

# Yukon

## Exploration & Geology Overview

# 2024





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**Yukon**  
**Exploration**  
**& Geology**  
**Overview**  
**2024**

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Front cover photograph: View from a ridge looking south over Engineer Creek and the Dempster Highway below. (Photo by Emilie Stewart-Jones, Yukon Geological Survey.)

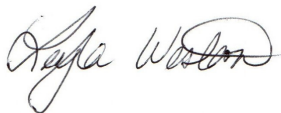
## Preface

The Yukon Exploration and Geology (YEG) volumes include two publications: Yukon Exploration and Geology Overview, and Yukon Exploration and Geology Technical Papers. These key annual publications from the Yukon Geological Survey (Energy, Mines and Resources, Government of Yukon) highlight geoscience research and activities across the Yukon from the previous year. The YEG Overview includes four papers that provide summaries of the Yukon Geological Survey's staff activities, as well as exploration and development overviews for both the hardrock and placer industries in the Yukon. The YEG Technical Papers volume contains a number of current research reports on various geoscience projects across the territory. The YEG Overview is available in digital format and in a limited colour print run. The YEG Technical Papers volume is available in digital format only. All Yukon Geological Survey publications can be downloaded from our website, <https://data.geology.gov.yk.ca/>.

As in previous volumes, YEG 2024 aims to provide the most up-to-date information on mining and mineral exploration activity in the Yukon, both in the hardrock and placer sectors. The success of YEG relies on the continued contributions from prospectors, exploration and government geologists, mining companies, and academic students, all of whom are willing to contribute to public geoscience for the benefit of the scientific community, the public, and the mineral industry of the Yukon. Their work is greatly appreciated.

More importantly, I would like to acknowledge the support from our 14 Yukon First Nation partners whose lands and traditional territories we continue to work on. The mining industry and the valuable geoscience data that is gathered would not happen without their engagement and support. We look forward to strengthening and fostering honest and meaningful partnerships with all Yukon First Nations.

I hope you enjoy the volume. Any input or suggestions you may have to improve future YEG publications are welcome. Please contact us at [geology@yukon.ca](mailto:geology@yukon.ca).

A handwritten signature in black ink, appearing to read 'Leyla Weston', with a stylized flourish at the end.

Leyla Weston



# Yukon Exploration and Geology Overview 2024

## Table of Contents

Yukon Geological Survey 2024 overview Carolyn Relf.....	1
Yukon placer mining 2024 development and exploration overview Sydney van Loon .....	21
Yukon hardrock mining, development and exploration overview 2024 Tiera V. Naber and Patrick J. Sack.....	37
Yukon Geological Survey's outreach program: 2024 highlights Amanda O'Connor and Leyla H. Weston.....	77
Yukon Exploration and Geology 2024 abstracts and plain language summaries.....	85
YGS list of publications and data releases for 2024.....	91



# Yukon Geological Survey 2024 overview

Carolyn Relf\*  
Yukon Geological Survey

Relf, C., 2025. Yukon Geological Survey 2024 overview. In: Yukon Exploration and Geology Overview 2024, L.H. Weston, A. Stuart, S.K. Schultz, A.D. Brubacher and D.C. Cronmiller (eds.), Yukon Geological Survey, p. 1–20.

## Introduction

The Yukon Geological Survey (YGS) has seen significant change over the last year, with eight new staff joining the team in 2024. This change has brought some new energy to the survey, enabling more visits to exploration projects and building the organization's capacity to deliver geoscience. This report provides a snapshot of YGS' staff and fiscal resources, and summarizes YGS' 2024 activities and project highlights.

Over the course of the year, YGS organized three workshops to assess current gaps in map coverage, seek input from clients about their needs, and consider how current trends such as interest in critical minerals and increasing frequency of landslides might influence YGS' priorities in the future. Following each workshop, a list of project ideas for future work was compiled; these are summarized in this report.

Gold prices in 2024 were high, averaging over C\$3351 per ounce during the production season. This was a major driver for placer activity in the Yukon, which recorded the highest production on record since 1886.

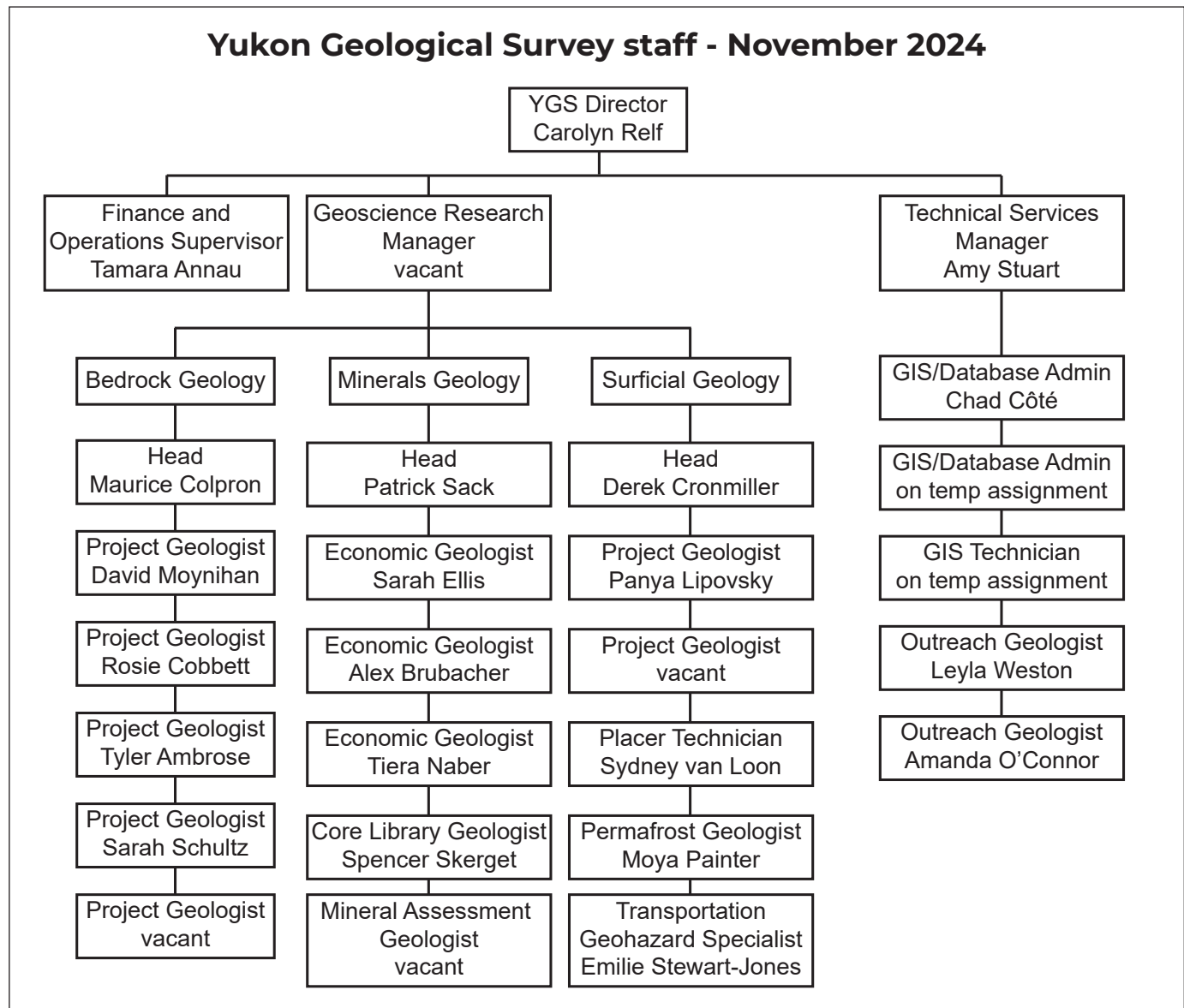
On a more somber note, the failure of the heap leach pad at Eagle Gold Mine in late June had a significantly negative impact on the First Nation of Na-Cho Nyäk Dun and the mineral industry in general. The medium to long-term effects of this incident on the environment and the mining sector are currently unclear.

## YGS resources

The YGS' organizational structure has four units (Fig. 1). The survey's geoscience program is delivered by three units, each focused on a specific discipline: Bedrock Geology, Surficial Geology and Minerals Geology. The units report to a Geoscience Research Manager who coordinates studies across the disciplines and liaises with research partners to enhance the YGS' capacity. As of December 15, 2024, the Geoscience Research Manager position was in the process of being staffed. The fourth unit, Technical Services, provides the underpinning support to manage all YGS' data, overseeing publications, social media and outreach. This unit reports to the Manager of Technical Services, who liaises with the Geoscience Research Manager to coordinate the timely release of information and ensure the database infrastructure meets YGS' needs.

Eight new staff were hired by YGS in 2024. Sarah Schultz joined the Bedrock Geology unit in March. Her expertise is in sedimentology and stratigraphy, and she will be tackling some regional stratigraphic questions in Selwyn basin over the next few years. Tiera Naber, Alex Brubacher and Spencer Skerget joined the Minerals Geology unit over the summer; Naber and Brubacher as Economic Geologists, and Skerget as the Core Library Geologist. Although he is not new to YGS, Patrick Sack has taken on a new role at the survey, filling the position of Head of Minerals Geology. Following the appointment of Derek Cronmiller as Head of Surficial Geology in January, Moya Painter was hired to backfill the Permafrost Geologist position, taking over the lead for managing Yukon's permafrost database and monitoring boreholes across the Yukon.

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**Figure 1.** Organization chart for the Yukon Geological Survey.

Emilie Stewart-Jones also joined the Surficial unit; her position is shared with Highways and Public Works and will focus on assessing permafrost-related issues that plague Yukon's highways. The newly created Manager of Technical Services position was filled by Amy Stuart in August; Amy began her Government of Yukon career in 2002 as a GIS Technician for the YGS and has now come full circle as the unit manager. Finally, Tamara Annau joined YGS as the Finance and Operations Supervisor, managing contracts, finances and administrative duties.

The YGS also lost some staff in 2024. Diane Skipton (Project Geologist) and Justin Emberley (Core Library

Geologist) returned to Newfoundland with their family in the spring. Skipton has joined the Geological Survey of Newfoundland and Labrador, and Emberley is managing core facilities for the Mineral Lands Division. Kristy Kennedy (Project Geologist) took a secondment with Kluane First Nation as their Director of Lands, Resources and Heritage. In addition to these departures, two staff within the Technical Services unit are on six-month temporary assignments with other departments: Brett Elliot (Geological and Spatial Database Administrator) is working for the Department of Tourism and Culture, and Bailey Staffen (GIS Technician) is with the Department of Education.

I would like to welcome the new staff; they bring new energy to the YGS and their enthusiasm is refreshing. I would also like to extend my gratitude to staff who have moved on to new opportunities; their contributions are appreciated and I wish them all the best in their new positions.

The 2024–25 operating budget for YGS totalled \$2 994 060 (Table 1). This represents a reduction of \$908 000 from the previous year as funding for geothermal research ended (2023–24 YGS received \$300 000 from Our Clean Future and \$380 000 from the Geological Survey of Canada [GSC]), and funding from Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC) for permafrost and geohazard studies wound down.

A key part of YGS' mandate is to provide geoscience information to the public. This information takes a variety of forms and targets a range of audiences. The YGS maintains both Facebook and Instagram accounts, which YGS uses to share information about activities, public events and staffing opportunities. The YGS also distributes geoscience information as raw datasets, maps and technical reports. A list of 2024 publications is included at the end of this volume. These information services are a key part of YGS' mandate.

## Geoscience planning

The YGS undertakes geoscience planning on a five-year cycle, and 2024 marked five years since the last planning event. Planning does not follow a prescriptive process; over the years, YGS has held both small staff retreats, and large workshops attended by cross-sections of client groups. Given the growing diversity

of survey activities and the influx of new staff, finding a single date to bring together all staff and their clients was challenging. As a result, in 2024 YGS held separate workshops for each unit: Bedrock Geology, Surficial Geology and Minerals Geology. The workshops involved key clients and/or stakeholders who provided input and helped identify emerging interests. A list of project ideas was generated at each workshop, but the projects were not ranked by priority.

Factors that are likely to impact YGS priority setting over the next five years include the increasing need to identify and monitor geohazards, pressure to complete land use plans, and interest in critical minerals. Support for the work by affected First Nations and opportunities to leverage funds will also influence priority setting. At each workshop, staff identified persistent geoscience questions and discussed the potential roles that evolving technologies (e.g., drone-based lidar and artificial intelligence) and novel applications of tools for unconventional uses (such as using passive seismic data to predict how seismic energy will disperse as permafrost thaws) might play in the future. Mapping of bedrock and surficial geology will continue as core activities for YGS, but new ways of doing the work and new uses of these foundational data layers informed workshop discussions.

The project lists were shared with members of YGS' Technical Liaison Committee in November for their feedback and comments. In the following sections, updates on the status of 2024 activities of each YGS unit are presented, followed by a summary of project ideas raised at each workshop. Readers are encouraged to reach out to provide additional project ideas to the survey; these can be shared via [geology@yukon.ca](mailto:geology@yukon.ca).

**Table 1.** YGS funding for fiscal year 2024–25.

Source	Funding for	Amount
YGS operational budget <sup>1</sup>	Geoscience program	\$1 305 000
Our Clean Future funds <sup>1</sup>	Permafrost geohazards	\$100 000
Klondike/Dempster highways geohazards <sup>2</sup>	Permafrost geohazards	\$106 060
Yukon Mineral Exploration Program <sup>1</sup>	Program grants	\$1 433 000
<b>Total</b>		<b>\$2 944 060</b>

<sup>1</sup> – funding source Government of Yukon

<sup>2</sup> – funding source Crown-Indigenous Relations and Northern Affairs Canada (CIRNAC)

## Current mineral projects

With several new staff in the Minerals Geology unit and a new unit head, the next few years will represent a growth phase for this part of the YGS. It is anticipated that mineral explorers will face increased timelines for the assessment and permitting of projects in the wake of Eagle Gold Mine's heap leach failure, which will give space for staff to become familiar with Yukon geology and focus on updating minerals-related databases. The YGS is acutely aware of the need for mineral potential maps to support land use planning, and updates to the datasets that inform mineral assessments are a current priority.

New staff have been encouraged to take on targeted mineral studies to increase their expertise in Yukon geology and broaden YGS' minerals-related knowledge base. In 2024, staff led or contributed to several such studies.

## Reduced Intrusion-Related Gold Systems

Sarah Ellis initiated a district-scale study of Reduced Intrusion Related Gold (RIRG) deposits in 2024 (Fig. 2). The study compares host-rock lithologies, geochemistry and vein character of the Brewery Creek, RC, Steiner and Valley deposits across the Selwyn basin. Results from this research are anticipated for release in early 2025.

## Coffee property geology

Before joining YGS, Brubacher worked for Newmont Corporation at the Coffee gold project (Fig. 2). Based on his knowledge of the property, he has begun compiling a property-scale geology map and an accompanying report describing the geology and gold mineralization. Work has been underway on this project since the fall, and the intent is to release an updated geology map and accompanying open file report before the 2025 field season. The project is a collaboration with exploration staff at Newmont Corporation.

## Student projects

Sack is currently co-supervising two MSc thesis students. Keagan Parry (University of Alberta; co-supervisor Pilar Lecumberri-Sanchez) is completing his second year of a study on Banyan Gold's AurMac property (Fig. 2). Detailed descriptions of the host rocks, stratigraphy and veins at the AurMac deposit are presented in the accompanying YEG volume

(Parry et al., 2025). Parry expects to submit his thesis some time in 2025.

Maria Carter (Simon Fraser University; co-supervisor Dan Gibson) began an MSc thesis project in 2024 at Trifecta Gold's Mount Hinton property (Figs. 2 and 3). She spent four weeks mapping bedrock and logging drill core at the property and is currently completing course work and preparing samples for analyses. Carter will undertake a second season of fieldwork in 2025.

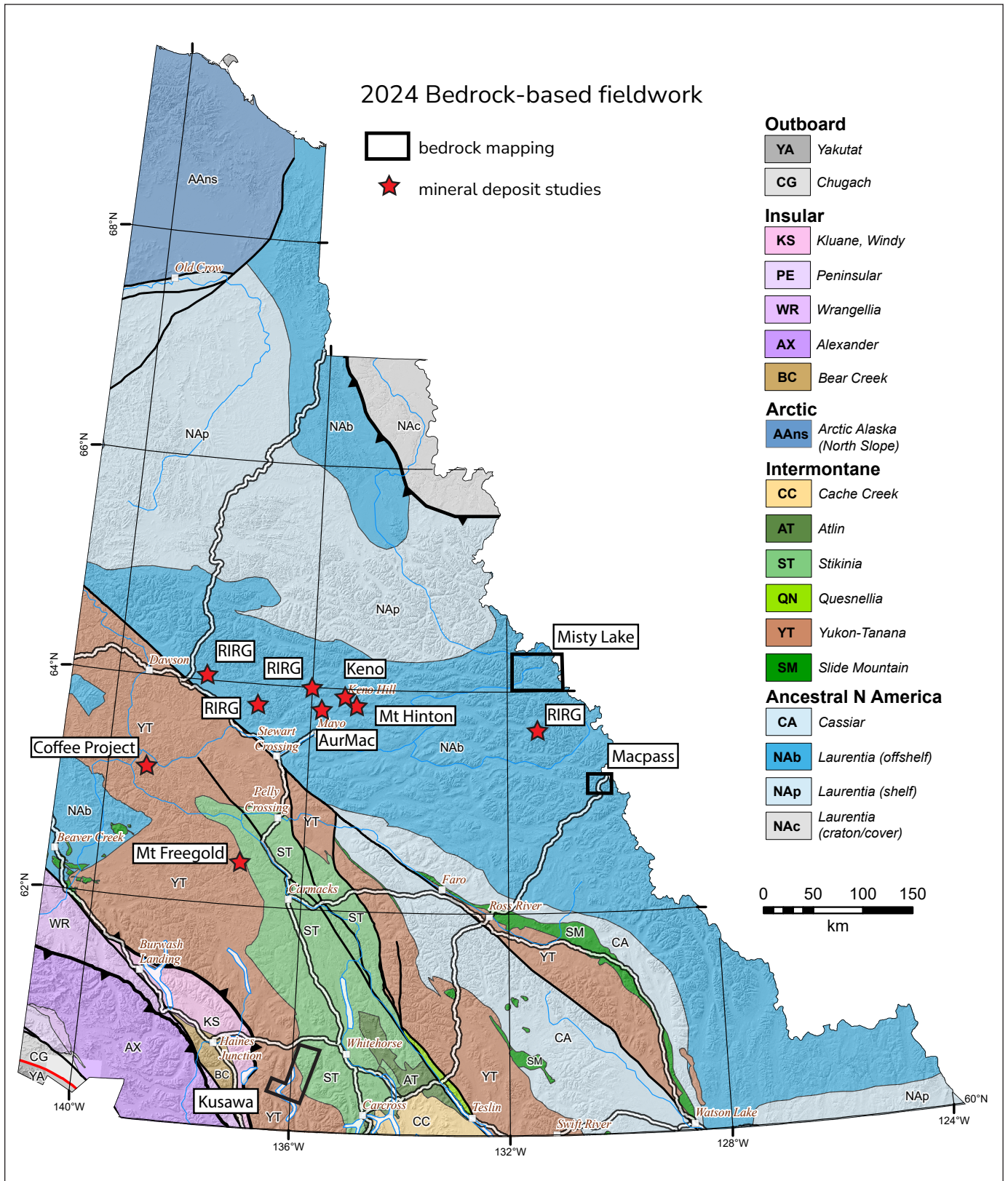
These two studies are part of a suite of four staged thesis projects planned between 2023 and 2030 in the Dublin Gulch-Keno area. A third MSc study of Victoria Gold's Raven deposit was planned to start in 2025, along with a PhD thesis linking results of the three MSc studies and generating a regional-scale model for mineralization in the district; however, Following the heap leach failure at Eagle Gold Mine, access to the Raven deposit is uncertain and Sack is pursuing other deposits to study.

## Collaborations with Geological Survey of Canada

Over the summer, Brubacher and Sack collaborated in the field with GSC colleague Nicolas Pinet on a study that is examining the link between plutonism, gold occurrences and silver-lead-zinc veins in the Keno Hill District (Fig. 2). They spent ten days sampling drill core and historic pits, focusing on carbonate gangue in well-mineralized samples. In 2025, samples will be analyzed at GSC-Québec's labs using the clumped isotope technique.

In 2021, Dawn Kellett and Pinet (both with the GSC) started a regional-scale, low-temperature thermochronology study across much of southern Yukon. Brubacher, who has experience working with U-Th-He data in apatite and zircon, has joined the research team and is interpreting a subset of the data from samples in a transect between the Denali and Tintina faults. This transect occurs in the vicinity of the Coffee gold deposit where Brubacher is currently compiling a map and report on the deposit (see above). The goal of the thermochronology transect is to characterize the timing of cooling and uplift across the Intermontane terranes, which may inform mineral deposit preservation potential.

In 2023, as part of a bedrock mapping project in the Sixtymile placer district, Sack and YGS Placer Geologist Sydney van Loon visited a placer pit, which had



**Figure 2.** Locations of 2024 YGS Bedrock Geology and Minerals Geology projects. Black outlines indicate bedrock mapping projects; red stars indicate mineral deposit studies. Stars labelled RIRG are reduced intrusion-related gold deposits, from west to east: Brewery Creek, RC, Steiner and Valley.



**Figure 3.** Head of YGS' Minerals Geology unit, Patrick Sack, visiting the Mount Hinton Project.

exposed the regionally significant Sixtymile-Pika fault. They sampled fault gouge from the pit and sent it to Kellett (GSC) for K-Ar illite dating. Sack, van Loon and Brubacher then spent a further three days visiting placer operations in the Klondike and Sixtymile areas, looking for additional exposures of fault gouge. Four additional samples were collected, including one from upper Dominion Creek that appears to be gouge material from the Australia Creek fault. This fault is interpreted as a mid-Cretaceous (ca. 100–110 Ma) low-angle detachment fault that exposes the Australia Mountain metamorphic core complex. The fault gouge samples are currently awaiting processing. If the samples yield viable K-Ar ages, further sampling may be pursued in 2025.

In October, Minerals Geology staff collaborated with GSC colleague Victoria Tschirhart to collect full tensor magnetic gradient data across the Revenue copper-molybdenum-gold porphyry on Triumph Gold's Mount Freegold property (Fig. 2). The project is a case study to assess the effectiveness of this low-impact exploration tool for porphyry systems. Four Minerals Geology staff (Sack, Naber, Brubacher and Skerget) assisted with field logistics and data collection. The results of this study will be published by the GSC. In 2025, the GSC/YGS team plans to spend several weeks at the Revenue deposit, logging and sampling core along sections through the deposit. Samples will be collected

by the GSC for physical rock property measurements, while YGS geologists will focus on characterizing alteration and mineralization. The latter study will add value to the GSC's magnetic gradiometry survey by calibrating the geophysical signals to lithologies and alteration, enabling its application to exploration for other porphyry deposits.

### Database updates

The Minerals Geology unit manages a number of spatial databases that contain minerals-related data, including MINFILE (mineral occurrence data), GARDEd (surficial geochemical data from assessment reports), and Drill Core (drill core data), to name a few. MINFILE data in particular are critical informants for mineral potential mapping, but keeping the data current has been challenging due to the database's text fields, which contain extensive narratives on regional geology

and exploration history. The database structure will be revised so it captures important tombstone data for each occurrence via picklists but excludes the narrative fields that are time-consuming to fill and challenging to search efficiently. Existing narratives will be retained, but they will be date stamped and will not be updated in the future. The structural changes to the database will occur between January and March 2025, then the existing data will be migrated to the new platform in the spring. Going forward, data will be captured as assessment reports are received to ensure the data reflect currently active projects. Exploration results that are not public will be retained behind a firewall until the assessment report is released. Information on work type will be displayed right away.

Another database of interest to clients is a physical rock properties database. Mappers at YGS systematically collect magnetic susceptibility data from outcrops, and staff record magnetic susceptibility and specific gravity measurements from hand samples as they are archived. Hand sample data currently reside in a spreadsheet, whereas field data are stored among individual bedrock mappers' datasets. Skerget has taken the lead on pulling the data and associated metadata (e.g., location, lithology, rock unit) together, and plans to release the data in 2025 as a geodatabase. Access to these data will allow end users to ground truth and model their geophysical survey data.

Updates to the Drill Core database were made following the donation of core from three of Yukon's most significant deposits. Hecla Mining donated core from two holes in the Keno Hill district (one hole each from the Birmingham and the Flame and Moth deposits). Snowline Gold donated core from two holes from their Valley deposit, and Banyan Gold donated core from a long hole that intersects ore from both the Powerline and Airstrip deposits. Descriptions of the Banyan and Snowline core are presented in the accompanying YEG volume (Parry et al., 2025 and Gamonal et al., 2025, respectively).

Finally, in fall 2024, YGS and the British Columbia Geological Survey (BCGS) initiated a project to scan and digitize data from assessment reports containing critical minerals data. This Cordillera-wide project is being funded by the GSC through their Critical Minerals and Geoscience Data Program. The Yukon's share of funding (\$250 000 over three years) will be used to convert scanned geochemical data from assessment reports into a digital format and capture it in the GARDEd database.

## Mineral potential maps for the Yukon

In December, YGS tendered a request for proposals to develop a series of commodity-specific mineral potential maps for the Yukon. The maps will be based on mineral systems and deposit models that are most relevant to the different geological domains across the Yukon (e.g., Selwyn basin, Intermontane terranes). A number of Yukon First Nations are asserting pressure to get land use planning underway, and a series of maps covering all of the Yukon will enable YGS to clip mineral potential maps to planning-area boundaries as needed, irrespective of the order in which planning progresses. A pan-Yukon approach will also ensure a consistent approach to mineral potential assessments, in contrast to previous planning exercises where maps were generated on an area-by-area basis and different methodologies were used in each planning area.

As of December 15, 2024, the contractor had not been identified. The intent of this project is to have the maps and supporting documentation complete by March 2026.

## Planning for future minerals projects

Staff of the Minerals Geology unit met with a few industry colleagues early in the fall of 2024 to discuss ideas for future minerals-related research. Project ideas

were broken into three categories: mineral deposit studies, desktop studies and regional geophysics.

### Mineral deposit studies

Project ideas identified at the workshop included characterizing VMS occurrences in the Insular terranes (deposits equivalent to Windy Craggy), examining Oligocene to Miocene porphyry systems in southwestern Yukon and targeted sampling for geochronology to document ages of mineralization. The latter study would support the capture of age data in MINFILE as well as allowing broad correlations of mineralization events at a regional scale.

Deposit-specific research was also discussed; such studies would integrate disciplines relevant to the deposit type (geochemistry, petrology, mineral paragenesis, structural analysis, stratigraphy, etc.). Research projects could include porphyry (e.g., Casino, Cash), VMS (e.g., Marg, Ice), SEDEX (e.g., Clear Lake) and carbonate-associated deposits (e.g., Mel), as well as ultramafic nickel-cobalt-copper systems (e.g., Nickel Shāw). Depending on the scope of the project, there is potential to support graduate student studies.

As part of a longer-term goal, the integration of the studies described above, combined with regional bedrock and isotopic data, would support the delineation of metallogenic domains.

### Desktop studies

In addition to field-based studies, several ideas for desktop studies were developed. These include case studies to characterize the soil expression of key deposit types in different surficial environments, ongoing mining of data from assessment reports (e.g., to add to the GARDEd database), and generating a spatial database of lidar data from assessment reports. It was also noted that efforts need to continue to grow the drill core collection and database, to capture deposit types that are not represented in the current collection.

### Geophysical surveys

Eleven years ago, YGS released a ZTEM survey covering part of the Selwyn basin (Condor Geophysics, 2013). The maps clearly highlight buried plutons and linear features, making it an excellent tool for identifying RIRG targets. The Technical Liaison Committee recommended expanding ZTEM coverage across this region to support exploration.

## Mineral industry liaison

In 2024, YGS staff visited 23 individual hard rock exploration properties, a number of them more than once, to track exploration progress over the field season (Fig. 4). Highlights of the 2024 exploration season are presented in this volume (Naber and Sack, 2025).

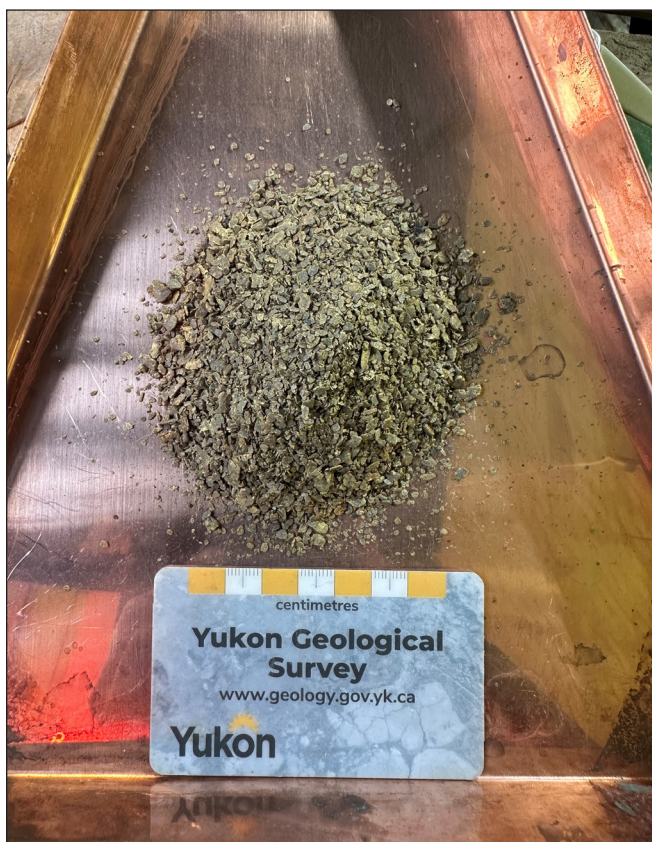
In addition to property visits, Sack organized two field trips for his staff during the summer: one to Coeur's Silvertip Project in northern BC and one multi-day trip to Banyan Gold's AurMac project, Sitka Gold's RC Gold project, Hecla Mining's Keno Hill Mine and Strategic Metal's Mount Hinton property. The purpose of the trips was threefold: to familiarize new staff with Yukon geology and mineral deposits, to demonstrate to staff what data should be collected on property visits, and to introduce staff to some of YGS' exploration industry clients. The Silvertip tour involved a colleague from the NWT Geological Survey and some industry geologists; the visit enabled discussions about the settings

and origin of carbonate replacement deposits in the northern Cordillera. The Keno-area trip involved YGS' two MSc students, giving them an opportunity to share their evolving ideas with staff, and for all participants to familiarize themselves with the geology in this part of the Yukon.

van Loon visited 95 placer operations in 2024 (Fig. 5). As of December 15, 2024, placer miners had produced about 85 799 crude ounces of gold worth C\$230M. This is the highest production since before the Klondike Gold Rush and it reflects the strong gold price. (Gold prices averaged C\$3351 per ounce between April 1 and November 1, 2024.) Details and highlights from the 2024 placer season are presented in this volume (van Loon, 2025). In November, van Loon organized the 2024 Placer Forum, which drew more than 120 attendees. The forum covered a variety of topics, including new developments in placer mining, regulatory updates, and information on wetlands mapping.



**Figure 4.** Yukon Geological Survey geologists on a property visit at Macmillan Pass.



**Figure 5.** Photo of gold recovered from Green Gulch, a tributary of Sulphur Creek in the Klondike.

## Yukon Mineral Exploration Program highlights

The Yukon Mineral Exploration Program (YMEP) allocated \$1.4M to support 43 early-stage exploration projects in 2024, including 14 placer projects and 29 hardrock projects. As of December 15, 2024, the program was on track to leverage an additional \$2.5M in private-sector spending. These statistics are preliminary and may change by the end of the fiscal year as some proponents have not yet completed their exploration programs.

Following input from YGS' Technical Liaison Committee in 2023, YGS made two modifications to the program for the 2024–25 fiscal year. First, the maximum grant for the hardrock Grassroots Module was increased from \$15 000 to \$25 000 to better reflect current costs associated with exploration work. Unlike the other modules, grassroots grants do not require matching or leveraged funds, although proponents are required to commit their time to their projects (i.e., they cannot draw a salary from the grant). Second, YGS eliminated the Focused Regional Module. This module has had

limited uptake in recent years, as many applicants favour the larger grants (up to \$50 000) available under the Target Evaluation Module. These changes led to a significant increase in the number of Grassroots applications; twelve Grassroots projects were funded in 2024, compared to an average of two per year over the previous decade.

More detailed summaries of YMEP highlights are presented in the hardrock and placer exploration overview papers in this volume (Naber and Sack, 2025 and van Loon, 2025, respectively).

## Bedrock mapping

Staff in YGS' Bedrock Geology unit had a relatively modest field season in 2024. Three of the four geologists (Tyler Ambrose, Rosie Cobbett and David Moynihan) recently completed multi-year mapping projects and are working to release final reports and maps on these studies. Ambrose and Cobbett initiated new mapping projects that are relatively narrow in scope (1–2 years), while Moynihan did some targeted sampling to resolve some outstanding tectonic questions in his recently completed map area. Schultz, who is new to YGS, started a new, multi-year sequence stratigraphic study in Selwyn basin.

## Kusawa project

Ambrose mapped rocks in the Kusawa Lake–Ibex Valley area in 2024 (Fig. 2). Bedrock geology here is dominated by the Paleocene Annie Ned batholith, which contains large rafts of amphibolite, metafelsic rocks, marble and older (Cretaceous) intrusive rocks. Although much of southwestern Yukon was mapped relatively recently by Israel and others (see metadata in Yukon Geological Survey, 2024), the Kusawa area itself has not been mapped since the 1950s (Wheeler, 1961). The supracrustal rocks preserved as rafts in the batholith are attributed to either parts of the Yukon-Tanana terrane (Snowcap assemblage) or the Takhini assemblage (Paleozoic of Stikinia; Hart, 1997) on the existing Yukon geology map (Gordey and Makepeace, 1999; Yukon Geological Survey, 2024), although these correlations have not been proven.

Fieldwork in 2024 revealed that a number of these rafts contain younger (Cretaceous) igneous and sedimentary units, and that rocks of the Takhini assemblage appear to be restricted to the Ibex Valley area. The upper Paleozoic Takhini assemblage rocks are variably deformed and metamorphosed and, in places, are

hard to distinguish from Upper Triassic Lewes River Group volcanic rocks of similar composition. Samples were collected for geochemical and geochronological analyses and the data will be used to determine the affinity of rocks in the study area.

### Misty Lake project

In 2024, Cobbett mapped in the Misty Lake area, at the eastern end of the Rackla belt (Fig. 2). Sedimentary rocks in the area represent two depositional settings: deep-water siltstone and mudstone of upper Proterozoic to lower Cambrian age (Narchilla Formation of the Hyland Group) occur in the southwestern part of the map area, and a shallow water package of limestone and siliciclastic rocks of lower Cambrian to late Devonian age (from oldest to youngest: Vampire, Sekwi and Rabbitkettle formations, and Earn Group) occur to the northeast. Previous mapping by Cecile (2000) interpreted a northeast-vergent thrust fault separating the deep water and shallow water rocks. Mapping at a more detailed scale found no evidence for the fault. Cobbett has re-interpreted the contact between the Narchilla Formation (uppermost part of the deep-water section) and the Vampire and Sekwi formations (lower part of the shallow water section) to be a facies transition (Fig. 6).

### Macmillan Pass stratigraphy

Schultz initiated a multi-year project studying shale in Selwyn basin in 2024. The aim of the project is to document the evolution of deep-water depositional systems in the basin and develop a sequence

stratigraphic framework using sedimentological, stratigraphic and geochemical data. Syndepositional and diagenetic textures are common features of sediment-hosted Pb-Zn occurrences in Selwyn basin, highlighting the link between deposition and mineralization and underlining the need to understand the depositional setting.

Fieldwork in 2024 focused on Devonian Portrait Lake Formation strata in drill core and outcrop on Fireweed Metal’s claims at their Macpass project (Fig. 2). Schultz collected samples for XRF, total organic carbon and  $\delta^{13}C$  isotope studies to distinguish the geochemical signatures of systems tracts, sequences and stratigraphic surfaces.

### Other mapping projects

Ambrose completed mapping in the north Rackla area in 2023 and has been working on a final map and report for the project. Mapping in this area has led to some changes that will be incorporated into the next iteration of the Yukon bedrock geology compilation map. Ambrose also spent some time in the Ogilvie Mountains with Stanford University researcher Erik Sperling and his PhD student. They are studying the stratigraphy of the Proterozoic Pinguicula Group, and the collaboration enabled Ambrose to compare these rocks with their stratigraphic equivalents in the north Rackla area.

Moynihan made progress on a bulletin for the Upper Hyland area over the last year. He also carried out some follow-up fieldwork in the Teslin-Quiet Lake area where he completed mapping in 2023. Moynihan’s

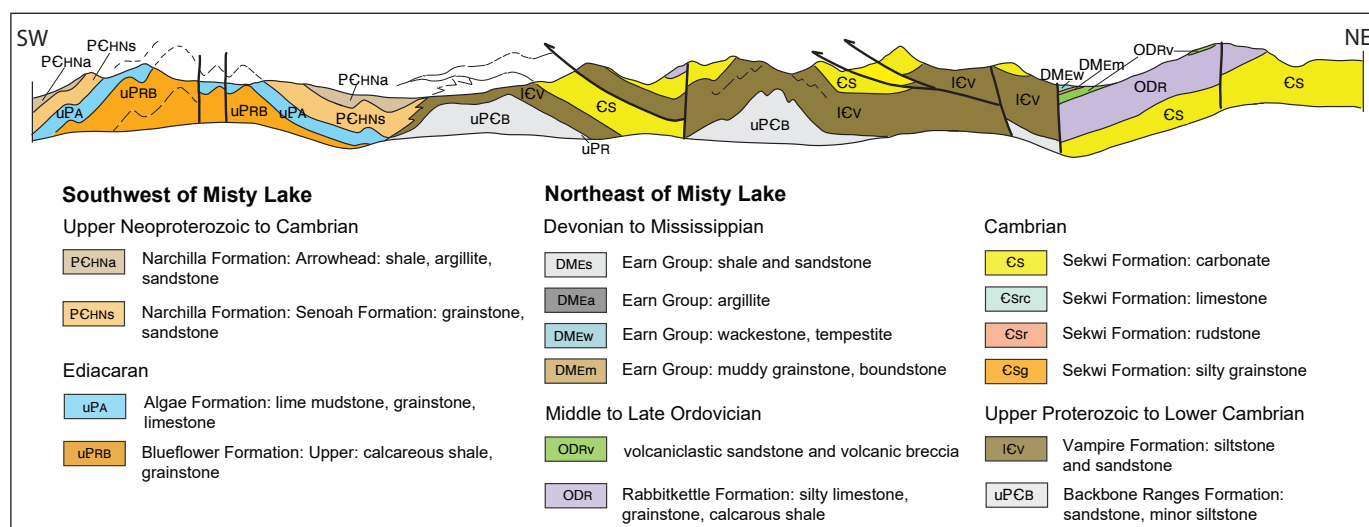


Figure 6. Cross section of the Misty Lake area, based on 2024 mapping by Rosie Cobbett. Deep-water sedimentary rocks in the southwestern part of the map area are interpreted as transitional to shallow-water rocks to the northwest.

work in the latter area has highlighted evidence for Permian-aged tectonism. For example, a narrow belt of garnet amphibolites and eclogites is interpreted as a subduction-related unit separating the Yukon-Tanana and Slide Mountain terranes. Several of these rocks were sampled in 2024 to confirm their correlation with the Permian-aged amphibolite-eclogite belt, and therefore with the terrane boundary.

