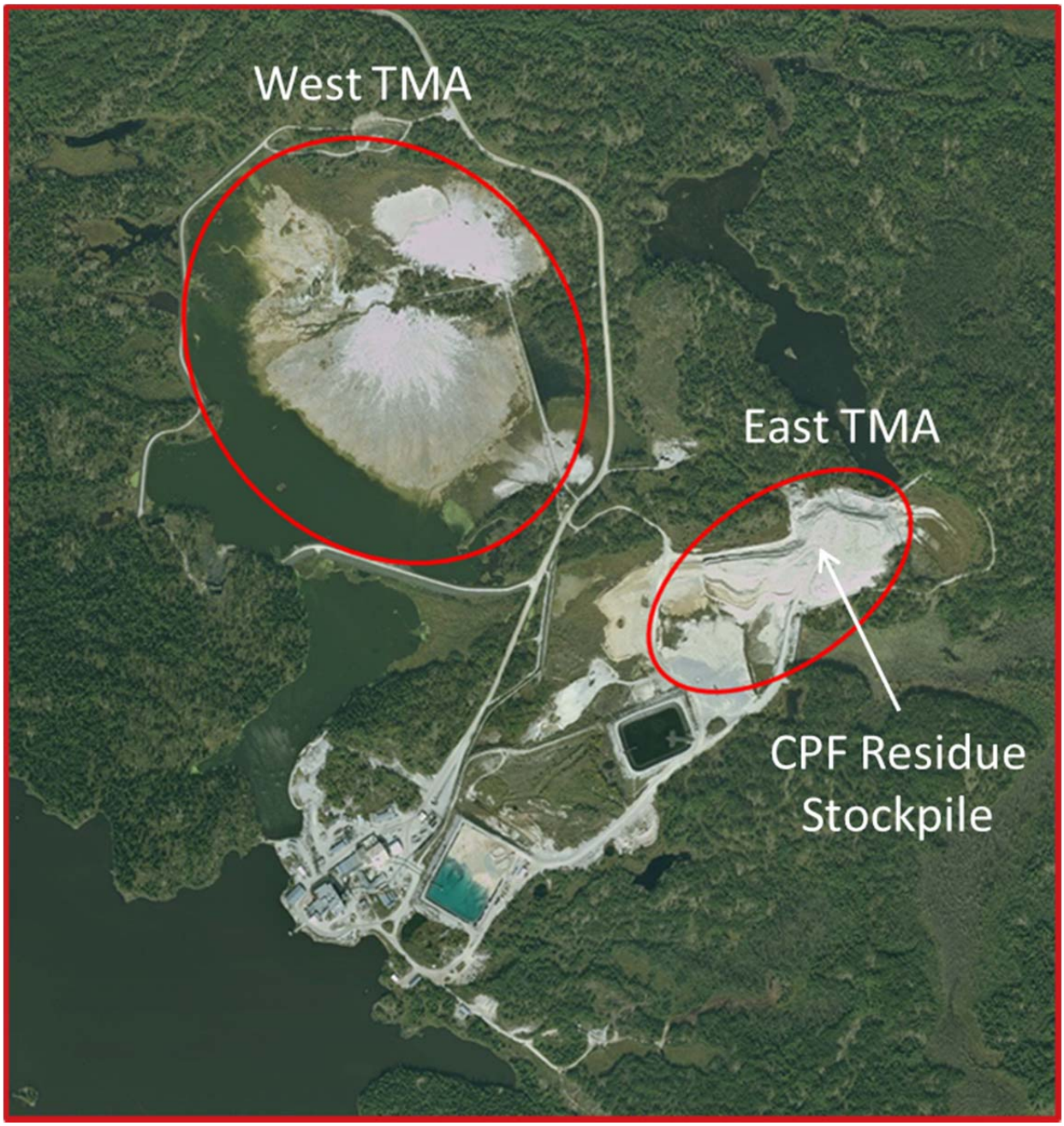


Figure 3-5 Conventional tailings location in the West TMA and conventional tailings and CPF residue in the East TMA.

