

# Mines Branch Review 2018



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# Mines Branch Review 2018

Mineral Resources Review 2018 is the result of the exemplary partnership between the provincial chapter of the Canadian Institute of Mining, Metallurgy and Petroleum and our team at the Mine's Branch of Natural Resources. Together we are committed to sustaining and growing the Newfoundland and Labrador exploration and mining sector.

Among the exciting news in 2018 we note that Vale has commenced the construction of the underground mine at Voisey's Bay, the Iron Ore Company of Canada is now producing at the Moss Pit (Wabush 3 Project), named in honour of Dr A.E. Moss, a mining pioneer who played a major role during the initial exploration at Carol Lake and Tata Steel Minerals Canada has received approvals to develop the Howse property in Labrador and is in the final stages of their wet processing plant construction.

Anaconda Mining continues to mine the Stog'er Tight deposit as it advances permitting for development of its Argyle project. Rambler Metals and Mining continues the planning of its tailings impoundment area expansion to provide tailings storage for Phase II of the Ming Mine incorporating the Lower Footwall Zone into its mine plan while increasing production to 1250 tonnes per day. The latest numbers from Natural Resources Canada on exploration and deposit appraisal investments in Newfoundland and Labrador show that \$41.5 million was spent in 2017 and \$48.3 million is expected to be spent in 2018 representing a significant improvement from the 13-year low of \$25.4 million spent in 2016.

We continue to collaborate with federal, provincial and territorial partners to develop a new national Mineral and Metals Plan "to solidify Canada's position as a global mining leader". At home, we have commenced the development of a Mineral Strategy for Newfoundland and Labrador, in partnership with Mining NL, to consistently be a top tier competitive jurisdiction for safe, environmentally responsible exploration and mining growth.

The Government of Newfoundland and Labrador signed a cooperation agreement with the Government of Quebec in April 2018. By working together, we can further map the geology in the Labrador Trough, in both Newfoundland and Labrador and Quebec while ensuring sufficient infrastructure capacity to ship products and support growth.

The Geological Survey had an active field program this year with 12 field projects (five in Labrador, and seven on the Island). These projects included:

- Bedrock mapping of the Andre Lake map sheet in the northern part of the Labrador Trough,
- Mineral deposit study of the Montgomery Lake Cu-Au prospect in the Labrador Trough,
- Regional Quaternary studies, bedrock mapping and mineral deposits studies in the Hopedale block area, as part of a Geo-mapping for Energy and Minerals (GEM) 2 program,
- Surficial geological mapping on the Great Northern Peninsula,
- Mineral deposits research focusing on volcanogenic massive sulphide (VMS) mineralisation in the Buchans – Roberts Arm Belt,
- Mineral deposits study of precious metals in central Newfoundland,
- Surficial mapping and till geochemistry in central Newfoundland,
- Fluorite mineralisation in the St. Lawrence area, and fluorite potential in central Newfoundland,
- Bedrock mapping on the Bonavista Peninsula,
- Monitoring of coastal areas vulnerable to erosion

Partnerships with the Geological Survey of Canada also continued to strengthen our geoscience knowledge in the province. As well, efforts are being made to place available additional data on the Geoscience Atlas.

It's been a busy year for the Mineral Development Division. Dam repairs are ongoing at the former Minworth tailings facility and at the Consolidated



Rambler west dam. **Mining Act** regulatory work has been brisk with submissions being reviewed for Rambler Metals' Phase II and tailings management area expansion, IOC's Magy pit, the new Ace Gypsum Mine and routine amendments and mill licence applications that came in during the past year, while also having representation on four Environmental Assessment committees for mine related projects.