## Planning for future bedrock projects

Bedrock Geology staff held a workshop in spring, 2024 to identify gaps in modern map coverage and compile unresolved geological questions. Based on these discussions they developed a list of ideas for future projects. The projects include a mix of systematic regional mapping and targeted thematic studies. Thirteen project ideas were identified in Selwyn basin (eight mapping projects and five thematic studies), eight projects in the Intermontane region (five mapping and three thematic), eight in southwestern Yukon (four mapping and four thematic), and five in North Yukon (three mapping and two thematic).

Broad descriptions of the project ideas are outlined below by region (Selwyn basin, Intermontane region, etc.) and some of the key questions that need to be addressed are briefly described. Figure 7 indicates the footprints of the map areas and most of the thematic study areas, except those that are regional in extent.

### Selwyn basin projects

The mapping projects identified in Selwyn basin (numbered SB1 to SB8 on Fig. 7) are, for the most part, centred on continental margin sequences northeast of the Tintina fault and south of the Dawson fault. They represent areas where stratigraphic correlations can be improved and questions around the timing and kinematics of faults can be resolved.

Areas SB1 and SB2 (Fortin Lake–Canol Road and Conglomerate Creek, respectively) are located adjacent to the Cassiar–McEvoy platform where the nature of the platform-to-basin transition and the origin of the platform are poorly understood. In SB4 (Tasin Range–Plata), where rocks of the Rackla and Hyland groups interfinger, new mapping could answer questions about the relationship between these units. Volcanic rocks of unknown age and origin have been documented in SB5 (Southern Mayo–Lansing) and SB6 (Rae Creek); these rocks present opportunities to pin ages to stratigraphy

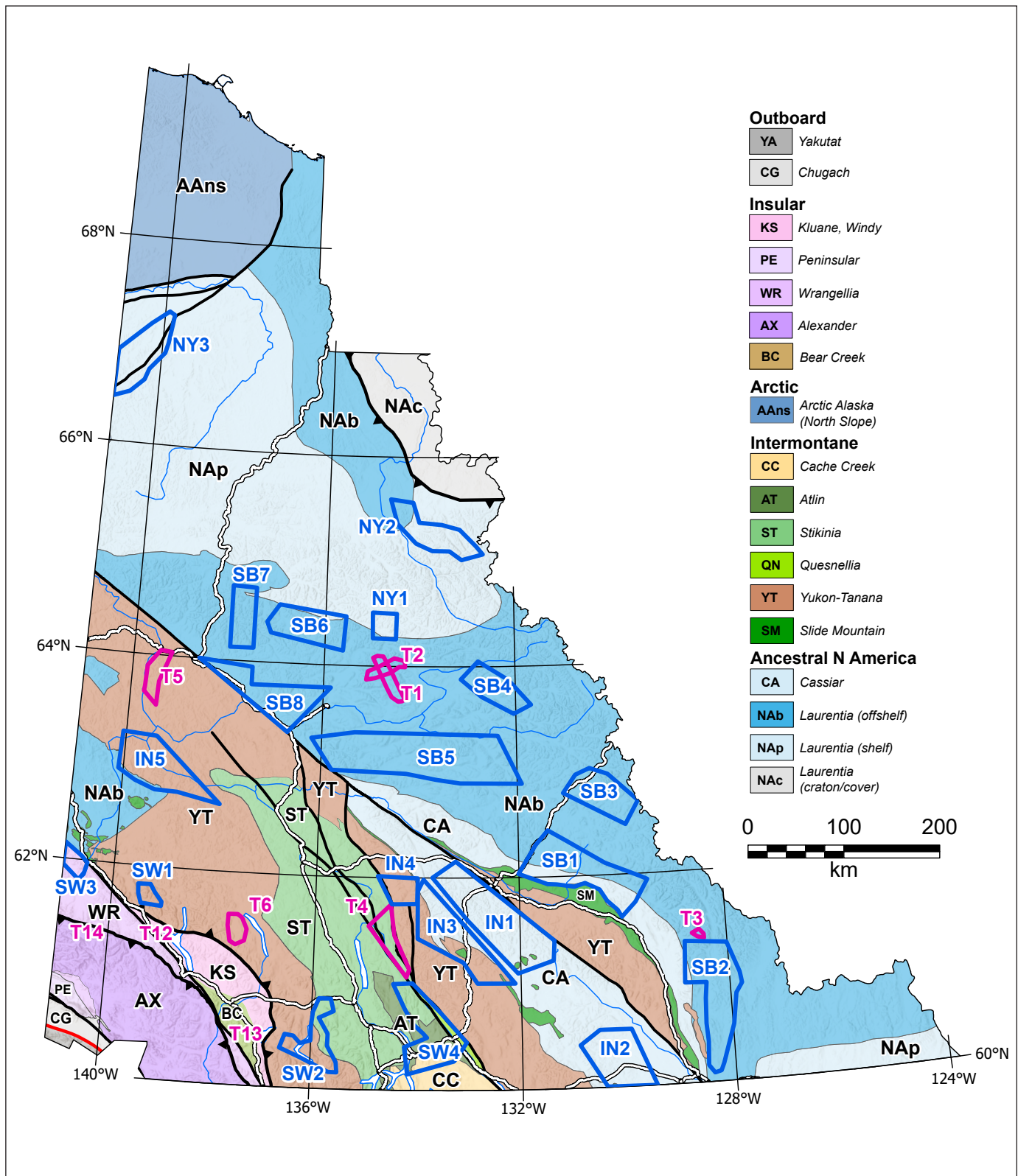
and provide insights into the geodynamic setting of the crust at the time(s) of volcanism. The enigmatic mid-Paleozoic Nogold succession is exposed in SB5; mapping here could determine where these clastic rocks fit into the regional stratigraphy. Sedimentary rocks in SB8 (northeast McQuesten; Bostock, 1964) have all been assigned to the Hyland Group, whereas more recent mapping in adjacent areas (e.g., Murphy et al., 1993; Murphy and Heon, 1994, 1995; Hunt et al., 1996) suggests other units may be present.

Several of the Selwyn basin map areas straddle the Dawson, Tombstone and/or Robert Service thrust faults in regions where they are not well documented. For example, the southeastern extent of the Robert Service is unknown: does it die out, or wrap around the Russell Range? New mapping in SB5 could help resolve this. Farther west in the basin, SB6 represents a gap between the McQuesten Lake (Skipton, 2024) and Hart River areas (Abbott, 1997), and SB7 is a gap between Hart River and the Ogilvie Mountains (Thompson, 1995). The three faults have been traced through these two gaps but have not been mapped in detail in these areas. To the southeast, ZTEM data (Condor Geophysics, 2013) highlight some major resistivity contrasts in SB3 (Itsi Lake–Prevost River), including a linear feature that may be an extension of the dextral Logan fault. New mapping here could test this possibility.

Beyond systematic mapping, several thematic studies have been identified for Selwyn basin. Two such studies were identified northeast of Keno Hill (Fig. 7). Project T1 (Roop Lakes) would examine a metamorphic culmination in the area and determine whether it represents local hornfels conditions (related to a buried pluton) or is a regional thermal high. Project T2 (Marg to Keno) would focus on volcanic rocks across the area to determine whether they are Devonian Earn Group rocks or part of the recently identified Permian volcanic sequence at Keno Hill (Scanlan et al., 2024).

Two key questions are associated with T3 (Tyers klippe in the Hyland area; Fig. 7). The first question relates to a unit of retrograded serpentinite that is interpreted as a klippe of uncertain affinity (oceanic crust?). The second question is whether the fault bounding the klippe is the Inconnu fault, and if so, whether the fault is folded, or has wedge-shaped geometry.

Two thematic studies proposed for the Selwyn basin are more regional in extent and thus not depicted on Figure 7. The first is a study of the contact metamorphic aureoles around Cretaceous plutons (T10) to constrain emplacement depths, and the second is a regional thermometry study of rocks across the basin (T11).



**Figure 7.** Map outlining footprints of proposed mapping projects and thematic studies from the 2024 Bedrock Geology unit's planning workshop. Areas outlined in blue are proposed for new mapping; areas outlined in red are locations of thematic studies. IN: Intermontane region, SB: Selwyn basin, SW: Southwestern Yukon, NY: North Yukon, T: thematic studies. The footprints for five thematic studies (T7 to T11) are not shown on the map as they are regional in scale.

## Intermontane region projects

Future mapping projects identified in the intermontane region focus primarily on the Yukon-Tanana and Cassiar terranes, and one project is defined in the Dawson Range (Fig. 7).

Two map areas (IN1 and IN2) are situated within the Cassiar terrane. Mapping area IN1 (St. Cyr Range–Pelly Mountains) would focus on understanding the nature and significance of the St. Cyr unit, delineating the McNeil klippe, and comparing Earm-equivalent rocks here to those in Selwyn basin. In IN2 (Rancheria River), the reason for the anomalous thickness of the Rosella Formation carbonate section is unclear: is this a relic of regional-scale mapping, or did depositional conditions vary along the length of the platform? Mapping area IN3 (southwest Quiet Lake) straddles the southwestern margin of the Cassiar platform and the boundaries between Cassiar, Yukon-Tanana and Slide Mountain terranes. New mapping could help to establish the affinity of rocks below the St. Cyr klippe (Cassiar terrane?), characterize igneous rocks in the area (which are more widespread than depicted on existing maps), and determine the relationship between eclogites in the St. Cyr klippe and Tower Peak ultramafic rocks. Mapping area IN4 (northeast Laberge-Lokken) represents a gap in mapping between the Livingstone–Teraktu Creek and Glenlyon areas and straddles the boundaries between the Cassiar, Yukon-Tanana and Slide Mountain terranes.

The fifth map area in the Intermontane region is IN5 (Dawson Range–White Gold). The Mineral Deposit Research Unit (MDRU) at the University of British Columbia recently led a multi-year metallogenic study in the region that combined mapping, property-scale mineral deposit studies, petrologic research and new geochronology. The study advanced knowledge significantly (e.g., Allan et al., 2013; Colpron et al., 2022); however, a number of questions persist. For example, the Yukon River and Moose Creek faults are still not well understood, and Permian rocks in the area are incorrectly mapped.

Three thematic studies were defined for the Intermontane region at the bedrock planning workshop. In the Semenof Hills area (T4) relationships between Yukon-Tanana, Stikinia and Slide Mountain terranes are unclear. New age data and petrological studies would help resolve these questions. In the Klondike (T5), the timing of metamorphism and deformation has been a long-standing question, and, as a more regional study, the geodynamic setting of Late Cretaceous to Cenozoic volcanism and sedimentation bears examination (T9).

The latter study is regional in extent and is not indicated in Figure 7.

## Southwestern Yukon projects

Southwestern Yukon refers to the area bound by the Dawson Range and Teslin fault to the north and northeast, respectively, and the British Columbia and Alaska borders to the south and west (Fig. 7). It includes rocks of Cache Creek, Atlin, Stikinia and Yukon-Tanana terranes, as well as the Insular terranes (Kluane Schist, Bear Creek, Alexander and Wrangellia).

Four mapping projects have been identified in southwestern Yukon, one of which, SW2 (Kusawa area), was initiated in 2024 (see above). East of Kusawa, SW4 (Delayee–Squanga lakes to Teslin River) straddles the north end of Cache Creek and Atlin terranes and parts of Whitehorse trough. Mapping here could resolve the relationship between clastic rocks in the Whitehorse trough (Laberge Group) and those in Cache Creek. The study could also answer questions about the nature of the ultramafic complexes east of Tagish and Marsh lakes.

In SW1 (Tincup Lake), a thick section of carbonate rocks and associated greenstones has been tentatively attributed to the Yukon-Tanana terrane, but the unit's affinity has not been tested by dating or geochemical analysis. Although mapping carried out here in 2008 has been incorporated into the Yukon bedrock geology compilation (Yukon Geological Survey, 2024), a standalone map has not been released. New mapping would resolve outstanding questions and catalyze the release of the map. Moving across the Denali fault, SW3 (Mint area) represents a gap in mapping in this part of Wrangellia. New mapping here would provide an opportunity to document intrusion-related mineral occurrences, which include both Miocene porphyries and mid-Cretaceous skarns.

Four thematic studies have been identified in southwestern Yukon. The first project, T6 (Sekelmun–Aishihik) identifies questions about the origin of a thick carbonate succession and its relationship to Yukon-Tanana terrane. The area was the focus of an MSc thesis supported as part of a joint YGS-GSC mapping project in 2010. A review of field notes and some targeted field sampling could address the question. Projects T12, T13 and T14 define questions about the timing and kinematics of Denali and Duke River faults in the Quill Creek, Bear Creek and Duke River areas, respectively (Fig. 7). The proposed studies include work to better resolve map units in these structurally complex areas.

## North Yukon projects

New field projects in North Yukon are located on platform rocks of ancestral North America (Fig. 7).

In the Blende area (NY1), new mapping would focus on Bouvette Formation stratigraphy, examining the distribution of facies and better defining ages. There are also questions about the age and origin of mafic rocks in this region: specifically, whether they are Ordovician volcanic rocks, or older (Mesoproterozoic) Hart River sills. Project NY2 (Knorr Range) exposes Neoproterozoic siliciclastic and carbonate rocks of the Mackenzie Mountains and Windermere supergroups. Recent mapping in the Northwest Territories led to revisions to stratigraphy and demonstrated that rocks of the Coates Lake Group occur over a much larger area than previously documented (Fallas, 2020). New mapping in NY2 would extend Fallas' revisions westward into the Yukon. The seismically active Richardson fault array occurs in this area and mapping may help resolve the nature of deformation in this region and how these structures relate to folds and thrusts to the south in Selwyn basin.

The northernmost project, NY3 (Keele Range) was last mapped in the 1960s as part of GSC's Operation Porcupine (Norris, 1979). The stratigraphic assignment of Proterozoic sedimentary rocks in this area is largely unknown, and the mapped geology does not match with units shown on the Alaska map to the west.

At a more regional scale, two thematic studies were proposed. The first, T7, is primarily a desktop exercise compiling and revising Bouvette Formation stratigraphy. The second, T8, would characterize Permian units across the Yukon stable block and their relationships to Permian rocks along the Dawson fault and into Selwyn basin.

The above projects will require a decade or more to complete, and to date they have not been prioritized. Decisions about which projects should proceed first will depend on a number of factors, including opportunities to collaborate and leverage resources, industry needs, support from First Nations and internal capacity.

## Geothermal energy research

A compilation of geothermal-related data generated by Sarah Sternbergh was updated and revised by Maurice Colpron. The compilation includes a variety of publicly available data and previously unreleased geothermal studies that were commissioned by the Yukon Energy

Corporation. These include water chemistry of warm springs, temperature gradients measured from petroleum and mineral exploration wells, observations from winter open-water surveys, and data generated as part of the YGS geothermal research program (community-focused geophysical surveys, boreholes and radiogenic heat calculations). The data have been released as a series of layers online (Yukon Geothermal dataset: <https://data.geology.gov.yk.ca/Compilation/42#InfoTab>), and a report providing more background on each dataset is currently undergoing final edits and is expected to be released early in 2025.

In early 2024, YGS was approached by Government of Yukon's Department of Highways and Public Works (HPW) to collaborate on a study to assess geothermal potential in the City of Whitehorse. The Department of Highways and Public Works is exploring opportunities to reduce carbon emissions from heating public buildings in the city and one possible heat source they are considering is geothermal energy. Bedrock geology in the Porter Creek–Crestview area has striking similarities to that of the Takhini Hot Springs, including a Cenozoic granitoid heat source and permeable Triassic carbonate rocks. Colpron has been leading this project, which includes new gravity and seismic data that will enable modelling of depth to bedrock and construction of a 3D geological model for the northern part of the City of Whitehorse. A final report will be released in spring 2025.

## Geohazards and surficial geology studies

Similar to the Minerals Geology unit, YGS' Surficial Geology unit experienced significant staff changes in 2024. Staffing to backfill all positions is not yet complete.

The Surficial Geology unit wrapped up work on several community-scale geohazards studies in 2024 and expects to release surficial geology and geohazards publications for four communities in 2025: Haines Junction, Whitehorse, Beaver Creek and Teslin. At the Yukon Chamber of Mines' Geoscience Forum in November, Lipovsky presented draft geohazards maps for the Haines Junction area that were derived from her previously published surficial geology map (Lipovsky, 2024). She is currently finalizing these maps and accompanying report and is working on geohazards maps for the greater Whitehorse area. Cronmiller is working on a report for Beaver Creek to accompany the surficial geology and geohazards maps released

in 2024 (Cronmiller, 2024) and is finalizing maps and an accompanying report for Teslin.

Before leaving YGS, Kennedy completed edits on a surficial geology report for the Burwash Uplands area. The draft report will undergo editing and is targeted for release in spring 2025.

In June, Whitehorse hosted the International Conference on Permafrost. The event was an excellent opportunity to show the international research community some of the work being done by YGS. Staff participated in the technical program and co-led field trips to the Robert Service Way landslide (Lipovsky) and Klondike and Dempster Highways area (Cronmiller).

## Fieldwork

Surficial Geology staff had a very busy field season in 2024. Painter visited borehole sites in communities and upgraded instrumentation in many of them (Fig. 8). Stewart-Jones and Painter examined known problem areas along the Dempster, Alaska, North Klondike and Robert Campbell highways to assess geohazards and to support efforts by HPW to develop a Yukon Highway Geohazard Management Program. The program is being designed to monitor, assess and incorporate geohazard information into transportation planning. Cronmiller continued work monitoring and studying landslides along the North Klondike Highway. In 2024, he started a novel study, examining evidence for ground deformation preserved in trees on slow moving landslides. The results may yield a means to pin ages on slope failure events. In August, Lipovsky and Painter supported work by Government of Yukon's Water Resource Branch (WRB) at the Eagle Gold Mine site. The WRB installed a number of wells below the failed heap leach pad to enable groundwater monitoring and capture, and YGS logged the wells and documented permafrost.

Beyond hazard-related work, Cronmiller and Lipovsky initiated a new study to determine the extent and timing of glacial lakes in southern Yukon. The work began with some sampling of Glacial Lake Champagne and Neoglacial Lake Asek shorelines near Haines Junction; the samples were collected for optically stimulated luminescence (OSL) dating. If analyses are successful, the study will expand eastward to involve OSL sampling in the Southern Lakes area. The product currently envisioned is a map, or series of maps, documenting the formation and drainage histories of lakes in the region following the last ice retreat.



**Figure 8.** Moya Painter and Emilie Stewart-Jones drilling a borehole to monitor permafrost in Ross River.

## Collaborations with universities

Surficial Geology staff are providing support to and collaborating with several university researchers. In the Klune region, Lipovsky assisted Catalina Pino-Rivas (Simon Fraser University) in a study of earthquake-induced landslides in the area. She shared data to assist with project planning and accompanied Pino-Rivas on reconnaissance fieldwork in the summer. Lipovsky also collaborated with John Stix (McGill University), whose research team is using drones to document and assess hazards in the region between Beaver Creek and the White River (see Roman et al. [2025] in the accompanying volume). Cronmiller is collaborating with Stephan Gruber (Carleton University) to characterize landslides in the Klondike region. Gruber is modelling permafrost behaviour to enable better predictions of how deep-seated and shallow (active layer detachment) slides may behave over time as the ground warms. Cronmiller and Lipovsky are also working with University of Calgary researcher Jan Dettmer. Dettmer is a seismologist, and he and his research team are using passive seismic surveys to identify areas where seismic risk may increase in the future as frozen ground thaws (unconsolidated sediments are susceptible to more intense shaking than rock or frozen sediments).

## Data management

The locations of 68 boreholes installed by Yukon University were captured by Painter in the Yukon Permafrost Database in 2024 (<https://service.yukon.ca/permafrost/>). She also acquired data from Newmont Corporation on their Coffee property and put out a wide appeal to exploration companies for other property-scale borehole datasets to capture in the Yukon database.

To support the Geohazard Management Program, Stewart-Jones built a highways geohazard database, which she and Painter have begun populating. Priority sections of interest include parts of the North Klondike Highway near Dawson, between Pelly Crossing and Stewart Crossing, as well as areas along the Dempster and Alaska highways. This database is being developed primarily for use by HPW personnel, but once it is complete, YGS will examine ways to make portions of the data publicly accessible.

The Yukon surficial geology compilation map was updated in 2024 with the incorporation of new mapping in the Macmillan Pass area by consultant Derek Turner. Turner's map was originally produced for Fireweed Metals, but the company offered to share the map with YGS for public release. This generous offer is gratefully acknowledged here.

## Planning for future geohazards projects

In April, Surficial Geology staff held a half-day workshop to identify future needs for geohazard studies. The discussion focused primarily on areas with known hazards and ongoing commitments (such as updates to community hazard maps funded under Yukon government's Our Clean Future initiative).

Although the Surficial Geology group is also responsible for surficial mapping, the discussion did not include ideas for future mapping projects, since staff are heavily committed to geohazards research for the foreseeable future. Once a new Project Geologist is on board, the group will look at gaps in surficial coverage and scope new project ideas for consideration.

## Updates to community geohazards maps

Under phase two of Our Clean Future funding, YGS has committed to examine existing community geohazards maps and assess their currency. In some cases,

previously identified hazards require a reassessment, as permafrost thawing has advanced and changed ground conditions. In the near term, Old Crow and Mayo have been identified as priorities for updating. This work may involve installation of monitoring equipment to track ground subsidence and/or permafrost temperatures. In the next five years or so, the intent is to revisit all communities to assess the status of known hazards and document new ones.

Since 2022, WRB has been developing flood maps for communities. Beyond identifying areas that are susceptible to flooding, the maps offer insights into areas where bank erosion may accelerate in response to high water. There are likely opportunities for YGS to collaborate with WRB to develop more general hazard maps that capture a variety of natural hazard information, including fluvial hazards.

## Site specific hazards studies

Yukon Parks recently reached out to YGS to request assistance assessing landslide risks along some of its park trails. They plan to upgrade existing trails in Tombstone Territorial Park in the near future and want to avoid areas that pose a risk to hikers. The YGS has agreed to support Yukon Parks and has proposed generating a surficial geology map of Tombstone Territorial Park that documents not just hazards, but the distribution of surficial materials and glacial limits within the park. The park is a popular destination for both Yukoners and tourists, many of whom seek information about the landscape features they see.

Another area of concern is a landslide above the South Klondike Highway near Conrad Campground. The steep slopes on the west side of the lake pose a significant hazard along both Tutshi Lake and the west arm of Tagish Lake; in July, a slide at the south end of Tutshi Lake closed the highway for several days (Fig. 9).

Site-specific landslide hazards are widespread in the Yukon, and during the next year or two YGS needs to develop a system for assessing risk and assigning appropriate mitigation measures, such as collecting lidar data at appropriate intervals to support change detection analysis or—in cases where risk exceeds acceptable thresholds—installing instruments to monitor slopes in real time. The YGS has met with Government of Yukon's Emergency Measures Organization and had initial discussions about risk management.



**Figure 9.** Photo (view to north) of landslide on the South Klondike Highway by Tutshi Lake.

### Yukon wide geohazards projects

As YGS collects more site-specific data on landslides, the need for a Yukon-wide landslide susceptibility map is becoming evident. Stewart-Jones' work over the next year will identify key areas of concern along highway corridors. Updating of community geohazards maps will identify sites that require regular, or even continuous monitoring in and around communities. It is expected that within a few years, YGS will be able to develop a landslide susceptibility map that can be shared online and updated on a regular basis.

Another Yukon-wide database that has been identified as a priority is the highways geohazards database, which has been initiated by Stewart-Jones. Work to populate it will occupy a significant amount of her time in the coming year, and it will need to be maintained once initial data have been captured. This database includes landslides, as well as other geohazards such as areas underlain by ice-rich permafrost and sites prone to erosion.

### Outreach and engagement

As in previous years, YGS was actively involved in geoscience education activities during the year. Amanda O'Connor and Leyla Weston organized field trips and classroom visits for 25 classes in the City of Whitehorse and visited schools in Ross River, Faro and

Teslin. They also organized educational activities for students from Kluane Lake School at the Kluane Lake Research Centre. They participated in events organized and hosted by communities, including a 'Confluence' in Carcross (a science research expo organized by Carcross Tagish First Nation), walking tours of Miles Canyon (run by the Yukon Conservation Society), Family Day at the Yukon Chamber of Mines' Yukon Geoscience Forum (Fig. 10), and Yukon's Science, Technology, Engineering and Mathematics (STEM) Expo science fair, to name a few.

The YGS partners with Yukon Parks and Parks Canada each summer to run interpretive geology hikes in Tombstone Territorial Park and Kluane National Park, respectively. The annual Weekend on the Rocks has become a major event for Tombstone Territorial Park, attracting more than 50 tourists each year.

New in 2024 was a partnership with Casino Mining Corporation and Alkan Air to host a 'Yukon Youth Career Engagement Day'. High school students from grades 10 to 12 from Whitehorse and the surrounding communities were invited to participate in a day-long event to learn about career opportunities in geology, aviation and the mining industry. Highlights of the day included a short flight over deposits of the Whitehorse copper belt, followed by a field trip to the copper belt led by YGS.



**Figure 10.** Left to right: Amanda O'Connor, Moya Painter and Leyla Weston with YGS' Augmented Reality Sandbox at Yukon Chamber of Mines' Family Day event in November.

Highlights from some of YGS' outreach events are posted on social media. These posts commonly attract requests from teachers and recreational organizations for YGS-organized tours and events. The 2024 Weekend on the Rocks video shows some of the activities that were offered at Tombstone Territorial Park in August (<https://www.facebook.com/reel/1183575862926556>). Another video posted in August was put together by a YGS field assistant who spent time in the field with GSC geologist Nathan Cleven. Cleven was mapping an area within Teslin Tlingit Council's (TTC) Traditional Territory, and the field assistant, a TTC citizen, created a Tlingit language video documenting her experiences mapping and exploring in a remote part of her territory (<https://www.facebook.com/YukonGeologicalSurvey/videos/1955205288251467>).

In addition to activities designed to showcase Yukon geology, YGS spent time engaging with Yukon First Nation governments regarding survey activities: discussing plans for future projects, seeking input from First Nation government staff on the impacts and timing of proposed fieldwork, and sharing results of current and recently completed work. In 2023, YGS initiated a pilot project with the GSC to coordinate engagement with First Nations governments. The intent is to reduce engagement fatigue by jointly communicating both surveys' proposed activities in each Yukon First Nation Traditional Territory. The pilot project was started because the two surveys do similar types of work, which created confusion in some communities about the difference between the two survey organizations. The YGS and GSC held joint meetings in 2024 with Kwanlin Dün, Carcross Tagish, Tr'ondëk Hwëch'in and Vuntut Gwitchin First Nations and Teslin Tlingit Council. Highlights of YGS' outreach activities for 2024 are presented in this volume (O'Connor and Weston, 2025).

## Summary

The YGS carried out its 2024 program against a backdrop of staff turnover and the as-yet unclear environmental and economic impacts of the heap leach failure at Eagle Gold Mine. Near-term challenges for YGS include orienting new staff to Yukon geology and Yukon government culture and managing a budget that is likely to be affected by the costs of remediation at Eagle Gold Mine. In spite of these uncertainties, there is room for optimism about YGS' future. The new staff who joined the survey in 2024 are excellent fits; they are filling capacity gaps and establishing their own research niches.

On a personal note, this will be my last YGS Overview, as I will be retiring in March 2025. Compiling an annual summary of YGS activities has helped keep me in touch with the breadth and depth of work that goes on at YGS and allowed me to track how the survey has evolved and grown over the past 17 years. The foundational work of mapping geology and resolving basic questions related to tectonics, stratigraphy, metallogeny and glacial history (to name a few) will, I hope, continue into the future. The knowledge generated from this work is what underpins the survey's reputation for excellence. The growth areas—geohazards work, geoscience education, and engagement with Yukon First Nations—are all responses to changing societal needs. Climate change is driving the geohazards research, and as countries push to reduce emissions, public awareness of critical minerals and geothermal energy is becoming increasingly important. In a society that relies heavily on social media to inform itself, YGS has a valuable role to play in improving scientific literacy. Finally, as more clarity emerges around how natural scientists can advance reconciliation (Wong et al., 2020; Signal Fire: Natural Science and Reconciliation in Canada: <https://www.signalfirefilm.ca>), YGS' path to establishing trust-based relationships with Yukon First Nations is becoming clearer. I see a bright future for YGS, and I'll miss being part of it.

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# Yukon placer mining 2024 development and exploration overview

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van Loon, S., 2025. Yukon placer mining 2024 development and exploration overview. In: Yukon Exploration and Geology Overview 2024, L.H. Weston, A. Stuart, S.K. Schultz, A.D. Brubacher and D.C. Cronmiller (eds.), Yukon Geological Survey, p. 21–35.

## Introduction

The Yukon placer industry has continued to thrive amid strong and rising gold prices. There was a slight increase in activity this past season. A total of 156 operations were active across the Yukon, which was up from 147 in 2023. The Dawson Mining District remained most active, and included 70% of operations in the territory, while the Mayo and Whitehorse districts accounted for 21 and 9%, respectively. A combination of strengthening gold prices, favourable weather, and increased activity resulted in record placer revenue from April 1 to November 1, 2024. The reported placer production in 2024 of 85 799 crude ounces yielded a production revenue of C\$230 million, which marks the highest in Yukon's placer gold production history since 1886. This highlights the industry's resilience and growth, bolstered by positive economic conditions and advancements in mining technology.

## Climate for mining

The fall season of 2023 in the Yukon was marked by warm temperatures and high precipitation in the form of rain that extended well into early winter. Temperatures stayed above average until January, when colder conditions finally set in. February and March 2024 brought fluctuating temperatures that averaged out to near-normal levels. The southern and central regions recorded above-average precipitation, ranging from 90 to 120% of normal. In contrast, northern regions, including the Dawson area, experienced snowfall between 120 and 150% of normal (Government of Yukon, 2024a). This led to widely varied snowpack conditions across the territory. Old Crow in the north set new records for snow depth in 2023–2024, while in May 2024, central Yukon reported snowpacks that were significantly below average (Government of Yukon, 2024b).

A return to typical seasonal temperatures occurred in the Dawson area in April 2024, whereby daily maximums reached 9.9°C and the mean temperature was 2.3°C. Clear skies and cool overnight lows moderated these conditions. Such climate variability, along with substantial snowpack accumulation in

certain regions, impacted mining operations during the early spring months. By May 2024, the Dawson area experienced typical spring weather, and daytime highs averaged 16.1°C, allowing some mining operations to commence sluicing by the May long weekend.

Throughout the summer months (July and August 2024), temperatures were warmer on average in Dawson, and the mean temperature was 15.4°C compared to the normal mean temperature of 14.0°C (G. Bramwell, pers. comm., 2024). Precipitation was also at near-normal levels, recording a total of 117 mm in Dawson and 102 mm in Whitehorse. Sluicing operations benefitted from favourable conditions extending into October, as daytime highs did not fall below 0°C until October 15th.

## Gold production summary

Favourable gold prices and climate conditions led to strong gold production, resulting in a 16% increase from 2023. From April 1 to November 1, 2024, reported placer gold production totalled 85 799 crude ounces, marking the fourth time production has exceeded

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80 000 crude ounces in the last twenty years. The total placer production revenue from April 1 to November 1, 2024, amounted to C\$230M with an average gold price of C\$3351 per ounce (Fig. 1).

The Yukon is divided into 11 placer-mining areas: Klondike, Indian River, Lower Stewart/South Klondike, West Yukon, Clear Creek/South McQuesten, Mayo/Duncan, Dawson Range, Livingstone, Kluane/Gladstone/Kimberly, Whitehorse South, and Watson/Hyland (Fig. 2). The five leading areas for the 2024 season were the Indian River (39 907 crude ounces), Klondike River (14 725 crude ounces), West Yukon (12 645 crude ounces), Lower Stewart (11 173 crude ounces), and Mayo (3972 crude ounces). The Indian River area leads in production and contributes 47% of the Yukon's total placer revenue. This is primarily due to the high concentration of active operations, which include some of the largest placer mines in the Yukon. Figure 3 illustrates the distribution of placer gold production from each placer area, based on reported royalties as of November 1, 2024. Placer gold production values

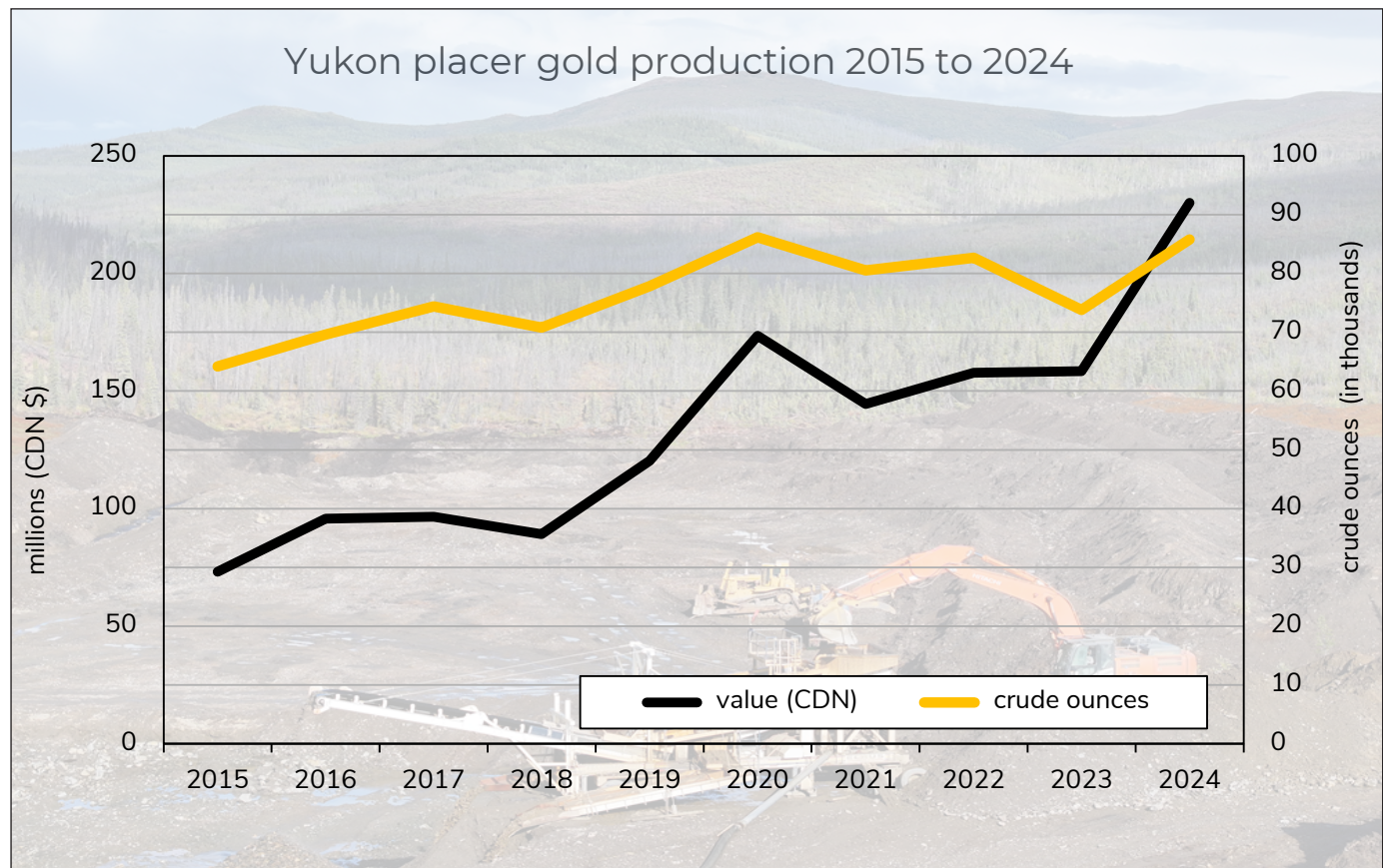
are sourced from royalty data collected by the Yukon Mining Recorders' offices.

The three highest-producing drainages in the Yukon are Indian River reporting 9543 crude ounces (Indian River placer area), Sixty Mile River reporting 9209 crude ounces (West Yukon placer area), and Dominion Creek reporting 7928 crude ounces (Indian River placer area). The number of active operations remained consistent this past year and totalled 156. Of these, 70% are located in the Dawson Mining District, 21% in the Mayo Mining District, and 9% in the Whitehorse Mining District.

## Development highlights

### Klondike River area

There was a 28% increase in production from 2023 in the Klondike River area, which includes the prominent tributaries of Bonanza and Hunker creeks. Despite a



**Figure 1.** Yukon placer gold production in Canadian dollars over the past ten years including most recent production from April 1 to November 1, 2024. The chart displays crude ounces produced and the total value.

