APPENDIX J

GEOCHEMICAL CHARACTERIZATION OF THE UMWELT QUARRY

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Memo

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From:	Kelly Sexsmith Kirsty Ketchum	**Project No:**	1CS002.005
Cc:	Catherine Paul, Sabina Richard Cook, Knight Piésold Ltd.	**Date:**	October 1, 2014
Subject:	Geochemical Characterization Results for the Umwelt Quarry		

1 Introduction

Sabina Gold and Silver Corporation (Sabina) is planning to seek regulatory approvals to initiate site preparation work for early construction activities at Back River. This work would be initiated in advance of completing the environmental assessment for the Back River Project, and would establish basic infrastructure including an all-weather road and an extended airstrip in the Goose area (Sabina 2014). The site preparation activities would require development of a quarry within the footprint of the future Umwelt open pit to provide material for construction.

SRK Consulting was asked to compile and review relevant data from the Umwelt quarry area, and to assess the acid rock drainage/metal leaching (ARD/ML) potential of the quarry rock to determine whether it would be suitable for construction. This memo presents the results of our assessment.

2 Background

2.1 Proposed Quarry at Umwelt

The Umwelt quarry would be located entirely within the footprint of the future Umwelt pit, as shown in Figure 1.

The site preparation work will require a total of 550,000 cubic meters of quarry rock, which would be obtained from the current quarry west of the Goose Camp and/or the proposed Umwelt quarry. The relative amount of material from each of these quarries will be determined by operational logistics which are yet to be solidified. However, up to 550,000 cubic meters could be sourced from the Umwelt quarry.