The Mineral Lands Division is undertaking a thorough review of program processes with the goal to provide more modernized and efficient services. A process to replace the existing Mineral Rights Administration (MIRIAD) system is underway with a plan to implement a new system in 2019. The number of exploration approvals has surpassed 300 this year, consistent with the last few years. The exploration approval application process has been modified to reduce water use licencing requirements and to provide more clarity for prospecting activities. Mineral exploration site inspections continued across the province and included visits to several sites in Labrador with officials of the Nunatsiavut Government. After limited activity in the core storage facilities in 2017 as a result of pending structural inspections

of the core racks, activities increased to normal levels in 2018 with a steady flow of industry, government, and academic personnel. A new process standard was developed for quarry permit applications reducing permit processing time by two-thirds. Extending from this, a review of the quarry legislation has also begun which will include a comprehensive consultation process into 2019. Similar to the planned replacement of MIRIAD, an update to the Quarry Management System (QMS) will be proposed for consideration in 2019.

I wish to extend my appreciation to all who have contributed to the success of this critical industry in 2018 and to those who have contributed to the success of this important conference.



Perry Canning  
ADM Mines Branch



# GEOLOGICAL SURVEY

The Geological Survey operates within the Intergovernmental Geoscience Accord, a pan-Canadian framework for cooperation and collaboration among the federal, provincial and territorial geological surveys. Cooperation and collaboration minimize overlap and duplication, enhance synergies among jurisdictions to resolve regional geoscience problems, and facilitate optimal utilisation of resources.

Three goals of the Departmental Strategic Plan are to enhance the knowledge-base of geoscience data, to identify opportunities for resource development, and to improve the promotion of these opportunities. The 2018-19 programs of the Geological Survey of Newfoundland and Labrador (GSNL) directly address these goals mainly through its field programs, publications, retention of qualified staff, and successful advancement of these activities. Budget 2018 provided GSNL \$4.6 million.

Almost \$500,000 was allocated to field activities this year. In Labrador, there were five field projects. Bedrock mapping of the Andre Lake map area and a short field visit to the Montgomery Lake Cu-Au prospect were a continuation of a multidisciplinary approach to enhancing our understanding of the bedrock geology and mineral potential of the northern part of the Labrador Trough. Three projects undertook bedrock mapping, regional Quaternary studies, and mineral deposits studies in the Hopedale block area, as part of a Geo-mapping for Energy and Minerals (GEM) 2 program managed at Natural Resources Canada.

On the Island, seven field projects were conducted. One (1) was a new project: 1) Surficial geological mapping on the Great Northern Peninsula; The remaining 6 are continuations of projects initiated in previous years. These are: 2) Mineral deposits research focusing on volcanogenic massive sulphide (VMS) mineralization in the Buchans–Roberts Arm Belt; 3) Mineral deposits study of precious metals in central Newfoundland deposits; 4) Surficial mapping and till geochemistry in central Newfoundland; 5) Fluorite mineralization in the St. Lawrence area, and fluorite potential in

central Newfoundland; 6) Bedrock mapping on the Bonavista Peninsula; and 7) Monitoring of coastal areas vulnerable to erosion.

Office-based research studies comprised data and map compilation for inclusion in the Geoscience Online database, including bedrock, surficial, mineral occurrence and geophysical data; data interpretation for bedrock mapping in the Bay d'Espoir area; bedrock mapping of the Archean Ashuanipi Complex in western Labrador; compilation of research on iron ore in western Labrador a detailed summary of the geology of parts of northern Labrador; bedrock geology mapping of the Mesoproterozoic Seal Lake Group in Labrador; a regional synthesis of the bedrock geology of the Forteau and Hawke Bay formations (Labrador Group) in western Newfoundland; detailed systematic description of Cambrian trilobite fossils within the Forteau and Hawke Bay formations (Labrador Group); examination of the geological burial and exhumation history of the continental margin of this province, in collaboration with the Geological Survey of Denmark and Greenland; till geochemistry of parts of the central volcanic belt of Newfoundland; reprocessing of (private sector) geophysical data; synthesis of geochemical data from Labrador and adjacent parts of Québec; and processing of data from UAV (drone) surveys as part of the Coastal Monitoring program. Laboratory geochemical analyses of lake-sediment and water, till and rock samples collected in 2017 continued using the Geological Survey's ICP-ES and ICP-MS analytical equipment. In addition, updates to the Mineral Occurrence Data System were ongoing, and processing of the Geological Survey's paleontology collection at The Rooms, Newfoundland Museum, continued.