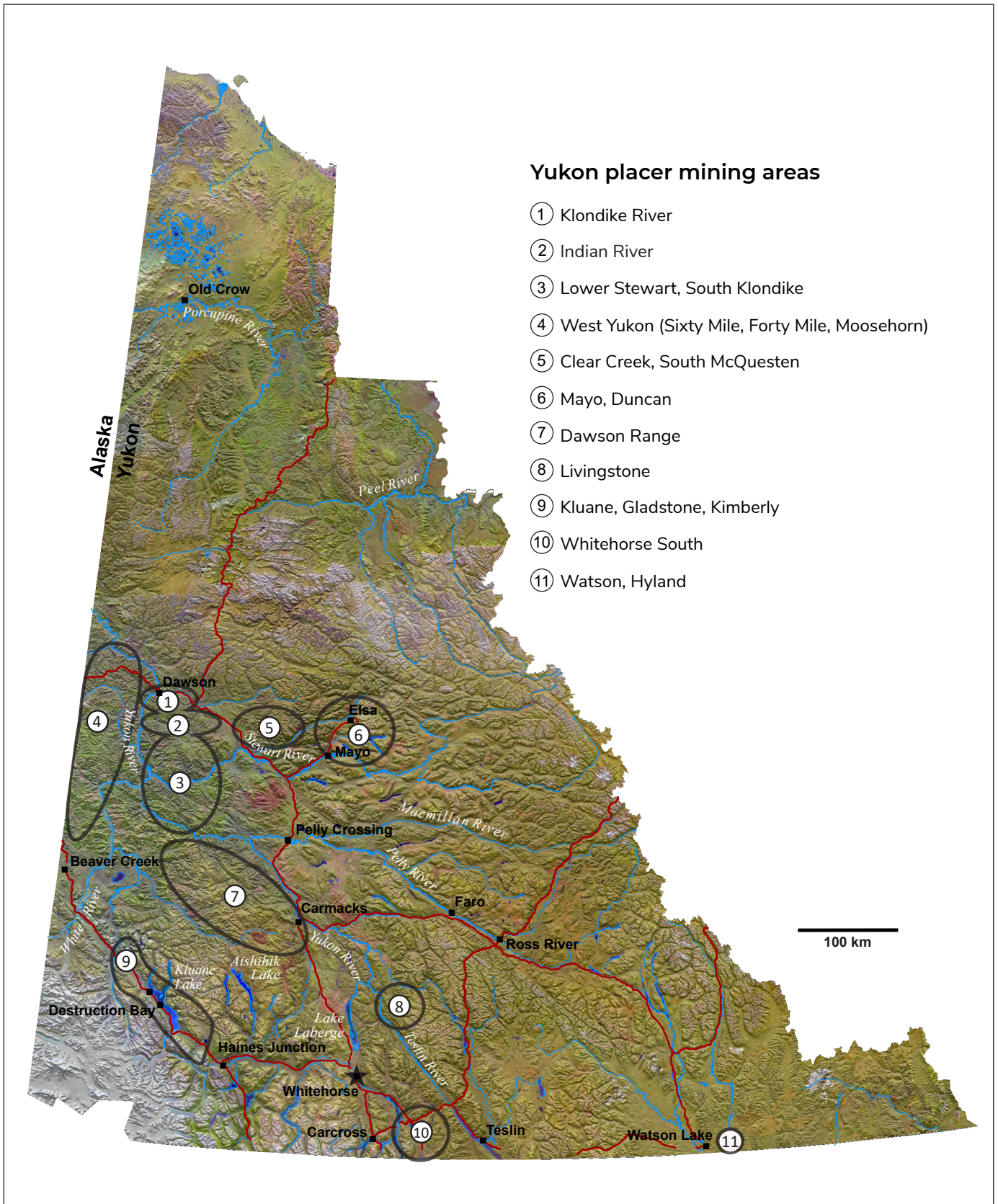
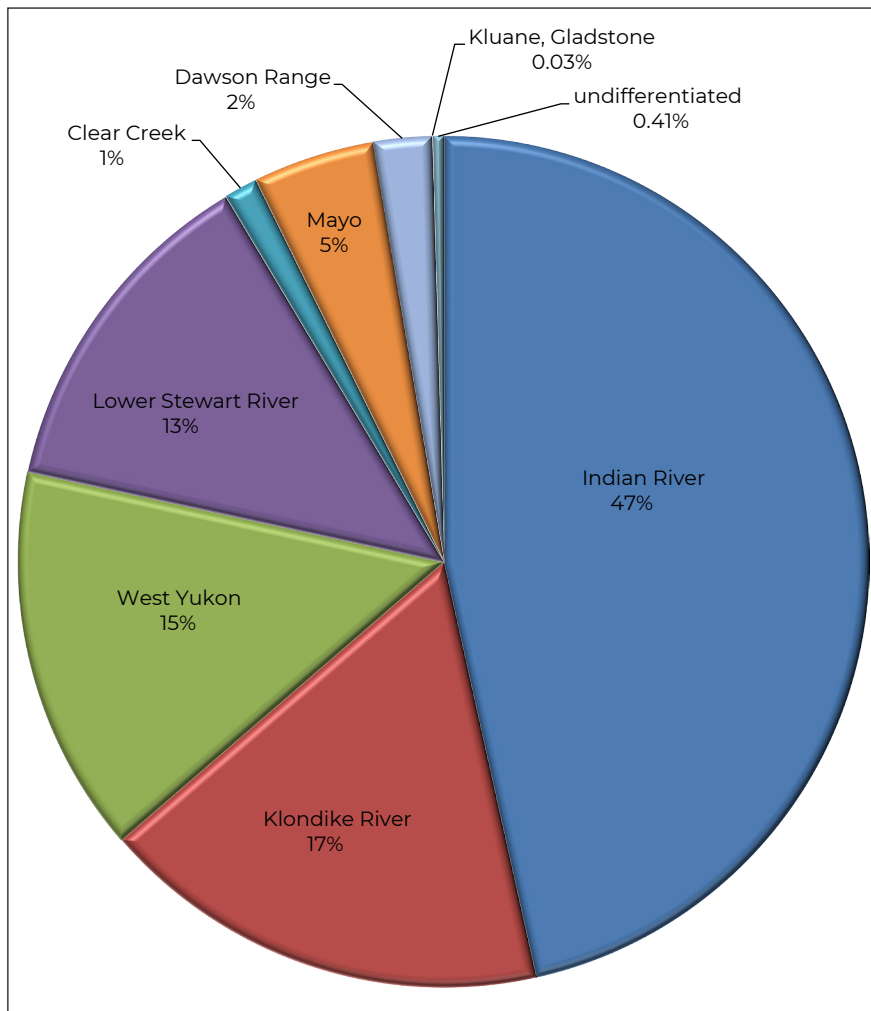


Figure 2. Placer-mining areas of the Yukon.



**Figure 3.** Distribution of placer gold production by area, based on royalties reported from April 1 to November 1, 2024.

slight dip in 2023, the overall trend over the last five years demonstrated gradual growth. Furthermore, the Klondike River placer area had the highest density of active placer operations. The main contributors in 2024 were Lovett Hill (5497 crude ounces), Paradise Hill (2684 crude ounces), Hunker Creek (2665 crude ounces), Bonanza Creek (1804 crude ounces), and Adams Gulch (595 crude ounces; Fig. 4).

M. Fraughton completed his fifth season sluicing on Swede Creek, a tributary of the Yukon River, approximately 9.5 km upstream from the City of Dawson (Fig. 5). The operation had a crew of up to three people, and mining was focused on the left limit in the lower part of the drainage. Since its inception, a total of 11 468 m<sup>3</sup> (15 000 yd<sup>3</sup>) of material was sluiced at the mine using two Hitachi 290 excavators and a 30 m<sup>3</sup> (40 yd<sup>3</sup>)/hr trommel. The stratigraphy reflects

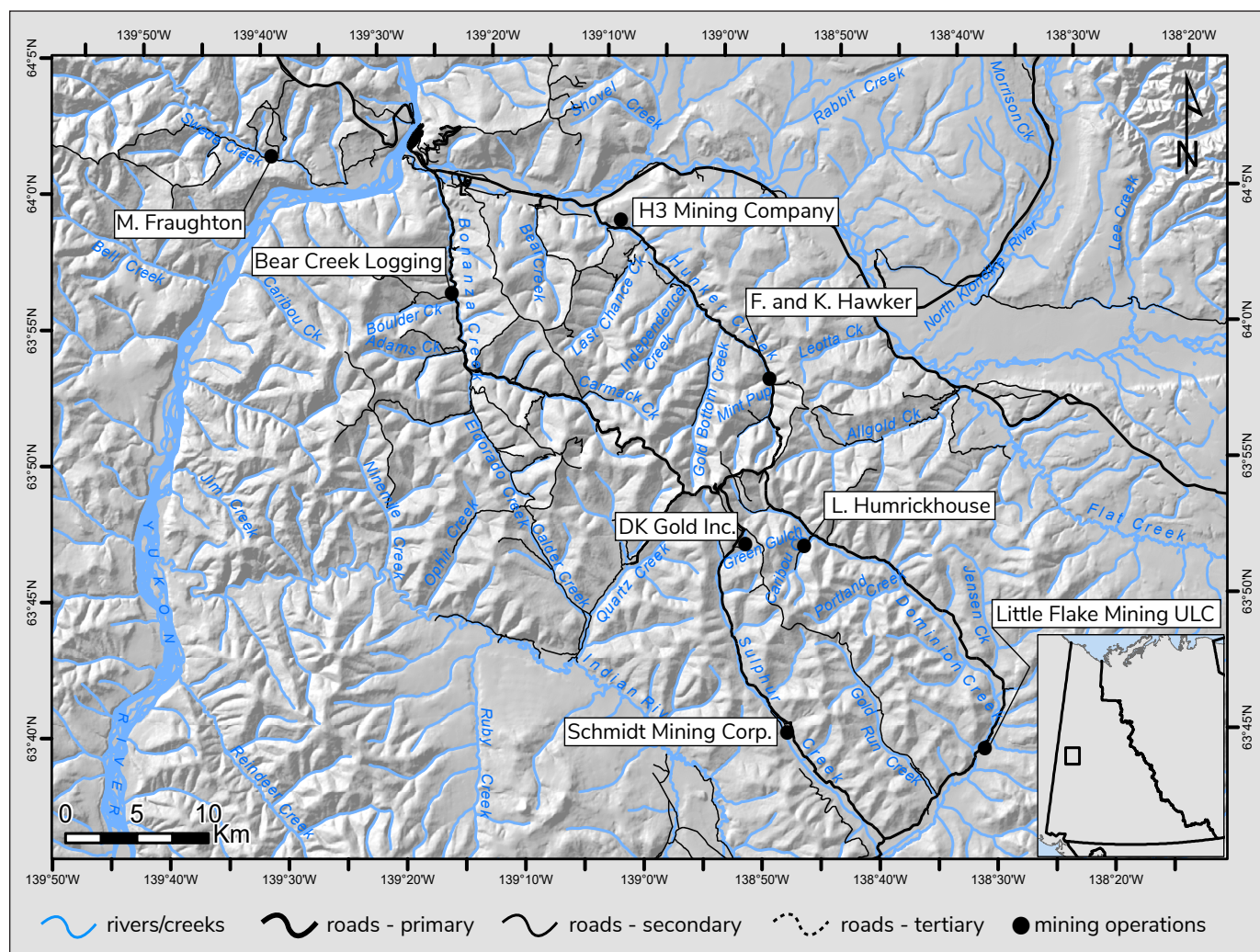
a braided river system, featuring a boulder lag at the bedrock contact. Mining targeted the lowermost 0.6 m (2 ft) of coarse gravel and the uppermost 0.6 m (2 ft) of bedrock. Gold recovered had a fineness of 73%. The largest nugget weighed 23 grams.

Ownership on lower Hunker Creek shifted this season, when G. Slonski and K. Elgie sold their property to H3 Mining Company. During the 2024 season, H3 Mining stripped 91 m (300 ft) off the top of Australia Hill on the left limit of Hattie Gulch, targeting a White Channel deposit having a total thickness of 41 m (135 ft). The company's 11-person crew reached pay in September 2024 and sluiced the lowermost 3 m (10 ft) of White Channel gravel situated on bedrock.

Bear Creek Logging leased from Dulac Mining and operated at the mouth of Boulder Creek, a right-limit tributary of Bonanza Creek. A high-level White Channel bench deposit immediately downstream from the confluence of Bonanza and Boulder creeks is known as Boulder Hill, and is an area that has been mined since the Klondike Gold Rush. Supported by the Yukon Mineral Exploration

Program (YMEP) program, they conducted a drill program in the spring to explore for potential in-situ Bonanza Creek gravel that may have been preserved beneath a historical hydraulic tailings fan derived from Boulder Hill. The target was also situated outside of dredge limits, where the hydraulic tailings preserved paleo-Bonanza Creek side pay on the far, right limit of the valley. Bear Creek Logging moved 114 683 m<sup>3</sup> (150 000 yd<sup>3</sup>) of material and employed up to five people throughout the season.

F. and K. Hawker, both seasoned miners in the Klondike, have been active since 2015 on Mint Pup, a left-limit tributary of Hunker Creek. Once they completed cut on the upper reaches of Mint Pup in July 2024, they shifted operations to the left limit of Hunker Creek in late July. The Hawkers targeted an area of flat topography upstream from the confluence of Mint Pup and Hunker



**Figure 4.** Locations of highlighted placer operations in the Klondike River and Indian River placer areas.

Creek, which was interpreted to be a potential extension of Hunker Creek side pay. They stripped a 46 by 24 m (150 × 80 ft) cut, where they encountered 8 m (26 ft) of frozen black muck overlying 0.9 m (3 ft) of in-situ Hunker Creek gravel (Fig. 6). The entire gravel unit was sluiced as pay.

### Indian River area

Indian River remains the top-producing placer area, accounting for 47% of the Yukon's total placer production and reporting 39 907 crude ounces in 2024. Production rose 32% from 2023, including an 8% increase noted over the last five years. The top producing drainages for 2024 were Indian River (9543 crude ounces), Dominion Creek (7928 crude ounces), Quartz Creek (7371 crude ounces), Eureka Creek (6936 crude ounces), and Sulphur Creek (6455 crude ounces; see Fig. 4).

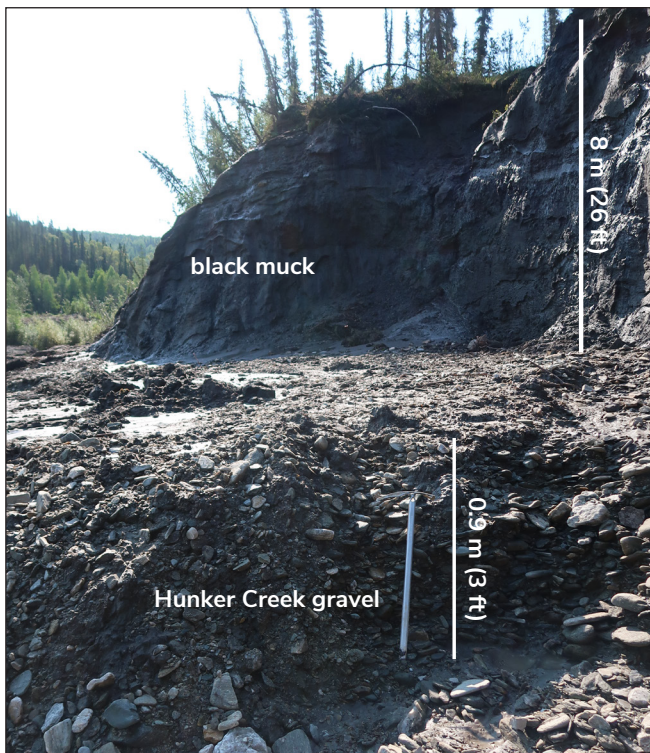
Little Flake Mining ULC continued mining on their lower Dominion Creek property and expanded by acquiring the Gold Run and Sulphur creek claims, formerly owned by TD Oilfields Services Ltd. An exposure on lower Dominion Creek revealed a section with a total thickness ranging from 6.7 to 7.6 m (22–25 ft); mining efforts focused on the lowermost 1.2 m (4 ft) of gravel within the section. A 25-person crew completed a cut measuring 92 903 m<sup>2</sup> (1 million ft<sup>2</sup>; Fig. 7). A second, larger cut measuring 278 709 m<sup>2</sup> (3 million ft<sup>2</sup>) was also prepared, and 111 484 m<sup>3</sup> (1.2 million ft<sup>3</sup>) of material was processed during the 2024 season. Extensive stripping was completed, including 232 257 m<sup>3</sup> (2.5 million ft<sup>3</sup>) stripped down to pay, and an additional 371 612 m<sup>3</sup> (4 million ft<sup>3</sup>) of overburden removed. The company has a target of sluicing 278 709 m<sup>3</sup> (3 million ft<sup>3</sup>) of pay annually as part of their proposed mine plan.



**Figure 5.** M. Fraughton's operation on lower Swede Creek. The 2024 mining cut is outlined by a black dashed line; the blue arrow shows stream flow direction.



**Figure 7.** Little Flake Mining ULC's 2024 mining cut on Dominion Creek.



**Figure 6.** Exposure at F. and K. Hawker's operation on the left limit of Hunker Creek, located immediately upstream from the mouth of Mint Pup.

L. Humrickhouse leased Stuart Placers Ltd.'s property on Caribou Creek, marking the first mining activity in over a decade on this right-limit tributary of upper Dominion Creek. A crew of up to eight people processed material at a rate of 61 m<sup>3</sup> (80 yd<sup>3</sup>)/hr using an oscillating screen deck. Mining focused on two main placer settings: the modern alluvial gravel in the valley bottom, and a left-limit bench deposit. Both deposits have little overburden to strip. The bench deposit contains 1.8 m (6 ft) of predominantly fine, pebble-rich gravel, including a cobble lag at the bedrock contact. Approximately 70% of the gold recovered from the modern alluvial gravel was coarse grained, and the fineness averaged 840.

In 2024, DK Gold Inc. shifted their operation from Gold Run Creek, a tributary of Dominion Creek, to their claims on Green Gulch, a left-limit tributary of upper Sulphur Creek. In partnership with Lucky Dog Mining Inc., they completed a 122 m (400 ft)-long cut on the left fork of Green Gulch. The operation had a crew of up to six people, and used monitors to thaw frozen black muck and pay gravel (Fig. 8). The pay gravel was situated on bedrock, and the thickness of pay varied due to a highly undulatory bedrock surface. The relief of the undulations ranged from 1.2 to 2.4 m (4–8 ft). Coarse gold was recovered, including a population of grains



**Figure 8.** Monitoring at DK Gold Inc. and Lucky Dog Mining's joint operation on the left fork of Green Gulch.

that appeared to be locally derived. The cut revealed extensive old-timer workings, in the form of abundant shafting.

Schmidt Mining Corp. began sluicing on Sulphur Creek during the 2024 season, following their purchase of the property in 2022, and a season of stripping in 2023. Mining operations were located at two different sites: on the mid to left limit, 3 km downstream from Brimstone Gulch, and across from the mouth of Brimstone Gulch on the right limit of Sulphur Creek. The main cut measured 107 by 366 m (350 × 1200 ft). The lowermost gravel unit, known as the Ross gravel (rich in quartz clasts), rapidly thinned at the upstream end of the cut. Notably, Yukon Consolidated Gold Corporation's (YCGC) Dredge No. 8, built in 1938, remains in the area to this day (Fig. 9). This dredge operated on Sulphur Creek until 1966, processing 14.96 million m<sup>3</sup> (19.58 million yd<sup>3</sup>) of material, and recovering approximately 222 000 fine ounces (Green, 1977). Based on the average gold price of C\$3351 for the 2024 season, this amount of gold would be valued at \$744M.



**Figure 9.** YCGC Dredge No. 8 on the mid reach of Sulphur Creek. Schmidt Mining's active cut is visible in the background.

### West Yukon area

West Yukon’s production rose significantly in 2024 and was up 47% from 2023. Additionally, there has been an increasing trend in production over the last five years. Sixty Mile River drainage was the lead producer for this placer region, reporting 9209 crude ounces or 73% of the area’s total placer production. Following Sixty Mile River were Browns Creek (1268 crude ounces), Bedrock Creek (708 crude ounces), and Ten Mile Creek (558 crude ounces; Fig. 10).

Yukon Exploration Green Gold Inc.’s claims on Huot Gulch, a right-limit tributary of Boucher Creek, were leased to G. Unrauh this year, marking the first instance of mechanized mining in the drainage. During the 2023 season and in preparation for mining, stripping was completed, and a 61 by 149 m (200 × 490 ft) cut was prepared. A two-person crew began mining in 2024, and a total of 38 230 m<sup>3</sup> (50 000 yd<sup>3</sup>) of material was

stripped and 9 175 m<sup>3</sup> (12 000 yd<sup>3</sup>) was sluiced. This season’s mining operations took place in an area of the valley bottom that is wide, and where mine planning and water management were easily facilitated. However, richer gold deposits are expected in deposits further upstream where the valley narrows.

Three operations were active on the middle reach of Browns Creek, approximately 15 km upstream from its confluence with the Fortymile River. Mining in close proximity, the three operations focused on different areas of the drainage (Fig. 11). D. van der Woude’s operation was farthest upstream where he focused on the left limit of Browns Creek. R. Unger, just below van der Woude’s operation, focused his mining on the right limit of the drainage. The third and lowermost operation belongs to M. Brunnmeyer, who leased the ground from R. Unger. He mined using a floating trommel and had a crew of up to three people. The pay

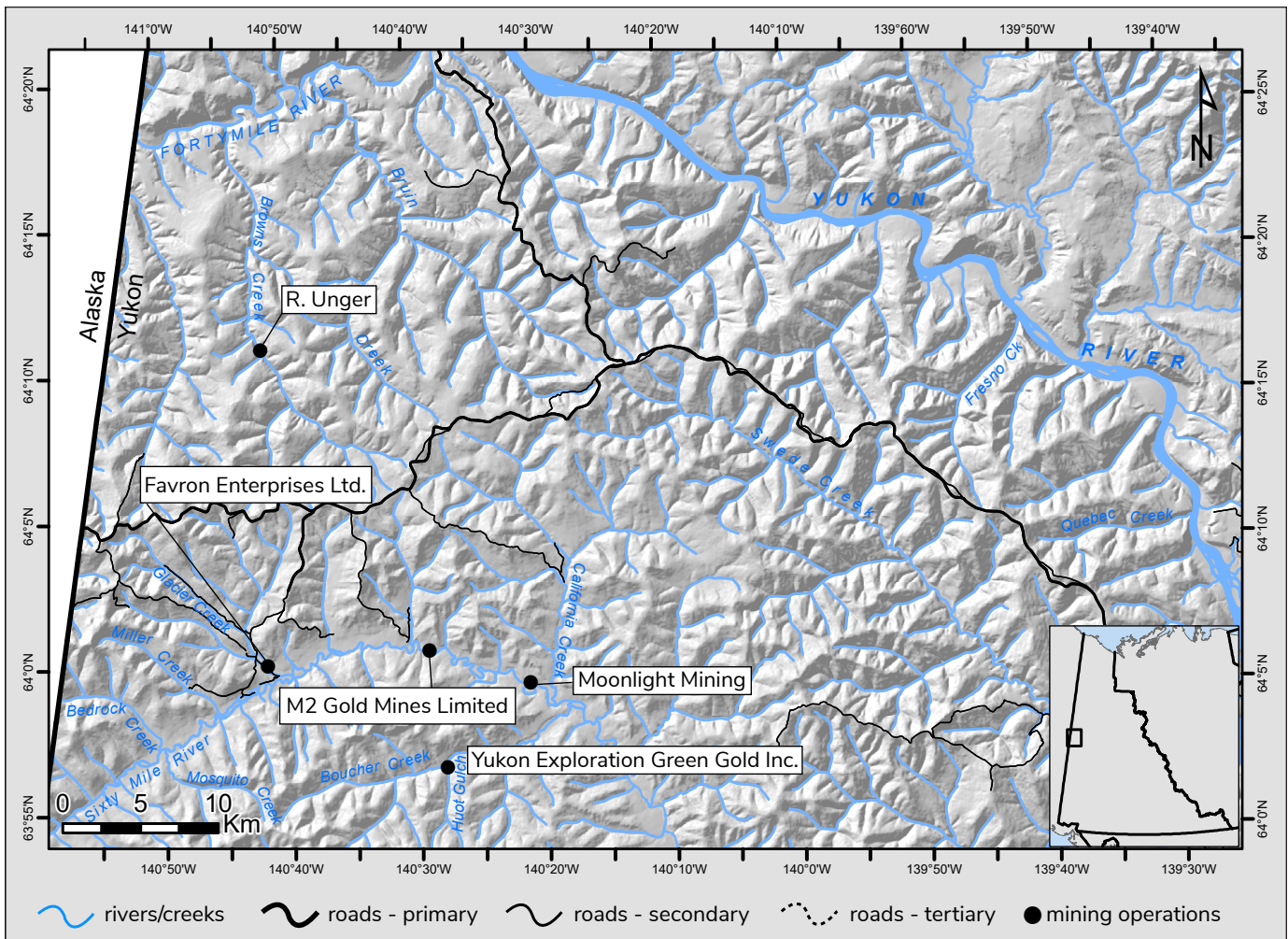


Figure 10. Locations of highlighted placer operations in the West Yukon placer area.



**Figure 11.** Aerial view of three active sluicing operations on Browns Creek. The view is looking upstream or to the south.

gravel on Browns Creek is consistent throughout the three properties and is situated on bedrock. It consists of 1.5 m (5 ft) of cobble gravel that fines upward into a pebble gravel. The gravel is in contact with an undulating bedrock surface, which creates variability in the thickness of the sluiced section.

Favron Enterprises Ltd. made a substantial operational shift, moving from their operations on Sulphur and Hunker Creeks, and focusing on claims within the Glacier Creek, Big Gold Creek, Bedrock Creek and Sixty Mile River drainages. Stripping efforts began on lower Glacier Creek in 2022 and continued throughout the 2023 season. In the late summer and fall of 2024, work extended to the Sixty Mile River and lower Bedrock Creek. The first year of sluicing began on Glacier Creek during the 2024 season.

Moonlight Mining relocated to their property on the Sixty Mile River, immediately upstream from the mouth of California Creek. They conducted sonic drilling on the property to further evaluate the placer potential and began their first year of sluicing in 2024. A five-person crew targeted four bench levels on the left limit of Sixty Mile River. The lowermost gravel unit (in the modern valley bottom) was sluiced for pay and consisted of 0.6 to 0.9 m (2–3 ft) of coarse gravel in contact with bedrock. All gold recovered was larger than 1.4 mm (14 mesh).

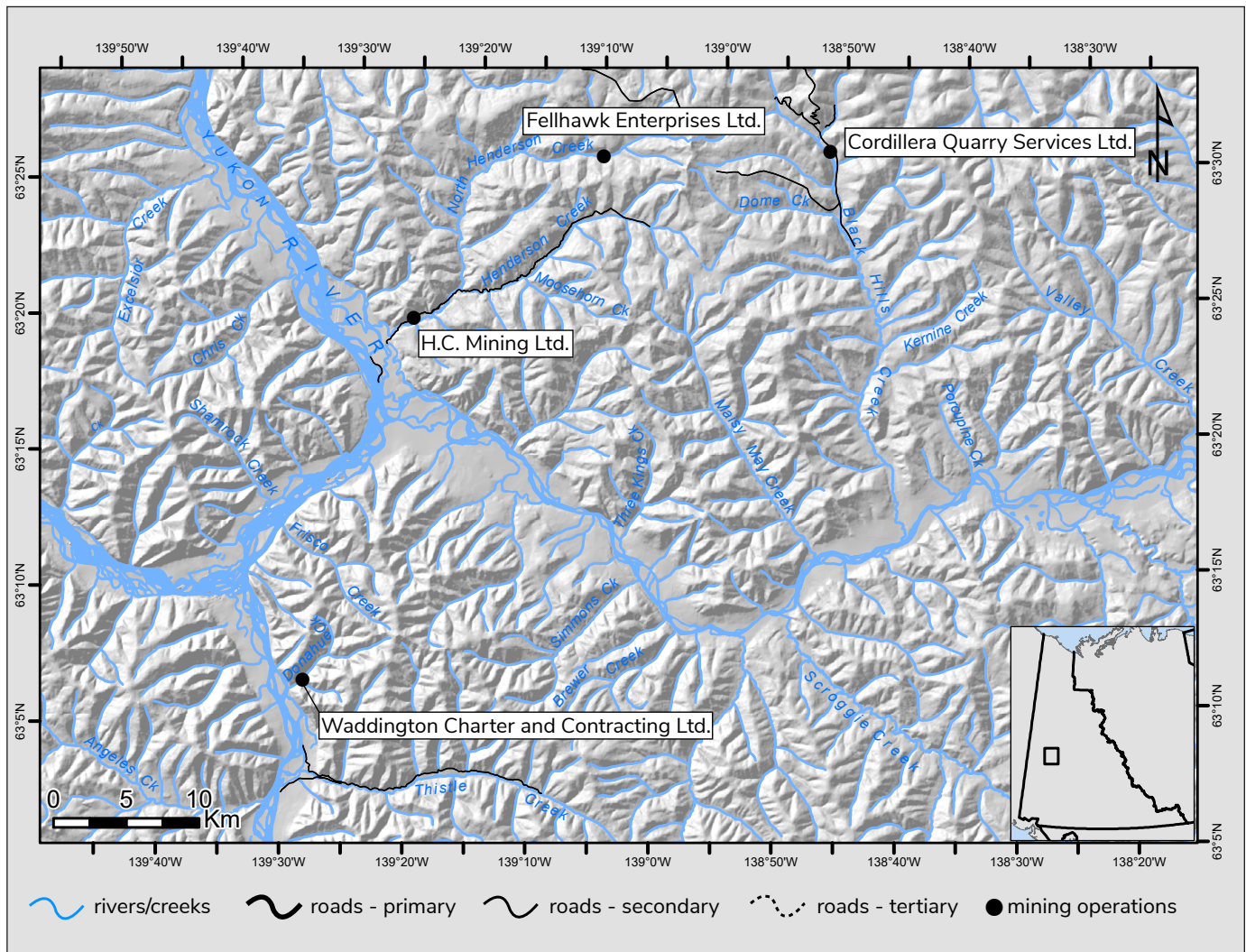
M2 Gold Mines Limited continued mining on the Sixty Mile River, and a 24-person crew worked two daily shifts totalling 23 hours. Three trommels were used at the operation, and the two largest measured 2.1 m (7 ft) in diameter, and were capable of sluicing material at a rate of up to 122 m<sup>3</sup> (160 yd<sup>3</sup>)/hr. The company mined two left-limit bench cuts, one right-limit bench cut, and multiple valley-bottom cuts. A total of 0.6 m (2 ft) of gravel and up to 0.3 m (1 ft) of the bedrock surface was sluiced from the bench deposits. The pay gravel was siltier near the bedrock contact. In the valley bottom, they sluiced up to 0.9 m (3 ft) of gravel and 0.6 m (2 ft) of the bedrock surface. Here, the thickness of the overburden varied from a couple of feet near the river to as much as 3.7 m (12 ft) at the far limits of the valley bottom.

### Lower Stewart/South Klondike area

The Lower Stewart/South Klondike area had a 9% production increase from 2023. The area produced a total of 11 173 crude ounces, which represents 13% of the Yukon's total placer production for 2024. The bulk of production was from Henderson Creek, which contributed 5559 crude ounces, amounting to 50% of the area's output. Other contributors were Barker Creek (1933 crude ounces), Black Hills Creek (994 crude ounces) and Kirkman Creek (937 crude ounces; Fig. 12).

Cordillera Quarry Services Ltd., a new operator in the area, leased ground from T. Nixdorf and mined on Black Hills Creek, between the right-limit tributaries of Childs Gulch and Oil Gulch. One cut upstream from the mouth of Oil Gulch exposed a prominent, right-limit bench deposit, where the pay gravel is in contact with bedrock. The bedrock is highly undulatory, resulting in a variable thickness of the gravel unit from 0.6 to 1.8 m (2–6 ft). The bench cut measured 107 by 4.6 m (350 × 15 ft) at the time of the author's visit in August 2024. The mine employed 4 to 8 workers and used a Macon SD-300 plant to sluice material at a rate of 38 to 57 m<sup>3</sup> (50–75 yd<sup>3</sup>)/hr. Future mine plans include further exploration to determine the extent of the left-limit bench deposit, and a drill program to evaluate Oil Gulch.

Donahue Creek is a right-limit tributary of the Yukon River, located 6 km downstream from Thistle Creek. E. Stretch first staked the creek in 2000; however, minimal work has been completed since initial staking. In 2024, the ground was leased to Waddington Charter and Contracting Ltd. who moved into the drainage and opened up a 137 by 33 m (450 × 110 ft) cut at the



**Figure 12.** Locations of highlighted placer operations in the Lower Stewart/South Klondike placer area.

mouth of a lowermost, unnamed, left-limit tributary (Fig. 13). The deposit consists of a chaotic, high-energy gulch gravel, and contains boulders up to 0.9 m (3 ft) in diameter. The lowermost 0.9 m (3 ft) of gravel was targeted as pay.

In 2024, H.C. Mining Ltd. operated in two locations on their lowermost Henderson Creek claims. A 22-person crew worked daily double shifts, sluicing with up to five plants—three on lower Henderson, and two at a newly established site on Cabin Creek, a right-limit tributary about 5 km upstream from the confluence with Moosehorn Creek. Mining focused on a left-limit bench deposit downstream from the forks of Henderson and North Henderson creeks, while continuing work on upper Henderson at the Cabin Creek cut. At Cabin

Creek, the sluiced gravel had a total thickness of 2.7 m (9 ft), and was processed using two Macon screen-deck plants, fed in tandem by a Caterpillar 349 excavator (Fig. 14).

Fellhawk Enterprises Ltd. continued their mining efforts on North Henderson Creek, leasing ground from H.C. Mining Ltd. In 2024, a five-person crew completed a substantial cut, measuring approximately 64 by 457 m (210 × 1500 ft), and spanning the full width of the modern valley bottom. Gravel thickness increased as they progressed upstream, and the crew sluiced the lowermost 1.2 m (4 ft) of gravel situated on bedrock. Gravel on the right limit is more compact, slightly coarser, and has a higher percentage of matrix compared to the gravel on the left limit.



**Figure 13.** Aerial view of Waddington Charter and Contracting Ltd.'s active cut on Donahue Creek. The cut is outlined with a black dashed line. The view is looking upstream and to the east.

### Clear Creek, Mayo and Keno area

Substantial production declines occurred in the Clear Creek/South McQuesten and Mayo/Duncan areas over the last year. As of November 1, 2024, Clear Creek/South McQuesten recorded a 44% decrease from 2023, whereas Mayo/Duncan area had a 22% reduction. In the Clear Creek/South McQuesten area, placer production was derived from four drainages: Clear Creek (860 crude ounces), Barlow Creek (142 crude ounces), Josephine Creek (53 crude ounces), and Big Creek (39 crude ounces). In the Mayo/Duncan placer area, Granite Creek reported the highest production at 1456 crude ounces, followed by Minto Creek (787 crude ounces), Hight Creek (683 crude ounces), and Owl Creek (614 crude ounces; Fig. 15).

In the spring of 2024, ownership in the Clear Creek placer area shifted to Smoler Bros Mining, who acquired the Barlow Creek property from Caw Mining & Exploration Ltd. They completed an 18 by 274 m (60 × 900 ft) cut at the confluence of Barlow and Zinc creeks, targeting left-limit side pay that was previously untouched by the former operator. Additionally, they stripped a cut farther up the Barlow Creek drainage. Using a single screen deck capable of processing material at a rate of 38 m<sup>3</sup> (50 yd<sup>3</sup>)/hr, they sluiced a coarse gravel unit situated on bedrock. The pay gravel ranged in thickness



**Figure 14.** Drone image of a Caterpillar 349 excavator feeding two screen decks in tandem at H.C. Mining Ltd.'s upper Henderson Creek operation near the confluence with Cabin Creek.

from 0.6 to 1.5 m (2–5 ft), and the thickness decreased upstream. The gold recovered was mostly fine grained; however, the occasional nugget was found.

J. Wilson's operation consisted of a five-person crew who continued to progressively mine upstream into a canyon on Bennett Creek, which is a left-limit tributary of Minto Creek (Fig. 16). Mining was focused on a narrow section of the canyon, where the operators cut through a false bedrock of till and exposed a section totalling 7.3 m (24 ft) in thickness. The target was a V-shaped channel that cut into the underlying, decomposed bedrock. The sluiced section was 1.2 m (4 ft) thick and 6.1 m (20 ft) wide. The mined area in the canyon recovered a significant percentage of nuggets, whereas very minimal coarse gold was encountered downstream of the canyon.

