



IDENTIFICATION

Department	Position Title	
Industry, Tourism and Investment	Permafrost Data Scientist	
Position Number	Community	Division/Region
63-15073	Yellowknife	NWT Geological Survey

PURPOSE OF THE POSITION

The Permafrost Data Scientist conceives, designs, and conducts scientific studies that increase the knowledge of permafrost conditions around communities, key infrastructure corridors, development projects, and areas of cultural and environmental significance.

SCOPE

The Permafrost Data Scientist (Scientist) is located in Yellowknife and reports to the Senior Permafrost Scientist. The Scientist works with other permafrost researchers and geoscientists at the Northwest Territories Geological Survey (NTGS). The incumbent conducts scientific research and data analysis that contribute to infrastructure decisions, environmental management, climate adaptation and mitigation strategies, and general scientific and engineering knowledge.

All governments in the NWT have recognized the need for permafrost and environmental geoscience knowledge in order to better understand and adapt to the effects of climate change on infrastructure and the environment. An ability to predict the environmental impacts of climate change represents a distinct advantage in planning and maintaining infrastructure and in preparing for changes to the natural environment such as changes in water quality due to permafrost thaw. This knowledge is now a key factor in supporting sustainable economic development and maintaining a positive socio-economic environment for NWT residents.

Permafrost research supports decision making related to the development and maintenance of transportation infrastructure. The NTGS contributes to these goals through environmental geoscience research, compiling relevant datasets, and disseminating information to stakeholders. The NTGS works closely with the Government of Northwest Territories (GNWT)



Department of Infrastructure in contributing permafrost knowledge to inform construction, maintenance, and regulatory decisions for existing and new road corridors.

Permafrost thaw is increasing the frequency and magnitude of geohazards, affecting the cultural, environmental, and socio-economic health of the NWT. The NWT Climate Change Strategic Framework (NWT CCSF) has identified that understanding permafrost conditions and the effects of climate change on terrain stability is necessary to develop informed mitigation and adaptation strategies that minimize impacts on society and supports responsible infrastructure development. Scientific knowledge of permafrost conditions provides the necessary foundation for predicting the impacts of climate change in the north, making the discipline relevant across scientific disciplines and government and industry sectors. The NWT CCSF 2019-2023 Action Plan acknowledges that developing a modern and comprehensive permafrost knowledge base is a significant need.

The Scientist works with legislative, regulatory and policy frameworks that include the NWT CCSF and its Action Plan, the NWT Transportation Strategy, the GNWT Knowledge Agenda and its Action Plan, the *NWT Scientist Act*, Aurora College research policies, and the *Mackenzie Valley Resource Management Act*.

The Scientist develops, plans, and implements permafrost research projects. Projects vary from regional, multi-disciplinary collaborative studies to smaller targeted projects that may be conducted independently. The Scientist will also work on research projects that focus on characterizing sensitive permafrost terrain and geohazards and monitoring thaw-induced landscape change. In implementing these projects, the Scientist may be required to recruit and supervise field staff, ensuring that occupational health and safety procedures are implemented and complied with.

A permafrost data management system organizes and disseminates data to inform future land-use decisions. Permafrost field data includes geotechnical information such as ground ice percentage, ground temperatures measured at various depths throughout the year using automated data loggers, and environmental data such as site-specific snow, vegetation, and surface water conditions. Permafrost data can also include information collected using remote sensing techniques such as satellite imagery, Interferometric Synthetic Aperture Radar (InSAR) and Light Detection and Ranging (LiDAR). Permafrost data represents tens of millions of dollars of field drilling, sample analysis, and instrumentation costs. If managed responsibly, these data provide the foundation for monitoring permafrost change, planning development, and mitigating climate change impacts.

A key NTGS mandate is to publicly disseminate research data and interpretations in a timely manner. The Scientist is responsible for authoring papers and developing publications of high technical quality that are suitable for publication by the NTGS or in refereed scientific journals. The Scientist also disseminates information by delivering presentations at community



meetings, professional conferences, and to interested NTGS clients. In addition, the incumbent contributes to NTGS outreach activities by giving public presentations, producing plain-language science communication products, and engaging with students.

