MINING INDUSTRY
HUMAN RESOURCES COUNCIL

SPOTLIGHT:
GEOLOGICAL AND MINERAL TECHNICIANS

2024

MINING INDUSTRY
HUMAN RESOURCES COUNCIL

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Published April 2024

Canada

This project is funded in part by the Government of Canada.

The opinions and interpretations in this publication are those of the author and do not necessarily reflect those of the Government of Canada.

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Overview

Canada's mining industry has entered a promising new era of growth. Since 2020, increased demand for critical minerals and rising metal and mineral prices have fueled substantial capital investments and mineral exploration spending. With global momentum towards decarbonization and green energy initiatives, Canada's key position in the green economy offers a bright future for careers in its mining sector.

Establishing a robust talent pipeline is increasingly important for the sustainable growth of the industry. To this end, The Mining Industry Human Resources Council (MiHR) has identified several essential occupations that face potential labour shortages in the coming years. This publication focuses on one of these crucial occupations: **Geological and Mineral Technicians** (NOC 22101)[1].

Aimed at both job seekers and employers, this report offers information on the position's primary responsibilities, level of remuneration, educational prerequisites and skills profile. Additionally, it delves into the geographical distribution, demographic characteristics, and latest employment and postsecondary education trends for Geological and Mineral Technicians.

Job Description

Geological and Mineral Technicians provide technical support and services or may work independently in the fields of oil and gas exploration and production, geophysics, petroleum engineering, geology, mining and mining engineering, mineralogy, extractive and physical metallurgy, metallurgical engineering and environmental protection. They are employed by petroleum and mining companies, consulting geology and engineering firms, and by governments and educational institutions as well as by a variety of manufacturing, construction and utilities companies[2].

Mining Needs You

Why are Geological and Mineral Technicians important?

We need Geological and Mineral Technicians to conduct surveys and analyze geophysical data. They must be detail-oriented, adaptable, and enjoy working outdoors to direct survey programs and provide technical services related to production.

What is it Like to Work as a Geological and Mineral Technologist in Mining?

Geological and Mineral Technologists work at the mine site with Engineers and Geologists or in a laboratory. In the mine, they prepare equipment, take samples, support mapping and drilling, enter data and package samples. With experience, they spend more time coordinating and compiling reports in an office.

Why are People Attracted to this Career?

Geological and Mineral Technologists enjoy a challenging variety of routine and new tasks, the outdoors, and appreciate the opportunity to learn and work with new technology.

Source: Mining Industry Human Resources Council, "We Need Mining, Mining Needs You". https://www.miningneedsyou.ca/job/geological-and-mineral-technician/

1 Labour market data is aligned with Employment and Social Development Canada's (ESDC) National Occupational Classification (NOC) framework. Statistics cited throughout this report will correspond to NOC 22101 (Geological and mineral technologists and technicians), as it is the closest match.

2 *Statistics Canada, Occupational and Skills Information System (OaSIS).*

Duties and Responsibilities

Geological and Mineral Technicians perform some or all of the following duties:

- Conduct or direct geological, geophysical, geochemical, hydrographic or oceanographic surveys, prospecting field trips, exploratory drilling, well logging or underground mine survey programs.
- Configure, operate and maintain geophysical survey and well logging instruments and equipment.
- Prepare notes, sketches, geological maps and cross sections.
- Prepare, transcribe or analyze seismic, gravimetric, well log or other geophysical and survey data.
- Assist engineers and geologists in the evaluation and analysis of petroleum and mineral reservoirs.
- Prepare or supervise the preparation of rock, mineral or metal samples and perform physical and chemical laboratory tests.
- Conduct or assist in environmental audits, in the design of measures to minimize undesirable environmental effects of new or expanded mining and oil and gas operations, and in the development of waste management and other related environmental protection procedures.
- May supervise oil and gas well drilling, well completions and work-overs.
- May conduct or supervise studies and programs related to mine development, mining methods, mine ventilation, lighting, drainage and ground control.
- May assist engineers and metallurgists in specifying material selection, metal treatments or corrosion protection systems.
- May assist hydrogeologists in evaluating groundwater and well circulation and in report preparation.
- May develop specifications for heat treatment of metals or for welding, design welding fixtures, troubleshoot welding processes or quality problems and supervise welding projects.
- May coordinate crew members' activities during seismic tests.