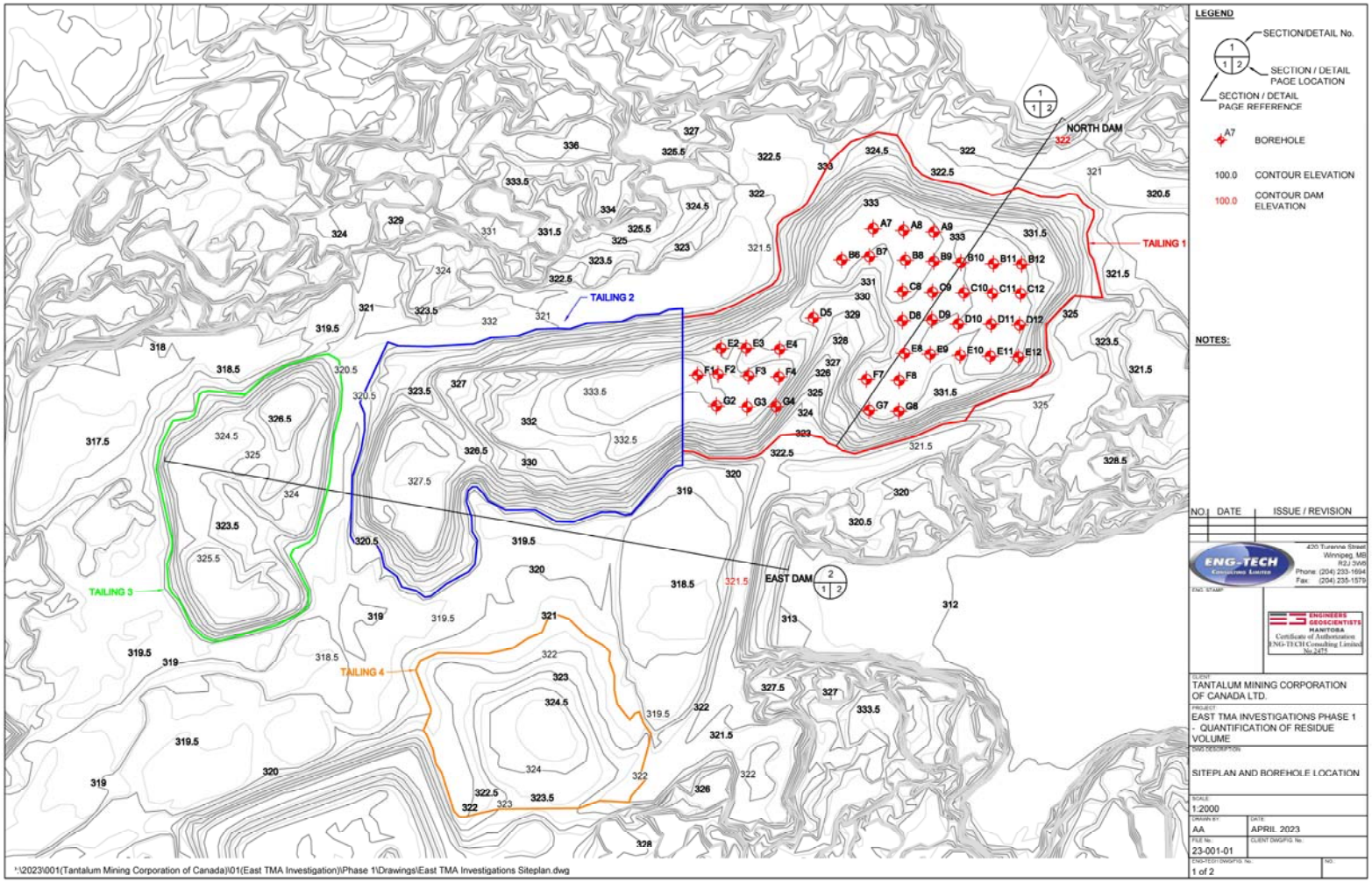
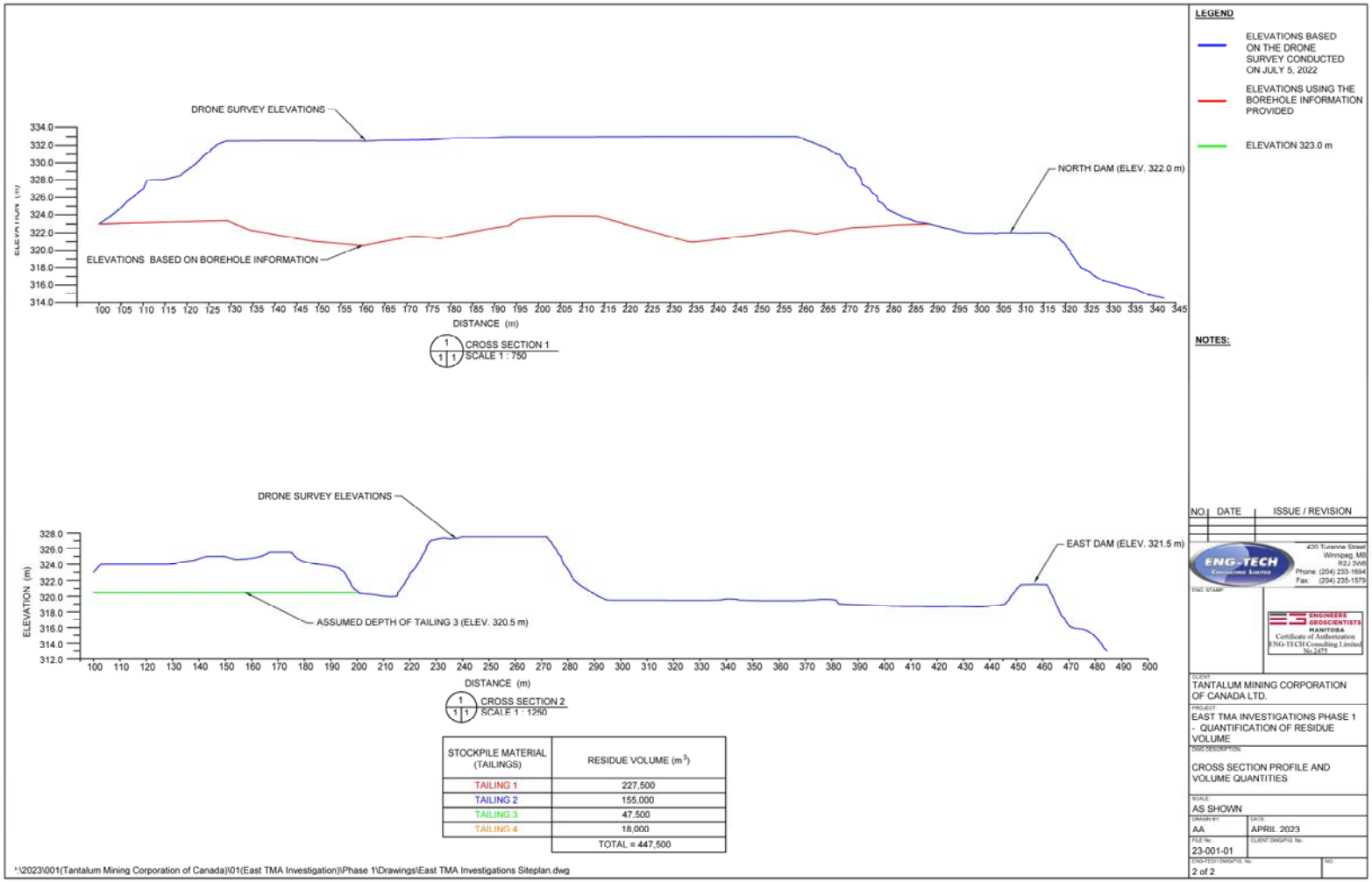