FTG Exploration Ltd. has operated on Duncan Creek since 2021, using sonic drilling to delineate a meandering pay channel preserved beneath 15 m (50 ft) of till. This narrow channel, 6.1 m (20 ft) thick and 9.1 to 12.2 m (30–40 ft) wide, required high-density drilling at close spacing to trace its trajectory. In 2024, an eight-person crew ran double shifts and had a sluicing goal of 700 to 800 hours for the season. The main focus for the first part of the 2024 season was a 65 by 48 m (215 × 160 ft) cut immediately below

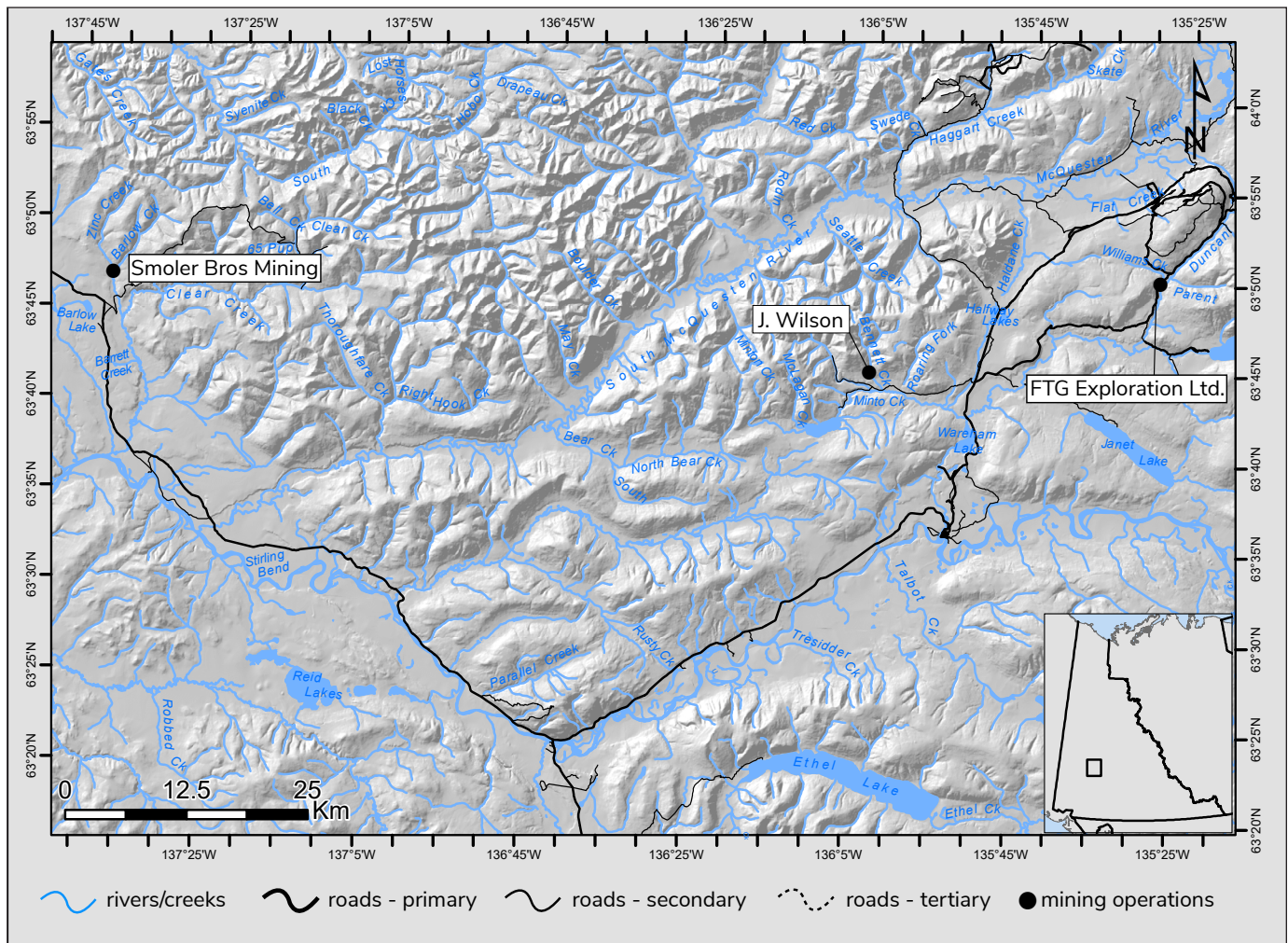


Figure 15. Locations of highlighted placer operations in the Clear Creek, Mayo and Keno placer areas.

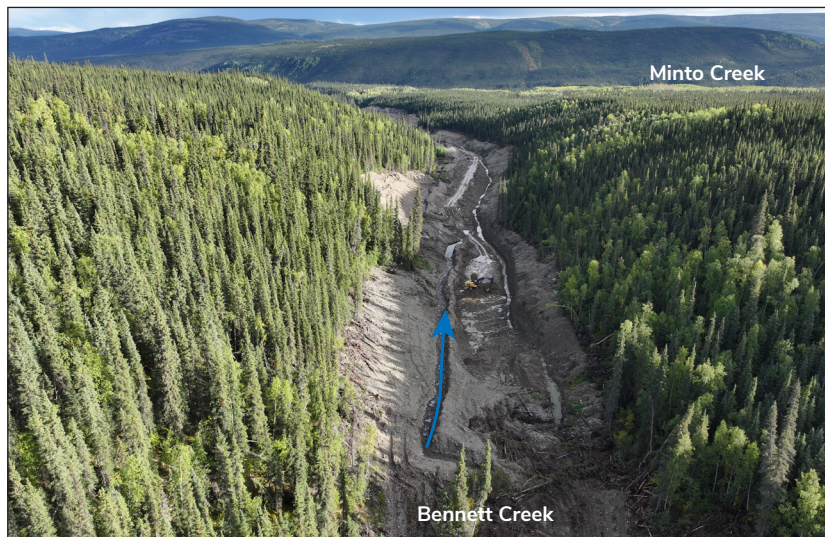


Figure 16. Aerial view of a narrow section along Bennett Creek where J. Wilson focused his 2024 mining efforts. The blue arrow shows stream flow direction; the view is looking downstream or to the south.

the confluence of Parent Creek, a left-limit tributary of Duncan Creek. This cut targeted the deeply buried, meandering paleochannel. A second cut, immediately downstream from the deep-channel cut, was on the left limit, and measured 71.3 by 121.9 m (234 × 400 ft). This cut targeted previously unmined Duncan Creek side pay that was identified through aerial photos. In early September, they focused their efforts on a third and final cut situated on the right limit of Duncan Creek, immediately downstream from the mouth of Williams Creek. Here, the operators focused on 3.0 to 4.6 m (10–15 ft) of modern Duncan Creek gravel, overlain by 4.6 m (15 ft) of muck.

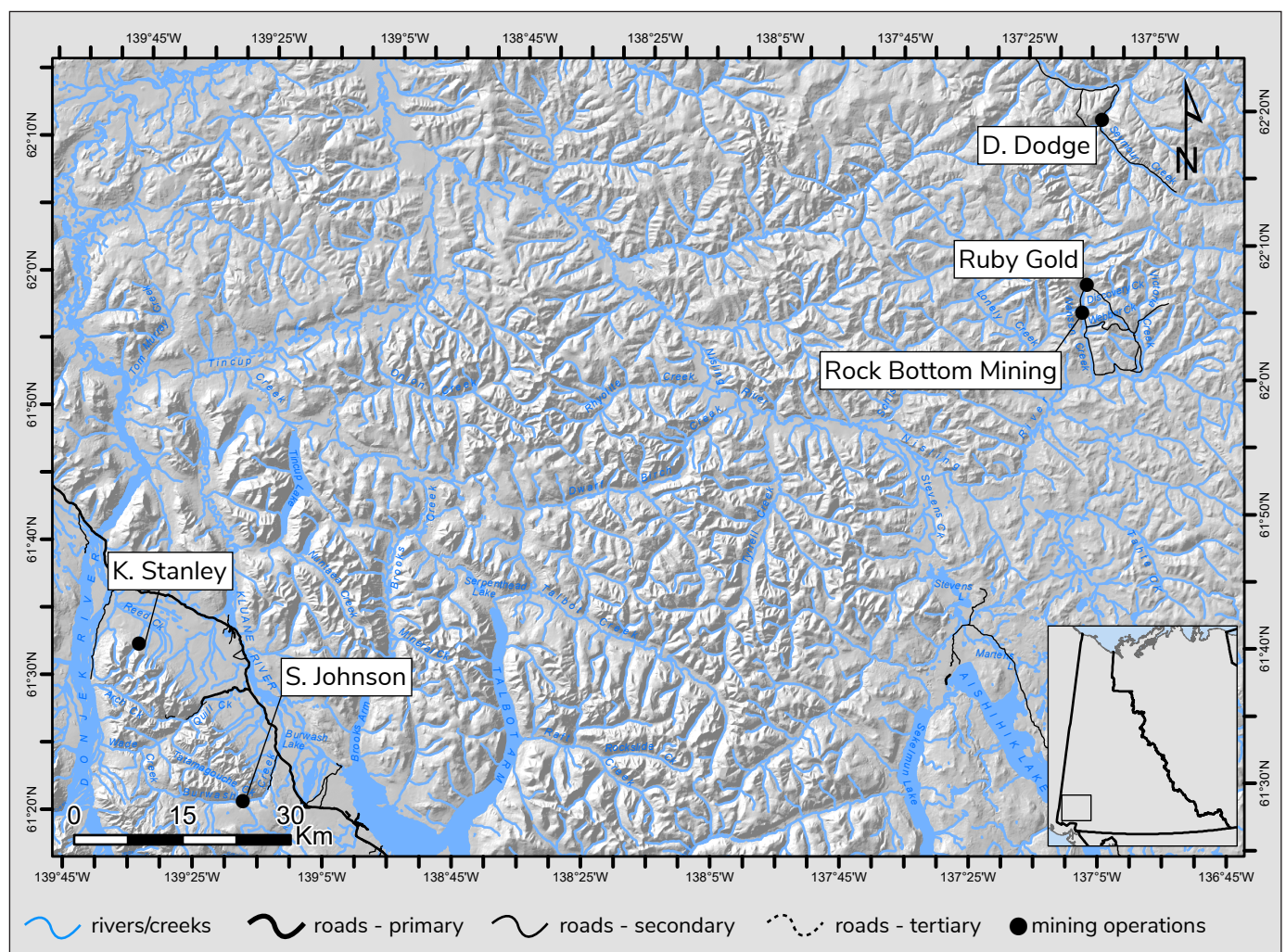
## Whitehorse Mining District

The Whitehorse Mining District, comprising Dawson Range, Livingstone, Kluane/Gladstone and Whitehorse South, collectively contributed 2% or 1928 crude ounces of Yukon's total placer production as of November 1, 2024. Top producers within the district, all located in the Dawson Range, included Canadian Creek (1085 crude ounces), Seymour Creek (445 crude ounces), and Nansen Creek (308 crude ounces; Fig. 17).

For the past four seasons, Batavia Mining has been steadily advancing downstream along the lower reaches of Canadian Creek toward its confluence with Britannia Creek. The operation targeted a wandering pay streak, and focused on the right-limit side pay. Mining efforts concentrated on sluicing 1.2 m (4 ft) of gravel on bedrock, and the highest gold concentration was recovered from the lowermost 0.6 m (2 ft) of the

gravel. A boulder lag marked the base of the gravel unit, suggesting a high-energy stream environment. Additionally, a silty to clay-rich layer at the bedrock contact indicated erosion and weathering of the underlying bedrock at the time of alluvial deposition. In 2024, an eight-person crew completed two cuts, including a lowermost cut measuring 134 by 44 m (440 × 145 ft), which will be expanded in the 2025 season. Recovered gold grains were worn and well-travelled, and often contained quartz inclusions. The fineness ranged between 870 and 920.

D. Dodge continued mining on Seymour Creek in the same location as 2023, upstream from the mouth of Guder Creek. His primary area of focus was on modern Seymour Creek gravel (Fig. 18). The gravel was 3 m (10 ft) thick and exhibited a texture typical of a braided river system. The gravel unit was slightly coarser



**Figure 17.** Locations of highlighted placer operations in the Whitehorse Mining District, comprising Dawson Range, Livingstone, Kluane/Gladstone, and Whitehorse South placer areas.



**Figure 18.** Aerial view of D. Dodge's 2024 operation on Seymour Creek. The view is looking upstream or to the south.

near the bedrock contact. Overburden consisted of black muck and ranged in thickness from 0.6 to 0.9 m (2–3 ft), requiring minimal stripping. A crew of six people processed pay using two Derockers in tandem, that were fed by a Volvo 400 excavator. Material was processed at a rate of 7.325 m (8 yd) every 3 minutes (122 m<sup>3</sup> [160 yd<sup>3</sup>]/hr). Gold recovered from Seymour Creek had a fineness of 860 to 870. Gold grain size fell into three distinct populations: <0.6 mm, <0.84 mm and >0.84 mm (–30, –20 and +20 mesh, respectively).

Ruby Gold leased from Pishon Gold Resources Inc. and commenced operations at the confluence of Nansen and Summit creeks in 2023. They mined using a small trommel, and processed material over a three-week period to test the ground. In 2024, the operation scaled up significantly, employing a six-person crew to mine an 88 by 85 m (290 × 280 ft) cut on lower Summit Creek. The crew stripped 1.2 to 1.8 m (4–6 ft) of overburden before targeting 1.2 to 1.8 m (4–6 ft) of modern Summit Creek gravel. A well-defined channel was identified that cut into the underlying bedrock.

Rock Bottom Mining has been actively operating in the Nansen Creek drainage since 2022, focusing on both Nansen Creek and Discovery Creek, a left-limit tributary of Nansen Creek. In 2023, they completed a reverse circulation (RC) drill program that guided their 2024 mining activities. In 2024, a five-person crew completed a 128 by 77 m (420 × 252 ft) cut (Fig. 19) while operating daily 12-hour shifts. As they mined



**Figure 19.** Rock Bottom Mining's 2024 activity on Nansen Creek, downstream from the mouth of Discovery Creek, where they were targeting a deeply buried paleochannel. The blue line shows stream flow direction. The view is downstream and to the south.

through the cut, they systematically bulk sampled each unit, encountering two distinct till units and a deeply buried Nansen Creek paleochannel. This was the first time the Nansen Creek paleochannel was targeted using modern mining methods. A 1.8 m (6 ft)-diameter by 6.1 m (20 ft)-long trommel was used to process material at a rate of up to 76 m<sup>3</sup> (100 yd<sup>3</sup>)/hr.

S. Johnson focused on mining the right-limit side pay of Burwash Creek, downstream from its confluence with Tatamagouche Creek. While mining, he intercepted a buried, side-valley channel that is believed to be a preserved glacial meltwater channel. The channel deposit consisted of a compact cobble gravel including large boulders; clasts commonly reached 0.9 m (3 ft) in diameter. A three-person crew worked daily 12-hour shifts to process the material.

K. Stanley's operation on Kelly Creek, situated within the Shakwak Trench, focused on a high-energy fan deposit. Significant glacial erosion from a northerly advancing ice sheet carved out the valley floor; however, paleochannels are believed to be preserved in sheltered areas like the lee sides of bedrock ridges or within deep channels cut into the underlying bedrock. The pay unit is a cobble gravel that is 0.6 to 0.9 m (2–3 ft) thick, and is overlain by 3.1 to 3.7 m (10–12 ft) of overburden. Since initiating mining in 2022, Stanley has primarily been operating solo and has targeted the modern stream channel and fan deposits on Kelly Creek.

## Summary

The Yukon placer industry continued to show robust growth in 2024, driven by strong gold prices and favourable mining conditions. This past season marked record-breaking placer gold production, reaching 85 799 crude ounces as of November 1, 2024, and generating C\$230M in revenue—the highest in Yukon’s history since 1886.

The Klondike region, particularly the Indian River placer area, led production and recovered 39 907 crude ounces of gold, representing 47% of the Yukon’s total yield. Significant outputs were also reported from Dominion Creek and Quartz Creek. Other regions, including West Yukon and Lower Stewart/South Klondike, also experienced growth, particularly West Yukon, which reported a 47% increase in production.

Challenges such as variable weather and regulatory delays were noted, but advancements in technology and efficiencies maintained high productivity. This past season also included shifts in ownership, triggering new investments. This in turn drove exploration and development, and highlights the resilience and adaptability of the Yukon placer mining industry.

## Acknowledgments

A sincere thank you goes to the placer industry, more specifically to all the miners and their employees, who continue to share information, extend their hospitality, offer to start excavators for fresh exposures, and enable meaningful dialogue. We sincerely value the collaboration and the industry’s willingness to allow us on site and to share and collect data (Fig. 20).

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**Figure 20.** Coarse gold recovered from Greens Gulch by DK Gold and Lucky Dog Mining.



# Yukon hardrock mining, development and exploration overview 2024

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Yukon Geological Survey

Naber, T.V. and Sack, P.J., 2025. Yukon hardrock mining, development and exploration overview 2024. In: Yukon Exploration and Geology Overview 2024, L.H. Weston, A. Stuart, S.K. Schultz, A.D. Brubacher and D.C. Cronmiller (eds.), Yukon Geological Survey, p. 37–76.

## Introduction

The Yukon hardrock mineral exploration sector continued to thrive in 2024 with the release of exciting results and the announcement of seven new mineral resources. Although there were many successes in the Yukon's exploration industry this past year, they were not immune to the negative impact of the heap leach pad failure that occurred on June 24, 2024, at Victoria Gold Corp.'s Eagle Gold Mine. At the time of writing, the Yukon Geological Survey (YGS) estimates exploration expenditures in the Yukon to be \$145M<sup>1</sup> for the year, based on company press releases, System for Electronic Document Analysis and Retrieval (SEDAR) postings, and conversations with industry clients. This estimate of the exploration expenditure is down 9% from \$160M in 2023 (Fig. 1). Development expenditures for 2024 are estimated to be \$40M, down from \$84M in 2023 (Fig. 1). The decrease in exploration expenditures in 2024 compared with 2023 can be attributed to the heap leach pad failure at the Eagle Gold Mine, which impacted exploration programs across the Yukon. This led some companies to temporarily pause or completely halt their program for the remainder of the 2024 exploration season. The halt in exploration programs was, in part, a response to the demands voiced by some First Nations, such as the First Nation of Na-Cho Nyäk Dun, who called for an immediate halt to all mining and exploration activity in their Traditional Territory (First Nation of Na-Cho Nyäk Dun, 2024). The Government of Yukon responded stating that the territory cannot halt all existing, permitted mineral development activities, as mining and exploration companies are protected under the federal and territorial legislation and the Umbrella Final Agreement (Government of Yukon, 2024b).

Mineral production is estimated to be at least \$190M<sup>2</sup> (approximately 57.5% attributed to silver production and 42.5% attributed to gold production), down from \$513M in 2023 (Fig. 2). Mineral production was low in 2024 due to the current closure of the Eagle Gold Mine, which was one of the two active hardrock mines in the Yukon. However, production revenue at Keno Hill Mine remains high due to precious metal prices reaching an all-time high and remaining strong in 2024.

As of November 30, 2024, there were 84 active exploration projects in the Yukon (Fig. 3; Appendix A), which is comparable to the number of projects in 2022 and 2023; 29 of these were partially funded through the Yukon Mineral Exploration Program (YMEP). In 2017, the Yukon began to experience a decline in the number of active exploration projects along with fewer active companies and individual prospectors, especially during the COVID-19 pandemic; however, those numbers have stabilized since 2022 (Fig. 4). In 2024, the majority (approximately 70%) of active exploration projects occurred within the Traditional Territories of the First Nation of Na-Cho Nyäk Dun

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*1 All estimated expenditure projections are in Canadian dollars and reflect the current estimates as of November 30, 2024, and will not be finalized until the end of January 2025.*

*2 This mineral production estimate was calculated using Eagle Gold Mine's Q1 and the average of Keno Hill's Q4 projection (i.e., 2.85 Moz); Eagle Gold Mine's Q2 values were not available at the time of writing.*

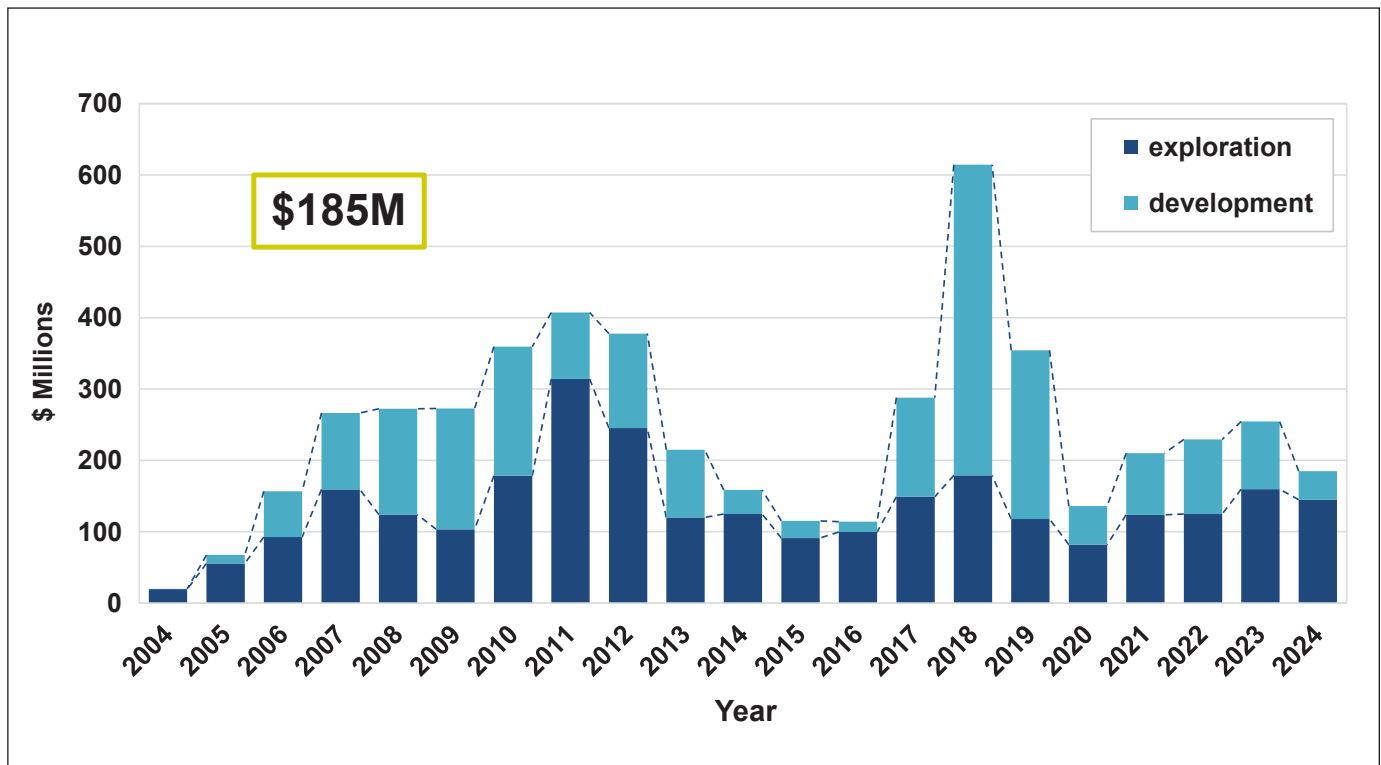


Figure 1. Yukon Geological Survey's estimated exploration and development expenditures from 2004 to 2024.

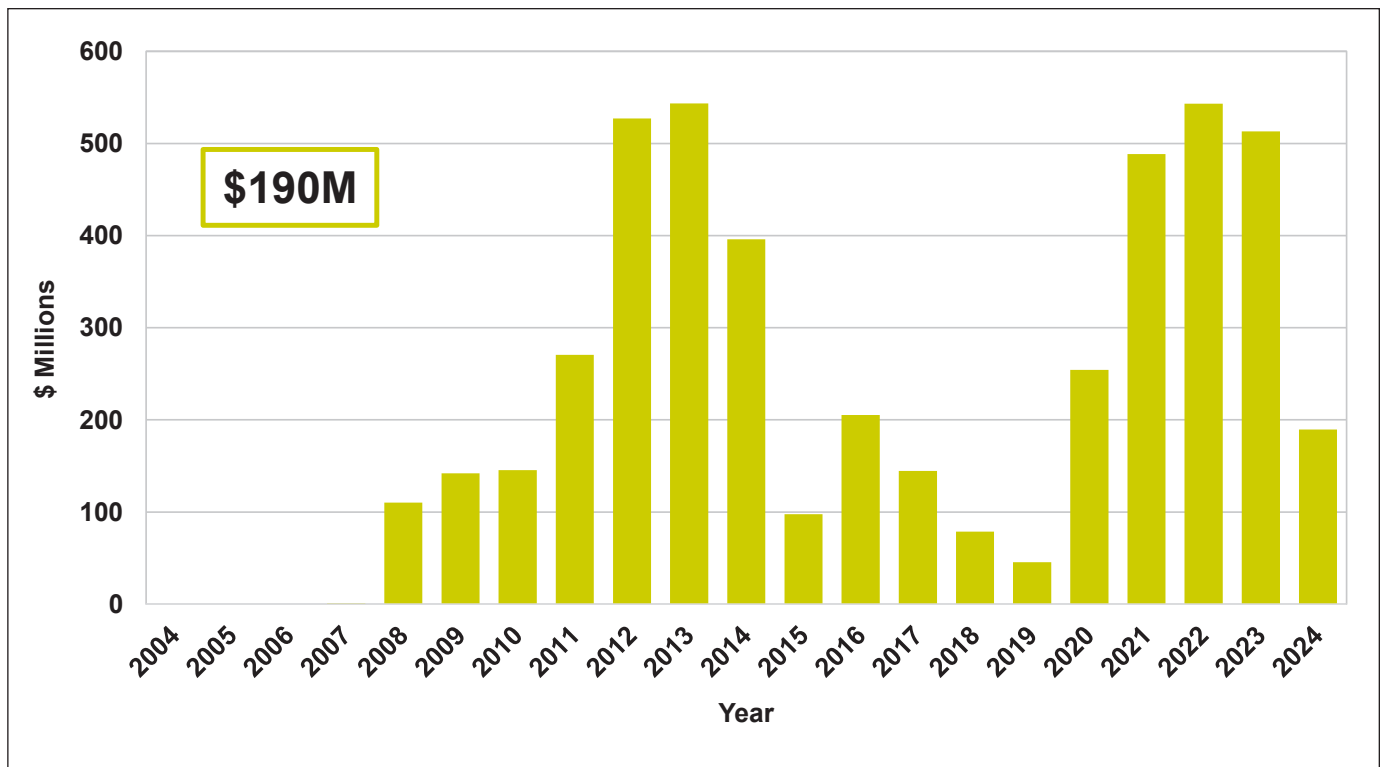


Figure 2. Yukon Geological Survey's estimated mineral production values from 2004 to 2024.

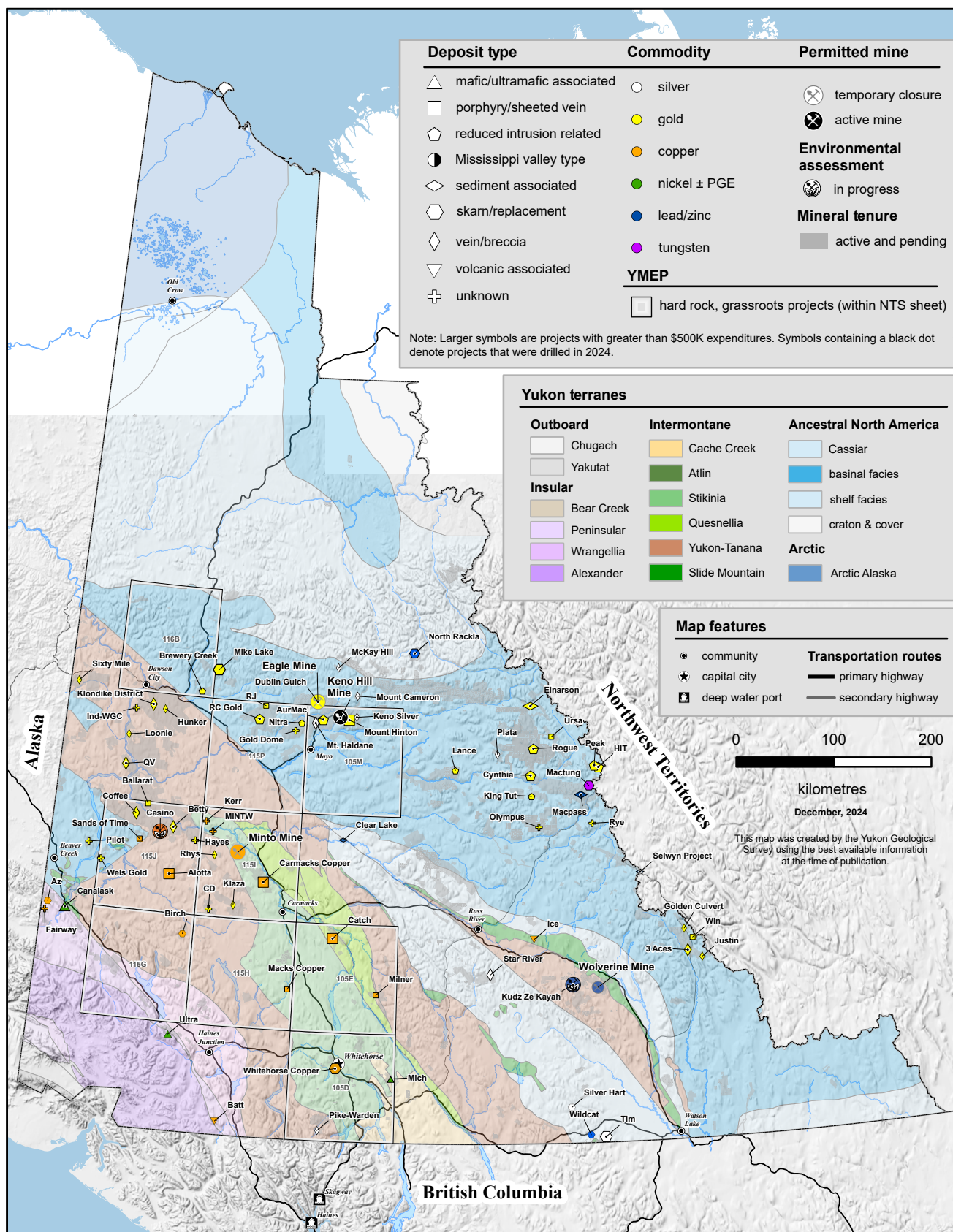
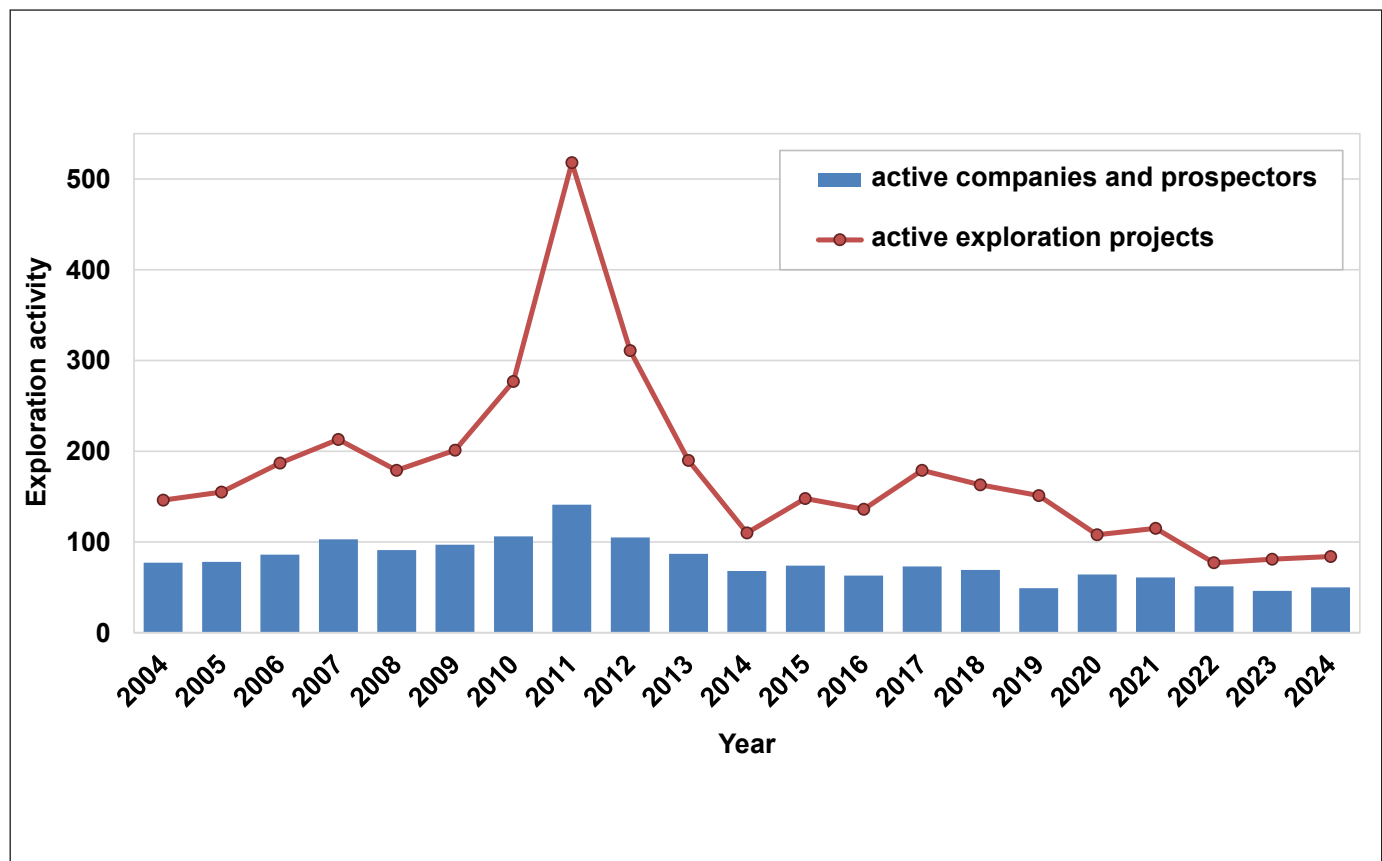


Figure 3. Active hardrock projects in the Yukon as of November 30, 2024.



**Figure 4.** Annual number of active exploration projects and number of active companies and prospectors in the Yukon from 2004 to 2024.

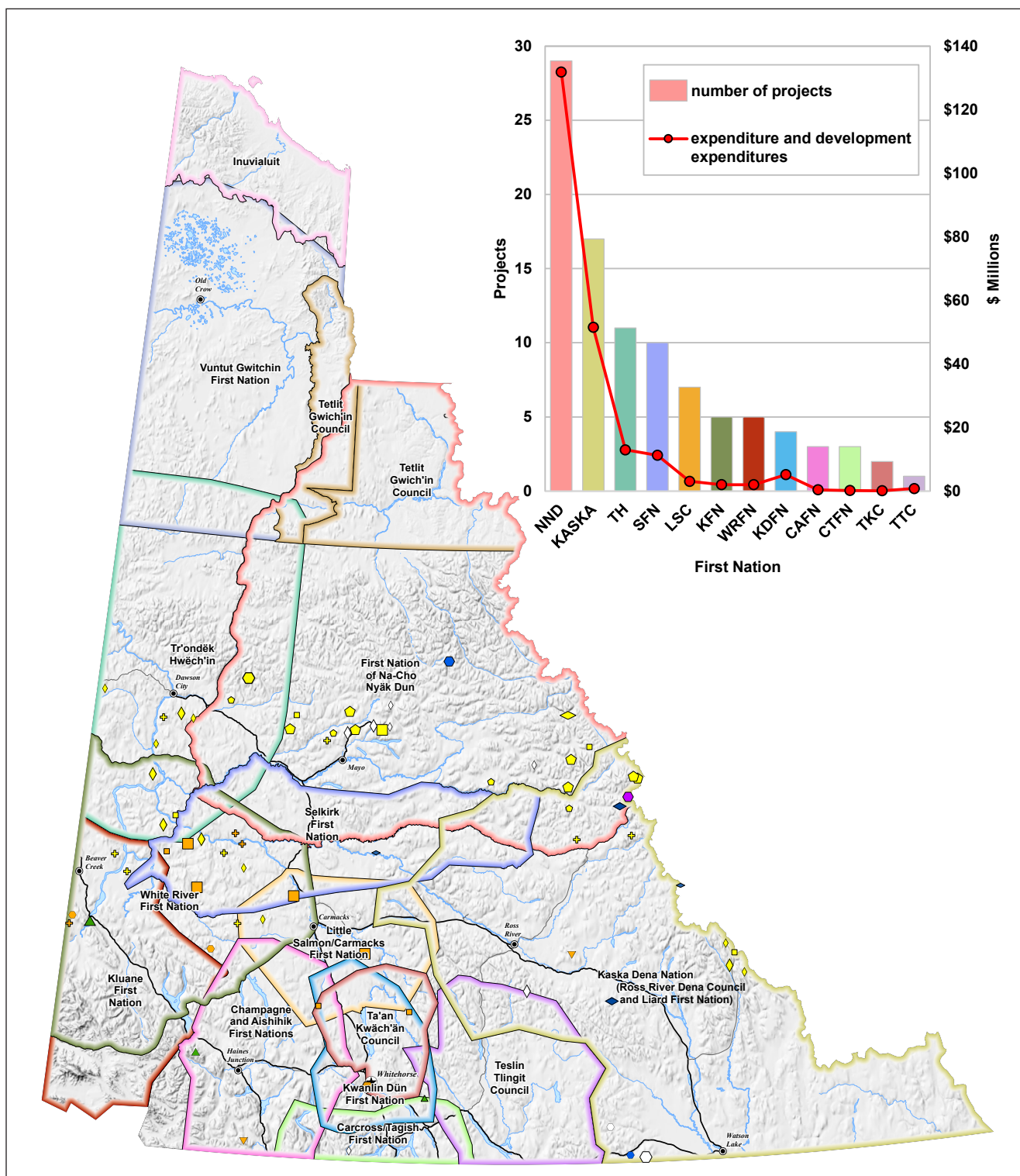
(29 projects; 30%), Kaska Dena Nations (17 projects; 18%), Tr’ondëk Hwëch’in First Nation (11 projects; 11%) and the Selkirk First Nation (10 projects; 10%; Fig. 5). Similarly, the highest-combined expenditures across the First Nations’ Traditional Territories were approximately \$132M for the First Nation of Na-Cho Nyäk Dun, \$51.5M for the Kaska Dena Nations, \$13.0M for Tr’ondëk Hwëch’in First Nation, and \$11.3M for Selkirk First Nation (Fig. 5).

Regarding exploration and development, there were 55 projects having expenditures of <\$500K each, operated by 33 companies and prospectors. There were 29 projects with total expenditures of ≥\$500K each, operated by 24 companies; of these, 23 projects had total expenditures exceeding \$1M each. Despite the impact that the Eagle Gold Mine incident had on exploration activities across the Yukon, some companies were able to raise extra funding mid-season, which extended their initial proposed exploration programs. The primary commodity in terms of total exploration expenditures in the Yukon continues to be gold, representing 47.6% of spending (\$69.0M), followed by

zinc-lead (28.4%, \$41.2M), copper (12.3%, \$17.9M), silver (9.5%, \$13.8M), nickel ± platinum group elements (PGE; 1.4%, \$2.0M) and tungsten (0.7%, \$1.0M; Fig. 6).

As of November 5, 2024, 5156 quartz claims had been staked in 2024, similar to 2022 and 2023 (Fig. 7). Most of the new claims were in the Whitehorse Mining District (59%, 3061 claims), followed by the Mayo (29%, 1491 claims) and Dawson (12%, 604 claims) mining districts. No new claims were staked in the Watson Lake Mining District (Fig. 8). A total of 163 729 claims remain in good standing, up from 162 340 in 2023. More claims were staked in the Whitehorse Mining District compared to previous years; during the last several years, claims were predominantly staked in the Mayo Mining District (e.g., 56%, 3251 claims in 2023).