Additional information:

- There is limited mobility among occupations in this group.
- Mobility may be possible between geophysical technology and electronic technology.
- Mobility may be possible between some occupations in this group and related fields of civil engineering technology.

Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Occupational and Skills Information System (OaSIS).

Wages and Pay

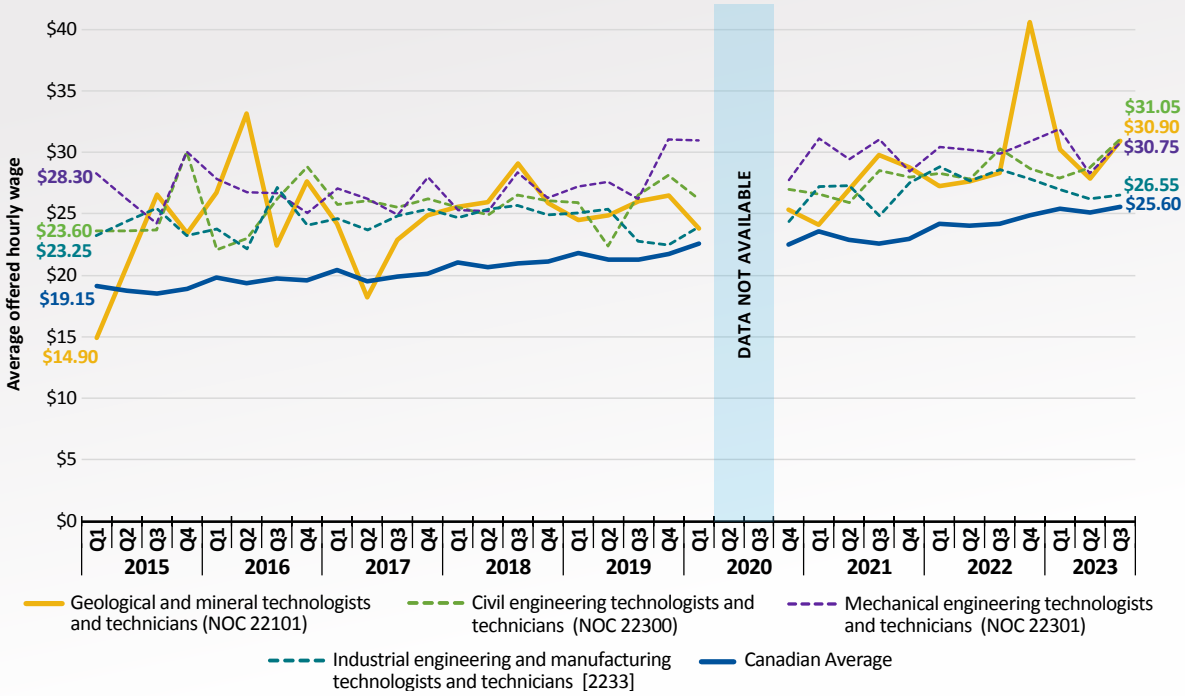
Geological and Mineral Technician careers offer relatively robust salary prospects, among the highest for Technologists and Technicians. In 2021, the median annual income for Geological and Mineral Technicians was $72,000, 66% higher than the national average and higher than the income for Civil or Mechanical Technicians. The data also shows that wages offered by employers have been trending upward in recent years.

Median Annual Income (Wages, salaries and commissions), Geological and Mineral Technicians and related occupations (2021)

NOC Code	Occupation	Median Annual Income
-	All occupations	**$43,200**
22101	**Geological and Mineral Technologists and Technicians**	**$72,000**
22300	Civil Engineering Technologists and Technicians	**$62,000**
22301	Mechanical Engineering Technologists and Technicians	**$70,000**
22302	Industrial Engineering and Manufacturing Technologists and Technicians	**$59,200**

Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Census of Population, 2021.