Figure 3-6 CPF residue stockpile locations in the East TMA (ENG-TECH 2023).



STOCKPILE MATERIAL (TAILINGS)	RESIDUE VOLUME (m^3)
TAILING 1	227,500
TAILING 2	155,000
TAILING 3	47,500
TAILING 4	18,000
	TOTAL = 447,500

Figure 3-7 CPF residue stockpile volumes in the East TMA (ENG-TECH 2023).

will supply the Digester Tank (R-01) as required. A management plan will be put in place to control fugitive dust emissions because of the composition of the CPF residue which is mostly fine-grained.

The excavation plan in the East TMA will target areas in the East TMA where older residue with the highest cesium concentrations exists. Areas identified as Tailings 1 (Red), Tailings 2 (Blue) and Tailings 4 (Orange) will be initially targeted as Tailings 3 is the area in which the most recent tailings with the highest recovery rates (lowest Cs content) were placed. The excavation plan will also address surface water drainage issues in the East TMA at the same time which will improve water drainage compared to existing conditions. Closure considerations will also be considered in developing the excavation plan as the waste material generated from reprocessing will no longer have any economic value and when dry-stacked in the East TMA they can be rehabilitated immediately following methods outlined in the Excavation Plan and the Mine's Closure Plan.

3.2 Processing Reagents and Consumables

The reactions occurring within the processing circuit as proposed require the same reactants as the current processing circuit. It is not anticipated that there will be any increase in the consumption of slaked lime as a result of the alteration as proposed. It is anticipated that there will be a significant reduction in the quantity of wash water associated with the alterations as proposed. The new plate filter presses require less than 10% of the wash water used by the existing belt filter press currently in use in the CPF.

