Memo

To: **Grant, Environmental Committee**
From: Darren Lindsay
cc: Enviro Technician, Camp Operations
Date: September 23, 2025
Re: Contaminated soils update

Introduction

This memorandum updates the 2019 contaminated soils investigation (SRK, 2020) with activities undertaken in 2021, 2022, 2024, 2025 continuing the investigation of areas where petroleum hydrocarbon (PHC) products were historically handled on the Ulu Gold project site, the definition of the extent of impacts, and the re-use of soils that met the applicable criteria. The initial objective of the proposed Soil Treatment Facility (STF) was to treat soils until they met Canadian Council of Ministers of the Environment (CCME) parkland land use (PL) guidelines for surface soils, surface soil re-use (Table A).

Background

Previous operators moved approximately 1,220 m^3 of PHC impacted soil from historic Camp 3 into the old Ulu tank farm (references within SRK, 2020) now known as the soil holding area at Ulu Camp. Previous operators also estimated approximately 3,042 m^3 of PHC impacted soils was present at the Ulu exploration site (references within SRK, 2020).

In 2019, twenty-seven test pits were excavated and sampled with the following results (SRK, 2020):

- Camp 3 Tank Farm area – all samples met CCME PL guidelines.
- Camp 3 Tank Farm relocated soils (in Ulu camp soil holding area) – samples exceeded CCME PL guidelines for either surface re-use or for sub-surface re-use.
- Main Tank farm (Ulu camp soil holding area) interior samples exceeded CCME PL guidelines for sub-surface re-use.
- Main Tank farm (Ulu camp soil holding area) perimeter samples to the east exceeded CCME PL guidelines for sub-surface re-use while other samples met CCME PL guidelines for surface re-use. It is suspected that the Tank Farm liner has been compromised with contamination spreading to the east.

- Day Tank area, removed in 2018, (immediately south of shop footprint) – internal sample exceeded CCME PL guidelines for surface and sub-surface re-use; perimeter samples met CCME PL guidelines for surface soil.
- Shop Floor – most samples exceeded CCME PL guidelines for sub-soils. The reporting indicated that approximately 30m^3 of this material was backhauled from site to Kitikmeot Environmental Ltd (KEL) however no clear reference has been located to support this.
- Parking Areas – all but one sample met CCME PL guidelines for surface soils.

Conclusions of the SRK Consulting Ltd (SRK) memorandum indicate that the stockpiled soils from the Camp 3 Tank Farm might be sufficiently remediated to meet subsoil objectives when they are offloaded and that a total soil volume requiring treatment was estimated to be 5,400 m^3, an increase of ~27% over the previous operators estimate.

Table A: Soil Quality Remediation Objectives for Petroleum Hydrocarbons

Objectives for Coarse-Grained Soils	F1 mg/kg	F2 mg/kg	F3 mg/kg	F4 mg/kg
Surface (0 to 1.5m depth)	210	150	300	2,800
Subsoil (>1.5m depth)	700	1,000	2,500	10,000

Blue Star Gold PHC Soils Activities

2020 (Peridotite, 2020)

- Contaminated soils were relocated to Ulu camp soil holding area.
- PHC soils localised to area of former Day Tank.
- Soil from shop floor shipped offsite for treatment (~6 m^3); estimated 20 m^3 remains to be shipped offsite.
- Contaminated soils in the Ulu camp soil holding area separated into ~150 m^3 piles; all results to date indicate these soils meet CCME PL sub-surface reuse criteria.
- Revised PHC soils volume that will require treatment to meet CCME PL sub-surface guidelines is 2,280 m^3. Of this 2,000 m^3 is located within the soil holding facility.

n.b. the re-piling of materials within the soil holding facility means that sampling history of the material cannot be tracked back farther than November 2020. This was the season the TSP-# pile numbers were established.

2021 (KEL, 2021)

Blue Star Gold contracted KBL Environmental Ltd (KEL) to undertake sampling of the stockpiled PHC soils.

- An estimated 1,300 m^3 of material was sampled in June and in July.
- Four stockpiles and one berm section required further treatment (405 m^3); TSP-5, TSP-9, TSP-10, TSP-11, Berm2
- All other sampling indicates soils are available for subsurface reuse and in some cases for surface re-use.
- No material required off-site disposal.

Blue Star, at the guidance of SRK Consulting Ltd (SRK), conducted additional sampling across the site (upper staging, lower staging) that had indications of PHC pad materials (mixed soils and rock) (section 3.3.2, BSG, 2022).

2022 (KEL, 2022)

Blue Star Gold contracted KEL to undertake sampling of the stockpiled PHC soils in August.

- Stockpiles resampled were TSP-5, TSP-9, TSP-10, TSP-11
- All samples met CCME PL guidelines for subsurface re-use.
- Berm2 was not resampled.
- *All material within the soil holding area and most of the surrounding berm meet CCME PL guidelines for sub-surface re-use and in some cases surface re-use.*

Additionally, KEL completed thirty-nine test pits across the site. (KEL, 2023).