The total meterage of diamond, reverse circulation and rotary air-blast drilling in 2024 was approximately 171 854 m (625 holes) on 26 projects, compared to 173 835 m (744 holes) on 34 projects in 2023 (Fig. 9; Appendix B).



**Figure 5.** Number of projects and exploration expenditures in 2024 across Yukon First Nation Traditional Territories. Note: several Yukon First Nations have overlapping traditional territorial boundaries, thus some projects and their associated expenditures may be counted in more than one instance. Exploration project symbology can be found in the legend of Figure 4. CAFN: Champagne and Aishihik First Nations, CTFN: Carcross/Tagish First Nation, KASKA: Kaska Dena Nation, KDFN: Kwanlin Dün First Nation, KFN: Kluane First Nation, LSC: Little Salmon/Carmacks First Nation, NND: First Nation of Na-Cho Nyäk Dun, SFN: Selkirk First Nation, TH: Tr'ondëk Hwëch'in First Nation, TKC: Ta'an Kwäch'än Council, TTC: Teslin Tlingit Council, WRFN: White River First Nation.

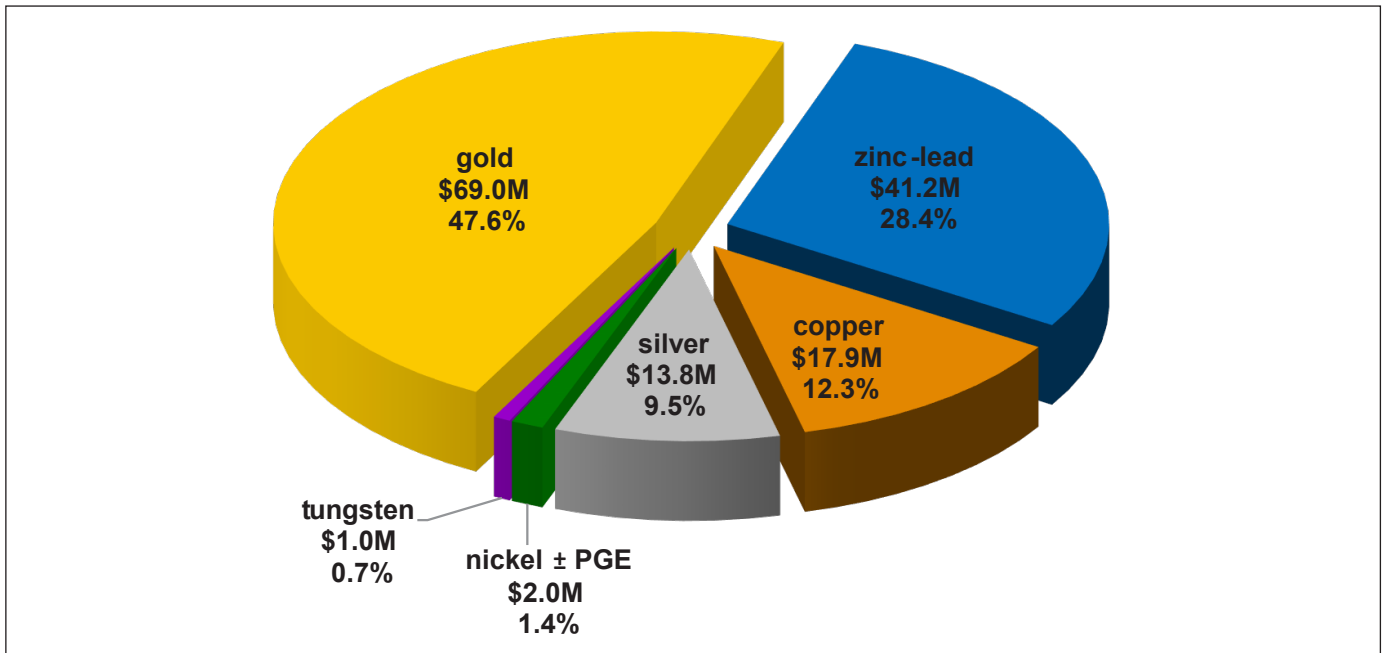


Figure 6. Breakdown of 2024 exploration expenditures in the Yukon by commodity.

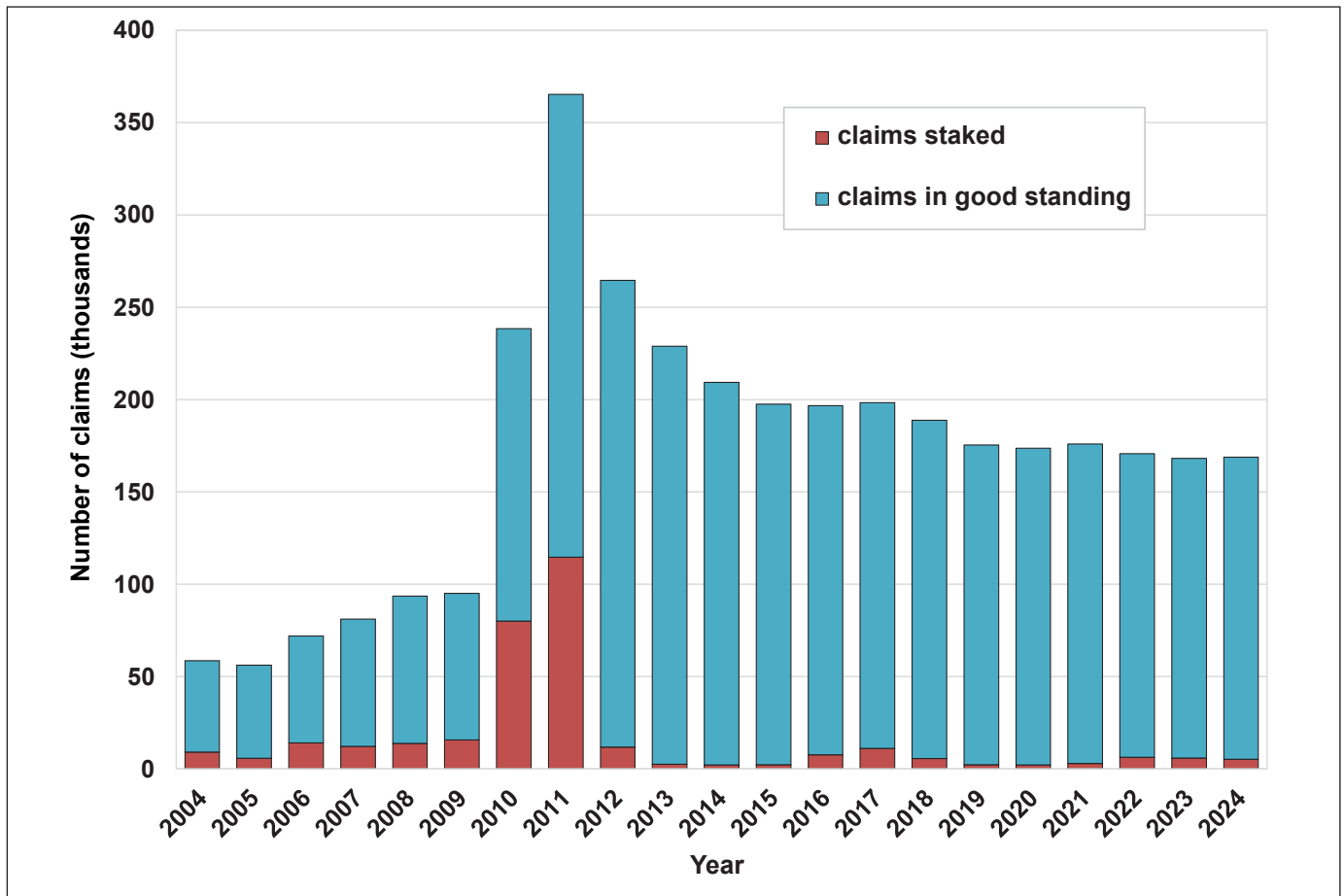


Figure 7. Claim-staking activity in the Yukon from 2004 to 2024.

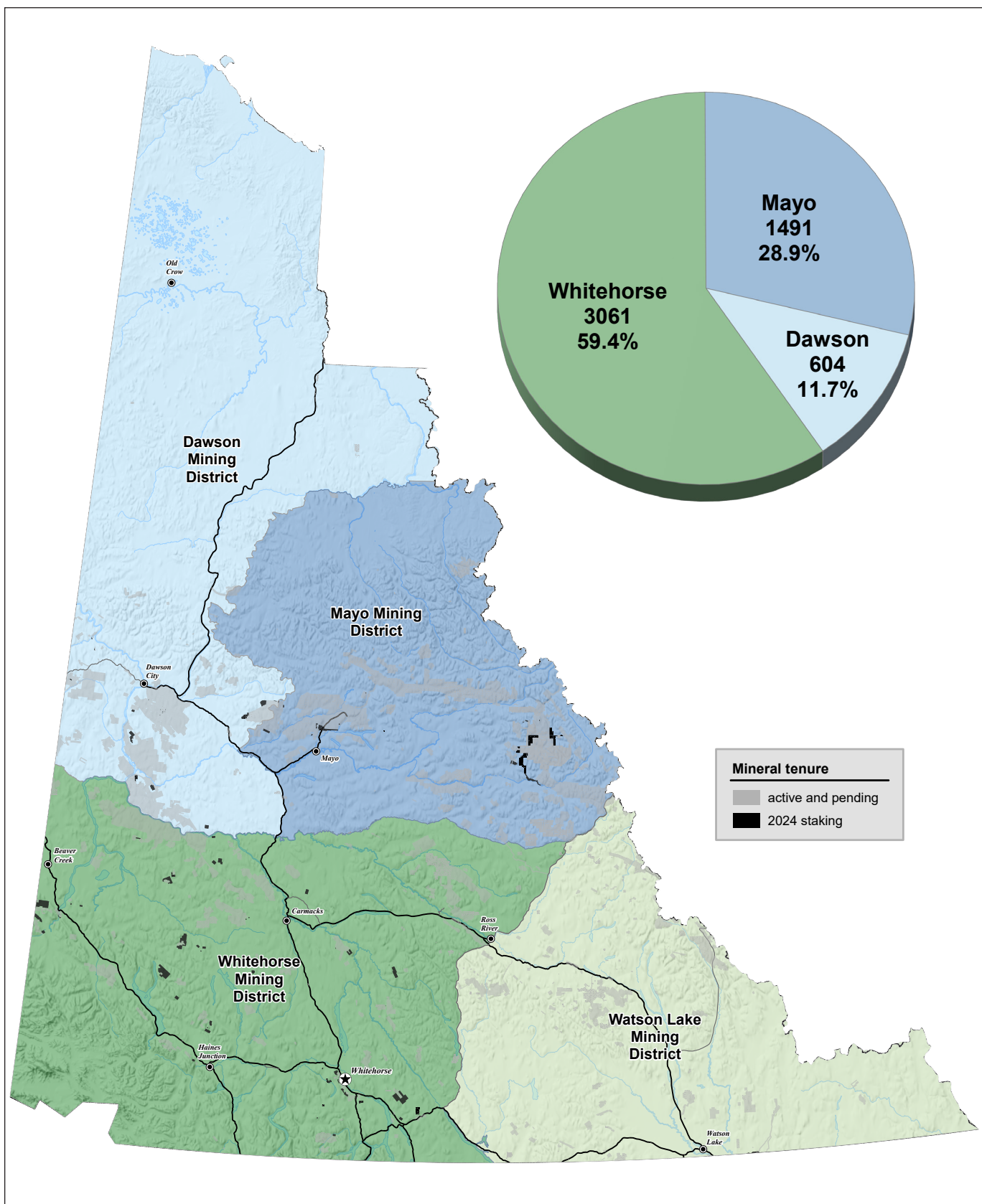


Figure 8. Claim-staking activity during 2024 in the Yukon by mining district.

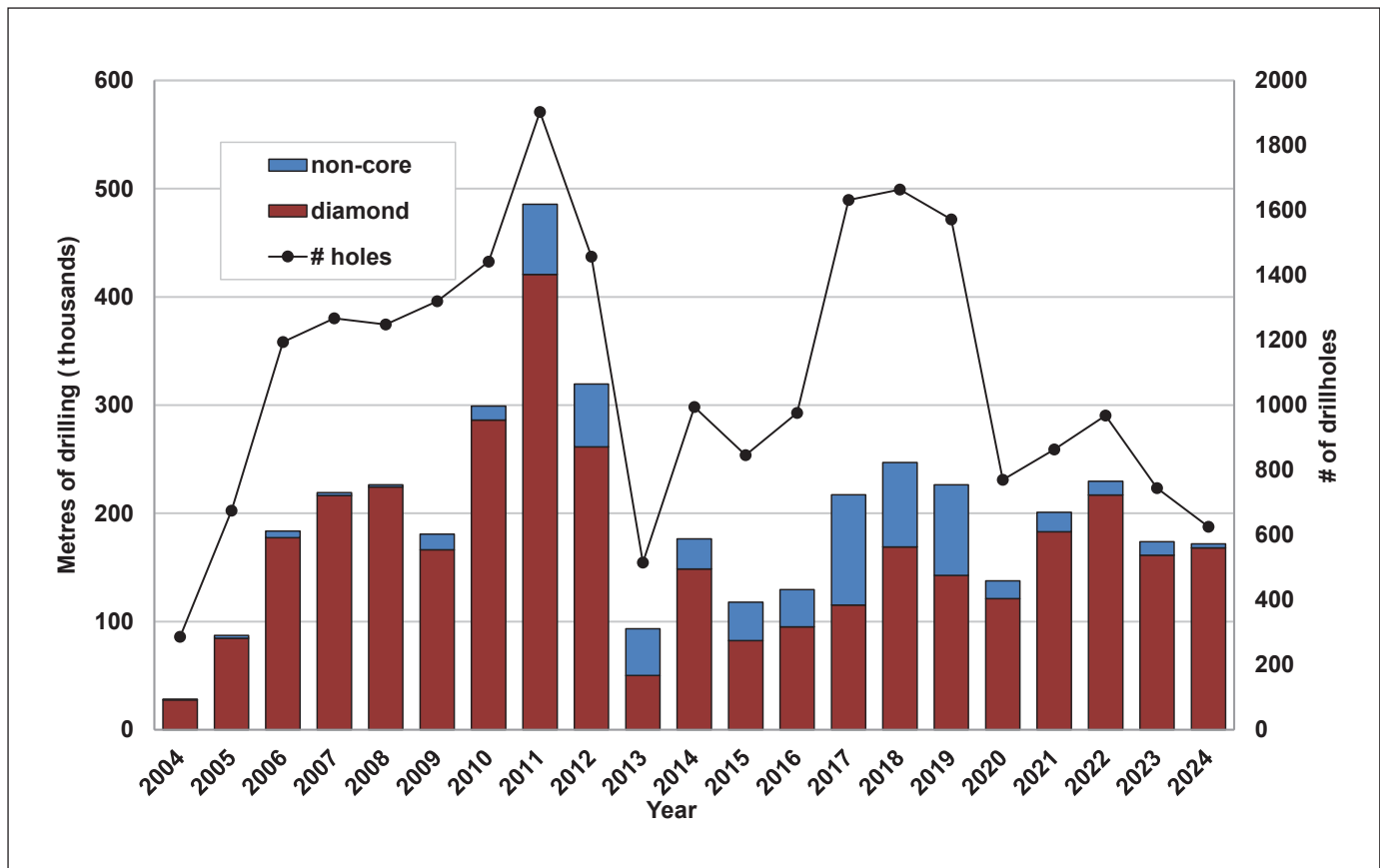


Figure 9. Diamond drilling, and reverse circulation or rotary air-blast drilling in the Yukon from 2004 to 2024.

## Mining activity

On June 24, 2024, a failure occurred at Victoria Gold Corp.'s heap leach facility at the Eagle Gold Mine on its Dublin Gulch property (Victoria Gold Corp., 2024c). Subsequently, the Government of Yukon initiated the temporary closure of the mine on July 5, 2024 (Government of Yukon, 2024a). Site remediation and environmental monitoring is ongoing at the Eagle Gold Mine (Government of Yukon, 2024c). On August 14, 2024, the Ontario Superior Court of Justice granted an order appointing PricewaterhouseCoopers Incorporated as the receiver and manager of Victoria Gold Corp. (Victoria Gold Corp., 2024d).

The Eagle deposit is a reduced intrusion-related gold deposit (RIRG). Total mine production since inception in 2019 is approximately 645 000 oz of gold. In the company's most recent technical report, a combined mine life of more than 10 years was projected for the Eagle and Olive deposits (Harvey et al., 2023). Gold production guidance at the Eagle Gold Mine for 2024 was estimated to be between 165 000 and 185 000 oz (Victoria Gold Corp., 2024b); slightly higher than

previous production years (166 730 oz gold in 2023 and 150 182 oz gold in 2022; Victoria Gold Corp., 2024a). Production for the first quarter of 2024 was 29 580 oz, compared to the 37 619 oz of gold production in the first quarter of 2023. The 21% decrease in gold production is attributed to lower grades related to mine sequencing of the Eagle orebody, the timing of leaching, and lower-than-planned stacking rates (Victoria Gold Corp., 2024b). Exploration at Dublin Gulch was focused on target expansion along strike of the current resource, and in-fill and step-out diamond drilling. At the Stienert target, 10 holes (2378 m) of diamond drilling were completed prior to the incident. Light detection and ranging (lidar) and orthophotography were completed at the Brewery Creek and Gold Dome properties.

Hecla Mining Company acquired Alexco Resource Corp. and the Keno Hill silver project in September 2022. The Keno Hill silver project has polymetallic, silver-lead-zinc vein-style mineralization and a historical production of more than 215 Moz of silver (Cathro, 2006). There are currently five deposits in the region as defined by Hecla Mining (Blais et al., 2024). The mill at Keno Hill Mine reopened in May 2023, and the company is

continuing to work toward full production of silver, lead and zinc concentrates. Production in 2024 was focused on the Flame and Moth, and Birmingham deposits. The company produced 2 144 045 oz of silver during the first three quarters of the year and has an affirmed production guidance for 2024 of 2.7 to 3.0 Moz of silver (Hecla Mining Company, 2024). The company reported that there was lower mill throughput during the third quarter of 2024, which is attributed to delays in receiving an authorization for construction, and a modification to a permit for the dry-stack tailings facility (DSTF). These delays are due to the Government of Yukon and the First Nation of Na-Cho Nyäk Dun prioritizing their response to Victoria Gold Corp.'s Eagle Gold Mine heap leach failure over progressing on permitting applications on other projects (Hecla Mining Company, 2024). Mill operations resumed on October 26, 2024, after receiving the construction authorization and modified DSTF permit, and following the completion of related design and construction work on the DSTF. In 2025, the company's environmental remediation services group is expected to increase construction activities, adding incremental demand on Keno Hill's infrastructure and resources. The company expects 2025 production to remain similar to 2024 and plans to advance permitting; invest in improving safety, environmental practices, and infrastructure; and prioritize stakeholder engagement. In 2026, after implementing these priorities, the company expects production to increase beyond 2024 levels.

An NI 43-101 technical report was filed for Keno Hill Mine on March 28, 2024, and included an updated mineral resource estimate and probable reserves effective December 31, 2023 (Table 1; Blais et al., 2024). Keno Hill has an 11-year reserve mine plan, and the total silver production is expected to be approximately 52.9 Moz over the mine life (Blais et al., 2024). Hecla Mining Company conducted a diamond drill program in 2024, which focused on underground

exploration and resource-definition drilling in the high-grade, Birmingham Bear zone veins (Bear, Footwall and Main vein zones), and in the Flame and Moth veins. They also completed surface exploration drilling at the Birmingham Deep, Birmingham townsite, Elsa17-Dixie, Silver Spoon, and Inca targets. The combined underground and surface drilling resulted in 55 holes totalling 27 500 m (Hecla Mining Company, 2024). Selected drill highlights include hole BMUG24-138 returning 3.1 m of 1993.7 g/t Ag, 6.7% Pb and 6.4% Zn from the Birmingham Footwall vein, and hole FMUG24-055 returning 4.5 m of 2237.5 g/t Ag, 11.6% Pb and 11.2% Zn from the Flame and Moth vein (Hecla Mining Company, 2024).

The Minto Mine is a metamorphosed copper-gold porphyry deposit (Kovacs et al., 2020). In July 2023, Minto Mine was placed into a court-appointed receivership with PricewaterhouseCoopers Inc. after Minto Metals Corp. had ceased operations. On September 5, 2024, the Yukon Supreme Court approved the first of two transactions that would have the Selkirk First Nation take over the copper-gold mine and its assets (CBC, 2024). The Selkirk First Nation has indicated that if the transactions are processed, there is potential for site exploration and the reopening of the mine.

## Permitting and mine development

BMC Minerals Ltd.'s Kudz Ze Kayah (KZK) project contains the ABM deposit (consisting of the ABM and Krakatoa zones). The ABM deposit is a replacement-style, polymetallic, volcanic-hosted massive sulphide (VHMS) deposit, which is in the advanced stages of a proposed open-pit and underground zinc, silver, copper, gold and lead mine. The company received a positive decision document from the governments of Yukon and Canada in June 2022, approving the proposed

**Table 1.** Hecla Mining Company's Indicated and Inferred mineral resource estimate and probable reserves at the Keno Hill Mine, effective December 31, 2023.

Category	Mass (kt)	Ag (g/t)	Pb (%)	Zn (%)	Au (g/t)	Contained Ag (koz)	Volume (m <sup>3</sup> )
Total Indicated	4086	258	0.91	3.49	0.2	33 926	–
Total Inferred	2573	384	1.13	1.83	0.1	31 791	–
Total Probable	1877	912	2.81	2.53	0.22	55 068	611 544
Total combined						120 785	

mine to proceed to the regulatory phase (reaffirmed in March 2024 with specific terms and conditions; YESAB, 2024). The company subsequently submitted Type A Water Licence and Quartz Mining Licence applications in September 2022. On October 9, 2023, BMC Minerals received a positive economic review for the project, confirming the robust economics of the proposed ABM Mine (BMC Minerals Ltd., 2023). BMC Minerals was active at KZK in 2024 and drilled a total of 69 holes (11 322 m), which were accompanied by a downhole electromagnetic (EM) survey. Additionally, the company completed an unmanned aerial vehicle magnetic (UAV-MAG) survey for detailed magnetic data over the ABM deposit (BMC Minerals Ltd., 2024). The drilling was completed to enhance exploration, as well as metallurgical and geotechnical studies. Drilling was focused along strike of the ABM zone to prepare for the future mine plan, and to test targets identified from the 2023 field program, such as the newly identified Fuego target, interpreted to be part of a possible copper-rich ‘feeder zone’ beneath the ABM deposit. Additional exploratory drilling was conducted at the Rhyolite peak target, a zinc-silver-rich stratiform target adjacent to the ABM deposit. At the time of writing, the company had released 14 assay results from the 2024 season. Selected significant assay results include hole K24-527 returning 16 m of 3.5% Cu, 0.5% Pb, 3.2% Zn, 88 g/t Ag and 0.8 g/t Au at Fuego, and hole K24-544 returning 4.5 m of 0.3% Cu, 2.5% Pb, 8.7% Zn, 291 g/t Ag and 1.7 g/t Au at Rhyolite Peak (BMC Minerals Ltd., 2024). Reverse circulation (RC) drilling for geotechnical and hydrological investigations were also completed as a requirement for the project to proceed to the regulatory phase of licencing.

Western Copper and Gold Corp.’s Casino project is one of Canada’s largest undeveloped copper-gold porphyry deposits. The Casino project received strategic investments by Rio Tinto in 2024 (\$5M) maintaining Rio Tinto’s ownership of approximately 9.7% of Western Copper and Gold’s outstanding common shares (Western Copper and Gold Corp., 2024a). The company is in the early stages of the assessment process for the Casino project and received a revised Environmental and Socio-economic Effects (ESE) statement guideline from YESAB in September 2023. In August 2024, the company submitted an updated and refined schedule for submission of the ESE statement for the project, indicating that the company will submit the statement in July 2025 (Western Copper and Gold Corp., 2024b). In preparation for the Casino project’s ESE statement, the company conducted a field environmental program in 2024, which included water monitoring (surface and groundwater), wildlife surveys and engineering work.

Newmont Corp. announced plans to divest from the Coffee gold project on February 22, 2024, as part of Newmont’s portfolio optimization (Newmont Corp., 2024). The Coffee project is currently considered to be a structurally controlled epizonal gold deposit. In November 2023, the company submitted an application for a Quartz Mining License. Throughout 2024, the company has continued to conduct economic and environmental baseline studies.

## Exploration activities in 2024

Exploration activities and exploration-related expenditures were predominantly in the Mayo Mining District; this has been a consistent trend in the last few years. The Mayo Mining District comprises the Clear Creek, Keno and Mayo regions, as well as most of the Selwyn basin northwest of the North Canal Road (Fig. 3). The majority of exploration was focused on searching for reduced intrusion-related gold (RIRG) deposits, high-grade silver-lead-zinc veins, and sediment-hosted massive sulphide deposits.

## Gold exploration projects

There were 41 active gold exploration projects in 2024. These projects accounted for 47.6% (\$69.0M) of the total exploration expenditure in the Yukon.

Snowline Gold Corp. filed an NI 43-101 technical report and released an inaugural Indicated and Inferred mineral resource estimate (MRE) at their Rogue project totalling over 7.3 Moz gold (Table 2; Burrell et al., 2024). The company completed 81 diamond drillholes (35 006 m) across their Rogue (64 holes for 28 248 m), Einarson (14 holes for 5413 m), and Cynthia (3 holes for 1345 m) projects to delineate zones of known gold mineralization and to test for the extension of mineralization. At the Rogue project, drilling was focused at the Valley deposit, and fewer holes were drilled at Aurelius, Cujo

**Table 2.** Snowline Gold Corp.’s initial mineral resource estimate for the Valley Deposit, effective May 15, 2024.

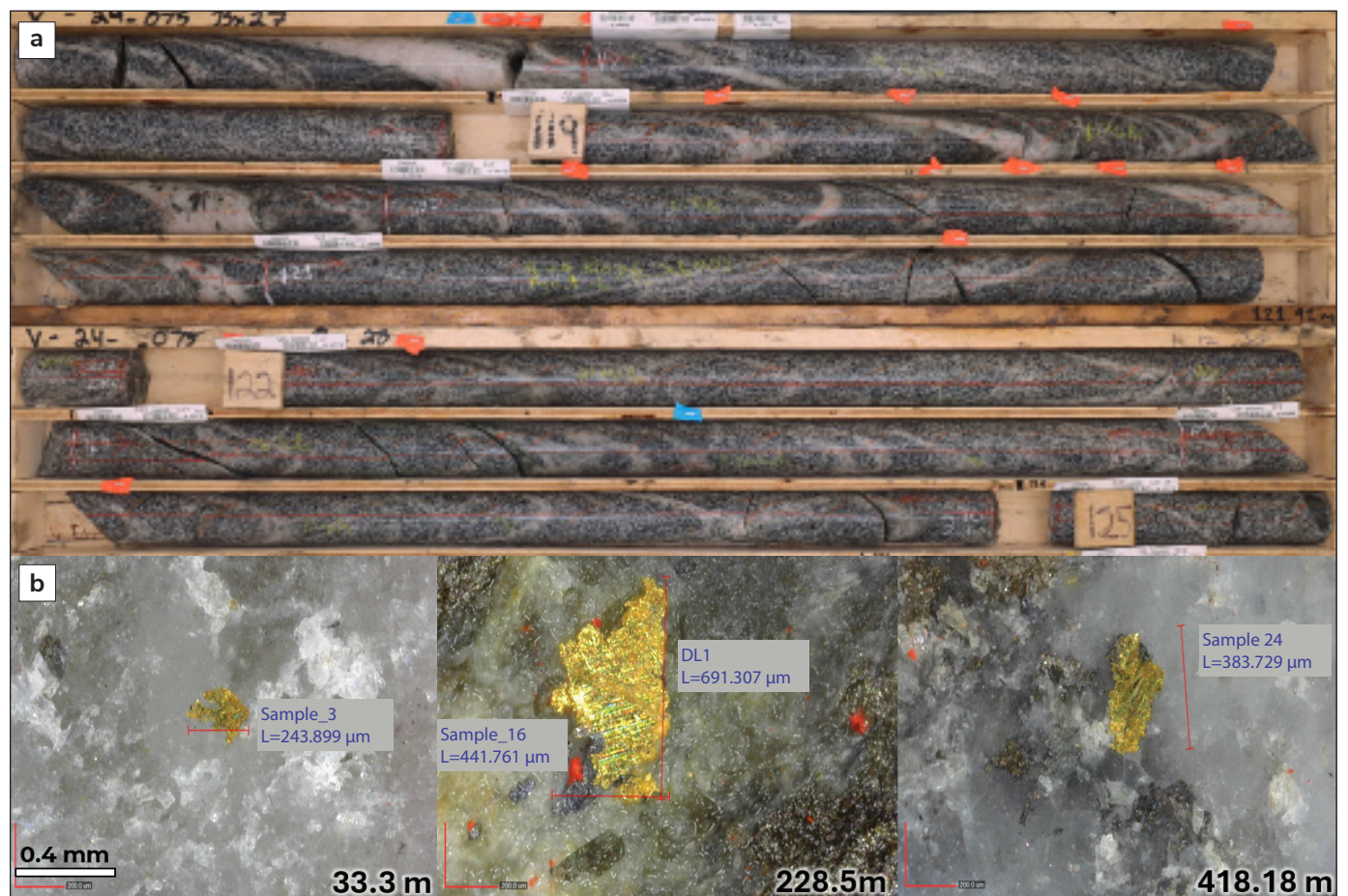
Mineral resource category	Tonnage (kt)	Average Au grade (g/t)	Contained Au (koz)
Indicated Resources	75 836	1.66	4052
Inferred Resources	81 039	1.25	3260
Total combined	156 875		7312

and the Reid targets. A selected assay highlight at the Valley deposit from hole V-24-075 returned 471.6 m of 2.38 g/t Au, including 22.0 m of 6.48 g/t Au (Fig. 10; Snowline Gold Corp., 2024a). At the Einarson project, drilling was focused at the Jupiter and Avalanche Creek targets. A selected assay highlight at the Jupiter target from hole J-24-022 returned 6.3 m of 6.88 g/t Au, including 2.0 m of 13.9 g/t Au (Snowline Gold Corp., 2024b). At Cynthia, drilling was focused at the Sydney target (assays pending). In addition to drilling, Snowline Gold Corp. conducted regional surface sampling and mapping programs, as well as airborne surveys at their Rogue, Einarson and Cynthia projects. The company also conducted rock sampling and a Z-Axis Tipper Electromagnetic (ZTEM™) survey at their Olympus project, and geological mapping and silt and rock sampling at their Ursa project.

Banyan Gold Corp. filed an NI 43-101 technical report and released a new pit-constrained Inferred MRE of

approximately 7.0 Moz gold across the Airstrip and Powerline deposits at their AurMac gold project (Table 3; Thornton et al., 2024). The company also completed an exploration program at their AurMac property consisting of diamond drilling of 118 holes (21 000 m), a ZTEM™ airborne survey, and metallurgical work. At the Powerline deposit, selected assay highlights from hole AX-24-538 returned 21.5 m of 1.06 g/t Au, and hole AX-24-540 returned 23.1 m of 5.68 g/t Au, including 0.2 m of 539.30 g/t Au (Fig. 11; Banyan Gold Corp., 2024b). The company also conducted work on their Nitra project, which received 2024 YMEP funding. Exploration at Nitra included soil sampling and a ZTEM™ airborne survey (Banyan Gold Corp., 2024a).

Sitka Gold Corp. acquired the Clear Creek claims earlier this year from Victoria Gold Corp., consolidating their claim package at their flagship RC Gold project (Sitka Gold Corp., 2024a). Sitka Gold Corp. conducted an exploration diamond drill program at their RC Gold



**Figure 10.** Valley drillcore from hole V-24-075. (a) Select interval of drillcore showing quartz-carbonate veins cut through relatively unaltered granodiorite. Orange and blue flags denote observations of visible gold. (b) Select instances of visible gold. (Snowline Gold Corp., 2024a).

**Table 3.** Banyan Gold Corp.'s pit-constrained Inferred mineral resource estimate for the AurMac deposit, effective February 6, 2024.

Deposit	Gold cut-off (g/t)	Tonnage (Mt)	Average Au grade (g/t)	Contained Au (koz)
Airstrip	0.3	35.243	0.75	845
Powerline*	0.3	312.243	0.61	6158
Total combined	0.3	347.486	0.63	7003

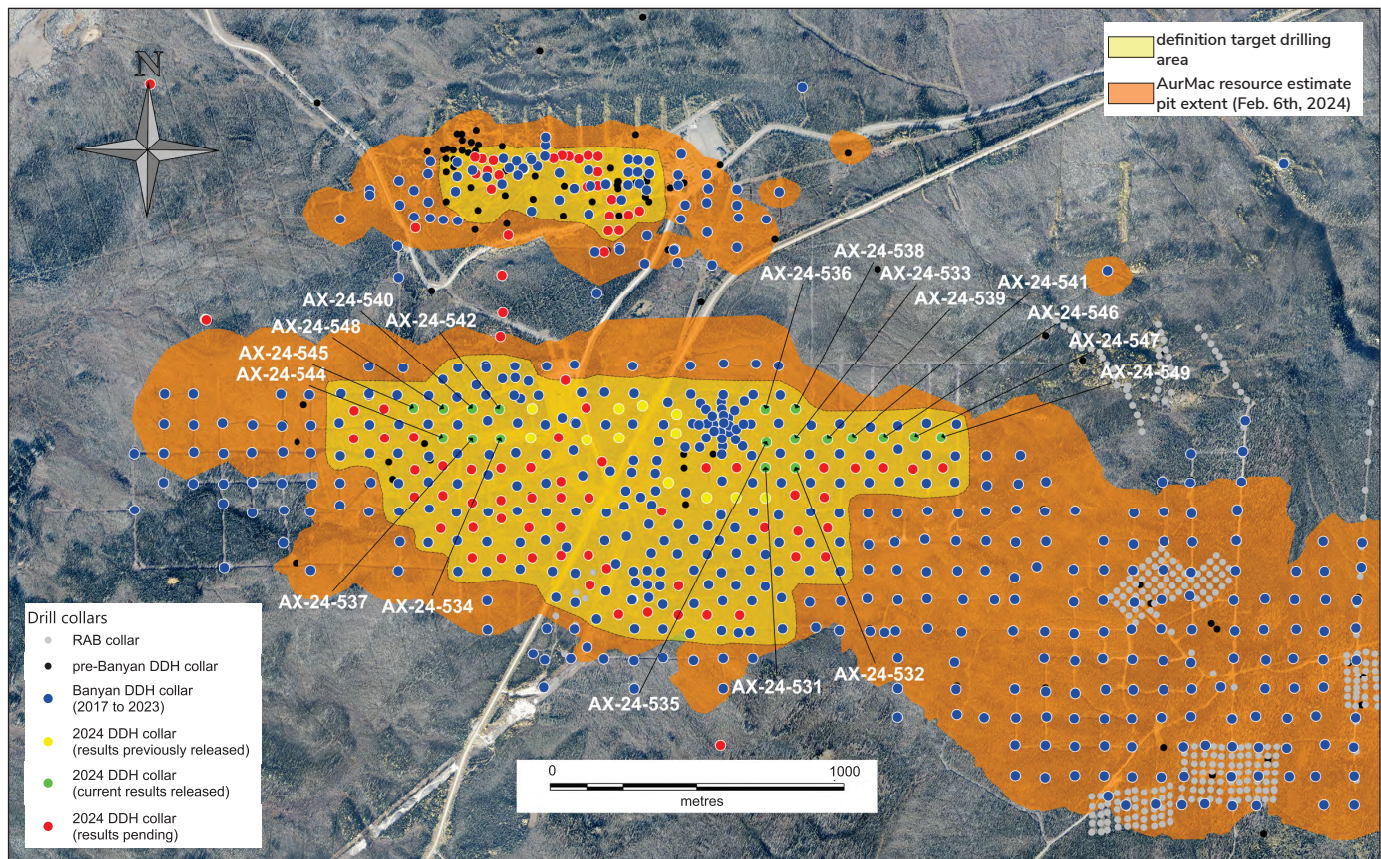
\*Includes Aurex Hill deposit.

project completing 20 drillholes (9700 m). The company also carried out prospecting, geological mapping and soil sampling in the G2 to Pukelman West corridor and along the Blackjack fault. The drill program was focused on step-out drilling at the Blackjack gold deposit (16 holes), and first-ever diamond drilling at the Rhosgobel (two holes) and Pukelman (two holes; assays pending) intrusions. Selected drilling highlights at the Blackjack gold deposit (Fig. 12) returned 678.1 m

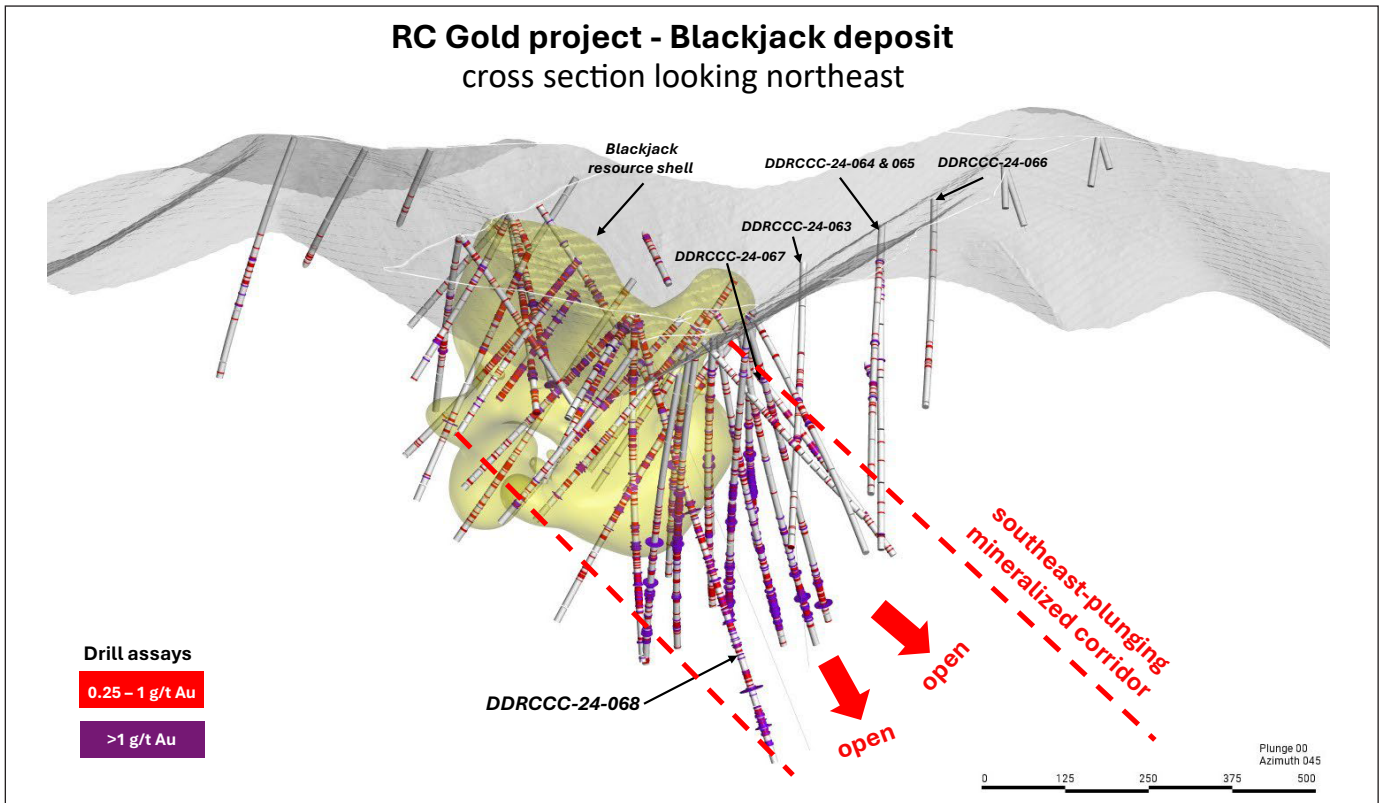
of 1.04 g/t Au (including 5.5 m of 17.59 g/t Au) from hole DDRCCC-24-068 (Sitka Gold Corp., 2024b). Additionally, the Rhosgobel intrusion returned 164.8 m of 0.82 g/t Au (including 1.8 m of 16.25 g/t Au) from hole DDRCRG-24-001 (Sitka Gold Corp., 2024c).