3.3 Processing Waste

The reactions that occur to produce the cesium products remain virtually the same with the differences mostly related to the point within the process that the reactions occur (Figure 3-8; Figure 3-9). Currently, digestion and neutralization take place in R-1/T-4. With the new process, the hot gangue will be hot filtered and the remaining solution will be cooled to crystallize into Cs-alum directly. Then, depending on the required end products (Cs-alum crystals or Cs sulfate solution), the crystals will be neutralized with lime. The Research and Development Team identified efficiencies in the new process as the old process progresses from pollucite →Cs-alum→Cs-sulfate→Cs-alum in the Fine Cesium Crystals (FCC) process, whereas the new process will progress from pollucite→Cs-alum. Transformation from Cs-alum will be dependent if the final end product is FCC, or if Cs-sulfate is required for Cs-formate production.

The final products and waste from chemical reactions occurring during the processing circuit currently and the final products and waste resulting from reactions in the upgraded processing circuit remain the same. Waste products from both processes include ore gangue, aluminum hydroxide, calcium sulphate and silica.

Digestion Tank (R-1) and Neutralizing Tank (T-04)

- Digestion of pollucite with sulfuric acid producing Cs-alum which is neutralized and transformed into Cs-sulphate partially in Tank R-1 and finished in T-04.
- Neutralization of Cs-alum with hydrated lime to produce highly-soluble Cs_2SO_4 and insoluble aluminium hydroxide, calcium sulphate, silica and ore gangue.

$$CsAlSiO_4 + 2H_2SO_4 \rightarrow CsAl(SO_4)_2 + SiO_2 \downarrow + 2H_2O + \text{Gangue} \rightarrow$$

$$2CsAl(SO_4)_2 + 3Ca(OH)_2 + SiO_2 \downarrow + 2H_2O + \text{Gangue} \rightarrow$$

$$Cs_2SO_4 + 2Al(OH)_3 \downarrow + 3CaSO_4 \downarrow + SiO_2 \downarrow + 2H_2O + \text{Gangue}$$

Filtration

- The contents of Tank T-04 are transferred to the Belt Filter and solid waste consisting of aluminum hydroxide, calcium sulphate, silica and ore gangue are filtered from the Cs-sulphate solution.
- This is the general makeup of the tailings.

Excess Acid Neutralization

- Neutralization of excess sulfuric acid with hydrated lime to produce water and insoluble calcium sulphate.

$$H_2SO_4 + Ca(OH)_2 \rightarrow 2H_2O + CaSO_4 \downarrow$$

Figure 3-8 Chemical reactions flow charts for the current processing circuit at the TANCO BLM CFP. Waste material formatted with red text.

Digestion Tank (R-1) and Hot Filtration Process

- Digestion of pollucite with sulfuric acid producing Cs-alum.
- Solids and liquids are sent to filter plate presses and silica and ore gangue are removed as the initial waste. Liquids are sent to cool and Cs-alum crystallizes forming a solid.

$$CsAlSiO_4 + 2H_2SO_4 \rightarrow CsAl(SO_4)_2 + SiO_2 \downarrow + 2H_2O + \text{Gangue}$$

Cs-alum Filtration

- Cs-alum crystals are separated from acid solution.
- Cs-alum sent to CFF process or to neutralization step.

Digestion Neutralization

- Neutralization of Cs-alum with hydrated lime to produce highly-soluble Cs_2SO_4 and insoluble aluminium hydroxide and calcium sulphate.
- This, combined with silica and ore gangue removed at the hot filtration step, is the general makeup of the tailings.

$$2CsAl(SO_4)_2 + 3Ca(OH)_2 \rightarrow Cs_2SO_4 + 2Al(OH)_3 \downarrow + 3CaSO_4 \downarrow$$

Excess Acid Neutralization

- Neutralization of excess sulfuric acid with hydrated lime to produce water and insoluble calcium sulphate.

$$H_2SO_4 + Ca(OH)_2 \rightarrow 2H_2O + CaSO_4 \downarrow$$

Figure 3-9 Chemical reactions flow charts for the updated processing circuit at the TANCO BLM CFP. Waste material formatted with red text.

4. Environmental Assessment

Significance is commonly considered in the context of its magnitude, geographic extent, duration, frequency, degree of reversibility and possibility of occurrence or any combination of these factors.

