GEOCHEMICAL DATA FROM SAMPLES COLLECTED IN 2022 FOR THE MOUNT HARPER GEOLOGIC MAPPING PROJECT, BIG DELTA, MOUNT HAYES, AND EAGLE QUADRANGLES, ALASKA

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GEOCHEMICAL DATA FROM SAMPLES COLLECTED IN 2022 FOR THE MOUNT HARPER GEOLOGIC MAPPING PROJECT, BIG DELTA, MOUNT HAYES, AND EAGLE QUADRANGLES, ALASKA

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INTRODUCTION

During the 2022 field season, geologists from the Alaska Division of Geological & Geophysical Surveys (DGGS) conducted 1:100,000-scale bedrock geologic mapping of ~3,100 mi^2 (~8,000 km^2) within the Big Delta, Mount Hayes, and Eagle quadrangles. This project aims to produce more detailed and modern geologic maps and supporting datasets to promote mineral resource exploration in eastern Interior Alaska.

The project area includes known gold (Au) mineralization, recently explored in the Richardson mining district, including the SAM project and the nearby Democrat Lode and associated prospects, and in the Goodpaster mining district at the LMS and Healy intrusion-related gold prospects. The Mount Harper area hosts a cluster of molybdenum (Mo) and tungsten (W) prospects, including porphyry Mo and W skarn styles, both of which have had industry interest over the decades. Ultramafic rocks occur in the South Fork and Volkmar river drainages; these bodies have an as-yet poorly understood potential to host platinum group elements (PGE), chrome (Cr), cobalt (Co), and nickel (Ni) resources.

The DGGS map area includes a section of pre-Mississippian to Permian metasedimentary and metaigneous rocks and Triassic to Paleogene intrusive and volcanic rocks. Major- and trace-element geochemistry for these rocks was analyzed to further our understanding of the resources in the area, including distinguishing between igneous and sedimentary protoliths for metamorphic rocks and characterizing and differentiating Mesozoic and Cenozoic magmatic events in the area.

Highlights of this geochemical report include sampling of the Healy and LMS projects and multiple prospects on Mount Harper and elsewhere in the map area. Sample 22Z336, collected south of the Brink prospect, yielded 1.52 ppm Au and 500 ppm W. A few samples collected at the LMS prospect yielded elevated silver (Ag) concentrations (for example, sample 22Z409 yielded up to 12.95 ppm). Additionally, sample 22Z406 yielded 1.48 ppm Au, 7.65 ppm Ag, and 1,787 ppm arsenic (As).

Samples collected at Larsen Ridge/Lucky 13 prospect near the top of Mount Harper yielded high Ag and W values. For example, 22Z271 (a massive quartz vein) yielded 18.87 ppm Ag and 1,100 ppm W, 22TJN157 (a skarn) yielded 5.75 ppm Ag, 2,348 ppm copper, 4,422 ppm manganese (Mn), and 600 ppm W, and 22Z270 (a granite) yielded 2,356 ppm Mo and 200 ppm W. The Richardson mining district has been previously sampled by DGGS (Twelker and others, 2017, 2018).

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The analytical data tables associated with this report are available in digital format as comma-separated value (CSV) files. Additional details about the organization of information are noted in the accompanying metadata file. All files can be downloaded from the DGGS website: doi.org/10.14509/31089.

All samples collected during this project, as well as laboratory sample rejects and pulps, will be stored at DGGS for the project's duration and will be available for public viewing upon request. Once the project concludes, the samples and the pulps will be archived at the Geological Materials Center in Anchorage.

DOCUMENTATION OF METHODS

Sample Collection

Rock samples were collected for two different purposes. Visibly mineralized or altered rock samples were preferentially collected and analyzed for trace-element geochemistry. Additionally, igneous and metaigneous rocks showing little alteration or weathering were collected for whole-rock major-oxide, minor-oxide, and trace-element analyses to aid in the classification and study of petrogenesis and tectonic setting. Most samples are "grab" samples collected for their overall representation of the outcrop. However, as noted in the sample field description, a few are "select" samples more deliberately collected from a specific feature.

Location data were collected using GPS-enabled tablets and smartphones running the ESRI Field Maps App. Data were merged into an ArcGIS geodatabase. The devices have a reported error of about 10 m. Latitude and longitude are reported in the WGS84 datum.

Sample Preparation

Rock samples were processed by Bureau Veritas Commodities Canada Ltd. Mineral Laboratories (BV Mineral Laboratories) using their PRP70-250 package. The samples were crushed to greater than 70 percent passing 2 mm, and a 250 g split was pulverized to greater than 85 percent passing 75 microns. Before crushing, samples for whole-rock analysis were trimmed by DGGS staff to remove weathering.

ANALYTICAL METHODS

Depending on the sample type, samples were analyzed for various suites of major and trace elements. In addition to BV Mineral Laboratories' accredited (ISO/IEC 17025) internal quality-control program, DGGS monitored analysis quality with one reference-material standard per batch of 20 analyses.

- Whole-rock geochemistry samples and major- and minor-oxides were analyzed by lithium borate fusion digestion and inductively coupled plasma emission spectroscopy (ICP-ES, BV Mineral Laboratories method LF300). Trace elements, including rare-earth elements, were determined using lithium metaborate fusion digestion and inductively coupled plasma mass spectroscopy (ICP-MS, BV Mineral Laboratories method LF100). Ag, As, Au, Bi, Cd, Cu, Hg, Mo, Ni, Pb, Sb, Se, Tl, and Zn were determined by aqua regia digestion and ICP-ES/MS (BV Mineral Laboratories method AQ200). Total C and S were analyzed by IR Combustion (BV Mineral

Laboratories method TC000). Pt, Pd, and Au were determined by fire assay with ICP-MS finish (BV Mineral Laboratories method FA130).

- Major- and trace-element values for rock samples were determined by BV Mineral Laboratories method MA250: Four-acid digestion followed by inductively coupled plasma-mass spectroscopy (ICP-MS); Au values were analyzed using flux digestion and fire assay and ICP-ES (BV Mineral Laboratories method FA330-Au).
- Samples that exceeded detection limits for elements of interest were reanalyzed using specific elemental tests. Over-limit values for Zn were analyzed using aqua-regia digestion followed by ICP-ES (BV Mineral Laboratories method AQ370). Mn, W, Pb, Cu, and Ni were reanalyzed using four-acid digestion followed by ICP-ES (BV Mineral Laboratories method MA370).

For each sample, data tables contain either assay values or coded-value placeholders (null = not analyzed; -1 = the element's assay result is less than the lower detection limit for the method; -2 = the element's assay result is greater than the upper detection limit for the method). Detection limits for each reported elemental value obtained by the various methods are documented in the metadata file.

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The views and conclusions contained in this document are those of the authors and should not be interpreted as representing the opinions or policies of the US Geological Survey. Mention of trade names or commercial products does not constitute their endorsement by the US Geological Survey.

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