- Impacted soils near the camp shop estimated 170 m^3 requiring treatment and 400 m^3 meeting CCME PL subsurface re-use criteria.
- Impacted soils near the former tank farm estimated 100 m^3 meeting CCME PL subsurface re-use criteria.
- Impacted soils near the upper staging area estimated 1,260 m^3 meeting CCME PL subsurface re-use criteria.
- Impacted soils near the lower staging area estimated 170 m^3 meeting CCME PL subsurface re-use criteria.

2023

No sampling program undertaken during the season however stockpiles were fully aerated using an excavator (Figure 1).

2024

Blue Star Gold contracted KEL to undertake sampling across the site in areas of concern identified in previous sampling efforts (BSG, 2022 and KEL, 2023).

KEL completed forty-two test pits collecting sixty samples across the site with analysis to identity natural versus human-caused hydrocarbon sources (KEL, 2024). KEL identified approximately 868 m3 of material requiring treatment and approximately 138 m^3 that meets CCME PL guidelines for sub-surface re-use.

n.b. these are "bank" volumes therefore material expected to be placed in a facility is closer to 1.3 times "bank" volume or ~1,128 m^3.

Blue Star Gold undertook and completed a placement of non-hazardous waste materials in the Landfill. The void fill material was the stockpiled soils within the soil holding facility that met CCME PL guidelines for sub-surface or surface re-use. PHC soil material remaining in the soil holding facility was spread across the floor of the holding area to maximize aeration.

2025

A soil hand auger and a portable gas meter (RKI Eagle II) calibrated to hexane and isobutylene standards were evaluated as tools to further define edges of PHC soils prior to excavation and piling in the soil holding facility.

The depth of PHC soils remaining in the soil holding area was measured in test pits used to examine the liner and a volume of 334 m^3 was estimated. This material was not sampled although based on previous sampling this material should meet CCME PL subsoil guidelines.

One "mega-bag' containing approximately 3 m^3 of PHC soils that had been placed near and within the soil holding area since 2019 was placed in a drum and sent offsite for disposal. Two drums were filled with additional material from the upper laydown area were also shipped offsite for disposal. No other action was undertaken with PHC soils this season.

Conclusions and Recommendations

Samples that the portable gas meter did not detect organic vapours with olfactory indications of mild PHC odours had results that meet CCME PL guidelines for surface soils; with moderate odours samples met CCME PL sub-surface re-use guidelines, and if the portable meter detected hexane >100ppm and isobutylene >10 ppm then the samples did not meet CCME PL surface re-use criteria (SRK, 2019). This confirms the procedure previously identified for evaluating and segregating PHC contaminated materials.

Approximately 20 m^3 of material may need to be shipped off-site for disposal; approximately 1,200 m^3 of material requires treatment and all other material can be used as surface cover (Figure 2).

Reclamation research for the petroleum hydrocarbon contaminated soils indicates that approximately 1,200 m^3 of material requires treatment to meet CCME PL sub-surface guidelines. This is far below the initial volumes estimated that would require the originally proposed Soil Treatment Facility. In addition, over the study period, natural processes (aeration) are positively impacting the remediation timelines. In the interim it is recommended to excavate and relocate materials needing treatment to the soils holding facility and aerate and sample regularly.

The last location requiring evaluation is below the existing soil holding area. The volume below this area is estimated to be 461 – 668 m^3. As this material is under a liner it is expected that only a small volume of material may require treatment to meet CCME surface re-use criteria. It is yet to be evaluated by test pitting and should be considered a priority final item to be undertaken.

Current recommendations are to evaluate below the lined soil holding facility to confirm that there are no problem soils. To use the soil holding facility as the area to treat the soils using natural aeration until they are eligible for sub-surface reuse. And then to place the subsurface re-use soils either in the landfill or other applicable structure.

References

Blue Star Gold Ltd 9BSG, 2022). Annual Report: Ulu Gold Project Exploration and Progressive Reclamation 20EN001 2BM-ULU2030. March 2022

KBL Environmental Ltd (KEL), 2021. 2021-114NT Esker Soil Characterisation Memo. September 24, 2021.

KBL Environmental Ltd (KEL), 2022. 2021-114NT Ulu Mine Soil Sampling, Blue Star Gold Project – Soil Characterisation Updated Summary. September 13, 2022.

KBL Environmental Ltd (KEL), 2023. Limited Phase II Environmental Site Assessment, Ulu Mine. January 12,2023.

KBL Environmental Ltd (KEL), 2024. 2024 Limited Phase II Environmental Site Assessment, Ulu Gold Mine Project. September 20, 2024.

Peridotite 932 Consulting Ltd (Peridotite), 2020. Memo. Ulu Project 2020 Reclamation Summary. November 12, 2020.

Figure 1: Aerating of stockpiles in the soil holding area August 2023.

Figure 2: Distribution of PHC contaminated soils as sampled 2019 – 2023; material in holding area used subsurface in 2024.