The Geological Survey's geoscience program employed 13 summer field- and office-support students, all of whom are enrolled in Earth Science or Geography programs at Memorial University. As well as assisting the GSNL, this employment with the Survey provides future geoscientists with valuable opportunities to train with our experienced field and office staff.

The GSNL leads the minerals advancement efforts of the Mines Branch. The branch has always had a strong presence at the traditional conference venues (Mineral Resources Review in St. John's, Baie Verte Mining, Exploration Roundup in Vancouver, Xplor in Montreal, and the PDAC in Toronto), and again was part of the Canadian delegation at the China Mining Meeting in Beijing and associated meetings in other Chinese cities.

### Staff Changes

There have been several staff changes in the Survey this year. **Ian Knight** (Regional Geology) retired following a remarkable 44-year career with the Survey, primarily focused on mapping the Carbonate terrane of western Newfoundland. **Robyn Constantine** (Terrain Sciences and Geoscience Data Management) has moved to Mineral Development Division. **Crispin Pike** has replaced **Carolina Valverde-Cardenas**, who is on a one year leave-of-absence, as our Promotions Geologist.

Joining the Geological Survey is **Arlene Ashford** as Administrative Assistant, Director's Office.

In an attempt to maintain the corporate knowledge and scientific expertise of our retiring geoscientists the Geological Survey had earlier implemented an Emeritus Program. This program is open to all retired geoscientists, and I am pleased to note that in addition to **Andy Kerr** (Mineral Deposits), **Charlie Gower** (Regional Geology) and **David Liverman** (Terrain Sciences), **Ian Knight** (Regional Geology) has joined the Emeritus Geoscientist ranks.

### Linkages and Partnerships

The GSNL benefits through linkages and partnerships with other branches of government (provincial, national and international), with academic institutions and non-governmental organizations, and with national and international geoscience organizations.

- The partnership between the Canadian Institute of Mining, Metallurgy and Petroleum (Newfoundland Branch) and the Mines Branch of the Department of Natural Resources

results in the annual Mineral Resources Review conference.

- The Mines Branch is in partnership with the CIM Newfoundland Branch, Mining Industry NL, and PEGNL for the promotion of Mining Week.
- GSNL partners with the Geological Association of Canada (Newfoundland Branch) in actively supporting the annual student two-day conference in the spring, and field trip in the fall.
- GSNL is engaged with the National Geological Survey's Committee and the Committee of Provincial and Territorial Geologists to forward public geoscience.

The GSNL works closely with:

- The Department of Tourism, Culture, Industry and Innovation helping to develop the province's geotourism potential, including the Aspiring Geopark proposal on the Bonavista Peninsula, and the Aspiring Cabox Geopark in the Bay of Islands region, as well as continuing work on the province's paleontological and other initiatives such as the successful UNESCO World Heritage Status bid for Mistaken Point.
- The Department of Municipal Affairs and Environment on groundwater issues, partnering with them on a pilot program to analyze the chemistry of groundwater-sourced drinking water in private residences across the province.
- The Office of Climate Change on geoscience issues related to climate change, particularly coastal erosion.
- Fire and Emergency Services - NL and also to the departments of Transportation and Works, and Municipal Affairs and Environment, and municipal councils on potential geological hazards.
- The Department of Transportation and Works to provide guidance in the assessment of aggregate samples used in road construction and asphalt paving.
- The Geological Survey of Canada on multidisciplinary projects as part of the GEM2 and TGI5 initiatives.