Average offered hourly wage, Geological and Mineral Technicians and related occupations (2021)



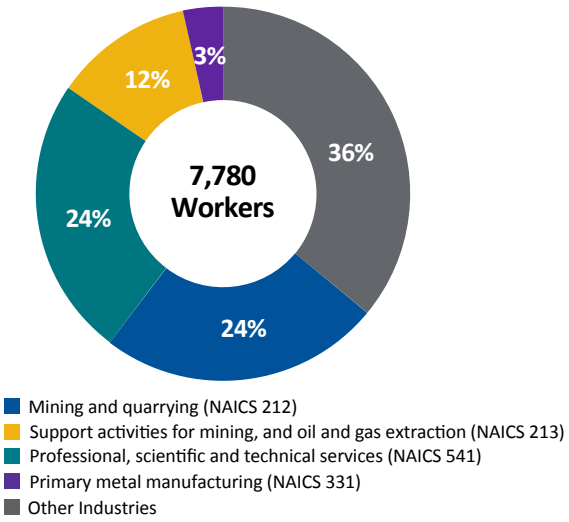
Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada Job vacancies, proportion of job vacancies and average offered hourly wage by selected characteristics, quarterly, unadjusted for seasonality, inactive (Table: 14-10-0328-01), 2024.

Places of Work

Industries that Employ Geological and Mineral Technicians

In 2021, close to a quarter (24%) of Geological and Mineral Technicians were in the *Mining and quarrying sector.* Other prominent sectors include *Oil and gas extraction, Support activities for mining and oil and gas extraction (12%)*, and *Professional, scientific and technical service (24%)*. Within these industries, some of the businesses that hire Geological and Mineral Technicians include oil, mining, consulting and manufacturing companies.

Employment by Industry, Geological and Mineral Technologists and Technicians (NOC 22101) (2021)



Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Census of Population, 2021.

Types of Employers

Below is a short list of the types of workplaces that typically employ Geological and Mineral Technicians in Canada:

- Consulting geology and engineering firms
- Education institutions
- Governments
- Manufacturing, construction and utilities companies
- Petroleum and mining companies

Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Occupational and Skills Information System (OaSIS).

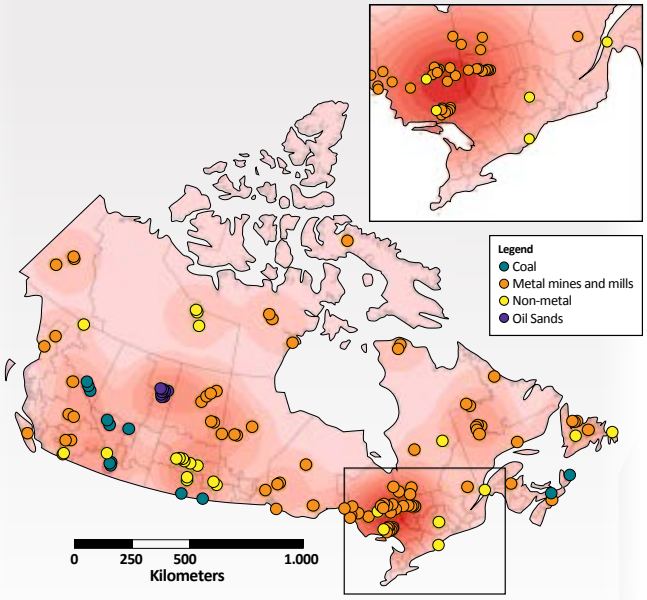
Work Setting

Geological and Mineral Technicians perform their duties either outdoors, often in remote areas, or indoors in offices or laboratories. Fieldwork involves exposure to various weather conditions, with Technicians sometimes staying on-site for extended periods to gather data and oversee equipment. Conversely, Technicians in office settings primarily utilize computers for data organization, analysis, report writing, and map production[3].

While most Geological and Mineral Technicians work full-time, their schedules vary depending on their work environment. Those in laboratories and offices typically adhere to standard hours, whereas field technicians may have irregular schedules.

In the mining industry, Geological and Mineral Technicians often travel to mining operations located in remote areas.

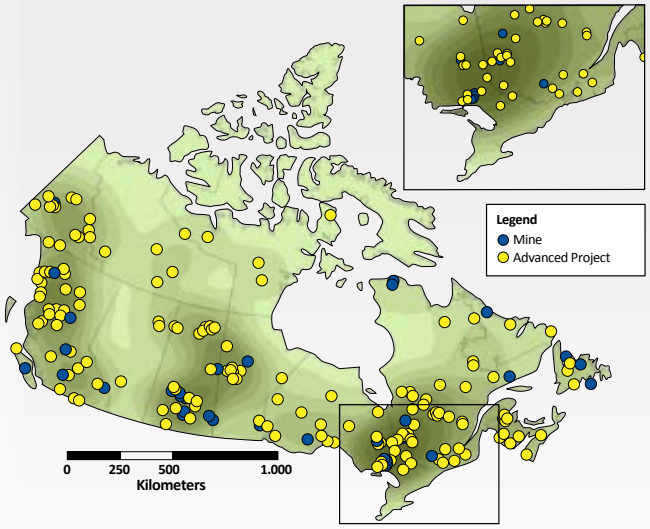
MAP 1 *Producing Mines in Canada*



Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Natural Resources Canada, Principal Mineral Areas, Producing Mines, and Oil and Gas Fields in Canada, 2022.