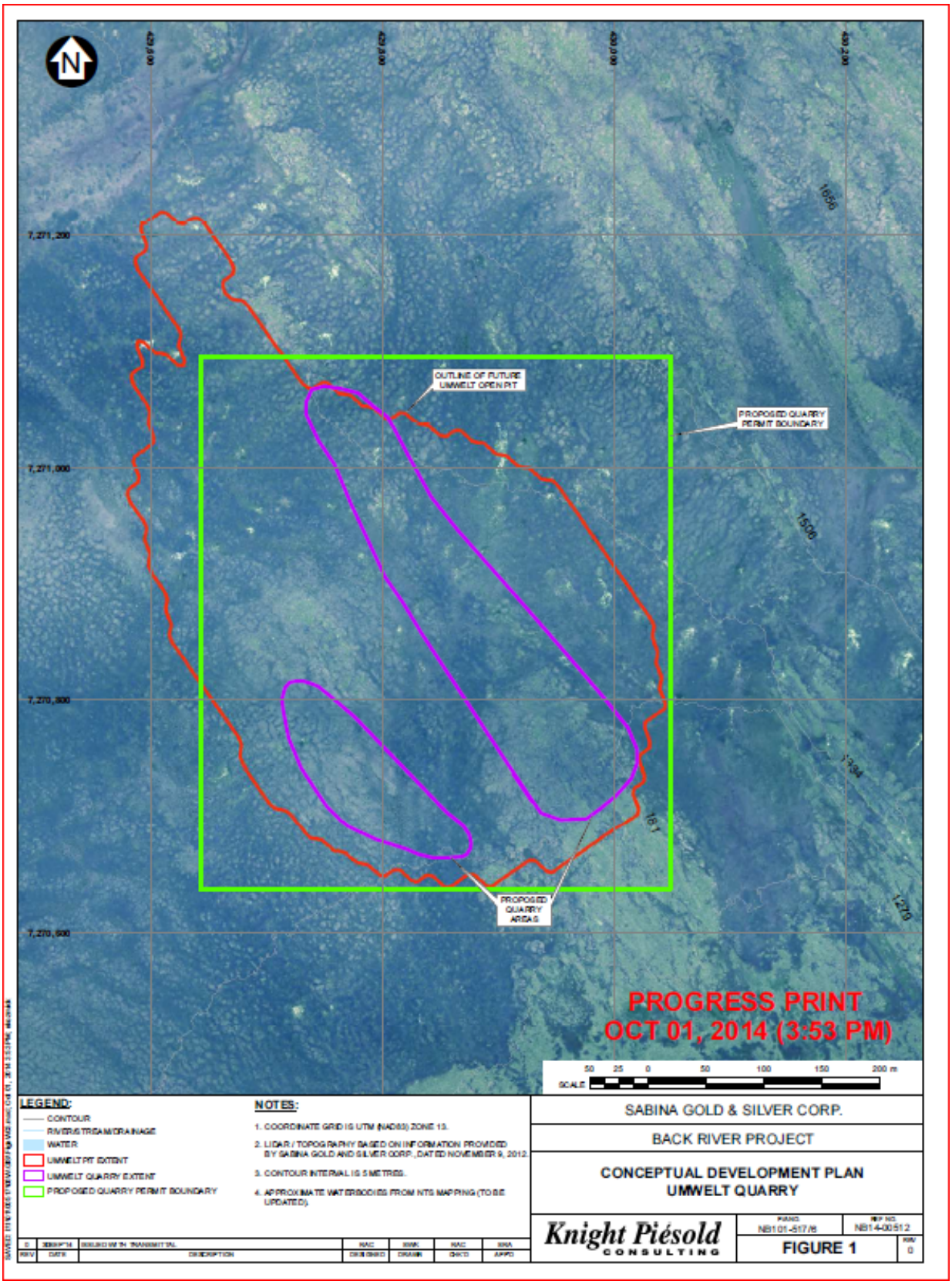

Figure 1: Umwelt Quarry Location

2.2 Geology

The Umwelt deposit consists of folded turbiditic meta-sediments of the Beechey Lake Group, including a banded iron formation (BIF), which is the primary host for gold mineralization, and interbedded greywacke and mudstones. This sequence is cut by felsic and gabbro dykes of variable thicknesses. The gold mineralization occurs within quartz ± carbonate veins and is typically found in association with sulphides within the BIF. Sulphide mineralization includes arsenopyrite, pyrite and pyrrhotite.

A geological plan and cross sections of the deposit area are provided in Figure 2. The areas outlined as a potential quarry resource are located within the upper greywacke unit on either side of the mineralization trend.

2.3 Geochemical Characterization Programs

Detailed results of the geochemical characterization program completed for the Back River Project are presented in the "*Back River Project – 2013 Geochemistry Baseline Report*" prepared by Rescan Environmental Services in March 2014, included as Appendix V11-4A of the DEIS.

In June 2014, SRK Consulting initiated additional static testing on waste rock from the Goose and George deposits to supplement the information presented in the DEIS. The focus of the more recent testing was to assess downhole continuity and thereby determine whether segregation of potentially acid generating material is feasible. Therefore, sampling was designed to obtain a continuous set of samples representing a typical cross section through each of the deposits. Complete results from this program will be presented in the FEIS.

Static testing data from both the earlier and more recent characterization programs included included sulphur speciation, total inorganic carbon analyses and either standard or siderite corrected NP. The acid potential (AP) was calculated based on the total sulphur content, and the NP was used without further adjustments.

This data has been combined and uploaded into geological modelling and visualization software (Leapfrog™) to identify samples that were representative of the potential quarry material at Umwelt. Samples were considered representative if they were located within the upper greywacke, within or in close proximity to the pit, and outside of the trend of the gold mineralization (Figure 2). Other samples from within the upper greywacke from both the Umwelt and Llama deposit areas were also considered in the assessment. However, it is noted that some of these are within the trend of the mineralization and may have been affected by mineralization processes. The quarry areas within the upper greywacke were selected specifically to avoid those areas.

Altogether, there were 73 samples from the upper greywacke unit, of which 16 were representative of the material within the potential quarry area.