Seabridge Gold Inc. conducted exploration at their 3 Aces project, drilling 15 diamond drillholes and 21 RC drillholes (7620 m total; assays pending). Drilling was focused on expanding known mineralized zones in the Central Core area and identifying new target opportunities (Fig. 13; Seabridge Gold Inc., 2024). The company also conducted geological mapping, till sampling and environmental baseline studies.

Klondike Gold Corp. completed 36 diamond drillholes (5827 m) on their Klondike project. Eight holes were drilled beneath the Stander zone and selected highlights returned 1.0 m of 39.52 g/t Au from hole EC24-523 and 1.0 m of 25.81 g/t Au from hole EC24-537 (Klondike Gold Corp., 2024b). Eleven holes were drilled along strike of the Stander zone, and a selected highlight from hole EC24-534 returned 4.0 m of 21.50 g/t Au, including 1.0 m of 9.50 g/t Au



**Figure 11.** AurMac drillhole locations. (Figure after Banyan Gold Corp., 2024b.) DDH: diamond drillhole.



**Figure 12.** Longitudinal section of completed drillholes at the Blackjack Zone at Sitka Gold Corp.'s RC project. Higher-grade mineralization is defined in a southeast-plunging mineralized corridor where gold grades increase at depth and suggest that drilling is vectoring toward the source of this gold system. (Figure after Sitka Gold Corp., 2024b.)



**Figure 13.** View of 3 Aces Central Core area. View is looking to the west.

(Klondike Gold Corp., 2024c). The results of the company’s drill campaign this year have increased the length of the Stander zone by 50%. The company also completed prospecting and mapping in the central and northwest areas of the property. While mapping, several new showings were discovered in outcrop that hosted visible gold. Rock samples collected from these showings include highlights of 52.7 g/t Au at Wasp, 46.6 g/t Au at Archy and 10 g/t Au at DJ (Klondike Gold Corp., 2024a). These new discoveries are located along the newly mapped ‘Eldorado fault’, which is interpreted to be a significant structure controlling the distribution of gold-bearing veins.

White Gold Corp. announced an updated Indicated and Inferred MRE for its flagship White Gold project, which hosts four near-surface gold deposits that are interpreted to represent a structurally controlled orogenic gold system (Table 4; White Gold Corp., 2024c). The gold resources at the project are almost entirely captured within an open pit and remain open for expansion in multiple directions. The company conducted exploration at the QV, Betty, Pilot, IND and Hunker properties, and also the Hayes and Loonie properties, which were YMEP-funded projects. At the QV project, exploration was focused on the Chris Creek target, which included first-ever diamond drilling of six holes (1082 m; assays pending), infill and extension soil sampling, rock sampling, and a VLF-EM survey (White Gold Corp., 2024b). The soil survey at QV doubled the northeast-striking, gold-in-soil anomaly to 2.2 km and returned the property’s highest gold values to date. Included in these high gold values were multiple soil samples that returned 82 to 600 ppb Au (White Gold Corp., 2024a), and rock samples having anomalous values of up to 1.09 g/t Au over a 1.25 km section within the gold-in-soil anomaly (White Gold Corp., 2024b). At the Betty property, diamond drilling

(six holes totalling 1131 m; assays pending) was conducted at the Betty Ford, White E and Black targets. The company completed property-scale lidar at Pilot, collected soils at IND, and conducted regional rock sampling at Hunker. At Hayes, the company carried out regional soil sampling and collected rock samples at the Isaac porphyry target. At the Guilder target on the Loonie property, the company collected soil samples and conducted a VLF survey.

Rackla Metals Inc. completed an exploration program at their Astro West property, which consisted of four diamond drillholes (954 m), prospecting, geological mapping, rock and talus-fine sampling, and a photogrammetry survey (Rackla Metals Inc., 2024). Drilling was focused on the HIT and Peak targets; assays are pending. The company also conducted prospecting and stream sediment sampling at their Eddy project that received 2024 YMEP funding.

Trifecta Gold Ltd. carried out exploration at their Mt. Hinton project, as well as their Rye and Lace projects, which received 2024 YMEP funding. At the Mt. Hinton project, the company completed one hole (158 m) of diamond drilling, geological mapping, prospecting and airborne ZTEM™ and magnetic surveys (Trifecta Gold Ltd., 2024b). The company’s drill program was limited to one hole due to a series of equipment issues. The company conducted soil and rock sampling, and a lidar survey at their Rye project. Assay results of samples from outcrop yielded up to 7.25 g/t Au, 240 ppm Bi and 5.23 ppm Te (Trifecta Gold Ltd., 2024a). At the Lance project, the company conducted geological mapping, prospecting, and soil and rock sampling.

Prospector Metals Corp. carried out exploration at their flagship Mike Lake project, comprising geological and structural mapping, rock sampling, and lidar and

**Table 4.** White Gold Corp.’s updated Indicated and Inferred mineral resource estimate for the White Gold project, effective October 28, 2024.

Type	Classification	Cut-off (g/t)	Tonnes (kt)	Grade (g/t)	Contained Au (oz)
Open-pit	Indicated	0.35	17 637	2.12	1 200 900
	Inferred		23 916	1.38	1 061 400
Underground	Indicated	2.3	23	2.84	2100
	Inferred		556	3.09	55 200
Total combined	Indicated		17 660	2.12	1 203 000
	Inferred		24 472	1.42	1 116 600

WorldView-3 remote sensing surveys. Rock assay results include up to 79.96 g/t Au and up to 3.98% Cu from the newly identified Vary zone (Prospector Metals Corp., 2024a). Additionally, Lorrie Lake area yielded up to 2049 g/t Ag, 33.27% Pb and 5.08% Zn (Fig. 14; Prospector Metals Corp., 2024b). The company's exploration program aimed to assess multiple known historical prospects across the property to gain an understanding on controls on mineralization. The program resulted in the identification of a series of steeply dipping, north to northeast-trending and east-trending structural corridors that transect the property and appear to be a primary control on mineralization in all rock types.

### Copper exploration projects

There were 22 active copper exploration projects in 2024. These projects accounted for 12.3% (\$17.9M) of the total exploration expenditure.

Gladiator Metals Corp. is continuing their diamond-drill program on their Whitehorse Copper project. By the end of 2024, the company estimates that they will complete 70 holes (15 000 m) across several prospects, including Cowley Park, Best Chance, Black Cub, Arctic Chief and Chiefs Trend. Selected drill highlights at the Cowley Park prospect include hole CPG-047 returning 98 m of 1.49% Cu, 0.04 g/t Au, 3.68 g/t Ag and 187 ppm Mo, including 14 m of 7.67% Cu, 0.07 g/t Au, 15.16 g/t Ag and 217 ppm Mo; and hole CPG-049 returning 79 m of 1.37% Cu, 0.06 g/t Au, 4.38 g/t Ag and 261 ppm Mo, including 26 m of 3.31% Cu, 0.06 g/t Au, 8.97 g/t Ag and 44 ppm Mo (Fig. 15; Gladiator Metals Corp., 2024b). The company also conducted induced polarization (IP) surveys at Black Cub, Gem, Cowley Park, and an airborne magnetic survey at Cowley Park (Gladiator Metals Corp., 2024a).

Cascadia Minerals Ltd. conducted an exploration program at their Catch project, consisting of five diamond drillholes (3055 m) at the Spark zone, and prospecting, geological mapping, and surface sampling at both the Spark and Amp zones. A selected drilling highlight from a step-out hole at the Spark zone included 106.0 m of 0.37% Cu and 0.22 g/t Au from hole CA-24-006 (Cascadia Minerals Ltd., 2024a). A selected rock assay at the Amp zone returned 1065 g/t Au and 267 g/t Ag (Cascadia Minerals Ltd., 2024b). Cascadia Minerals Ltd. also conducted exploratory surface-sampling programs at their early-stage projects, which included their Mack's Copper property, and the 2024 YMEP-funded Sands of Time and Milner projects, all

of which the company suggests host potential for new copper-gold porphyry discoveries.

Forge Resources Corp. expanded their land package at their Alotta project by 55% and conducted 1815 m of diamond drilling (four holes; assays pending) at the previously untested Payoff and Severance areas (Forge Resources Corp., 2024a). The company has commissioned a structural analysis study on their oriented drill core to help test different styles of gold mineralization at the Alotta project (Forge Resources Corp., 2024b).

Granite Creek Copper Ltd. conducted an exploration diamond-drill campaign at their Carmacks Copper project, consisting of four holes (1420 m; assays pending) at the newly discovered Gap zone (Granite Creek Copper Ltd., 2024). The Gap zone is located adjacent to existing pit-constrained resources (pits 147 and 2000S) and was traced for approximately 170 m. The Gap zone remains open along strike and at depth, and disseminated copper mineralization was observed in three of the four drillholes (Fig. 16).

### Silver, lead-zinc and tungsten exploration projects

There were a total of 16 active silver and lead-zinc projects, and two active tungsten exploration projects in 2024. Together, these projects accounted for 38.7% (\$56.0M) of the total exploration expenditure.

Fireweed Metals Ltd. released a new MRE and filed the related NI 43-101 technical report for the Macpass project (Table 5; Landry et al., 2024). The MRE provides an updated resource estimate for the Tom and Jason deposits and the inaugural resource estimate for the Boundary zone and End zone deposits. The Macpass project is one of the world's largest undeveloped zinc resources, and one of the world's largest known accumulations of germanium and gallium.

In 2024, Fireweed Metals Ltd. carried out an exploration program at their Macpass project (Fig. 17) that consisted of 49 diamond drillholes (16 013 m) along with a large regional exploration program targeting new discoveries using prospecting, soil sampling, ground gravity surveys, airborne Versatile Time Domain Electromagnetic (VTEM™) surveys, and lidar and orthophoto surveys (Fireweed Metals Ltd., 2024b). Of the 49 holes drilled, 26 holes were drilled at Boundary zone (Fig. 18), 6 at Tom South, 2 at Jason, 7 at Popcorn, and 8 at other exploration targets

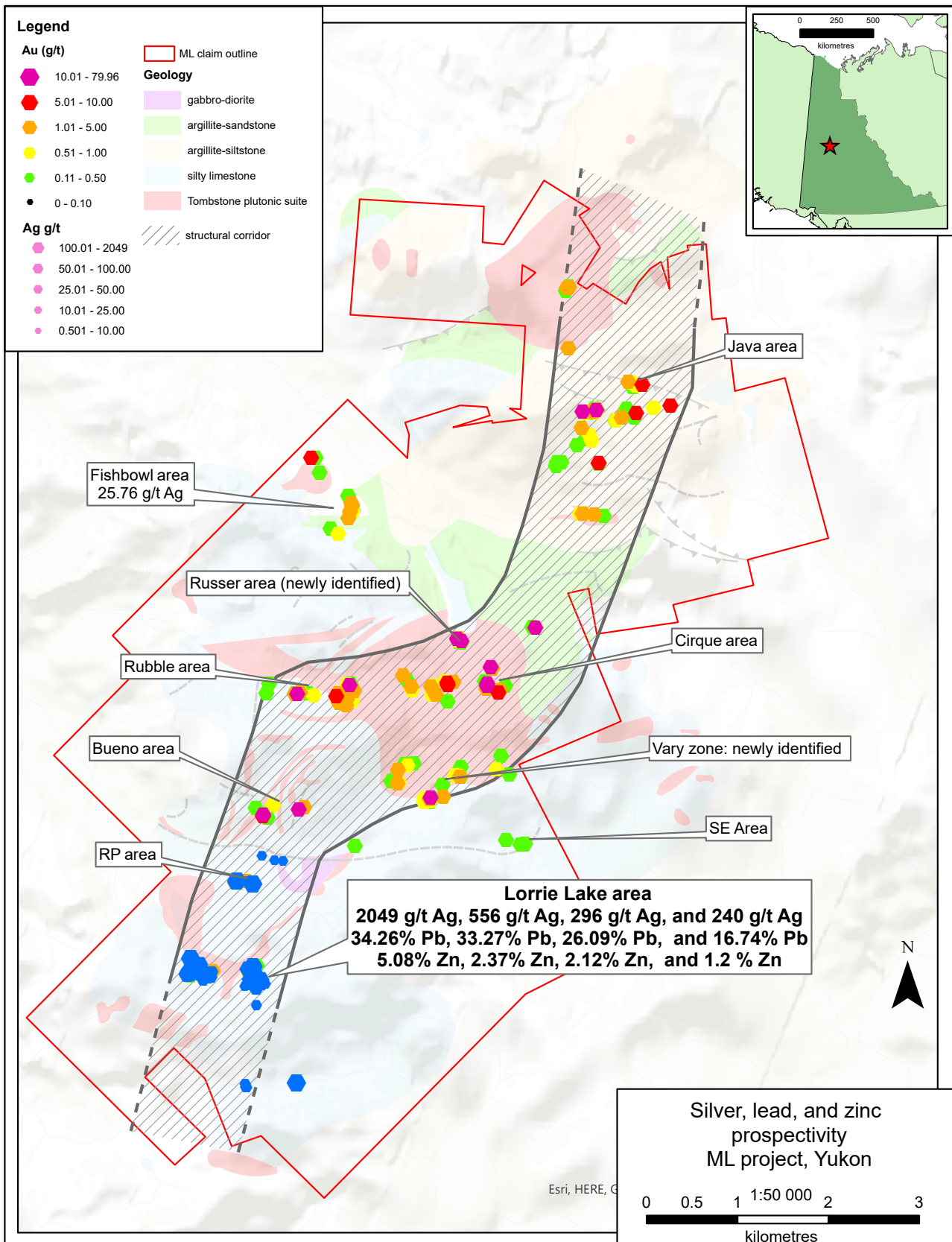
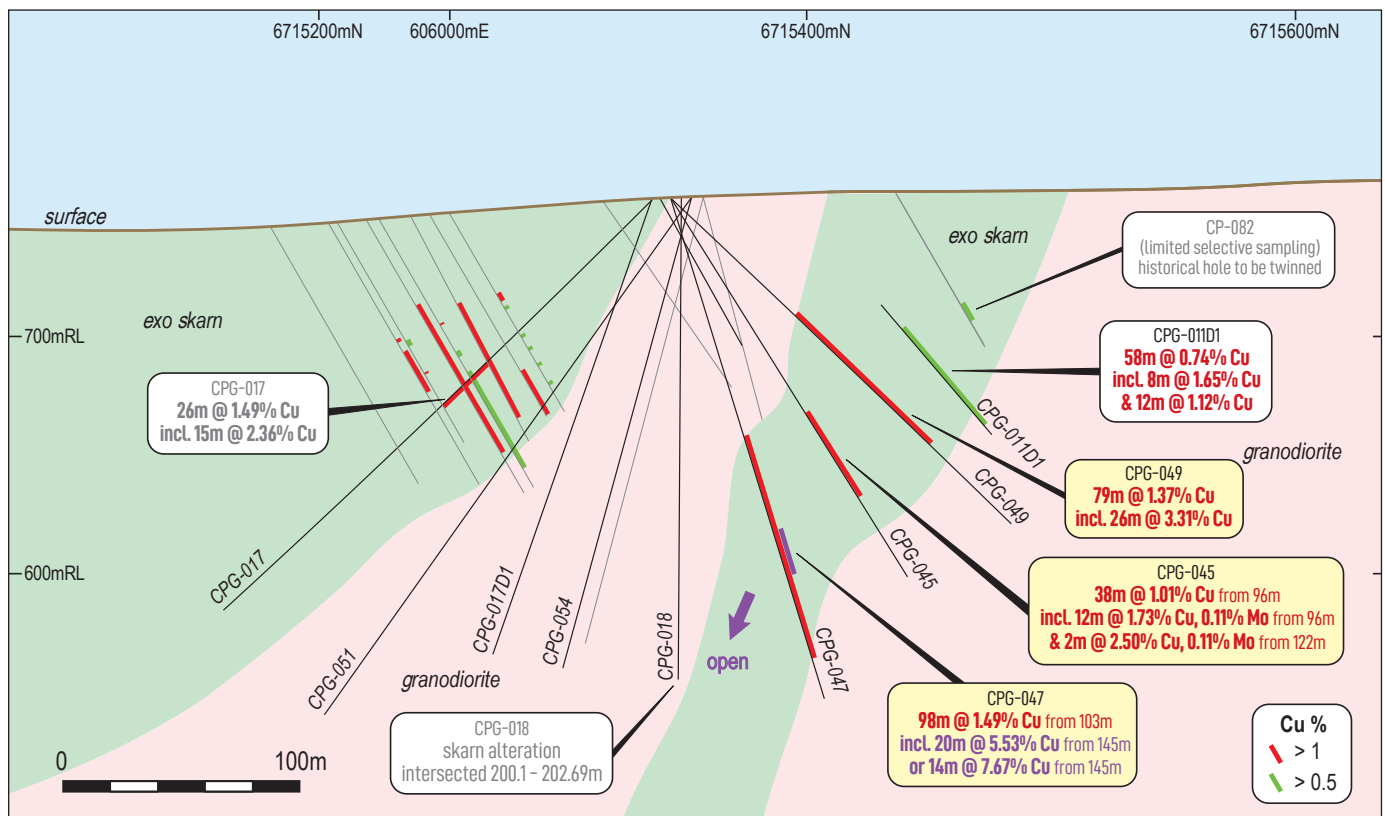


Figure 14. Rock and chip assay results from the Mike Lake project. (Figure after Prospector Metals Corp., 2024b.)



**Figure 15.** Section through the Cowley Park prospect illustrating Gladiator Metals Corp.'s drilling and recently returned assay results. The view looking approximately to the west. (Figure after Gladiator Metals Corp., 2024b.)

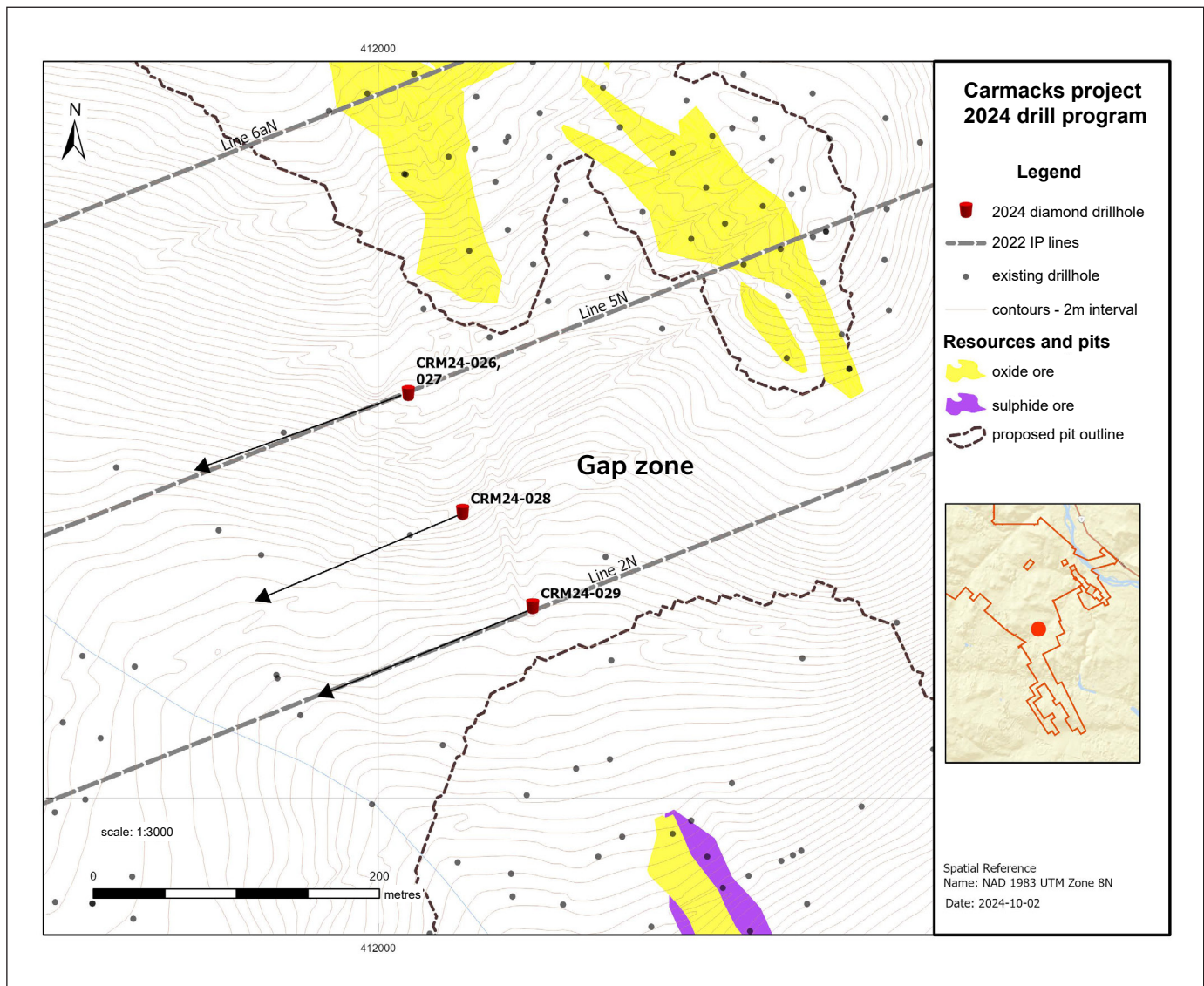
around the property. Selected Boundary zone assay highlights from hole NB24-014 returned 54.58 m (31 m true width) of 8.68% Zn, 3.68% Pb and 87.4 g/t Ag, including 26.08 m (15 m true width) of 13.15% Zn, 6.35% Pb and 139.9 g/t Ag (Fireweed Metals Ltd., 2024c). Additionally, a step-out intersection from hole NB24-015 (Fig. 19) returned 63.54 m of 6.08% Zn, 0.89% Pb and 10.7 g/t Ag, including 2.75 m of 12.71% Zn, 0.31% Pb and 24.8 g/t Ag (Fireweed Metals Ltd., 2024e). A selected Popcorn highlight from hole NB24-004 returned 46.03 m of 4.88% Zn and 3.6 g/t Ag, including 14.13 m of 8.27% Zn and 5.3 g/t Ag (Fireweed Metals Ltd., 2024a). A selected Tom South highlight from hole TS24-002 returned 15.12 m (10 m true width) of 10.39% Zn, 18.10% Pb and 296.9 g/t Ag, including 8.15 m (5.4 m true width) of 12.76% Zn, 22.44% Pb and 361.4 g/t Ag (Fireweed Metals Ltd., 2024d).

At Fireweed Metals Corp.'s Mactung project (see Fig. 17), the company conducted prospecting, a soil sampling program, and ongoing environmental work. Mactung is a tungsten skarn deposit associated with a mid-Cretaceous granitic intrusion(s) in eastern Yukon. The deposit straddles the border between the Yukon

and Northwest Territories and is the largest known tungsten resource in the world (Fireweed Metals Corp., 2023).

Cantex Mine Development Corp. conducted a diamond drill program consisting of 33 holes (6000 m) at their North Rackla project (Cantex Mine Development Corp., 2024b). Of the 33 holes, 28 were drilled at the Massive Sulphide zone and 5 were drilled at the Copper zone on the west side of the claim block. The drilling at the Massive Sulphide zone focused on the Discovery sector and extended the strike length of the mineralization. A highlight from the Copper zone from hole YKDD24-287 returned 2.9 m of 11.4 g/t Ag and 4.54% Cu (Cantex Mine Development Corp., 2024a). At the Discovery sector, a highlight from hole YKDD24-302B returned 13.63 m of 17.3 g/t Ag, 3.59% Pb and 3.66% Zn, including 2.4 m of 69.1 g/t Ag, 16.74% Pb and 9.08% Zn (Cantex Mine Development Corp., 2024b).

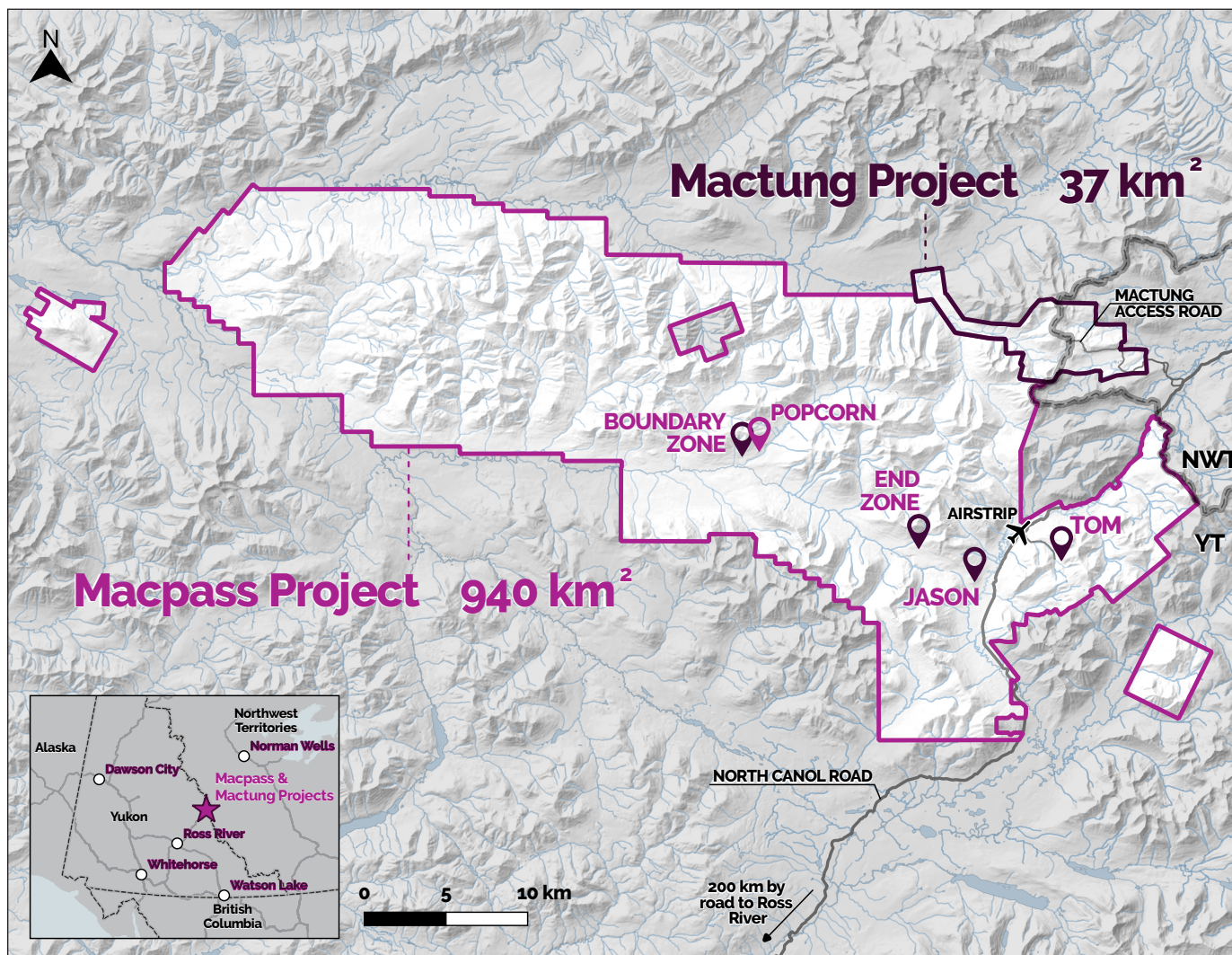
Silver North Resources Ltd. conducted 732 m of diamond drilling in three holes at the West fault and Main fault targets on their Haldane silver project (Silver North Resources Ltd., 2024b). Selected drillhole highlights are



**Figure 16.** Gap zone location and recent drilling at the Carmacks Copper project. (Figure after Granite Creek Copper Ltd., 2024.) IP: induced polarization.

**Table 5.** Fireweed Metal Corp.'s combined open pit and underground constrained mineral resource estimate at the Macpass project, effective October 17, 2024.

Category	Tonnes (Mt)	Zn grade (%)	Pb grade (%)	Ag grade (g/t)	Zn contained (Mlbs)	Pb contained (Mlbs)	Ag contained (Moz)	Tonnage (Mt)	Ge (g/t)	Ga (g/t)	Ge contained (kg)	Ga contained (kg)
Total Indicated	55.98	7.27	1.58	24.4	6784	1952	43.54	55.98	10.98	7.38	614 800	412 900
Total Inferred	48.46	7.48	2.08	25.3	5500	2226	39.42	48.46	8.14	5.82	394 400	282 100

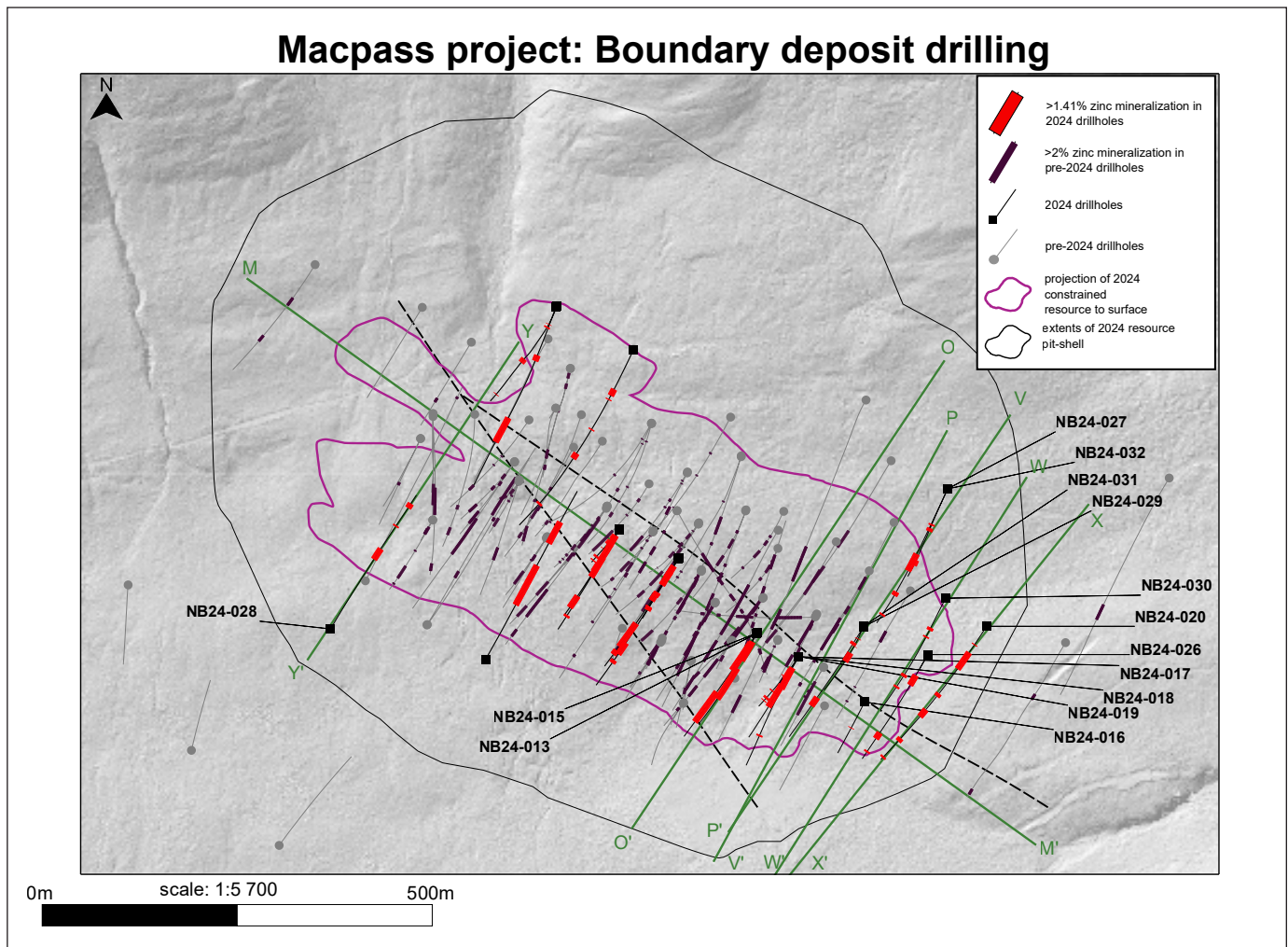


**Figure 17.** Macpass and Mactung project locations. (Figure provided by Fireweed Metals Ltd. [Fireweed Metals Ltd., 2024a].)

as follows: hole HLD24-29 returned 3.05 m of 460 g/t Ag, 0.16 g/t Au, 4.34% Pb and 1.23% Zn, and hole HLD24-30 returned 1.83 m (true width) of 1088 g/t Ag, 3.90 g/t Au, 1.89% Pb and 0.63% Zn, including 0.73 m (true width) of 2470 g/t Ag, 9.64 g/t Au, 3.88% Pb and 0.99% Zn (Silver North Resources Ltd., 2024b). Drilling confirmed that the Main fault target hosts multiple high-grade, silver-bearing veins and breccias.

Coeur Mining Inc. conducted work on the Tim project, which they are currently optioning from Silver North Resources Ltd. (Silver North Resources Ltd., 2024a). Coeur Mining Inc. drilled six diamond drillholes (2252 m) targeting the Wolf fault. Additionally, they carried out surface sampling, as well as airborne magnetic, airborne radiometric, and mobile magnetotellurics (MT) surveys.

Yukon Metals Corp. is a new company in the Yukon and acquired multiple claim packages totalling approximately 18 000 hectares (Yukon Metals Corp., 2024a). In 2024, they completed a large program on their Star River project, and smaller programs at their Birch, Az and Fairway copper projects. At the Star River project, the company conducted prospecting, geological mapping, rock sampling, drone lidar, and ground-based gravity and Time Domain Electromagnetic (TDEM) surveys (Yukon Metals Corp., 2024b). The company sampled across multiple showings and received significant gold and silver assay results. Highlighted results from rock samples include 101 g/t from F2, multiple samples ranging from 1.62 up to 9.35 g/t Au at Saddle, and 9.74 g/t Au near FLT (Fig. 20). Elevated silver was found in several samples at F2 and F3, including 1935



**Figure 18.** Composite intervals in 2024 drilling and pre-2024 drilling. Constrained resource projection to surface, and proposed pit shell at the Boundary Zone are also included. (Figure after Fireweed Metals Ltd., 2024e.)



**Figure 19.** Galena and sphalerite-rich massive sulphides in drillhole NB24-024; 389.9 to 396.0 m at Boundary Zone (Figure provided by Fireweed Metals Ltd. [Fireweed Metals Ltd., 2024c].)

to 1940 g/t Ag at F2 and 1790 g/t Ag at F3 (Fig. 20; Yukon Metals Corp., 2024b). One assay (K140057) contains 10 936 g/t Ag from a new mineral occurrence on the property called New MX. The company's TDEM survey identified four prominent conductive zones for mineralization (Yukon Metals Corp., 2024c).

Metallic Minerals Corp. released an NI 43-101 technical report with an inaugural MRE on their Keno Silver project and a combined underground and in-pit total resource estimate from four separate deposits (Formo, Fox, Caribou and Homestake) totalling 9.81 Moz Ag, 8500 oz Au, 44.88 Mlbs Pb and 99.08 Mlbs Zn (Table 6; Armitage et al., 2024). The company also drilled three diamond drillholes (700 m; assays pending) and ran a soil sampling program at their Keno Silver project. Reclamation work was carried out at their McKay property.

CMC Metals Ltd. released a new Inferred MRE at their Silver Hart project for an open pit totalling 4.3 Moz Ag, 9.9 Mlbs Pb and 84.7 Mlbs Zn (Table 7; CMC Metals Ltd., 2024b). The company also completed a reclamation program at their Silver Hart project (CMC Metals Ltd., 2024a).

### Nickel ± PGE exploration projects

There were three active nickel ± PGE exploration projects in 2024: GT Resources Inc.'s Canalask project, FPX Nickel Corp.'s Mich project and Stillwater Critical Minerals Corp.'s Ultra project. These projects accounted for 1.4% (\$2.0M) of the total exploration expenditure for the Yukon.