As per NRCan data from 2022, Canada had a total of 135 active mines. Map 1 depicts their geographic spread, denoting the type of operation and where there is a higher density of mines relative to other areas. The figure shows the largest cluster of mining activity is found in Northeast Ontario and Abitibi-Témiscamingue, Québec, where there is a long and established history of mining.

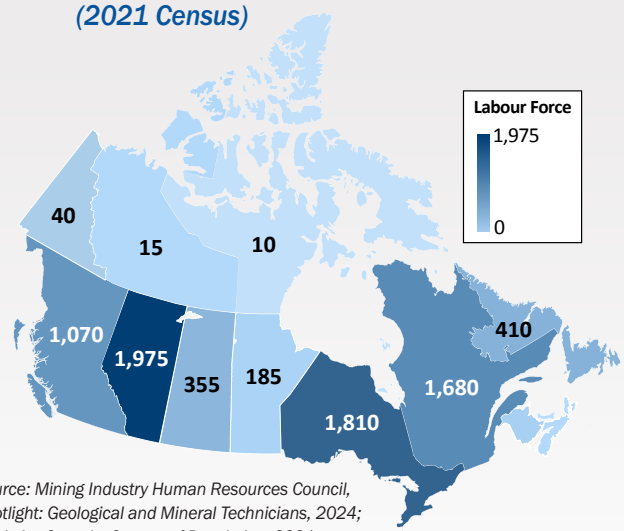
MAP 2 *Critical Mineral Projects in Canada*



Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Postsecondary Information System (Table 37-10-0182-01).

The shift to a green economy in Canada will largely depend on critical minerals that will make clean energy technologies possible. With its vast geological landscape, Canada is well-positioned to be a producer of key critical minerals as they are anticipated to increase in demand. Map 2 displays critical mineral projects across Canada in 2021. These projects encompass a variety of critical minerals, including Zinc, Copper, Cobalt, Nickel, among several others.

MAP 3 *Labour Force by Province, Geological and Mineral Technologists and Technicians (NOC 22101) (2021 Census)*



Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Census of Population, 2021.

Map 3 shows how the labour force of Geological and Mineral Technicians is distributed across the country by province of residence. Among provinces, Alberta has the largest number of Geological and Mineral Technicians, followed by Ontario and Quebec.

3 *U.S. Bureau of Labor Statistics, Occupational Outlook Handbook, 2023.*

Education, certification and licensing

The following list includes the education, training and/or certifications required to work as a Geological and Mineral Technician in Canada.

Educational Requirements

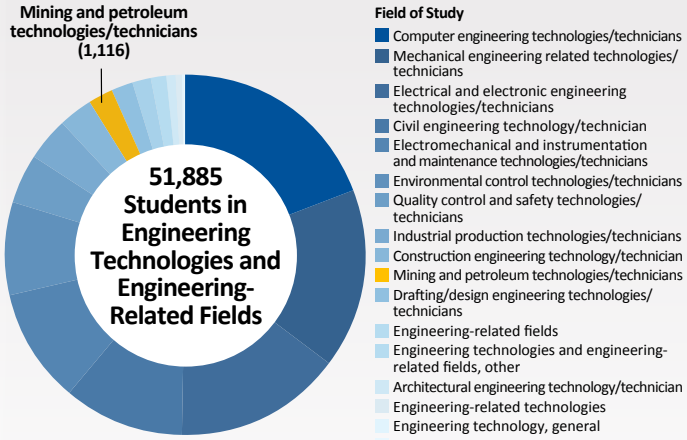
- Geological and Mineral Technologists usually require completion of a two- to three-year college program in geological technology, petroleum technology, petroleum engineering technology, hydrogeology or groundwater technology, mining technology, mining engineering technology, mineralogy, metallurgical technology, or welding technology.
- Geophysics Technologists usually require completion of a two- to three-year college program in electronics technology.
- Geological and Mineral Technicians usually require completion of a one- to two-year college program in a related field.
- Certification in geological and mineral technology or in a related field is available through provincial associations of engineering/applied science technologists and technicians and may be required by employers.
- In Quebec, membership in the regulatory body for professional technologists is required to use the title "Professional Technologist."

Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Occupational and Skills Information System (OaSIS).

Postsecondary Education Trends

For college students, Geological and Mineral Technician programs are not a very popular choice. More specifically, mining technologies constitutes only 2% of all engineering technologist programs. By contrast, computer engineering technicians make up 19% of enrolments in this category.

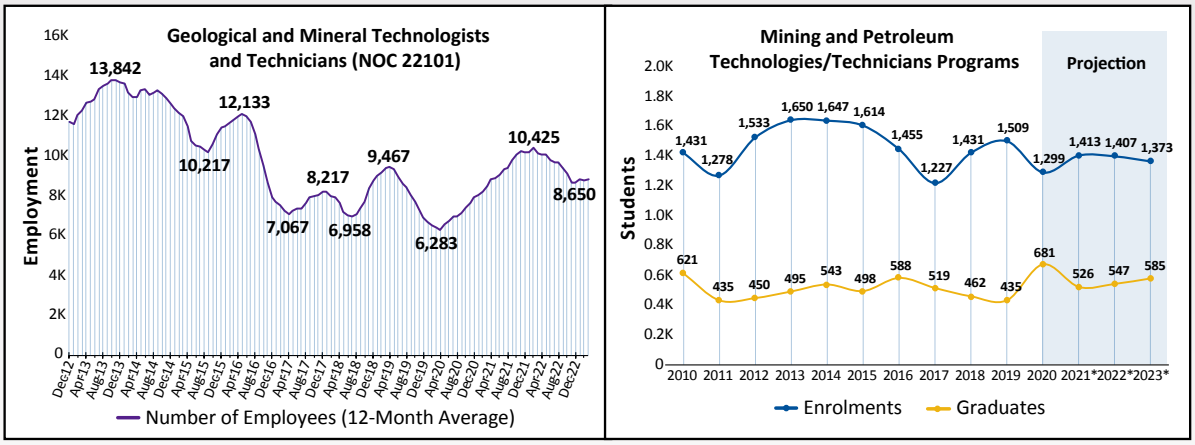
Canadian Postsecondary Enrolment in Accredited Geological and Mineral Technician Programs (2020)



Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Postsecondary Information System (Table 37-10-0182-01).

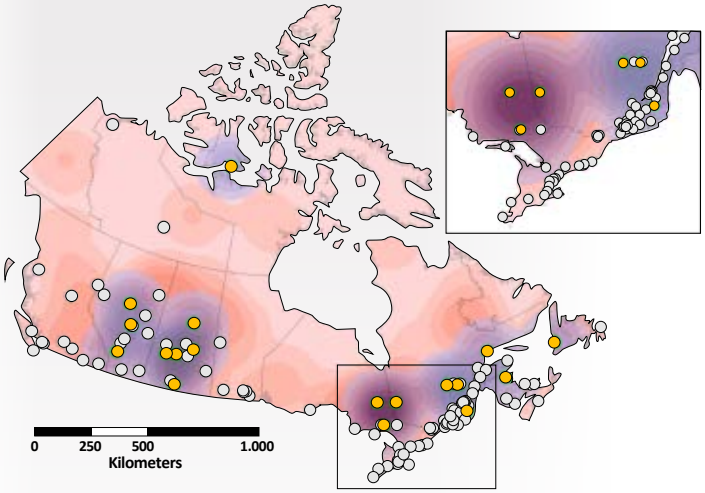
Employment for Geological and Mineral Technicians appears to be highly volatile. From 2012 to 2016, employment declined by a third, yet the number of graduates increased, also by a third. Over a 10-year period, the number of employees was as high as 14,000 and as low as 6,000. On the other hand, postsecondary education trends appear to fluctuate mildly, with enrolment and graduation numbers being very close to what they were a decade ago. This underscores the weak correlation between the two.

Employment and Postsecondary Education Trends, Geological and Mineral Technicians (2012–2023)



Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Postsecondary Information System (Table 37-10-0182-01).

MAP 4 *Colleges with Mining Technologies Programs (2020-2021)*



Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Postsecondary Information System (Table 37-10-0182-01).