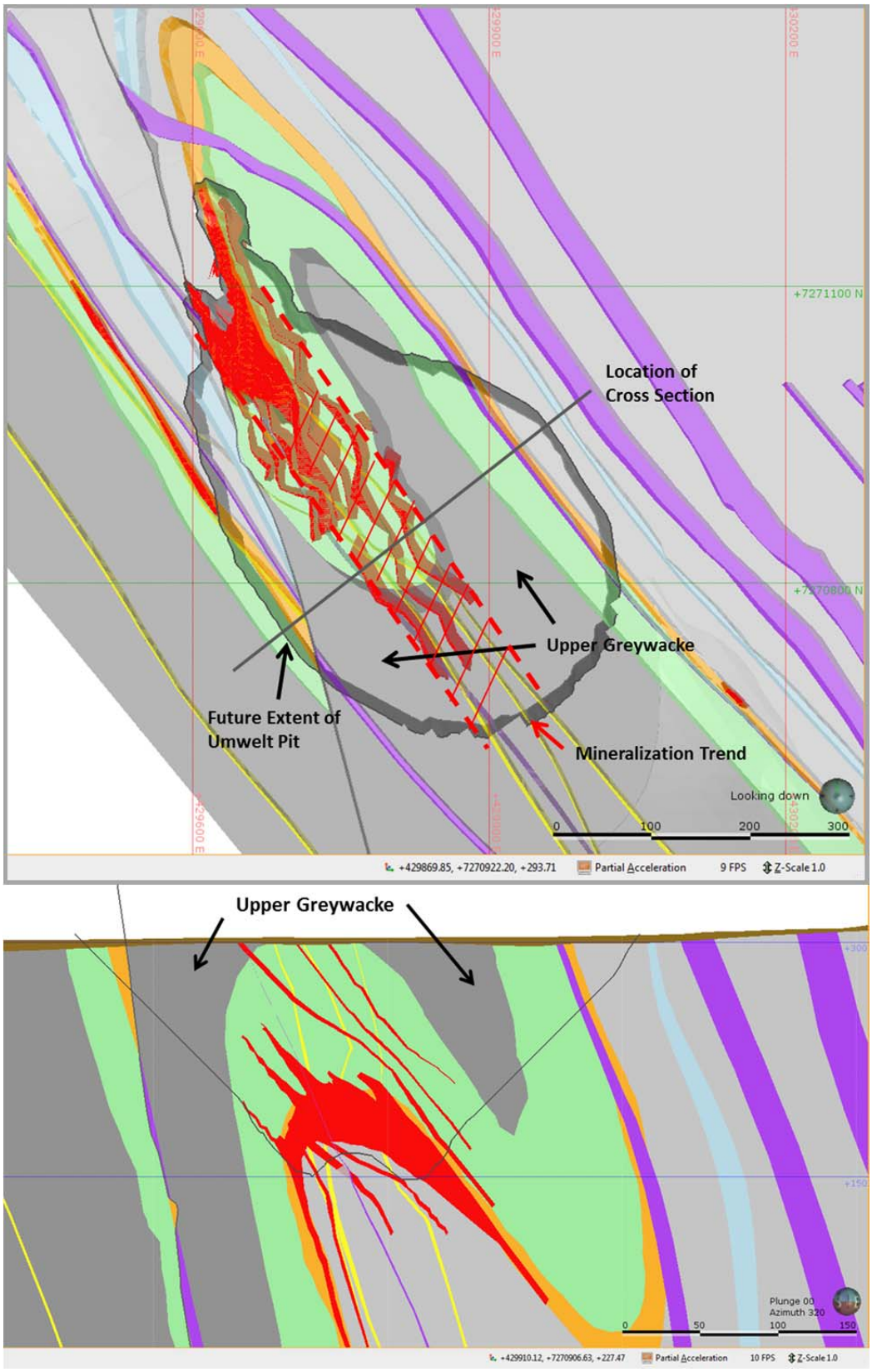

Figure 2: Plan and Section of Umwelt Geology

3 Umwelt Quarry Results and Discussion

Relevant static testing data from the Umwelt quarry area are summarized in Appendix 1. Figure 3 is a plot of the neutralization potential (NP) versus acid potential (AP) for the upper greywacke showing results for all of the samples from the Umwelt and Llama deposit areas, with circles depicting the samples that are specifically representative of the potential quarry areas located on either side of the Umwelt mineralization trend.

The results for the upper greywacke indicate that in general, this unit contains very little sulphide (estimated based on total sulphur content and reported as AP), with average AP values of 6.5 kg $CaCO_3$ eq/t, and only 10% of the samples having an AP of greater than 10 kg $CaCO_3$ eq/t. The generally low AP suggests that this material is not likely to be an appreciable source of acidity. NPs were also very low indicating limited pH buffering capacity. Based on these results, approximately 67% of samples are classified as non-PAG or as having a low sulphur content (AP <5), 27% are classified as having an uncertain potential for ARD (NP/AP=1 to 3), and 5% are classified as potentially acid generating (PAG; NP/AP<1).

As stated previously, 16 of the upper greywacke samples are considered to be representative of the potential quarry area. The majority of these are classified as non-PAG or low sulphur material, and three samples are classified as having an uncertain potential for ARD. Only one of these samples has an AP greater than 10 kg $CaCO_3$ eq/t, again, indicating that this material is unlikely to be an appreciable source of acidity.

Previous work on the project has indicated that arsenic is the main contaminant of potential concern (COPC). Samples representing the quarry areas had solid phase arsenic concentrations consistently less than 50 ppm (with a median of 11 ppm), indicating a relatively limited potential for metal leaching.

4 Summary and Conclusions

In general, these results indicate that the majority of the upper greywacke samples representing the proposed quarry areas within the Umwelt pit are classified as non-PAG or low S material with a limited potential for ARD. Additionally, based on low solid phase arsenic concentrations, metal leaching is unlikely to be an issue. For these reasons, upper greywacke from the proposed Umwelt quarry area is considered suitable for use in construction.