The Scientist compiles NWT geotechnical, permafrost, and geohazard data, develops and maintains associated databases, analyzes and synthesizes data, and publishes technical reports, maps, and scientific papers. This work supports infrastructure planning and academic research, provides information on the state of the NWT environment, contributes to geohazard knowledge, and provides technical evidence for decision making.

By employing responsible data management, data sharing, and quality control practices, the Scientist also contributes to overall GNWT data stewardship, particularly in the context of climate change impacts and needs. Ultimately, the work of the incumbent contributes to a positive socio-economic environment for NWT residents.

The Scientist provides information, evidence, and advice to NWT regulatory boards to inform their decision-making processes. This information may be used to establish terms and conditions for Land Use Permits, Water Licenses, and Environmental Impact Assessments that are issued or ordered by regulatory agencies.

The Scientist collaborates with other NTGS colleagues, the NWT Centre for Geomatics, the GNWT departments of Infrastructure, Lands, and Environment and Natural Resources, federal departments such as Natural Resources Canada, and Indigenous governments and organizations. The Scientist also regularly collaborates with academic partners and co-supervises university graduate student projects and field activities. Other collaborators include engineering and environmental consultants and non-profit organizations.

Annual work planning may be conducted in collaboration with the Department of Infrastructure and with other GNWT departments and research partners as appropriate. Work activities will regularly support infrastructure-related projects that involve geotechnical, permafrost, and geohazard data collection, compilation, and analysis.

The Scientist has significant latitude provided that best practices in scientific data collection, research, and methodology are followed. The position's work must be impactful in achieving the goals of the NTGS Strategic Plan and in meeting the needs of the GNWT and NWT residents.

RESPONSIBILITIES

- 1. Leads the development of field- and office-based research programs and conducts research on permafrost, ground temperature, and geotechnical data**
 - Develops and initiates scientific research projects that focus on permafrost and geotechnical data collection, observations, and interpretation of results.



- Plans fieldwork and leads field activities, both as a research leader and as a scientific contributor to collaborative projects.
 - Collaborates with university professors to facilitate, and in some cases oversee, the field component of post-doctoral, graduate, and undergraduate student research.
 - Supervises and mentors casual staff (GNWT summer students) in conducting fieldwork, capturing and managing field data, and developing scientific findings.
 - Develops comprehensive field safety plans and protocols for research teams and ensures they are rigorously followed.
 - On a daily basis while in the field, carefully documents research activities and safety-related activities and incidents.
 - Liaises with leaders and members of local governments and communities on field programs.
 - Contributes to the prediction, analysis, mitigation, and overall government management of geohazard situations.
 - Performs numerical or statistical analyses on thermal and geotechnical data.
 - Authors or co-authors reports and scientific papers on local and regional permafrost and geotechnical conditions with a focus on infrastructure corridors and NWT communities.
 - Coordinates field programs that involve the collection of permafrost, ground temperature, geotechnical, and geohazard information.
 - Ensures cost-effective, efficient, and safe work practices in the field and office.
 - Develops and contributes to strategic decisions on the environmental geoscience needs and priorities of the NTGS and the GNWT.
- 2. Develops and maintains a permafrost, geotechnical, and geohazard data management system for the GNWT.**
- Evaluates and solves permafrost, geotechnical, and geohazard data management problems that are unique in the NWT and/or GNWT context.
 - Works with local, national, and international partners to develop and implement data reporting standards, protocols, and best practices.
 - Works collaboratively with others to implement permafrost and geotechnical databases within the larger GNWT data management system.
 - Implements appropriate quality assurance and quality control methods for NWT data.
 - Acts as system administrator and ensures timely import of data submitted by others.
 - As required, seeks and secures external funding to sustain data management systems and activities.
- 3. Compiles, organizes, and archives permafrost, geotechnical, and geohazard data collected in the NWT.**
- Investigates past permafrost, ground temperature, geotechnical, and related projects conducted in the NWT.