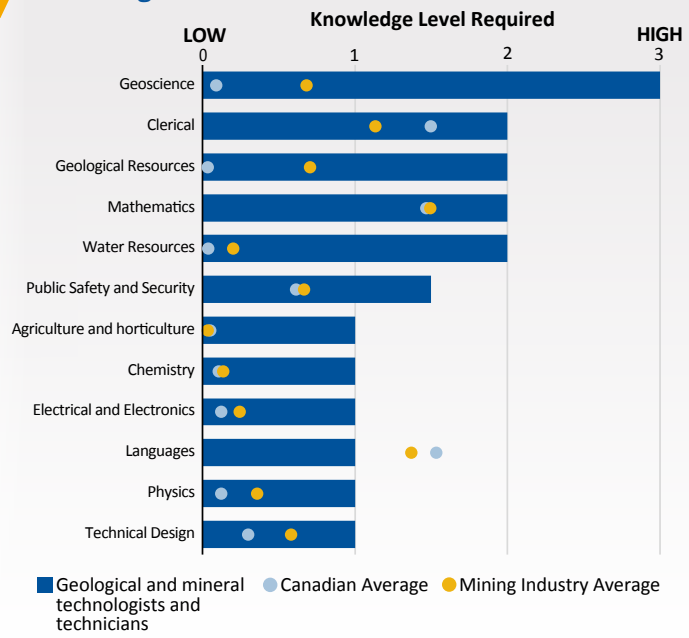
Of the 159 colleges that MiHR has identified, only 18 offered enrolment in mining technologies programs in 2020/21 (Map 4). While the number of program offerings is small, there is a relatively closer geographical alignment with mining hot zones in Canada. Nonetheless, mining technician programs are broadly not available in many provinces.

Knowledge, Skills, Abilities and Personal Attributes

The Occupational and Skills Information System (OaSIS)[4] describes the various competencies and characteristics of workers in a given occupation. The following charts provide a set of ratings for the level of knowledge or proficiency attributed to Geological and Mineral Technicians in Canada.

In this context, knowledge refers to the principles and practices most frequently used by Technicians for the execution of workplace tasks or activities.

Knowledge



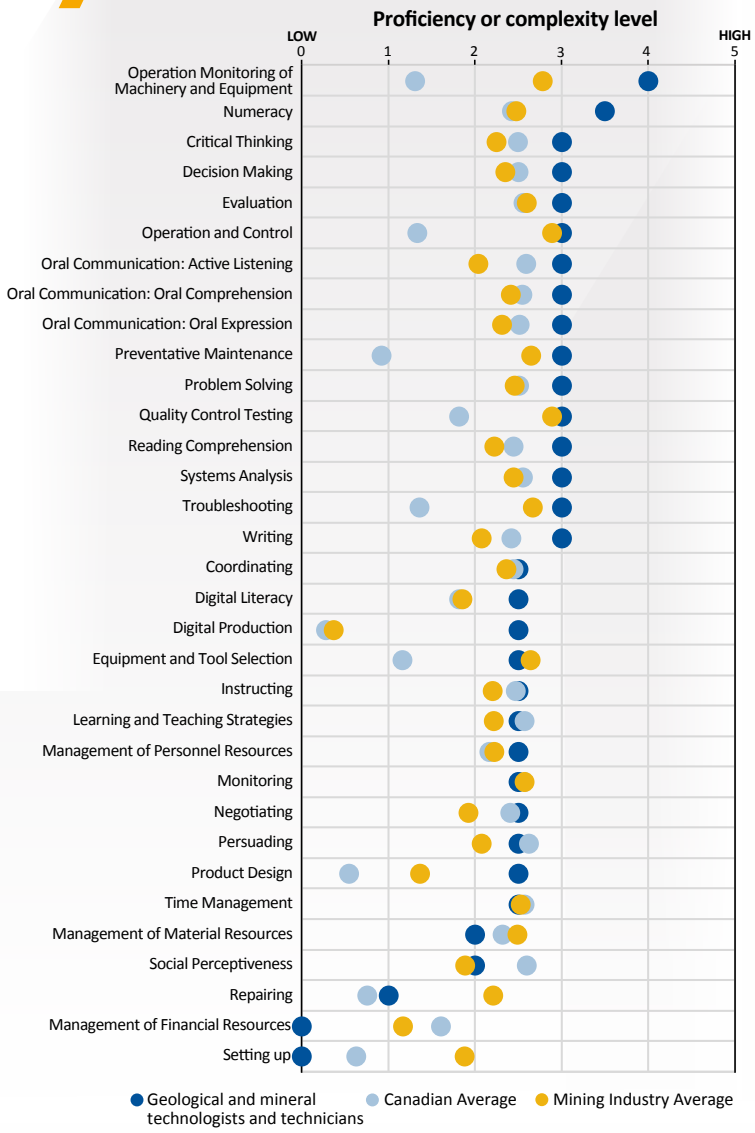
Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Occupational and Skills Information System (OaSIS)