- The Geological Survey of Denmark and Greenland on a project focusing on the geological burial and exhumation history of the continental margin of this province.
- The Ulster University, the Marine Institute of Ireland and Memorial University to examine submarine morainal systems at fjord mouths on the province's south coast.

As well as servicing the exploration and prospecting community, mainly through the Geoscience Publications and Information unit, GSNL partners with Mining Industry NL and the Earth Sciences Department at Memorial University on the Matty Mitchell Prospectors Resource Room. Staff also instruct at prospecting courses organized by the Mineral Development Division, Mines Branch. Several geologists have adjunct appointments in the Earth Sciences and Geography departments at Memorial University, and serve on supervisory committees for graduate students. We also provide direct and indirect support for research projects at Memorial University, and other academic institutions. The GSNL is a strong supporter of the geoscience community in the province, with several staff members holding significant positions in the national and local branches of the Geological Association of Canada, the Canadian Institute of Mining, Metallurgy and Petroleum, and the Atlantic Geoscience Society.

### Organizational Structure

The GSNL is organized into three sections under the direction of **Martin Batterson**. The sections are Mineral Deposits (Senior Geologist, **John Hinchey**), Regional Geology (Senior Geologist, **Alana Hinchey**), Terrain Sciences and Geoscience Data Management (Senior Geologist, **Stephen Amor**); the Geochemistry Laboratory, part of the Terrain Sciences and Geoscience Data Management Section, is under the direction of **Chris Finch**. In addition, the Geoscience Publications and Information unit of the Department of Natural Resources reports to the Director.

### Director's Office

The Director's office is responsible for the administration of the GSNL, logistical support of office- and field-based programs, and liaison with other divisions in the Mines Branch. The Director represents the GSNL on the Committee of Provincial and Territorial Geologists and the National Geological Surveys Committee.

The Director's office is responsible for the financial operations of the GSNL. **Arlene Ashford** (Administrative Assistant) is responsible for all requisitions, purchasing and payments, and assists the Director in budget monitoring. Logistical and communications support of field crews are handled by **Gerry Hickey** (Newfoundland) and **Wayne Tuttle** (Labrador). They are also responsible for maintaining all the GSNL field equipment. Field-safety training courses, including first aid, ATV, boat and helicopter safety, driver education, and chainsaw training (if required) are coordinated in-house. **Gerry Hickey** is our certified ATV safety instructor. **Wayne Tuttle** also carries out quarry inspections for central Labrador.

Safety in the field is a prime concern of the Geological Survey, and every effort is made to eliminate accidents through training and awareness initiatives. The Geological Survey was once again recognized for its safety record by the AMEBC – PDAC "Safe Day Everyday" Award in 2017.



Core sample containing base-metal mineralization obtained from the Handcamp prospect.

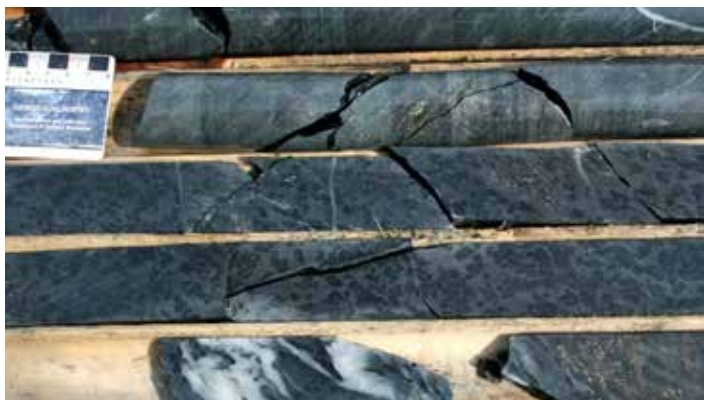


## Mineral Deposits Section

The Mineral Deposits Section (**John Hinchey**, Senior Geologist) is responsible for the documentation of metallic and non-metallic mineralization, conducting related research, and developing assessments of regional mineral potential. The section also has input in resource issues related to indigenous land claims, protected areas/land-use discussions, and in the promotion of the provinces' resources.