- Compiles, organizes, and archives permafrost, ground temperature, geotechnical, and geohazard data collected by the GNWT, partner organizations, researchers, and industry.
 - Plans and implements data compilation and synthesis projects.
 - Conducts and coordinates data recovery projects and generates data compilations for addition to the database.
 - Works with partners and supervises contractors to facilitate ground temperature and geotechnical data compilations.
 - Works with the NTGS Geoscience Editor to review and publish technical reports.
 - Develops proposals, including budgets and schedules, for data compilation and database projects.
- 4. Leads and participates in improvements to environmental geoscience data stewardship.**
- Meets with GNWT departments, industry, regulatory boards, and researchers on matters related to the collection and stewardship of NWT permafrost, geotechnical, and geohazard data.
 - Develops tools (e.g., data sharing agreements, GNWT contracting requirements) that assist in capturing all relevant data.
 - Develops and supports territorial, national, and international partnerships to improve permafrost and geotechnical data and information sharing standards.
 - Collaborates with other data managers on digital field data acquisition, management, and archiving strategies.
 - Promotes the utility and value of databases to government, industry, regulatory boards, and academic partners.
 - Collaborates with the Canadian Standards Association to revise and develop permafrost-related standards.
- 5. Publishes scientific reports and data in an appropriate and timely manner.**
- Publishes the results of original scientific work as lead author or co-author through the NTGS publication process and in peer-reviewed scientific journals.
 - Independently identifies and solves problems pertaining to scientific research, data management, fieldwork logistics, project financing, and working with other research teams.
 - Develops figures, maps, web pages, books, digital atlases, and other materials to meet project goals and deadlines.
 - Contributes as a scientific reviewer to the NTGS publication process and peer-reviewed scientific journals.
 - Responds to client requests for assistance in accessing and interpreting permafrost and environmental geoscience data.



- Assembles and presents research results at the Yellowknife Geoscience Forum and other professional scientific meetings and industry conferences.
- Organizes and conducts project workshops, technical sessions, and training exercises as required.
- Maintains regular contact with colleagues and clients to ensure constant critical feedback of work underway and a high technical quality of completed work.
- Maintains communications with others that help to identify new research and funding opportunities.
- Prepares non-technical promotional and educational materials about the databases, their derived products, and other information on permafrost and geotechnical conditions in northern Canada.
- Conducts or contributes to community information sessions and outreach activities.

WORKING CONDITIONS

Physical Demands

The incumbent works in a normal office environment but conducts up to 3 weeks of winter fieldwork and 3-4 weeks of summer fieldwork. During the summer field season, the incumbent will be hiking over rough terrain with a backpack and collected samples (up to 50 pounds) for 8 hours per day, up to 3 weeks per year; will be travelling in small aircraft and helicopters for up to 4 hours per day, up to 3 weeks per year; will be travelling in small water craft for up to 1 hour per day, up to 3 weeks per year. In the winter field season, work involves travelling by snowmobile, work at extreme cold temperatures, operation of 2-person drills and working alongside industrial diamond/sonic geotechnical drills for up to 8 hours per day, up to 3 weeks per year.

Environmental Conditions

While in the field, the incumbent can be exposed to: rapidly changing weather and to conditions such as cold (hypothermia), intense sun (burn), wind, rain; helicopters, airplanes, ATVs, road vehicles (physical injury, hearing loss, gas/fumes); insects and insect bites; dangerous, unforeseen, uncontrolled field situations such as vehicular accidents, attack by wild animals, falls and other accidents while on traverse (broken bones, cuts, etc.).

Sensory Demands

While in the field, the incumbent is subject to impacts associated with long hours of fieldwork (e.g., fatigue).

Mental Demands

While in the field, the incumbent is subject to substantial disruption of family life due to fieldwork in distant locations. The incumbent is also responsible for the continuous



management of scientific and logistical activities and safe work practices while in the field, including the prediction and mitigation of potentially hazardous situations and managing personality conflicts amongst field staff.