The significance criteria used in this analysis are defined in Table 4-1, as well as a description of the significance level (I to III) for each criterion. Although presented as distinct levels in Table 4-1, significance can be a gradient between not significant (Level I) to potentially significant (Level II) to very significant (Level III).

4.1 Physical Environment

4.1.1 Topography

The proposed alteration will be entirely contained within the current footprint of the CPF and the East TMA except for the staging area for reprocessing the CPF residue which will be immediately adjacent to the CPF in an area already disturbed by mining activities. Some changes in topography will occur in the East TMA but the engineering consultant is designing the excavation plan to allow for better management of surface water flow in the East TMA which should improve current conditions with respect to site water drainage.

Although some changes in topography will take place to control water movement within the East TMA, the area is currently being used for mining purposes, therefore, no negative change in environmental effects from current conditions with respect to topography are anticipated with the proposed alteration compared to pre-alteration levels (Table 4-2). The level of significance associated with the propose alteration with respect to topography is deemed to be no higher than Level I. Accordingly, the summary evaluation for this potential impact is deemed to be not significant.

4.1.1 Soils

The risk of soil contamination during the construction phases of the alteration is negligible as the required work is entirely contained within the CPF. The risk of soil contamination during the operational phase of the alteration will be minimal as most material handling of the CPF residue will occur within the boundaries of the East TMA and existing Spill Response Protocols and Best Management Practices for Materials Handling at the facility are sufficient mitigation measures for dealing with the potential environmental effects.

The only material handling of the residue outside the boundaries of the East TMA will occur in the staging area. A seepage collection system will be included in the design of the staging area that will prevent the release of any effluent coming in contact with the residue. Therefore, a Level I level of significance (not

Table 4-1 Significance Criteria and Levels of Significance.

Significance Level	Context		Magnitude / Geographic Extent	Duration / Frequency	Likelihood of Occurrence	Reversibility
	Ecological / Biophysical	Socio-Cultural				
I	No meaningful adverse biophysical effects	No meaningful adverse effects to socio-economic interests	Magnitude and/or geographical extent of impact(s) considered to be minor, and primarily or solely confined to Mine site	Construction phase of Mine, or during closure phase(s)	Unlikely to Occur	Readily reversible
II	Adverse effects involve commonplace species or communities	Adverse effects would involve meaningful inconvenience to local residents or land users	Magnitude and/or geographical extent of impact(s) have the potential to meaningfully affect off-property residents, lands or receiving waters	Life of Mine	Could reasonably be expected to occur	Can be reversed with difficulty
III	Adverse effects involve locally or regionally important species or communities	Adverse effects to livelihoods and/or property values	Magnitude and/or geographical extent of impact(s) expected to meaningfully affect off-property residents, lands or receiving waters	Extends beyond life of Mine	Will occur, or is likely to occur	Not reversible

Table 4-2 Summary of potential effects associated with the proposed alteration at the TANCO Bernic Lake Mine.