4 The OaSIS is a database developed by Employment and Social Development Canada (ESDC) that provides ratings for worker characteristics such as skills and abilities as well as the work environment associated with Canadian occupations.

Skills can be defined as the proficiencies that an individual needs to possess in order to perform effectively in a job, role, function, task, or duty.

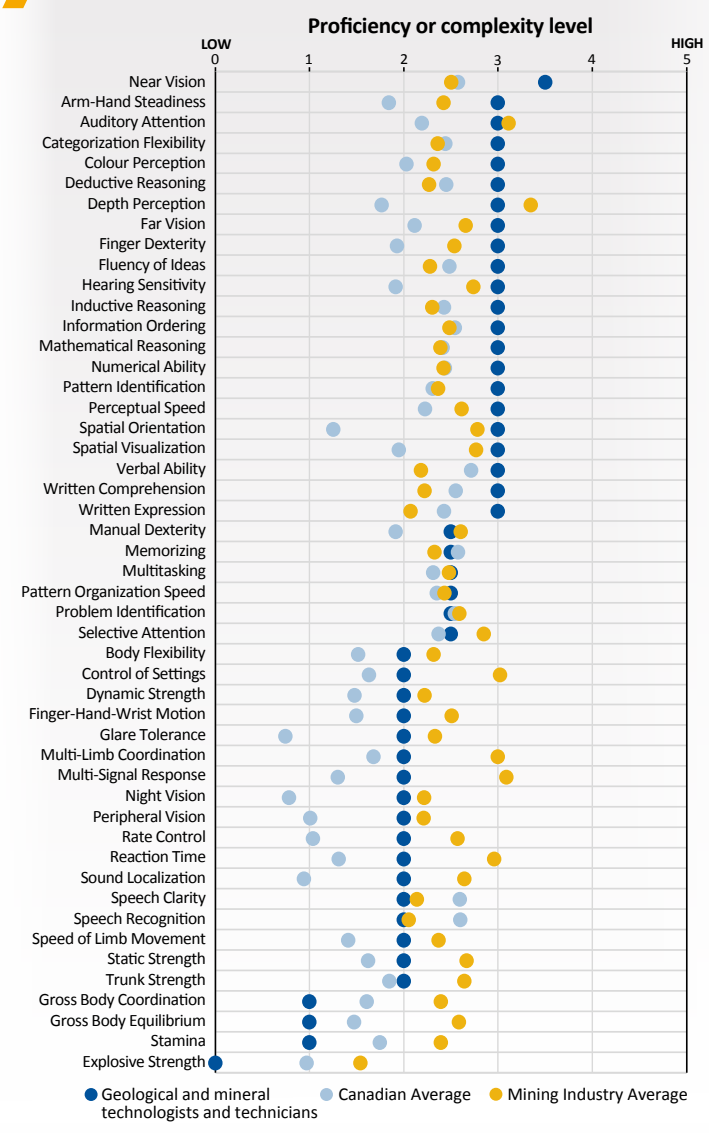
Abilities can refer to inherent and cultivated aptitudes that facilitate the attainment of knowledge and skills required to fulfill job responsibilities effectively.