GT Resources Inc. conducted their first drill campaign on the Canalask nickel-copper project in the summer of 2024. At the Footwall zone, five diamond drillholes (1010 m) were drilled and were complemented by Borehole Electromagnetic (BHEM) surveys (GT Resources Inc., 2024a). This is the first drill program at this zone since the 1990s. Two holes targeted the historical, high-grade Footwall zone, while three holes were planned to intersect an electromagnetic (EM) conductor and the favourable gabbro at the base of the Kluane ultramafic feeder dike. Unfortunately, none of the three holes that were drilled through the ultramafic feeder dike achieved their planned depth due to challenging overburden and blocky, faulted ground. Selected drill highlights at the Footwall zone, included hole CSK24-05, returning 33.5 m of 1.95% Ni, 0.05% Cu, 0.03% Co, 0.19 g/t Au and 0.44 g/t Pd (Fig. 21; GT Resources Inc., 2024a), and within the ultramafic feeder dike, hole CSK24-003 returned

46.5 m of 0.26% Ni, 0.14 g/t Pd and 0.07 g/t Pt, including 4.0 m of 0.32% Ni, 0.33 g/t Pt and 0.15 g/t Pt (GT Resources Inc., 2024b).

FPX Nickel Corp. received 2024 YMEP funding for their Mich project and expanded the Mich claims package from 19 to 87 km<sup>2</sup> in the first half of 2024. The company also conducted a surface-sampling program with the objective of advancing the project to a drill-ready state (FPX Nickel Corp., 2024).

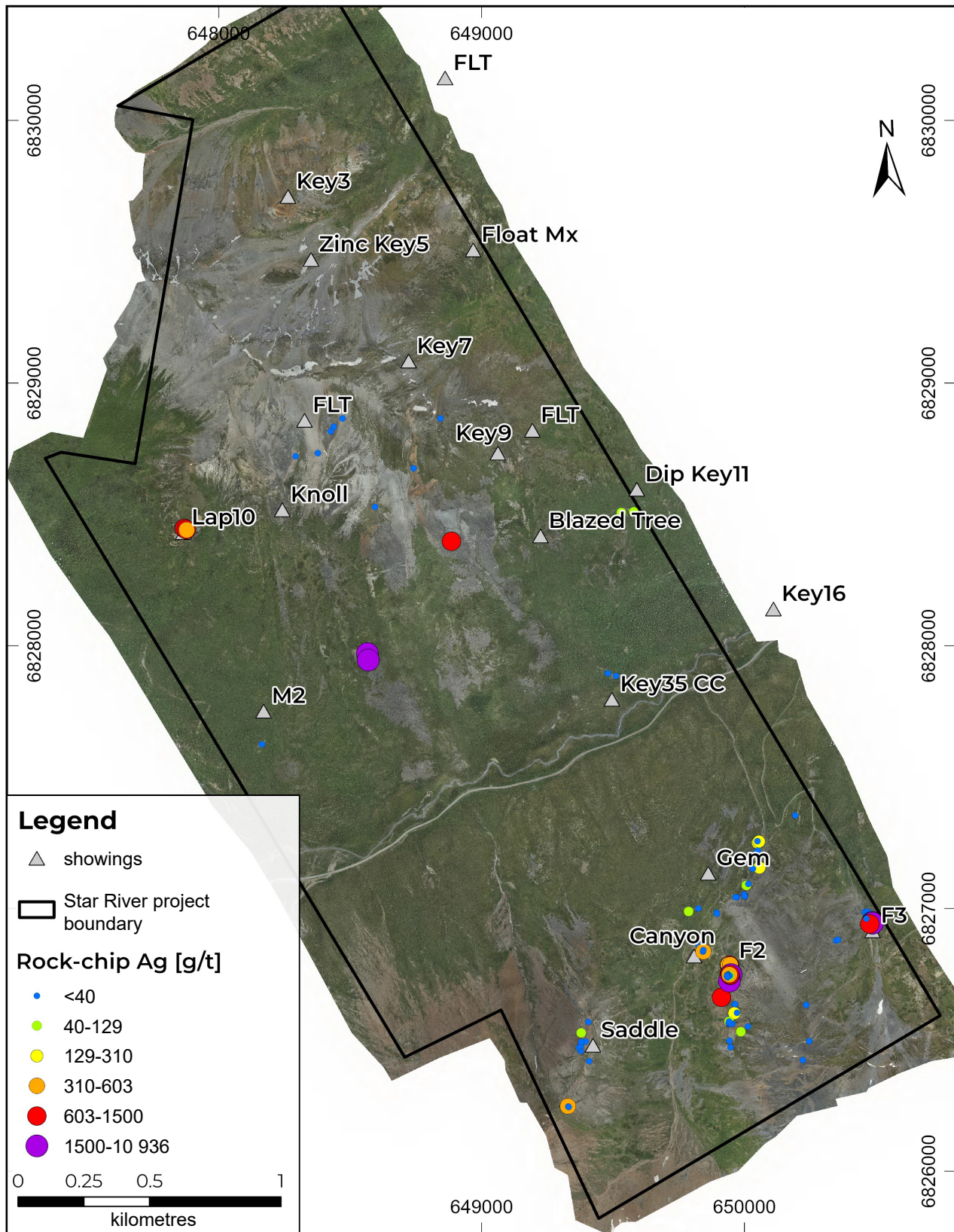
Stillwater Critical Minerals Corp. received 2024 YMEP funding for their Ultra project and carried out detailed geological mapping, prospecting, rock sampling and an unmanned aerial vehicle (UAV) photometric survey.

## Yukon Mineral Exploration Program

The Yukon Mineral Exploration Program (YMEP) is a Government of Yukon-funded program designed to support early-stage exploration by individual prospectors and companies. The funding supports placer and hardrock exploration projects by reimbursing a percentage of approved exploration expenditures. The program comprises three types of varying reimbursement rates and funding limits: hardrock projects are eligible for either the Grassroots or Target Evaluation modules, whereas placer projects can receive funding from a Target Evaluation module (Table 8). Applications for funding and submission of project proposals are due March 31 of each year. Detailed information on project modules, eligibility, and levels of funding can be found in the YMEP guidebooks at <https://yukon.ca/en/mineral-exploration-funding>.

### Yukon Mineral Exploration Program 2024

The total amount of YMEP funding that was available for the 2024–25 season was \$1.4M. The program was oversubscribed and 63 applicants sought more than \$2.2M. The breakdown of applications is shown in Table 8, and the geographic distribution of funded projects is illustrated in Figure 22. As of December 1, 2024, 43 applicants had funding agreements in place for the 2024–25 fiscal year: 29 (67%) hardrock and 14 (33%) placer (Table 8); 13 projects withdrew their applications or were ineligible for funding. An estimated \$3.9M was spent on all YMEP-supported projects, \$2.5M from industry and \$1.4M from YMEP. Hardrock projects accounted for \$2.6M of all program spending: \$1.6M from industry and \$1.0M from YMEP. Placer projects accounted for \$1.3M: \$900K from industry and \$400K from YMEP.



**Figure 20.** Locations of 2024 rock samples received to date including silver assays at the Star River project. (Figure after Yukon Metals Corp., 2024b.)

**Table 6.** Metallic Minerals Corp.'s Inferred mineral resource estimate for the Keno Silver project, effective February 1, 2024.

Deposit	Cut-off grade (AgEq g/t)	Tonnes (t)	Ag (g/t)	Au (g/t)	Pb (g/t)	Zn (g/t)	Ag (Moz)	Au (oz)	Pb (Mlbs)	Zn (Mlbs)
Formo	150	1 075 000	206	0.08	1.52	2.79	7.11	3000	36.02	66.14
Caribou	50	589 000	94	0.09	0.5	0.82	1.78	2000	6.46	10.6
Fox	50	793 000	28	0.02	0.09	1.26	0.73	500	1.53	22.04
Homestake	50	78 000	77	1.1	0.5	0.18	0.19	3000	0.87	0.31
Total	50/150	2 535 000	120	0.1	0.8	1.77	9.81	8500	44.88	99.08

**Table 7.** CMC Metals Ltd.'s open pit Inferred mineral resource estimate for the Silver Hart project, effective December 31, 2023.

Deposit	Tonnes (t)	Ag (g/t)	Pb (%)	Zn (%)	Ag (Moz)	Pb (Mlbs)	Zn (Mlbs)	Au (oz)	Pb (Mlbs)	Zn (Mlbs)
TM	269 000	152.7	0.56	1.88	1.319	3.3	11.1	3000	36.02	66.14
S	127 000	262.1	0.36	1.9	1.072	1	5.3	2000	6.46	10.6
KL	1 026 000	35.7	0.11	2.17	1.178	2.5	49	500	1.53	22.04
K	265 000	14.2	0.09	1.9	0.121	0.5	11.1	3000	0.87	0.31
M	202 000	98.1	0.58	1.82	0.637	2.6	8.1	8500	44.88	99.08
Total combined	1 889 000	71.3	0.24	2.03	4.327	9.9	84.7			

In 2023, YGS modified the YMEP evaluation criteria for hardrock applications to encourage exploration for critical mineral targets. Up to 10% of the total score was assigned to applications targeting critical minerals; 5% was assigned for projects that included critical minerals as a secondary target. In 2024, 29 hardrock projects included at least one critical mineral as a target, including two projects that focused exclusively on critical minerals. In 2024, YGS eliminated the Focused Regional hardrock module and increased the funding cap for the Grassroots module to \$25 000. These two changes resulted in 45% of hardrock projects being Grassroots, a level not previously seen in this program since the early 2000s.

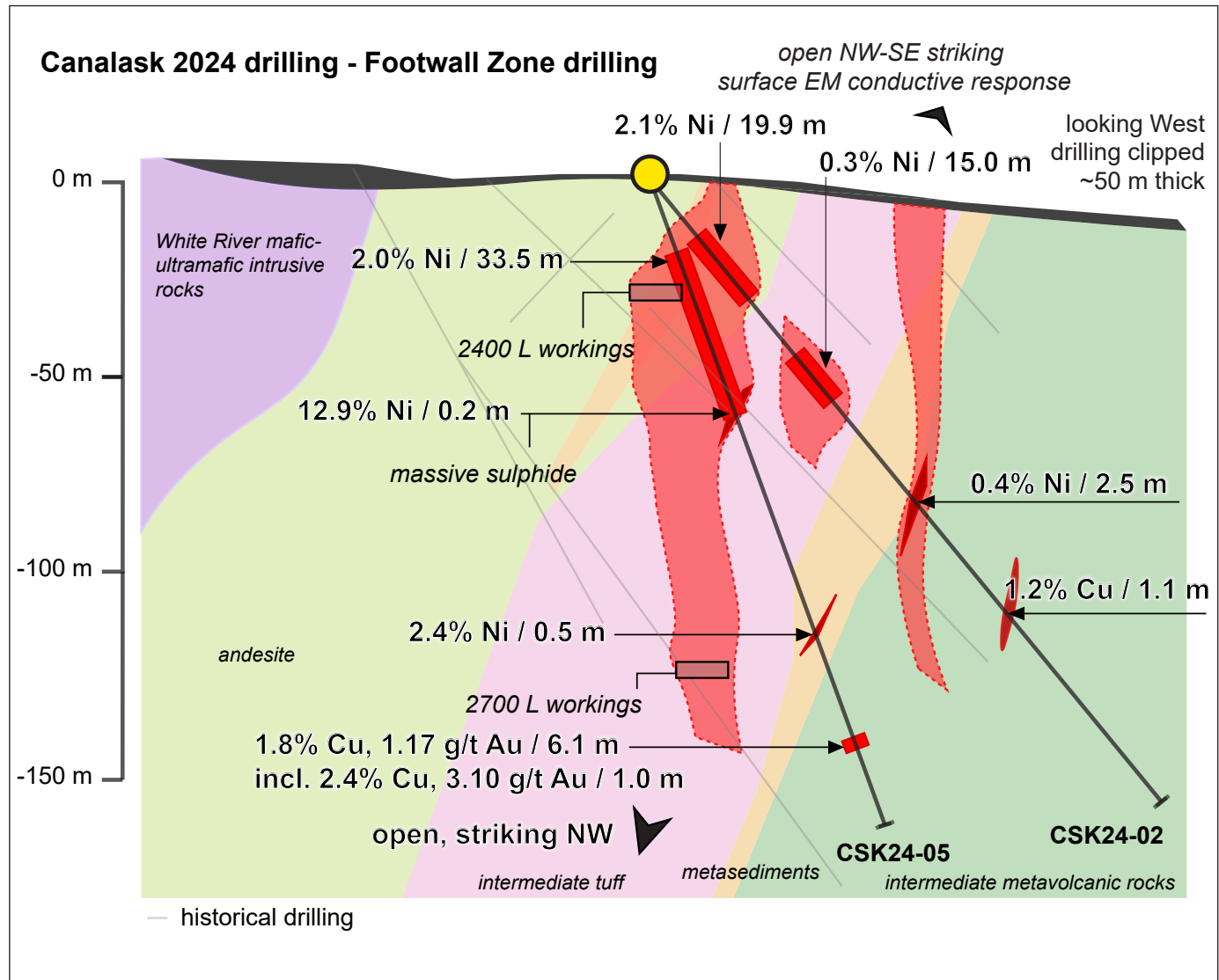
### Impacts of YMEP

The intent of YMEP is to support early-stage projects and stimulate new mineral discoveries in the Yukon. Several indicators can be used to measure the success of

the program, including local economic benefits, dollars leveraged, new discoveries, and option agreements. The economic benefits of the program not only include the potential for same-year discoveries and long-term investment, but also short-term local spending in the territory. In 2021, YGS began collecting data from YMEP recipients to quantify the local economic impact of the program. Feedback received from 2023 YMEP recipients demonstrated that 72% of total project expenditures stayed in the Yukon (Fig. 23).

### Yukon Mineral Exploration Program 2024 project spotlights and discoveries

Projects that result in new discoveries or significant advancement of a target can lead to further investment in mineral exploration in the Yukon. Every year, several YMEP-funded projects stand out and demonstrate exceptional initial results. Some projects raise additional funding on equity markets to conduct further work



**Figure 21.** Drillhole cross section of the Footwall zone looking west at the Canalask project. (Figure after GT Resources Inc., 2024b.)

**Table 8.** Total number applicants and funded projects for YMEP in 2024.

Type	Reimbursement percentage	Module	Total applicants	Total approved	Withdrawn/ineligible
Hardrock	100	Grassroots	18	12	3
Hardrock	50	Target Evaluation	22	17	2
Placer	50	Target Evaluation	23	14	8
Total			63	43	13

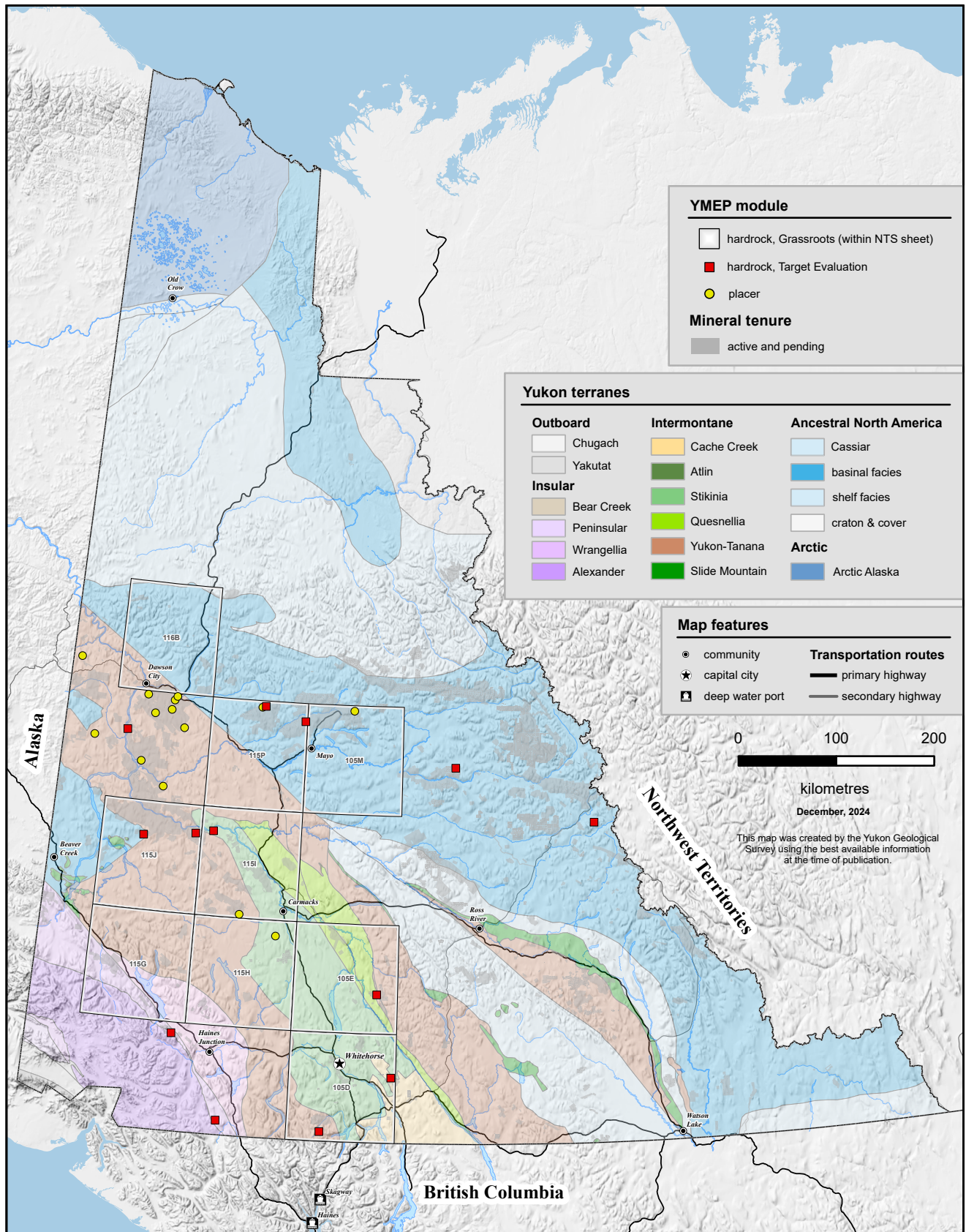
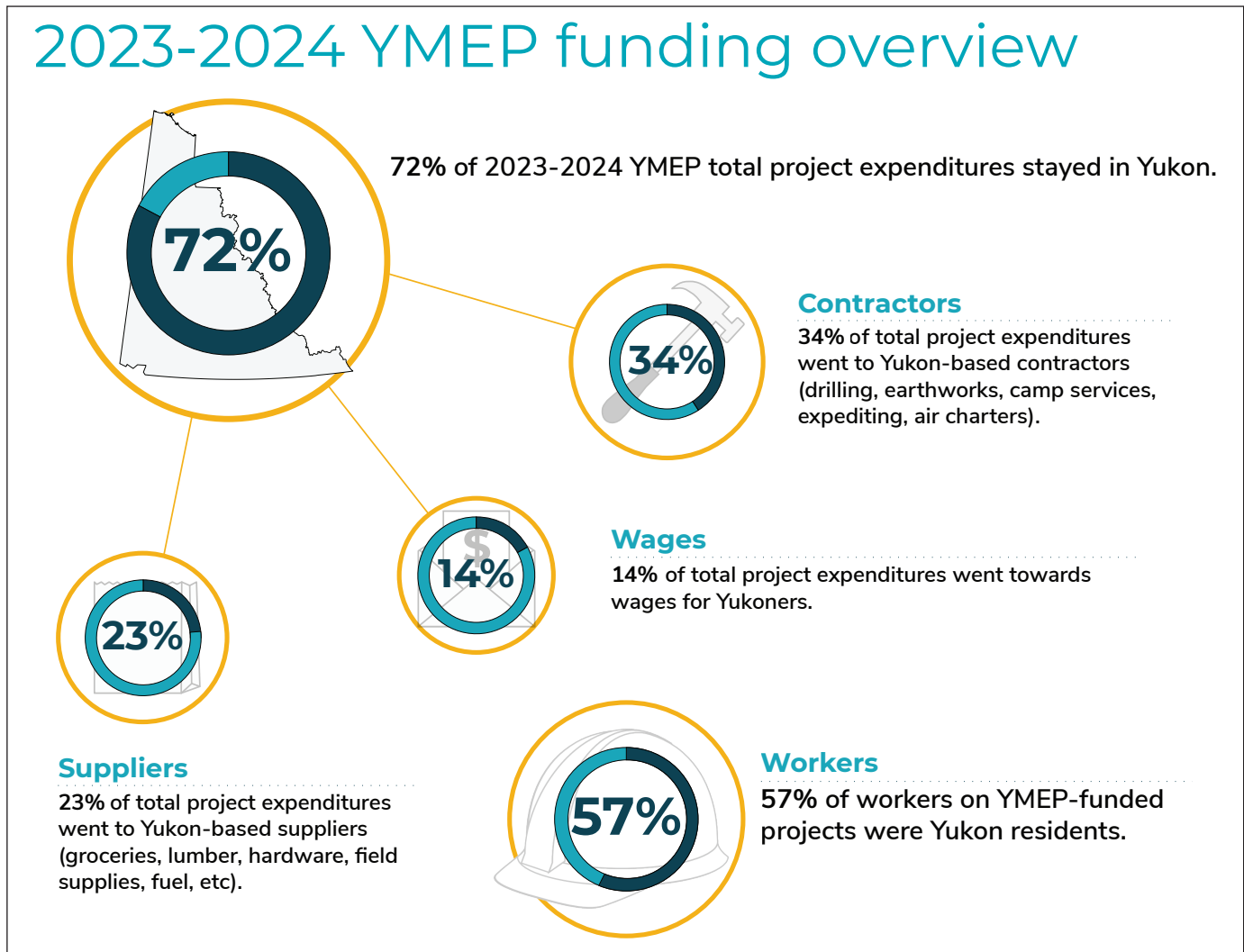


Figure 22. Geographical distribution of YMEP-funded projects in the Yukon for 2024–25.



**Figure 23.** Breakdown of expenditures for YMEP-funded projects in 2023.

during the same field season; others enter into property option agreements. New discoveries can fuel property and district-scale exploration, and some progress to advanced stages of exploration. This section highlights one project from each of the three YMEP modules that returned exciting results in 2024, as well as a project that has sustained ongoing YMEP investment and continues to yield promising results.

### Grassroots module: ORC property

Prospector Bill Mann ran a small prospecting, sampling and staking program on his ORC property in central Yukon, near the Vancouver Creek stock. This property is on the southern margin of the well-endowed Clear Creek district, which hosts several RIRG deposits. The property covers several known small (<1 km) intrusive

bodies with known tungsten skarn, silver-zinc-lead veins and intrusion-related gold grab and channel samples. Reconnaissance work in 2024 led to the discovery of megacrystic intrusive rocks more than 1 km from the nearest mapped intrusion. Additionally, four grab samples that were taken during staking were over the detection limit for Zn and/or Ag (>1% Zn, >1% Pb, >1000 ppm Ag; Fig. 24). These results combined with the property’s location near known deposits, suggest that the ORC property is worthy of future work.

### Target evaluation module: Mich project

The target at the Mich project (YMEP 24-033) is a nickel-iron alloy (awaruite) hosted in ultramafic and sedimentary rocks of the Cache Creek terrane in southern Yukon. Awaruite is a potential new source of



**Figure 24.** Sample 386431 from the ORC property, containing a drusy quartz vein that ran over Pb and Ag detection limits. Assay tag measures 10 cm in the long direction.

low-carbon, low-cost nickel for both the stainless steel and electric vehicle (EV) battery supply chains and is thus a critical mineral. In 2024, grid-based sampling was conducted at 100 by 200 m spacing within and around the Mich central zone, and 400 by 400 m spacing within previously unexplored areas in the new claims (FPX Nickel Corp., 2024). In total, 363 rock samples from an area of approximately 25 km<sup>2</sup> were collected in 2024, complementing the 181 surface samples collected from 2012 to 2014. The work this past season has delineated a footprint for the Mich central zone that measures 2.2 km in length by up to 575 m in width, the size and grade of which is comparable to that defined at the Baptiste deposit in the Decar nickel district of southern British Columbia (FPX Nickel Corp., 2024).

### Placer module: Matson, Marion and Twentymile creeks

Wildwood Exploration Inc. conducted an RC drill program in 2024 (YMEP Project 24-018) to assess the placer gold potential of the Matson Creek, Marion Creek and Twentymile Creek areas, resulting in findings that warranted further exploration. The YMEP program in 2024 focused on the Matson Creek leases, which encompass three five-mile prospecting leases extending to the Sixty Mile River. The Marion Creek leases include one five-mile lease on Marion Creek proper, a one-mile lease on upper Marion Creek, and a two-mile lease on a right-limit tributary. The Twentymile lease, situated north of the Marion leases, covers three

miles within the western arm of the Twentymile Creek drainage. Lidar data has been obtained for the entire lease area, including Matson, Marion and Twentymile creeks, and was used to guide drill-line placements for the 2024 drill program to target pay-streak orientations. The drill program, comprising 98 holes totalling 777 m (2551 ft), confirmed a concentration of economically viable placer gold in the drainages, validating the potential for further development.

**Rogue project: ongoing success**

Snowline Gold Corp’s discovery in 2021 and initial resource definition in 2024 (Burrell et al., 2024) of the Valley deposit on their Rogue property is a significant driver behind the resurgence in intrusion-related gold exploration in the Yukon. Within 30 km of the Valley deposit, there have been 12 YMEP-supported projects by nine different companies since 1990 (Table 9; Fig. 25). Total YMEP support for these projects is approximately \$300K (Table 9) and total resulting exploration expenditures are more than \$45M. The first predecessor funding program to YMEP in the area was in 1990 and successfully outlined two areas of intrusion-related gold mineralization (Ebert, 1991). Subsequent programs included prospecting, stream sediment sampling and geological mapping, all of

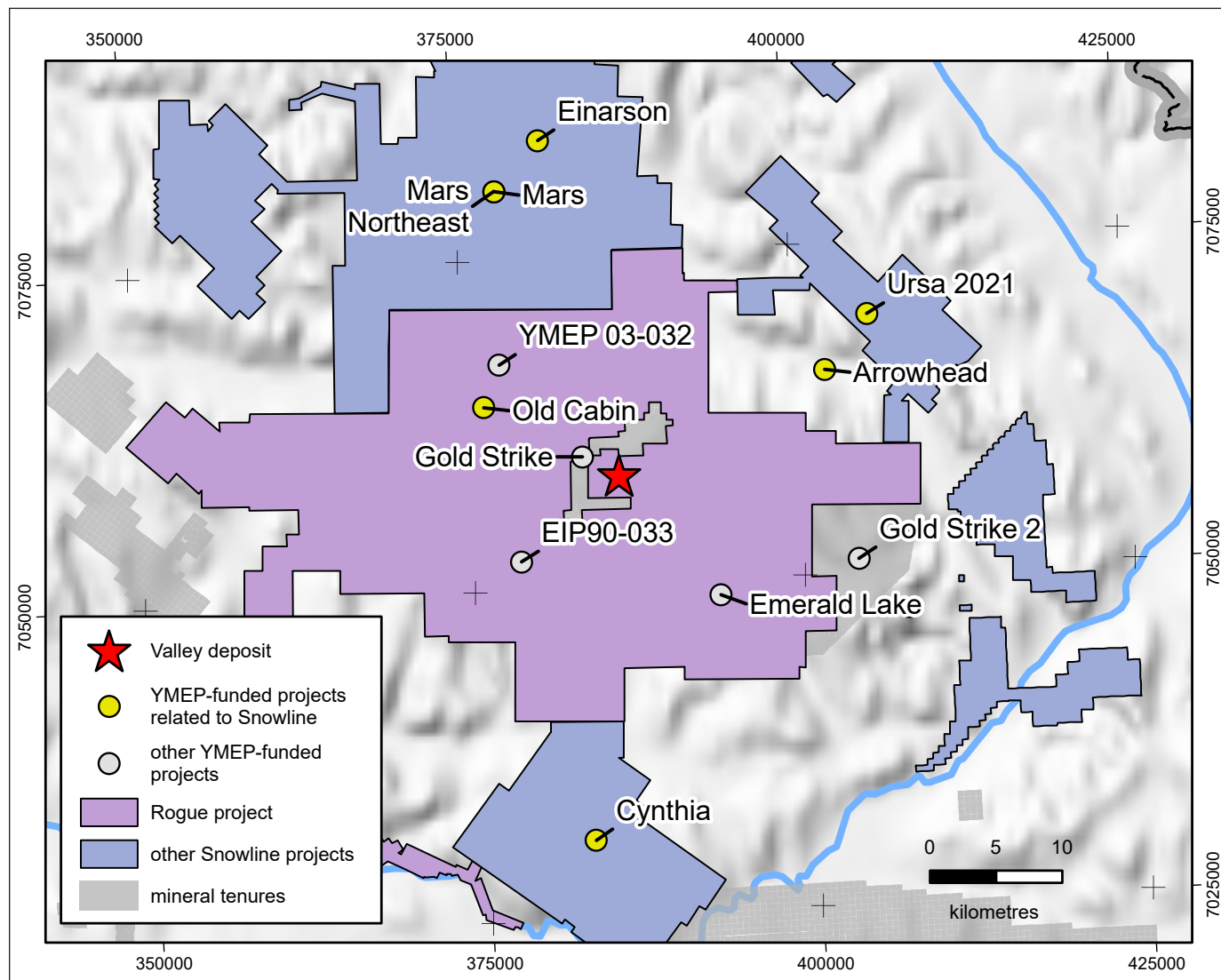
which indicated the presence of widespread, intrusion-related mineralization (e.g., Mueller, 2003). In 2016, a YMEP-supported program by Ron Berdahl included anomalous gold-in-soil results over what would become the northern margin of the Valley deposit (Mann, 2016). However, it took a further five years before the Valley deposit was officially discovered by diamond drilling. Following the discovery of the Valley deposit, exploration expenditures on the Rogue property have outgrown the YMEP program, and subsequent YMEP funding in the area has supported other early-stage exploration projects. The Valley discovery is a testament to the tenacity and perseverance of grassroots explorers in the Yukon. It also demonstrates the invaluable contributions of government support in the form of regional stream-sediment geochemical surveys (Friske et al., 1991; Jackaman, 2011), geophysical data (Condor Geophysics, 2013) and the YMEP program.

**Summary**

The Victoria Gold Corp. heap leach failure on June 24, 2024, cast a pall over the 2024 exploration and mining season. From a production perspective, the Eagle Gold Mine was the largest of the two operating hardrock mines in the Yukon during 2023 (in terms of production value). Thus, it is not surprising that the 2024

**Table 9.** All YMEP-funded (including all precursor programs) projects within 30 km of the recently defined Valley deposit.

Year	YMEP number	Project name	Module	YMEP contribution	Latitude	Longitude
1990	90-034	Emerald Lake	Grassroots	\$4439.25	63.55194	-131.14222
1990	90-033	EIP90-033	Grassroots	\$3101.04	63.57647	-131.44537
2003	03-032	YMEP 03-032	Focused Regional	\$15 000.00	63.71016	-131.47506
2009	09-118	Arrowhead	Focused Regional	\$16 250.00	63.70278	-130.97667
2009	09-116	Cynthia	Target Evaluation	\$15 350.00	63.38722	-131.33944
2015	15-088	Mars Project	Target Evaluation	\$40 000.00	63.82755	-131.47844
2016	16-046	Mars Northeast Project	Target Evaluation	\$21 420.50	63.82755	-131.47844
2016	16-032	Old Cabin	Focused Regional	\$24 296.75	63.68158	-131.49942
2019	19-007	Einarson	Target Evaluation	\$28 943.37	63.86164	-131.41029
2021	21-071	Ursa 2021	Target Evaluation	\$40 000.00	63.74	-130.91
2022	22-038	Gold Strike	Target Evaluation	\$50 000.00	63.64694	-131.34972
2024	24-057	Gold Strike 2	Target Evaluation	TBD	63.57431	-130.93087
Total:				\$258 800.91		



**Figure 25.** Map of Rogue property (in purple), which contains the newly defined Valley deposit. Also illustrated are the approximate locations of all YMEP-supported projects within 30 km of the Valley deposit.

production is estimated to be less than half of what it was in 2023 (\$190M versus \$513M), despite Hecla Mining Company’s increase in production by more than 1 Moz Ag (2024 estimate to be 2.85 Moz Ag versus a 2023 production of 1.7 Moz Ag).

From an exploration perspective, 2024 started out with an early season of challenging financial markets despite a record-high gold price and generally high commodity prices. Unfortunately, the situation became even more challenging with the fallout from the Eagle Gold Mine failure. Concerns by Yukon First Nations, permitting delays, and financing uncertainties in the Yukon, resulted in further challenges for exploration companies in terms of securing funding. Despite these challenges, some companies were able to raise money

mid-summer, or had enough capital already secured, enabling continuation of significant exploration programs across the territory. The seven new and updated MREs released in the Yukon this year represent a significant step forward for the Yukon in terms of defining economically viable mineral endowment. Cumulatively, these seven MREs resulted in a total of 16 Moz Au, 150 Moz Ag, 12 Blbs Zn, 4 Blbs Pb, and the first-ever estimate for critical metals Ga and Ge measuring 1000 tonnes and 700 tonnes, respectively. The total value of metal from these resources, using average 2024 prices, is estimated at \$90B, and approximately 50% of these are new, never-before defined resources. Thus, despite serious setbacks in 2024, the exploration and mining industry continued to deliver high-quality resources to the market.

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## Appendix A. Exploration projects active in 2024.

Optioner/Owner	Project	Primary commodity	Deposit type	Work type
Aben Resources Ltd.	Justin	gold	vein/breccia	AGP
Banyan Gold Corp.	AurMac	gold	porphyry/sheeted vein	AGP, SGC, DD, ES
Banyan Gold Corp.	Nitra	gold	porphyry/sheeted vein	AGP, SGC
Bastion Minerals	Ice	copper	volcanic associated	RGC
BMC Minerals Ltd.	Kudz Ze Kayah	zinc-lead	sediment associated	P, G, AGP, GGP, SGC, RGC, DD, RC
Callum Ryan	Kerr	copper	unknown	P, G, SGC
Cantex Mine Development Corp.	North Rackla	zinc-lead	skarn/replacement	DD
Cascadia Minerals Ltd.	Catch	copper	porphyry/sheeted vein	P, G, SGC, RGC, DD
Cascadia Minerals Ltd.	Sands of Time	copper	porphyry/sheeted vein	SGC, RGC
Coeur Mining Inc.	Tim	silver	skarn/replacement	RGC, AGP, DD
Fireweed Metals Ltd.	Macpass	zinc-lead	sediment associated	P, G, AGP, GGP, SGC, RGC, DD, RC
Fireweed Metals Ltd.	Mactung	tungsten	skarn/replacement	AGP, SGC, RGC, ENV
Forge Resources Corp.	Alotta	copper	porphyry/sheeted vein	CS, DD
FPX Nickel	Mich	nickel	mafic/ultramafic associated	CS, RGC
Gladiator Metals	Whitehorse Copper	copper	skarn/replacement	G, AGP, DD
Granite Creek Copper Ltd.	Carmacks Copper	copper	porphyry/sheeted vein	DD
GT Resources Inc.	Canalask	nickel-PGE	mafic/ultramafic associated	DD
Hecla Mining Company	Keno Mine	silver	vein/breccia	DD
Honey Badger Silver Inc.	Plata	silver	vein/breccia	P, G, SGC, AC

### Abbreviations

CS – claim staking  
P – prospecting  
G – geology  
T – trenching

RGC – rock geochemistry  
SGC – soil/silt geochemistry  
DD – diamond drilling  
RC – reverse circulation drilling

AGP – airborne geophysics  
GGP – ground geophysics  
ES – economic studies  
DI – airborne drone imagery

**Appendix A. (continued) Exploration projects active in 2024.**

Optioner/Owner	Project	Primary commodity	Deposit type	Work type
K2 Gold Corp.	Wels Gold	gold	unknown	SGC
Klondike Gold Corporation	Klondike District Property	gold	vein/breccia	P, G, RGC, DD
Gary Lee	Wildcat	zinc-lead	skarn/replacement	SGC
Lode Gold	Golden Culvert	gold	vein/breccia	AGP
Metallic Minerals Corp.	Keno Silver	silver	vein/breccia	SGC, DD
Metallic Minerals Corp.	McKay Hill	silver	vein/breccia	ENV
Newmont Corporation	Coffee Project	gold	vein/breccia	ES, ENV
Prospector Metals Corp.	Mike Lake	gold	skarn/replacement	P, G, RGC
Rackla Metals Inc.	Hit (Mehitabel)	gold	porphyry/sheeted vein	P, G, SGC, RGC, DD
Rockhaven Resources Ltd.	Klaza	gold	vein/breccia	MET
Seabridge Gold Inc.	3 Aces	gold	vein/breccia	G, RGC, DD, RC
Selwyn Chihong Mining Ltd.	Selwyn Project	zinc-lead	sediment associated	RC
Silver North Resources	Mt. Haldane	silver	vein/breccia	DD
Sitka Gold Corp.	RC Gold	gold	porphyry/sheeted vein	P, G, SGC, DD
Snowline Gold Corp.	Cynthia	gold	porphyry/sheeted vein	G, AGP, SGC, RGC, DD
Snowline Gold Corp.	Einarson	gold	sediment associated	P, G, AGP, SGC, RGC, DD
Snowline Gold Corp.	Rogue	gold	porphyry/sheeted vein	CS, P, G, AGP, SGC, RGC, DD
Snowline Gold Corp.	Ursa	gold	porphyry/sheeted vein	G, SGC, RGC
Stakeholder Gold Corp.	Ballarat Project	gold	porphyry/sheeted vein	P, G, AGP, GGP, SGC

**Abbreviations**

CS – claim staking  
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## Appendix A. (continued) Exploration projects active in 2024.