Classification of Potential Effect	Alteration Phase	Potential Effect	Magnitude of Effect	Direction of Effect	Duration of Effect	Frequency of Effect	Scope of Effect	Mitigation Measures	Residual Effects	Reversibility	Significance
Physical											
Topography	Construction/ Operation	Modification in topography	Negligible	Negative	Long-term	Intermittent or continuous	Project Site	No changes in topography are associated with the upgrades to the CPF. There will be ongoing changes in the topography in the East TMA as material is removed and replaced after reprocessing. Residue removal and replacement will follow a predetermine plan to ensure improvements in surface water drainage in the TMA.	Negligible	Reversible	Not significant
Soils	Construction/ Operation	Soil contamination	Negligible	Negative	Long-term	Rare	Project Site	Continue to follow current management plan for the transport and storage of CPF residue. Use current best practices when refueling equipment and appropriate containment measures. Clean up any hydrocarbon spills immediately.	Negligible	Reversible	Not significant
Geology	Construction/ Operation	Bedrock excavation	Negligible	Negative	Long-term	Rare	Project Site	Work in the CPF does not require any excavation during construction of equipment. Residue staging area will be built on grade or consist of a portable bin and will only require minor excavation at the surface.	Negligible	Reversible	Not significant
Emissions											
Air	Construction/ Operation	Dust	Minor onsite and negligible offsite	Negative	Long-term	Intermittent or continuous	Project Site	Use current Best Management Practices for Control of Fugitive Dust/ Use dust suppression, if required.	Negligible	Reversible	Not significant
	Construction/ Operation	Noise	Minor onsite and negligible offsite	Negative	Long-term	Intermittent or continuous	Project Site	Construction activities short-term and noise will be generally limited to developed area/Noise levels similar to other equipment currently operated at the Mine/Remote location limits socio-cultural effects.	Negligible	Reversible	Not significant
	Operation	Exhaust Emissions	Minor onsite and negligible offsite	Negative	Long-term	Intermittent or continuous	Project Site	Exhaust emissions including GHG, will be minimal as residue transfer will only occur for brief periods. Equipment required for excavation is the same as the equipment used for dry-stacking materials and therefore the change in usage will be offsetting.	Negligible	Reversible	Not significant
Groundwater	Construction	Groundwater Drawdown/Quality	Negligible	Negative	Short-term	None	Project Site	Construction activity does not require any major excavation. Excavation of residue from stockpile will occur above the water table.	Negligible	Reversible	Not significant
	Operation	Groundwater Quality	Negligible	Negative	Long Term	Rare	Project Site	Surface water coming in contact with mining activities will not be allowed to pond and infiltrate into groundwater flows. Water will be collected and transferred to West TMA for treatment. Groundwater will continue to be monitored in the East TMA. Use current best practices when refueling equipment and appropriate containment measures. Clean up any hydrocarbon spills immediately to prevent infiltration into groundwater flows.	Negligible	Reversible	Not significant
Surface Water	Construction/ Operation	Surface Runoff	Negligible	Negative	Long-term	Intermittent	Project Site	Control surface water runoff during all phases redirecting flows into the TMA for treatment prior to its release into the environment.	Negligible	Reversible	Not significant
	Operation	Surface water usage	Negligible	Negative	Long Term	None	Project Site	The quantity of water used in processes is expected to be substantially reduced. Water used in process will continue to be recycled from the Containment Cells.	Negligible	Reversible	Not significant
	Operation	Surface water quality	Negligible	Negative	Long Term	Intermittent	Project Site	Surface water run-off will be redirected to the TMA and will be treated to meet guidelines in current licence and the *MDMER.*	Negligible	Reversible	Not significant

Table 5-2(cont'd) **Summary of potential environmental effects associated with the proposed alteration at the TANCO Bernic Lake Mine.**

Classification of Potential Effect	Alteration Phase	Potential Effect	Magnitude of Effect	Direction of Effect	Duration of Effect	Frequency of Effect	Scope of Effect	Mitigation Measures	Residual Effects	Reversibility	Significance
Ecological											
Flora and Fauna	Construction/ Operation	Habitat disturbance	Negligible	Negative	Long-term	None	Project Site	All required equipment will be located within the current footprint of the Project.	Negligible	Not applicable	Not significant
	Commissioning/ Operation	Noise	Negligible	Negative	Long-term	Intermittent or continuous	Project Site	Construction will be short-term and increased noise levels will be generally limited to within site boundaries. Operational noise levels similar to other equipment currently located in the area.	Negligible	Not applicable	Not significant
	Transportation	Habitat disturbance	Negligible to Major	Negative	Long-term	None	Project Site/Local Highways	No additional increase in the quantity of final products requiring transport anticipated.	Negligible	Reversible depending on incident	Not significant
Sociological											
Employment	Construction/ Operation	Increased Employment and Job Stability	Minor	Positive	Long-Term	Continuous	Project Site	Recruit from the local workforce for construction, if possible. Increased raw materials for processing will provide greater job security for current employees at the Mine.	Minor	Not applicable	Significant
Health and Safety	Construction/ Operation	Safety of workers	Negligible to Major	Negative	Long-term	Rare	Project Site	All work conducted in accordance to Manitoba's *Workplace Safety and Health Act*/ All workers receive appropriate training/ Workers must wear appropriate PPE at all times and follow all TANCO Health and Safety guidelines associated with proposed alteration during commissioning and operation of the new infrastructure..	Negligible to Major	Reversible depending on incident	Not significant
	Transportation	Safety of workers and community	Negligible to Major	Negative	Long-term	None	Project Site/Local Highways	No additional increase in the quantity of final products requiring transport anticipated.	Negligible to Major	Reversible depending on incident	Not significant

significant) is assigned to the potential environmental effects on soil associated with the proposed alterations (Table 4-2).

4.1.1 Geology

All infrastructure associated with the alteration will occur within the CPF except for the staging area for the residue and should not affect bedrock in the area. The staging area at most will include a slab-on-grade concrete pad which will also not effect bedrock. If a liquid-tight bin is used for the staging area then the potential risk to bedrock is further reduced. Therefore, a Level I significance is assigned to the potential environmental effects on bedrock and is deemed not significant (Table 4-2).