The incumbent is also required to present research or work plans to scientific peers, collaborators, community groups, etc.; attend research meetings in southern Canada 2 to 4 times per year and give presentations at international conferences.

KNOWLEDGE, SKILLS AND ABILITIES

- Knowledge of scientific principles and techniques pertaining to permafrost and geotechnical research and monitoring, and/or engineering, including field-based data acquisition, management, and analysis.
- Knowledge of the drivers that influence permafrost conditions, especially those related to surficial geology and geomorphic processes in northern Canada.
- Knowledge of the linkages between: (i) permafrost and geotechnical information, and; (ii) data compilation and data usage for assessing terrain conditions or in engineering design.
- Knowledge of the common methods used in geohazard prediction, assessment, and mitigation.
- Knowledge of the methods, techniques, and practices of digital information management, including manipulation, interpretation, digitization, retrieval, and storage of data.
- Knowledge of data management principles and appropriate data structures for permafrost and geotechnical information.
- Knowledge of government strategic priorities and the role of permafrost and geotechnical data in contributing to infrastructure planning, design, and maintenance.
- Knowledge of the roles and environmental geoscience needs of other government departments, agencies, and industry.
- Knowledge of the legal and ethical obligations of the geoscience or geotechnical engineering profession.
- Knowledge of databases and basic computer coding to upload, search, evaluate, manipulate, and analyze datasets.
- Project management, organizational, and logistical skills to effectively manage and participate in independent and collaborative research projects.
- Data management skills to organize, archive, and manage large volumes of permafrost and geotechnical information.
- Analytical skills to describe and synthesize permafrost data and to model data using statistical or numerical methods.
- Skills in scientific report writing, critical peer review, and editing of scientific reports and interpretations.
- Supervisory skills to oversee contractors, other staff, and field assistants.



- Field skills that are grounded in best practices in safety management and permafrost and environmental geoscience research and monitoring.
- Presentation skills that result in effective communication with scientific and engineering peers and laypersons.
- Ability to work effectively, both independently and in collaboration with other professionals.
- Ability to conceptualize, design, and implement a permafrost and geotechnical database.
- Ability to complete projects on time and within budget, often in conjunction with the performance of other duties.
- Ability to produce scientific reports of high technical quality suitable for publishing in external journals or through the NTGS.
- Ability to efficiently use computer hardware and software for data collection, data management, synthesis and modeling, and presentations (e.g. MS Office; ArcGIS; specialized graphic design, statistics, and modelling software; database software).
- Ability to use programs that require some degree of computer coding.
- Ability to clearly and effectively communicate scientific information in visual, oral, and written formats and at an appropriate level.
- Ability to commit to actively upholding and consistently practicing personal diversity, inclusion and cultural awareness, as well as safety and sensitivity approaches in the workplace.

Typically, the above qualifications would be attained by:

A minimum of a Master of Science (M.Sc.) degree in Geology, Geography, or related field, or an M.Sc. in Engineering with a specialization in geotechnical or geological sub-disciplines, with expertise in permafrost environments and at least two years of work experience in industry, academia, or a government agency in a related capacity.

Assets include:

- A demonstrated track record of data management experience and peer-reviewed scientific publication.
- Eligibility for registration in Northwest Territories and Nunavut Association of Professional Engineers and Geoscientists (NAPEG).

Equivalent combinations of education and experience will be considered.

ADDITIONAL REQUIREMENTS

Position Security (check one)

- No criminal records check required
- Position of Trust – criminal records check required
- Highly sensitive position – requires verification of identity and a criminal records check



French language (check one if applicable)

- French required (must identify required level below)

Level required for this Designated Position is:

ORAL EXPRESSION AND COMPREHENSION

Basic (B) Intermediate (I) Advanced (A)

READING COMPREHENSION:

Basic (B) Intermediate (I) Advanced (A)

WRITING SKILLS:

Basic (B) Intermediate (I) Advanced (A)

- French preferred

Indigenous language: Select language

- Required
 Preferred