Skills



Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Occupational and Skills Information System (OaSIS)

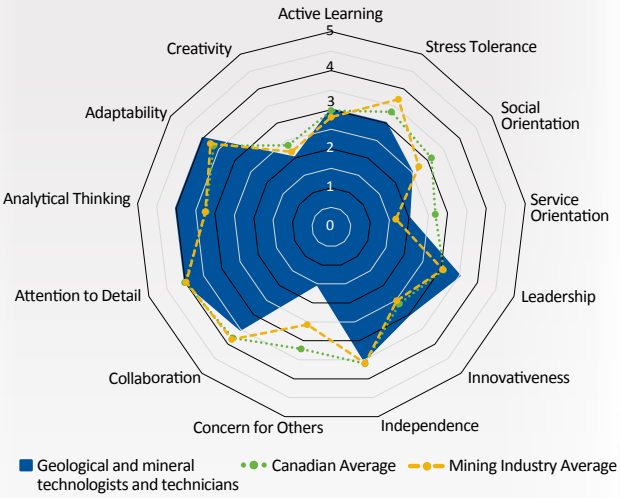
Abilities



Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Occupational and Skills Information System (OaSIS)

Similar to abilities, personal attributes are inherent traits that are cultivated through social contexts and personal experiences. They shape the person and are a valuable asset in determining work performance.

Personal Attributes



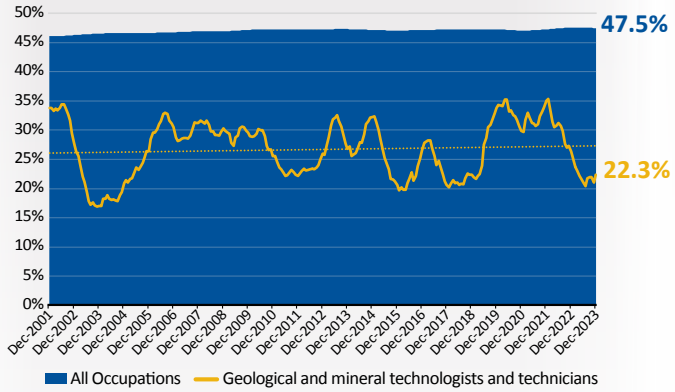
Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Labour Force, Occupational and Skills Information System (OaSIS)

Demographic Representation

Understanding the demographic profile of Geological and Mineral Technicians is crucial for workforce planning, promoting diversity and inclusion, tailoring skills development programs, implementing retention strategies and gaining insights into industry trends.

Women's representation among Geological and Mineral Technicians (22.3%) has remained stagnant over the last 20 years, and it is lower than the Canadian average (47.5%) as of December 2023.

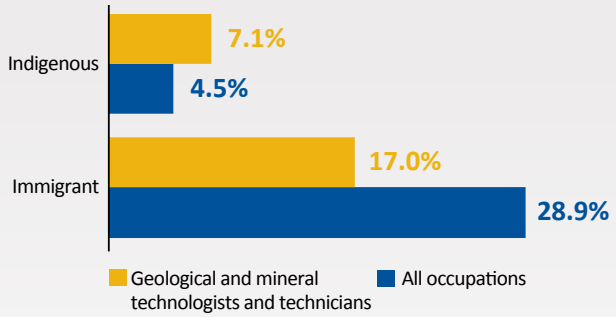
Women's Representation (2001-2023, 12-month Moving Average)



Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Labour Force Survey (Custom Data)

According to the Census, the proportion of immigrants in this occupation (17%) is well below the level found across all occupations (29%). The reverse is true in the case of Indigenous peoples; their representation among Geological and Mineral Technicians is 7.1%, compared to only 4.5% across all occupations in Canada.

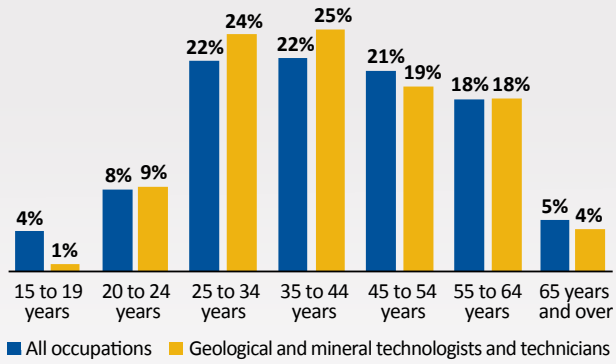
Indigenous & Immigrant Representation (2021 Census)



Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Census of Population, 2021

Roughly half (49%) of all Geological and Mineral Technicians are within the ages of 25 and 44, while nearly a quarter (22%) are nearing or past retirement age. To ensure a robust labour supply pipeline, it is imperative to recruit young workers to replenish the gap created by retiring workers.

Age Distribution (2021 Census)



Source: Mining Industry Human Resources Council, Spotlight: Geological and Mineral Technicians, 2024; Statistics Canada, Census of Population, 2021