4.1 Emissions

4.1.1 Air

Short-term intermittent increases in hydrocarbon, dust and noise emissions may be observed during the construction phase of the proposed upgrades to the processing circuit; however, these emissions will be limited to the area immediately adjacent to the CPF. TANCO will employ Best Management Practices for Control of Fugitive Dust, minimize the size of disturbed areas and use dust suppression, if necessary, during construction as mitigation measures. Noise emissions will increase for the short-term during construction due to the use of heavy equipment and power tools but given the remote location of the facility, it is not anticipated to have any socio-cultural effects and any ecological effects would be short in duration.

After the alterations are implemented and operational, excavation of the residue from the stockpile could potentially create fugitive dust emissions. There is also the potential for dust emissions when transferring residue from haul trucks into the holding area and while transferring the residue into the CPF for processing. Best Management Practices for Control of Fugitive Dust will be employed in these areas.

There will be no increase in exhaust emissions including greenhouse gases as a result of excavation and transportation of material from the East TMA to the CPF residue staging area. Equipment currently used for dry-stacking will instead be utilized for excavation and transport which will offset any potential increases. The release of emissions from equipment should also be minimal due the short periods that these transfers will occur to keep the staging area stocked with material.

Construction is short-term and mitigation measures should control dust emissions during this period. Increased noise during construction will also be short-term and generally limited to within site boundaries. Once the circuit becomes operational, mitigation measures should also control dust emissions and noise levels will remain comparable to pre-alteration levels. Emissions from the operation of heavy equipment used to transfer residue from the East TMA to the CPF will be periodic and short in duration which is expected to have a minimal effect on the overall emissions released from the facility compared to pre-alteration levels. Therefore, it is deemed that the alterations are insignificant with respect to air quality and assigned Level I significance (Table 4-2).

4.1.2 Water

Groundwater

Because the location of the upgraded processing circuit is contained within the CPF, no additional effects on groundwater from construction and operation with this aspect of the proposed alteration are expected. Seepage from the residue staging area will be collected and returned to the Containment Cell to be recycled as process water to prevent any increased risks to groundwater resources. Excavation of the residue in the East TMA will occur well above the water table and is not expected to increase effects on groundwater compared to pre-alteration levels. The residue stockpile is located in the East TMA where groundwater is regularly monitored and any notable changes in groundwater quality will be detected by the monitoring program.

As there is no change in the risk to groundwater sources above current levels during construction or operation of the proposed alteration, a significance Level I is assigned with respect to potential environmental effects to groundwater and has been deemed not significant (Table 4-2).

Surface Water

No potential increases in environmental effects are anticipated with respect to surface water runoff in the area around the CPF as a result of construction activities and operation of the upgraded processing circuit. There is no increase in the quantity of surface water coming into contact with mining activities expected and all surface water around the CPF will continue to be collected in sumps inside the building and pumped to the West TMA for treatment prior to its release into the environment.

Surface water coming in contact with the residue stockpile in the East TMA will continued to be managed within the boundaries of the storage area. It is anticipated that surface water drainage will improve within the East TMA as a result of the proposed work as implementing an updated surface water management plan in concert with the excavation plan for the removal of residue from the tailings area is one of the objectives of the project.

The Mine's existing Spill Response Protocols and Best Management Practices for Materials Handling should be sufficient mitigation measures for dealing with the potential environmental effects related to surface water contamination due to the use of heavy equipment associated with the project.

Effluent quality and quantity are expected to remain unchanged as there is no increase in surface or groundwater requiring treatment in the West TMA. There will be a notable decrease in process water used to wash material in the upgraded processing circuit but the water used for these processes will continue to be recycled back into the CPF from the Containment Cells.

Because potential environmental affects to surface water runoff, water usage and effluent discharge are expected to be negligible with respect to the proposed alterations, a Level I significance has been assigned and the potential effects have been deemed not significant (Table 4-2).

4.1.3 Land

The chemical characteristics of the ore and reprocessed residue in the upgraded processing circuit in the CPF is expected to have similar chemical characteristics as the residue waste that is currently produced by the process except that residue from the new circuit will have a lower cesium content. Although, the order chemical reactions occurring in the process have been modified, the waste products generated should remain the same except they will be produced at different stages in the processing circuit. All waste will continue to be neutralized with slaked lime prior to transfer into the Containment Cells. The final quantity of residue transferred in the East TMA is expected to increase for residue that is being reprocessed as there is additional residual acid added to the residue that must be neutralized. The expected increase in the quantity of waste from reprocessed residue is expected to be 30%.