Optioner/Owner	Project	Primary commodity	Deposit type	Work type
Stillwater Critical Minerals Corp.	Ultra	nickel-PGE	mafic/ultramafic associated	P, G, RGC
Strategic Metals Ltd.	Batt	copper	volcanic associated	P, G, SGC, RGC
Strategic Metals Ltd.	CD	gold	unknown	GGP, RGC
Transition Metals Corp.	Pike-Warden	silver	vein/breccia	G, AGP, RGC
Trifecta Gold Ltd.	Lance	gold	unknown	P, G, SGC, RGC
Trifecta Gold Ltd.	Mount Hinton	gold	porphyry/sheeted vein	P, G, AGP, SGC, RGC, DD
Trifecta Gold Ltd.	Rye	gold	unknown	P, G, SGC, RGC
Victoria Gold Corp.	Brewery Creek	gold	porphyry/sheeted vein	DI
Victoria Gold Corp.	Dublin Gulch (Eagle)	gold	porphyry/sheeted vein	DD
Western Copper and Gold Corp.	Casino	copper	porphyry/sheeted vein	ENV
White Gold Corp.	Betty	gold	vein/breccia	DD
White Gold Corp.	Hayes	gold	unknown	G, SGC, RGC
White Gold Corp.	Hunker	gold	vein/breccia	RGC
White Gold Corp.	Ind-WGC	gold	unknown	SGC
White Gold Corp.	Loonie	gold	vein/breccia	GGP, SGC
White Gold Corp.	Pilot	gold	unknown	AGP
White Gold Corp.	QV	gold	vein/breccia	GGP, SGC, RGC, DD
Yukon Metals Corp.	Az	copper	skarn/replacement	P, G
Yukon Metals Corp.	Birch	copper	skarn/replacement	P, GGP, SGC, RGC

### Abbreviations

CS – claim staking  
P – prospecting  
G – geology  
T – trenching

RGC – rock geochemistry  
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AGP – airborne geophysics  
GGP – ground geophysics  
ES – economic studies  
DI – airborne drone imagery

**Appendix B. Drilling summary 2024.**

Optioner/Owner	Project name	DD		RC/RAB	
		# of holes	metres	# of holes	metres
Banyan Gold Corp.	AurMac	118	21 001		
BMC Minerals Ltd.	Kudz Ze Kayah	40	10 794	29	528
Cantex Mine Development Corp.	North Rackla	33	6000		
Cascadia Minerals Ltd.	Catch	5	3055		
Coeur Mining Inc.	Tim	6	2252		
Fireweed Metals Ltd.	Macpass	49	16 013		
Forge Resources Corp.	Alotta	4	1815		
Gladiator Metals	Whitehorse Copper	70	15 000		
Granite Creek Copper Ltd.	Carmacks Copper	4	1420		
GT Resources Inc.	Canalask	5	1010		
Hecla Mining Company	Keno Mine	55	27 500		
Klondike Gold Corporation	Klondike District Property	36	5827		
Metallic Minerals Corp.	Keno Silver	3	700		
Rackla Metals Inc.	Hit (Mehitabel)	2	604		
Rackla Metals Inc.	SER	2	355		
Seabridge Gold Inc.	3 Aces	15	4620	21	3000
Selwyn Chihong Mining Ltd.	Selwyn Project			1	183
Silver North Resources	Mt. Haldane	3	732		
Sitka Gold Corp.	RC Gold	20	9700		
Snowline Gold Corp.	Cynthia	3	1345		
Snowline Gold Corp.	Einarson	14	5413		
Snowline Gold Corp.	Rogue	64	28 248		
Trifecta Gold Ltd.	Mount Hinton	1	158		
Victoria Gold Corp.	Dublin Gulch (Eagle)	10	2378		
White Gold Corp.	Betty	6	1131		
White Gold Corp.	QV	6	1082		

**Abbreviations**

DD – diamond drilling

RC – reverse circulation drilling

RAB – rotary air-blast drilling

# Yukon Geological Survey's outreach program: 2024 highlights

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## Introduction

The Yukon Geological Survey (YGS), a branch within the Government of Yukon, is dedicated to advancing our understanding of Yukon's geology and disseminating this knowledge to various stakeholders, including other government departments, First Nations governments, private companies and the public.

The YGS team conducts research across a range of Earth science fields including surficial and bedrock geology mapping, mineral assessments, permafrost and landslide monitoring, geotechnical monitoring along highway corridors, and geothermal research. This research generates data essential for understanding Yukon's environment and addressing challenges.

A foundational understanding of Earth science is essential for government partners, First Nations and the public to fully benefit from YGS' findings. The YGS supports informed decision-making, responsible land stewardship, and economic development by making geoscience knowledge accessible. Outreach serves as a bridge between research and real-world application, ensuring that YGS's research is not only shared but also understood by end users.

The YGS seeks to inspire and engage with Yukoners by demonstrating how Earth science is both fascinating and relevant to daily life. The YGS helps individuals make informed decisions about the Yukon's land and resources by sparking curiosity and building an understanding of Earth science.

The YGS prioritizes outreach efforts by fostering collaboration with First Nations, supporting educators with curriculum-aligned resources, and encouraging public engagement with Earth science. This overview highlights YGS' outreach initiatives and achievements throughout 2024.

## Earth science education in Yukon schools

The YGS tailors its outreach activities to align with the British Columbia curriculum used by Yukon schools. Earth science appears across multiple grades, from grade three to specialized high school courses like Earth Sciences 11 and Geology 12. The YGS prioritizes assisting teachers with the grade five curriculum objectives, which focus on the rock cycle, as well as secondary students who are beginning to think about career decisions they will make after graduation.

In-class activities are tailored to the students' level and include:

- The rock cycle: identifying igneous, metamorphic and sedimentary rocks using Yukon samples. Students learn about how each rock type is formed, and then work in groups to identify specific samples. Students are prompted to use observational skills to notice textures as they handle samples.

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## Yukon outreach highlights

- Mineral identification: testing mineral physical properties like lustre, streak, hardness, magnetism and conductivity to identify common minerals. Students learn to use geologist's tools such as streak plates, pen magnets and items from Mohs hardness scale like pennies, nails and glass plates. Each student has an opportunity to get 'up close and personal' with mineral samples.
- Product matching: connecting raw materials to everyday items, illustrating how rocks and minerals are essential to products such as phones, copper pipes and toothpaste. This activity highlights the importance of rock and mineral 'ingredients' in creating the 'stuff' we enjoy using.

Workshops include hands-on activities that use rock and mineral samples, which teachers may not have access to. The YGS also maintains a dedicated set of rock hammers and safety glasses that are used on field trips for students to try their hand at breaking and collecting rock and mineral samples.

The YGS outreach activities also extend well beyond the classroom with field trips to geologically significant locations such as Miles Canyon, the Takhini thaw slump (Fig. 1), the clay cliffs in downtown Whitehorse (Fig. 2), the Carcross desert (Fig. 3) and Whitehorse Copper Belt (Fig. 4). Field trips allow students of all grade levels an opportunity to experience geology firsthand.

In 2024, the YGS' outreach team completed 25 school visits and field trips in and around Whitehorse. They also travelled to Yukon communities and offered two

days of workshops in Ross River, one day in Faro, one day in Teslin, and one day at the Kluane Lake Research Station with the students from the Destruction Bay school.



**Figure 2.** Panya Lipovsky of YGS points out features on the clay cliffs in downtown Whitehorse to students from FH Collins High School.



**Figure 1.** Students from the Experiential Science 11 (ES11) program exploring the Takhini thaw slump off the Alaska Highway.



**Figure 3.** Leyla Weston of YGS points out remnants of an ancient post-glacial lake to Golden Horn Elementary School students in Carcross.



**Figure 4.** Grade five students from Yukon Wilderness Integrated Leadership Development (WILD) School examine mineralized rock of the Whitehorse Copper Belt.

## Water Week

In 2024, YGS collaborated with the Government of Yukon's Department of Environment to deliver three Water Week workshops in Yukon classrooms. Organized by the Department of Environment, Water Week connects professionals from a variety of water-related fields with teachers to present engaging workshops on the science of water. The YGS facilitated a 'water and erosion' challenge for students in grades six and seven, introducing concepts of erosion and simulating the effects of a 100-year storm event. Working in teams, students designed and built contraptions to withstand such an event. This hands-on activity was extremely well received, with requests for its inclusion in future Water Week programming.

## Mining Week in Ross River and Faro

In May 2024, YGS partnered with Fireweed Metals to celebrate Mining Week with in-class geology workshops in Ross River and Faro. Students in Ross River participated in a map and compass orienteering challenge where they practiced navigation skills – essential for geological mapping and used in traditional on-the-land activities. In both communities, students explored Yukon's geology by learning to identify rock and mineral samples (Figs. 5 and 6). Younger students enjoyed hands-on activities like fossil-making and exploring geological time through the YGS fossil collection – a new addition to the outreach activities featuring fossils such as trilobites and corals from around the Yukon as well as a dinosaur bone from Alberta. These workshops emphasized the significance of Earth materials in daily life, fostering a deeper understanding of Yukon's geology.



**Figure 5.** Students in Ross River observing the reaction of dilute hydrochloric acid with limestone.



**Figure 6.** Students in Faro identify rocks during the rock cycle activity.

## Partnership with Kluane Lake Research Station

The YGS partnered with the Kluane Lake Research Station (KLRS) in 2024 to deliver hands-on geology programming for students from the Kluane Lake School in Burwash Landing. The workshop was hosted at the KLRS, providing an opportunity for students to step outside their regular classroom environment and engage with geology in an outdoor setting. Students learned to identify rocks and minerals, observed Kluane-specific samples, and worked together to create geological maps. These activities emphasized the importance of map reading and navigation skills while illustrating how geologists use clues from outcrops to understand regional geology (Fig. 7). The students also participated in an engaging earthquake engineering activity, exploring plate tectonics in the Kluane region, and learning about earthquake monitoring efforts at the research station. The day sparked curiosity and connected students to the unique geology of their surroundings.

## Public and community outreach events

The YGS recognizes the importance of increasing the public's understanding of geoscience. Many workshop and event participants have shared that they initially had little knowledge of Earth science or its impact on daily life. However, after attending these events, they gained a greater appreciation for its relevance (Fig. 8). Below are highlights from public outreach events.



**Figure 7.** Students from Burwash Landing learn how to use compasses during the geological mapping activity at the KLRS.

## Tombstone on the Rocks weekend

The YGS' Tombstone on the Rocks weekend is held annually at Tombstone Territorial Park in partnership with park staff on the Traditional Territories of the Tr'öndëk Hwëch'in First Nation and the First Nation of Na-Cho Nyäk Dun. This popular event features guided hikes and evening talks led by YGS geologists (Fig. 9). The guided hikes, which include hikes on the Goldensides and Grizzly Lake trails, allow participants to explore the geological history of the park and learn firsthand how to observe clues in the rocks and landscape that geologists have used to piece together this history (Fig. 10). Evening talks included an overview of the park's bedrock geology by YGS Bedrock Geologist Rosie Cobbett (Fig. 11) and an overview of the surficial geology of the park and discussion on Beringia by YGS' Head of Surficial Geology Derek Cronmiller.

## Kluane National Park and Reserve interpretive hike

In 2024, YGS hosted its second annual interpretive hike in Kluane National Park and Reserve, located on the Traditional Territories of the Champagne and Aishihik First Nations and the Kluane First Nation (Fig. 12). Modelled after the Tombstone on the Rocks weekend, YGS and Parks Canada have partnered to offer Earth science-themed public outreach events at Kluane National Park and Reserve. This year YGS geologists led a hike from the Thechàl Dhâl' Visitor Centre along the first few kilometres of the Ä'äy Chù trail. Moya Painter of YGS spoke about the glacial history of the park and the significant change of direction of the Ä'äy Chù in



**Figure 8.** Whitehorse Copper Belt field trip participants at the Little Chief pit. This field trip was run as a part of the 2024 International Conference on Permafrost, organized by the Canadian Permafrost Association.



**Figure 9.** Cobbett points out features on geological maps before an interpretive hike in Tombstone Territorial Park.



**Figure 11.** Cobbett giving an evening lecture on the bedrock geology of Tombstone Territorial Park at the interpretive centre.



**Figure 10.** Interpretive hike participants at the Grizzly Valley lookout in Tombstone Territorial Park with Derek Cronmiller and Amanda O'Connor of YGS.



**Figure 12.** Painter and Cobbett planning out a new interpretive hike route in Kluane National Park and Reserve.

2016. Cobbett, who completed her master's thesis on the area, discussed the Duke River fault and the bedrock geology of the park. The event drew participants from the local community as well as travellers on their way to Alaska, all of whom appreciated the extensive knowledge of the park shared by YGS geologists.

### Yukon Geoscience Forum Family Day

The Yukon Chamber of Mines hosts the Yukon Geoscience Forum each November in Whitehorse. The conference kicks off with a Family Day event on Saturday, held on the upper level of the Canada Games Centre. Organized by participating companies, government

agencies and non-governmental organizations, the event features engaging and educational activities for all ages.

In 2024, the authors, along with with Painter, participated by providing YGS' most popular activities, which include the augmented reality (AR) sandbox, rock and mineral identification and product matching (Fig. 13). The rock and mineral identification and product-matching activities provided children and their parents hands-on opportunities to learn about Yukon's geology by working together with guidance from a geologist.



**Figure 13.** Painter shows off the AR sandbox at Yukon Geoscience Forum Family Day.

The AR sandbox, a highlight of the event, captivated participants of all ages. This innovative tool projects a live topographic map onto the sand surface, updating in real time as users reshape the topography of the sand. By sensing the height of the sand, and projecting topographic lines onto the map surface, it makes understanding the complexities of topographic maps intuitive and interactive.

The Family Day event drew more than 300 attendees and received widespread praise.

## First Nations engagement

The YGS is committed to fostering early, collaborative engagement with Yukon First Nations on geology program activities to build trusting and meaningful relationships. This approach includes seeking input from First Nations governments during the initial planning stages of projects. Regular engagement includes spring and fall updates detailing program activities and holding meetings with Lands and Resources Department staff from First Nations governments to share and interpret data, results and publications. Recognizing the evolving landscape of engagement, YGS strives to adapt its approaches, learn continuously, and enhance the accessibility and impact of its outreach programs.

## Carcross/Tagish First Nation Research Confluence

In 2024 YGS was honoured to participate in the Carcross/Tagish First Nation (CTFN) Research Confluence, a community event designed to connect CTFN citizens with researchers working on CTFN lands. This open house-style gathering provided an opportunity for YGS Bedrock Geologist Tyler Ambrose to engage directly with the community, including the CTFN Lands Board, and discuss his research on their Traditional Territory. The YGS continues to integrate its researchers into engagement processes to encourage the two-way flow of ideas and foster collaborative relationships between researchers, First Nations governments, and citizens.

## First Nations hiring initiatives

The YGS strives to collaborate with First Nations governments to create meaningful on-the-job learning opportunities to First Nation citizens through fieldwork and mentorship. This year, while in Teslin to share data and geology project plans with the Teslin Tlingit Council (TTC) government, YGS facilitated geology workshops at the local school. During these workshops, the authors met Chloe Johnston or Khàshdách Tlá, a young woman working at the school with a clear passion for geology. Chloe was later hired as a field assistant on a collaborative project with Nathan Cleven of the Geological Survey of Canada (GSC). After receiving safety training, provided by YGS, Chloe joined Cleven and the GSC field team for a week of fieldwork on TTC Traditional Territory. The group set out to document the stratigraphy, structure and metamorphic history of a part of the Dorsey Range where the Yukon-Tanana terrane meets the much older rocks of the North American craton. Chloe got to shadow Cleven and the GSC team as they worked to develop a model for this area's tectonic evolution. Using video and photographic footage from her experience, including landscapes, rocks, helicopter rides and day-to-day experiences of fieldwork and living on the land, Chloe created a video to share her journey on social media. She combined her geology work with language learning by introducing Tlingit vocabulary related to the land to video viewers (Figs. 14 and 15). Chloe is a leader within her community and this opportunity provided valuable work experience for her as a student pursuing post-secondary studies in Earth science, and as a Tlingit language learner who is motivated to share her learnings with others. We hope her experience will inspire others to learn more about geology and the land. Her video is available here: <https://fb.watch/wdYSGMcpAm/>



**Figure 14.** Still image of Chloe Johnston or Khàshdáxh Tlâ from her video documenting her first geology field experience, created through a YGS-GSC partnership.

### Geological Survey of Canada collaborative pilot project

In 2023, YGS initiated an ongoing partnership with the GSC to streamline engagement processes with Yukon First Nations' governments when both organizations are conducting geological projects on a First Nation's Traditional Territory. This pilot project aims to reduce the administrative burden on First Nations governments while fostering collaboration and mutual understanding between the GSC and YGS.

The feedback received from Yukon First Nation government partners during the project's first couple of years has been positive, highlighting the value of this cooperative approach. The YGS is committed to refining the initiative to enhance accessibility and improve the availability of geological information for Yukon First Nations governments, to ensure that the program effectively meets their needs.



**Figure 15.** Still image from Chloe Johnston's video depicting GSC Field Assistant Eve Frechette taking strike and dip measurements on an outcrop in the Dorsey Range.

### Summary

The YGS' 2024 outreach activities highlight the organization's dedication to fostering Yukoners' understanding of Earth science, as well as the commitment to engage with Yukon First Nations. Through hands-on school workshops, collaborative First Nations engagement, and public events, YGS bridges the gap between geoscience research and its practical applications in daily life, empowering Yukoners with knowledge to make informed decisions about their land and resources. The YGS shares findings in ways that are engaging and understandable, ensuring that this information is useful for decision-makers and communities.

To keep up to date with the latest YGS news and events, follow us on Facebook here: <https://www.facebook.com/YukonGeologicalSurvey/>

If you would like to contact the YGS outreach team you can email [YGS-Outreach@yukon.ca](mailto:YGS-Outreach@yukon.ca) to request a field trip or classroom visit for your class.



# Yukon Exploration and Geology 2024 abstracts and plain language summaries

The following abstracts and plain language summaries are from the Yukon Exploration and Geology 2024 volume. Full versions of the individual papers are available from the Yukon Geological Survey website, <https://data.geology.gov.yk.ca/>.

## Geology and mineralization of the AurMac metasediment-hosted gold deposits, central Yukon (NTS 105M/13)

**R. Keagan Parry, Pilar Lecumberri-Sanchez and Patrick Sack**

### Abstract

The AurMac property, located 35 km north of Mayo in central Yukon, includes two metasedimentary rock-hosted gold deposits: the 6158 koz Au Powerline deposit and the 845 koz Au Airstrip deposit. Mineralization at the Powerline and Airstrip deposits is characterized by gold in sheeted quartz veins and mineralized skarn horizons, respectively. The AurMac deposits straddle the Robert Service thrust fault whereby the Powerline deposit is hosted in the Late Proterozoic to Cambrian Hyland Group hanging wall, and the Airstrip deposit is hosted in the Mississippian Sourdough Hill Member of the Keno Hill Quartzite footwall. Host rocks comprise siliciclastic metasedimentary rocks, variably calc-silicate–altered calcareous metasedimentary rocks and magmatic rocks. Magmatic rocks in the Powerline zone consist of foliated mafic horizons that are geochemically similar to Cambro-Ordovician magmatic rocks found in Hyland Group metasedimentary rocks in the McQuesten, Mayo, Clark Lakes and Hart River map areas. In the Airstrip zone, magmatic rocks include a steeply south-dipping, unfoliated, aplite dike. Evidence for intrusion-related gold mineralization at AurMac includes sheeted vein and skarn mineralization similar to the intrusion-hosted, intrusion-related gold deposits at Dublin Gulch, as well as the presence of metamorphic porphyroblast assemblages that suggest contact metamorphism. These findings suggest potential for further discovery of mineralized intrusion-hosted zones on the AurMac property and sediment-hosted, intrusion-related gold deposits elsewhere in the region.

### Plain language summary

The AurMac project, located 35 km north of Mayo in central Yukon, includes two gold deposits: the Powerline and Airstrip deposits. The Powerline deposit is estimated to contain over six million ounces of gold, and the Airstrip deposit contains nearly one million ounces of gold. Mineralization in the Powerline deposit is found in quartz-rich veins, whereas gold at the Airstrip deposit is found in a type of metamorphic rock known as skarn. The Powerline deposit is hosted in rocks that are approximately 500 million years old, and the Airstrip deposit is hosted in rocks that are approximately 350 million years old. A large fault, known as the Robert Service thrust, separates the two deposits. The mineralization at the AurMac deposits have some similarities to the mineralization that is found in the deposits of the Eagle Gold Mine in central Yukon and suggests the potential for another significant economic deposit of the same style.

## **Western Arctic Regional Network of Seismographs (WARNS): History, challenges and improvements in continuous broadband seismic data recordings in northwestern Canada**

**Andrew J. Schaeffer, Jeremy M. Gosselin, Pascal Audet, Maurice Colpron, Scott Cairns and Barrett Elliott**

### **Abstract**

The Western Arctic Regional Network of Seismographs (WARNS) is a collection of 20 seismic stations that addresses critical gaps in the seismic network coverage in northwestern Canada. This seismic network has a complex history of adoption and integration of past temporary seismic experiments. We summarize this history along with the challenges in operating in the Canadian north. The WARNS stations provide continuous, weak-motion broadband seismic recordings. The data from these are made accessible (in real time for many stations) via integration within the EarthScope Data Management Centre. This enables open access and facilitates improvements in regional earthquake monitoring and geoscientific discovery. Northwestern Canada is geologically and tectonically complex, which leads to elevated geohazard potential. The environment in the Canadian north is also rapidly evolving in response to climate change, which has the potential to enhance hazards. Studies that rely on data from WARNS play an important role in developing adaptation strategies for the evolving needs and hazards in Canada's north.

### **Plain language summary**

The Western Arctic Regional Network of Seismographs (WARNS) is a system of 20 seismic stations in northwestern Canada that continuously measures ground vibrations created by local and distant earthquakes. This network is designed to address gaps in earthquake monitoring across this remote region. The network builds on earlier temporary experiments. The WARNS stations provide continuous recordings of ground motion, and much of this data is available in real time through the EarthScope Data Management Centre. This open access improves earthquake monitoring and supports numerous branches of scientific research. Northwestern Canada is a geologically complex area with significant earthquake and geological hazards. This is further complicated by climate change rapidly transforming the northern environment, potentially increasing risks. Research using WARNS data is essential for developing strategies to adapt to these evolving hazards and meet the region's future needs.

## **Stratigraphic context for reef-building microbialites in the Tonian Reefal assemblage (Fifteenmile Group) of the Yukon**

**Charlotte Spruzen, Katie M. Maloney, J. Wilder Greenman, Maxwell A. Lechte and Galen P. Halverson**

### **Abstract**

The Tonian Period (1000–720 Ma) likely represents a critical transition in microbial reef construction, given the emergence of reefs built by thrombolites and other cavity-dense microbialites. However, there are few detailed studies on Tonian reef development to constrain this ecologically significant transformation. Here, we build on previous documentation of reefal buildups in the ca. 850–780 Ma Fifteenmile Group in the Coal Creek inlier (Ogilvie Mountains) and contribute seven new detailed stratigraphic sections featuring microbial accumulations in the Reefal assemblage. We document the stratigraphic context for these Tonian reefs and distinguish between predominantly laminated and unlaminated microbial textures. In addition, we identify rare instances of exceptional preservation of unlaminated microbialite, suggesting that reef-building microbialites of the Reefal assemblage have similar framework morphologies to those of the approximately coeval Little Dal Group in the Mackenzie Mountains.

### **Plain language summary**

Before the evolution of animals, reefs were formed of carbonate rock built by micro-organisms. It has been suggested that around one billion years ago, these microbial reefs went through a transition from simple layered structures to complex clotted, three-dimensional frameworks. To better understand this transition, we studied an 800 to 850 million-year-old reef exposed in the Ogilvie Mountains of the Yukon, on the Traditional Territory of the Tr'ondëk Hwëch'in First Nation. We document substantial reefs that built up on uplifted topography, adjacent to a deeper-water basin of shale and carbonate rocks. We also demonstrate for the first time that these reefs were built by clotted frameworks, with strong similarities to reefs of the same age from the Northwest Territories.

## **Thermal imagery and lidar monitoring of ground instability on the Alaska Highway, southwestern Yukon**

**Justin Roman, John Stix, Margaret Kalacska, Oliver Lucanus, Pablo Arroyo-Mora and Panya Lipovsky**

### **Abstract**

Permafrost is integral to the landscape of the Yukon, and influences hydrology and ecology, and impacts infrastructure. Accelerated permafrost thaw due to climate change poses significant challenges, particularly for the Alaska Highway, a vital transportation route. This study investigates how thawing permafrost may relate to ground instability, resulting in cracks and deformations along the highway. Thermal infrared imaging, and light detection and ranging (lidar) mounted on remotely piloted aircraft systems (RPAS), along with ground surveys, were completed at three localities along the Alaska Highway between the White River and the community of Beaver Creek, Yukon. Through these surveys, temperature variations and topographic changes were examined. At many locations, the damage is characterized by a 1 to 2 m-wide subsidence feature running longitudinally along the middle of the highway. Associated with these zones of subsidence are potholes, as well as longitudinal and transverse cracks. In places, the system of cracks extends to the edge and shoulder of the highway, suggesting that the cracks and deformation are currently active features.

### **Plain language summary**

To better understand the damage to a part of the Alaska Highway in the Yukon caused by permafrost thaw, a series of drone-based surveys were conducted along the highway between the White River and the community of Beaver Creek. Three sites were surveyed where road damage is extensive; two sites had various engineered structures installed to help dissipate heat in the shallow subsurface, whereas the third site did not have any such structures. Drone-based thermal infrared imaging and lidar surveys were used to map the detailed thermal and topographic expression of the road surface, and each site was also surveyed on the ground. In the central part of the road, where damage was obvious, the surveys mapped a principal depression roughly parallel to the highway, containing more localized and deeper depressions that were slightly cooler than the surrounding road surface. Drone-based surveys offer rapid and cost-effective means of surveying and assessing critical infrastructure such as highways.

## **Valley deposit: A geological introduction and overview**

**Sergio Gamonal, Thomas Branson, Andy Turner, Hannah Couper and Sunny Yao**

### **Abstract**

The Valley deposit is located in east-central Yukon, 367 km northeast of Whitehorse. In 2012, Golden Predator Mining Corp. originally sampled gold-mineralized quartz veins in outcrop at what is now known as the Valley deposit. Snowline Gold Corp. subsequently followed up on the mineralization through diamond drilling from 2021 to present. The Valley deposit is a reduced intrusion-related gold system characterized by sheeted quartz-carbonate veins hosting free gold and associated lead-bismuth-tellurium sulphides, within a multi-phase, reduced granodiorite intrusion. The phases of the intrusion are physically and chemically distinct, exhibiting the evolution of a magma over time. Gold mineralization is strongly associated with vein density, whereby vein densities of >10 veins per metre correlate with gold grades of >1 g/t. In June 2024, the initial mineral resource estimate defined an Indicated Mineral Resource of 76 Mt at 1.66 g/t Au for 4.05 Moz Au, and an Inferred Mineral Resource of 81 Mt at 1.25 g/t Au for 3.26 Moz Au using a 0.4 g/t Au cut-off grade (Burrell et al., 2024).

### **Plain language summary**

Snowline Gold Corp. is a Yukon-based mineral exploration company that has carried out a substantial drilling campaign between 2021 and 2024 on the newly discovered Valley deposit. The deposit is located in east-central Yukon, 367 km northeast of Whitehorse, and 227 km east of Mayo. The Valley deposit is characterized by an intrusive rock containing a high abundance of gold-bearing quartz veins. The deposit covers an area approximately 700 by 400 m and extends to a depth of 400 m. The gold mineralization occurs at surface and is of unusually high grade for this type of deposit. This high-quality discovery has sparked interest for gold exploration in the eastern Yukon, and has stimulated further exploration for similar styles of mineralized systems. In early 2024, an initial mineral resource estimate was completed on the Valley deposit, and in 2025 this will be updated to include the most recent drilling.



# YGS list of publications and data releases for 2024

YGS released eight publications in 2024: three Open Files, a Geoscience Map, a Miscellaneous Report, a YGS summary report, and two annual reports.

## Open Files

Cronmiller, D.C., 2024. Surficial geology of the Beaver Creek Area, Yukon (parts of NTS 115K/7). Yukon Geological Survey, Open File 2024-1, 1:15 000 scale. <https://data.geology.gov.yk.ca/Reference/96043#InfoTab>

Lipovsky, P.S., 2024. Surficial geology of greater Haines Junction area, Yukon; parts of NTS 115A/11, 12, 13 & 14. Yukon Geological Survey, Open File 2024-2, 1:15 000 scale. <https://data.geology.gov.yk.ca/Reference/96053#InfoTab>

Witter, J.B., 2024. Analysis of geoscience data for geothermal exploration in the Dakwākāda (Haines Junction) area, Yukon. Yukon Geological Survey, Open File 2024-3, 42 p. plus appendices. <https://data.geology.gov.yk.ca/Reference/96052#InfoTab>

## Geoscience Map

Skipton, D.R., 2024. Bedrock geology map of the McQuesten Lake area, central Yukon (parts of NTS 106D/2, 3, 6 & 7). Yukon Geological Survey, Geoscience Map 2024-1, 1:50 000 scale. <https://data.geology.gov.yk.ca/Reference/96051#InfoTab>

## Miscellaneous Reports

Mitchinson, D., Cowan, D.C., Colpron, M., Fournier, D., Naylor, A., Dipple, G.M., Cutts, J.A. and Milidragovic, D., 2024. Regional scale 3D modelling of magnetic data to assess carbon mineralization potential of serpentinized ultramafic rocks in the Yukon. Yukon Geological Survey, Miscellaneous Report 26, 18 p.

## YGS summary reports

Yukon Geological Survey, 2023. Yukon Mineral Deposits Summary 2023. Yukon Geological Survey, 18 p.

## Annual reports

Yukon Geological Survey, 2024. Yukon Exploration and Geology Overview 2023. L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, 69 p.

Yukon Geological Survey, 2024. Yukon Exploration and Geology Technical Papers 2023. L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, 154 p.

## Annual overview papers

### (YEG overviews 2023)

Relf, C., 2024. Yukon Geological Survey 2023 overview. In: Yukon Exploration and Geology Overview 2023, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 1–16.

van Loon, S., 2024. Yukon placer mining 2023 development and exploration overview. In: Yukon Exploration and Geology Overview 2023, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 17–27.

Ellis, S. and Sack, P.J., 2024. Yukon hardrock mining, development and exploration overview 2023. In: Yukon Exploration and Geology Overview 2023, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 29–52.

Weston, L. and O'Connor, A., 2024. Yukon Geological Survey's Outreach Program: 2023 highlights. In: Yukon Exploration and Geology Overview 2023, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 53–61.

## Annual report papers

### (YEG technical papers 2023)

- Berumen-Borrego, F., Gilbert, H., Dettmer, J., Gosselin, J.M. and Shahsavari P., 2024. Shearwave velocities from broadband HVSR measurements for geothermal resource assessment near Burwash Landing, Yukon. *In: Yukon Exploration and Geology Technical Papers 2023*, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 1–15.
- Clarke, H.C., Cronmiller, D.C., Ward, B.C. and Groeneveld, K.A., 2024. Permafrost-related landslides following a 2017 wildfire, Dempster Highway, Yukon (parts of NTS 116G/9 and 116H/12). *In: Yukon Exploration and Geology Technical Papers 2023*, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 17–36.
- Han, J., Dettmer, J., Gosselin, J.M., Gilbert, H., Biegel, K. and Kim, S., 2024. Seismicity near the eastern Denali fault from temporary and long-term seismic recordings. *In: Yukon Exploration and Geology Technical Papers 2023*, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 37–50.
- Klyukin, Y., 2024. Surficial geochemical data extracted from assessment reports: Development and initial release of the database. *In: Yukon Exploration and Geology Technical Papers 2023*, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 51–56.
- Leishman, T., Gosselin, J.M., Dettmer, J., Cassidy, J.F. and Kang, T.-S., 2024. Preliminary site characterization for earthquake hazard assessment using ambient vibration techniques in Haines Junction, Yukon (parts of NTS 115A/11, 12, 13, 14). *In: Yukon Exploration and Geology Technical Papers 2023*, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 57–76.
- Léveillé-Dallaire, X. and Raymond, J., 2024. Hydrothermal modelling of Takhini Hot Springs (NTS 105D/14). *In: Yukon Exploration and Geology Technical Papers 2023*, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 77–96.
- Moynihan, D., 2024. Preliminary report on the bedrock geology southwest of Big Salmon Lake (parts of NTS 105F/3, 4, 5, 6), south-central Yukon. *In: Yukon Exploration and Geology Technical Papers 2023*, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 97–106.
- Painter, M., Cronmiller, D. and Lipovsky, P., 2024. Preliminary data from the establishment of longterm ground temperature reference sites in five Yukon communities. *In: Yukon Exploration and Geology Technical Papers 2023*, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 107–138.
- Webb, L.C. and Ambrose, T.K., 2024. Preliminary observations of the Mesoproterozoic Pinguicula Group in the Coal Creek inlier, Yukon (parts of NTS 116B/11, 14). *In: Yukon Exploration and Geology Technical Papers 2023*, L.H. Weston and Purple Rock Inc. (eds.), Yukon Geological Survey, p. 139–154.

## Contributions to external publications

- Biegel, K.M., Gosselin, J.M., Dettmer, J., **Colpron, M.**, Enkelmann, E. and Caine, J.S., 2024. Earthquake relocations delineate a discrete fault network and deformation corridor throughout southeast Alaska and southwest Yukon. *Tectonics*, vol. 43, no. 5, May 2024, e2023TC008140, <https://doi.org/10.1029/2023TC008140>. **YGS Contribution 067**
- Chen, Z., Grasby, S.E., Yuan, W., **Colpron, M.** and Liu, X., 2024. Methodology study of geothermal resource evaluation using remote-sensing and ground-surface temperature data, Burwash Landing, Yukon - status and preliminary results. Geological Survey of Canada, Open File 9177. [https://publications.gc.ca/collections/collection\\_2024/rncan-nrcan/m183-2/M183-2-9177-eng.pdf](https://publications.gc.ca/collections/collection_2024/rncan-nrcan/m183-2/M183-2-9177-eng.pdf)
- Fereydooni, H., Gruber, S., **Cronmiller, D.** and Stillman, D., 2024. Utilizing spectral induced polarization to identify the ice core of a pingo: A case study in Haines Junction, Yukon, Canada. *In: 12th International Conference on Permafrost*, 16–20 June 2024, R.A. Beddoe and K.C. Karunaratne (eds.), Whitehorse, Canada, International Permafrost Association, vol. 1, p. 87–93. **YGS Contribution 065**

Gopon, P., **Sack, P.**, Pinet, N., Douglas, J.O., Jenkins, B.M., Johnson, B., Penny, E., Moody, M.P. and Robb, L., 2024. Revealing Yukon's hidden treasure: an atomic-scale investigation of Carlin-type gold mineralization in the Nadaleen trend, Canada. *Mineralium Deposita*, October 30, 2024. <https://doi.org/10.1007/s00126-024-01325-9>

Gosselin, J.M., Biegel, K.M., Dettmer, J., Hersh, G., **Colpron, M.** and Enkelmann, E., 2024. Crustal stress near the Yakutat microplate collision from probabilistic earthquake focal mechanisms. *Canadian Journal of Earth Sciences*, October 15, 2024, <https://doi.org/10.1139/cjes-2024-0095>

Holley, E.A., Jilly-Rehak, C., **Sack, P.**, Phillips, D.L. and Gopon, P., 2024. Nanoscale Characteristics of Carlin-Type auriferous pyrite from the Nadaleen Trend, Yukon. *Economic Geology*, vol. 119, no. 7, p. 1643–1666. <https://doi.org/10.5382/econgeo.5107>

Makopoulou, E., Karjalainen, O., Elia, L., Blais-Stevens, A., Lantz, T., **Lipovsky, P.**, Lombardo, L., Nicu, I.C., Rubensdotter, L., Rudy, A.C.A. and Hjort, J., 2024. Retrogressive thaw slump susceptibility in the northern hemisphere permafrost region. *Earth Surface Processes and Landforms*, 13 p. <https://doi.org/10.1002/esp.5890>. **YGS Contribution 068**

**Painter, M.**, Copland, L., Dow, C., Kochtitzky, W. and Medrzycka, D., 2023. Patterns and mechanisms of repeat drainages of glacier-dammed Dań Zhùr (Donjek) Lake, Yukon. *Arctic Science*, vol. 10, no. 3, September 2024. <https://doi.org/10.1139/as-2023-0001>

## Datasets

### Newly created:

Yukon Geological Survey, 2024. Assessment Report Geochemistry (GARDEd). Yukon Geological Survey. <https://data.geology.gov.yk.ca/Compilation/41#InfoTab>. Released February 5, 2024.

## Articles of interest

Brideau, M.A., Arenson, L.U., Porter, M., Mickey, A., Eshpeter, T. and Allen, T., 2024. The Whitehorse escarpment–preliminary landslide risk assessment. 77th Canadian Geotechnical Conference and the 16th Joint CGS/IAH-CNC Groundwater Conference, September 2024, Montréal, Quebec, Canada. [https://www.researchgate.net/publication/384066252\\_The\\_Whitehorse\\_Escarpment\\_-\\_Preliminary\\_Landslide\\_Risk\\_Assessment](https://www.researchgate.net/publication/384066252_The_Whitehorse_Escarpment_-_Preliminary_Landslide_Risk_Assessment)

Buryak, S.D., 2024. Refining the geochronology and paleoenvironmental significance of key tephra beds in Yukon and Alaska. Unpublished PhD thesis, University of Alberta, Edmonton, Alberta, Canada. <https://doi.org/10.7939/r3-q7mb-qz17>

Caine, J.S., Orlandini, O.F., Vollmer, F.W. and Lowers, H.A., 2024. Brittle regime slip partitioned damage and deformation mechanisms along the eastern Denali fault zone in southwestern Yukon. *Journal of Geophysical Research: Solid Earth*, vol. 129, no. 11, November 2024. <https://doi.org/10.1029/2024JB029506>

Dong, Y.-L. and Zhang, Z.-J., 2024. Deep Forest modeling: An interpretable deep learning method for mineral prospectivity mapping. *Journal of Geophysical Research: Machine Learning and Computation*, vol. 1, no. 4, December 2024, e2024JH000311. <https://doi.org/10.1029/2024JH000311>

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# Yukon Geological Survey

Yukon Geological Survey staff are located in two buildings in Whitehorse: the Elijah Smith Building at 300 Main Street, room 102, and the H.S. Bostock Core Library at Mile 918 on the Alaska Highway.

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