Once the upgrades to the CPF are complete, the waste of any ore or reprocessed residue processed will have no economic value and once transferred to the TMA it may be stacked and re-vegetated according to the methods described in the Excavation Plan and the Mine Closure Plan.

Although, it is anticipated that there will be an increase in the amount of residue waste generated when stockpile residue is reprocessed, it will be stored and monitored in the East TMA following the existing management plan and should not pose any additional risk to the environment. In fact, closing out the residue stockpile will limit the exposure of the residue to surface waters which have been determined the main vector responsible for the movement of residue leachate within the East TMA.

4.2 Ecological

Environmental effects with regard to flora and fauna due to habitat disturbance are not expected as the construction and operation of the proposed alteration will occur entirely within the current footprint of the Mine. There will be a short-term increase in noise around the CPF during the construction phase but the noise will be localized and limited to the current footprint of the development. Operation of heavy equipment used for excavation of residue in the East TMA will be comparable to the noise generated by heavy equipment used to dry-stack the material currently.

Because there is no anticipated increase in habitat disturbance and noise levels will be comparable to pre-alteration levels, it is deemed that the alterations are insignificant with respect to ecological environmental effects and assigned Level I significance (Table 4-2).

4.3 Sociological

4.3.1 Employment

Positive potential sociological effects related to employment opportunities will be associated with the construction phase of the alteration (Table 4-2). No additional labour is expected during the operational phase of the alteration as current staff will continue to oversee operations inside the CPF and the external

contractor currently managing the movement of residue from the Containment Cell to the East TMA will be responsible for excavating and transporting material from the TMA to the CPF. Although no long-term increases in employment are associated with the alteration, the current labor force at the facility will benefit from long-term job stability as the reprocessing of residue increases the feasibility of the cesium products production at the Mine for a number of years

Both these potential effects are positive and significant possibly creating new employment positions during construction and increased job security during the operational phase.

4.3.2 Health and Safety

There is a potential for negative effects to worker safety during the construction and operation of upgraded processing circuits and the transfer of residue from the East TMA to the CPF. These effects can range from negligible to major depending on the severity of the incident; however, the potential for these effects to occur are minimal as Health and Safety Guidelines at the TANCO Bernic Lake Mine are strictly adhered to and enforced. These guidelines include:

- All construction and operational activities will be carried out in accordance with the *Workplace Safety and Health Act*,
- All workers associated with the construction and operation of the new processing circuit will receive appropriate training for the activities being undertaken including activities undertaken by outside contractors,
- TANCO's Best Management Practice for the Control of Fugitive Dust will be followed to limit worker exposure to dust emissions,
- Appropriate personal protective equipment will be worn by workers during all phases of the project to limit exposure to noise and dust of or any additional negative effects.

Continued use of TANCO's Health and Safety Guidelines should result in no increased risk of negative effects regarding worker safety above pre-alteration levels. For this reason, the change in environmental effects associated with health and safety is deemed not significant (Table 4-2).

5. Conclusions

A detailed review of physical and process alterations to the processing circuit at the TANCO BLM CPF indicate that the proposed changes have been deemed as not significant when compared to the level of development as currently licensed for all components except employment related sociological effects. It should be noted that positive sociological effects are anticipated through increases in employment during the construction phase and greater job security during the operational phase for the project.

Effects associated with the physical environment, emissions, water resources and ecological and health and safety aspects remain virtually unchanged as the proposed development is contained within the current footprint of the CPF and the East TMA and measures currently used at the facility are sufficient to mitigate any additional adverse effects. No anticipated increase in environmental effects are expected

with regard to water usage, surface water quality or the volume of effluent discharged in the receiving environment from the tailings facility is anticipated. Effluent quality will continue to remain within regulatory limits outlined in the Mine's current *Environmental Act* Licence and the *MDMER* (Government of Canada 2002) through treatment in the Tailings Management Area at the facility and therefore, possess no additional potential environmental effects to the receiving environment.

The proposed alterations to the processing circuit in the CPF and the East TMA at the TANCO BLM are believed to be minor in nature because the potential negative environmental effects resulting from the alteration are expected to be insignificant when compared to pre-alteration levels.

6. References

Government of Canada. 2002. *Metal and Diamond Mining Effluent Regulations*. Retrieved March 2, 2021 from https://laws-lois.justice.gc.ca/eng/Regulations/SOR-2002-222/index.html.