### Mineral Occurrence Data System (MODS)

The MODS is a detailed database containing geological and mineral resource information on the province's mineral occurrences. It incorporates public-domain information gathered from mineral exploration and Geological Survey reports and is managed by **Greg Stapleton**, with assistance from **Jan Smith**. During 2018, updating was undertaken on a province-wide basis, but focus was placed on volcanogenic massive sulphide (VMS) mineralization hosted by the volcanic terranes of central Newfoundland, and mineralized gabbros and sulphide-rich shales of the eastern Labrador Trough. The MODS is accessible from both the Geoscience Atlas and the MODS query form on the GSNL website. It is a real-time database, with new and updated information becoming available online within 24 hours after input.



Cordierite alteration developed within the main mineralized zone, Gullbridge deposit.

### Base-metal Mineralization

**James Conliffe** continued his research on the base-metal metallogeny of the Labrador Trough, western Labrador. In 2018, field-work was limited



Field work – Montgomery Lake Cu-Au prospect, Labrador Trough.

to a short field visit to the Montgomery Lake Cu-Au prospect, where samples of mineralized and altered rocks were collected for geochemical and spectral analyses to better characterize the alteration styles, and classify the mineral deposit type. Research on the genesis of magmatic sulphide occurrences in western Labrador continued, and a **Current Research** article on the Ni-Cu-PGE potential of Montagnais gabbro sills in western Labrador will be published in 2019; the **CR** article summarizes the results of a recently completed B.Sc. (Hons.) project by Andrew Smith at Memorial University.

**John Hinchey** continued his research examining volcanogenic massive sulphide (VMS) occurrences in central Newfoundland. Ongoing office-based work includes petrographic, lithogeochemical, and geochronological studies on samples from the North Steady Pond Formation of the Baie d'Espoir Group, host to the Katie VMS occurrence. The goal is to document the style of VMS mineralization, to characterize the host rocks, and to gain a better understanding of the

tectonostratigraphic architecture of the area. John is also involved with the Mines Branch Promotional Team and attends conferences (Mineral Exploration Roundup and PDAC) to assist in promotion of the provinces' mineral potential.

**Greg Sparkes** continued his research examining the volcanogenic massive sulphide (VMS) mineralization developed within the central Buchans–Roberts Arm Volcanic Belt. Ongoing deposit-level studies focused on characterizing the styles of alteration and related mineralization developed within select areas of the region. Field work conducted in 2018 included the collection of visible/infrared reflectance spectroscopy data, together with detailed geochemical sampling of representative drillholes targeting select VMS-related occurrences. These data will be utilized to aid the characterization and regional correlation of the various base-metal prospects, and enable their comparison with other VMS-related mineralizing environments, developed elsewhere within the Buchans–Roberts Arm Volcanic Belt (e.g., Buchans and Pilley's Island deposits). Results from this work will form the basis of a 2019 **Current Research** article.

### Precious-metal Mineralization

**Hamish Sandeman** continued field work in central Newfoundland investigating the setting of precious-metal mineralization in the Glenwood area and along the Dog Bay Fault, north-northeastwards to the Gander Bay coast. This work incorporated further examination of regional bedrock outcrops and historical exploration trenches at known sites of mineralization, such as the Clydesdale, T-Rex, Blue Peter, Lachlan, Logan, Bullet and Lucky Moose showings.

In the first half of July, Hamish, along with colleague, **Heather Campbell**, and field assistants **Chris Power** and **Alex Bugden**, collaborated with a Geological Survey of Canada field party, on the multidisciplinary Geo-mapping for Energy and Minerals (GEM) 2 project, focused on the Hopedale map area (NTS 13N) of Labrador. He spent 12 days undertaking geological mapping and sample collection while ground-truthing the aeromagnetic map of the 1:250 000 map area, soon to be



Student assistant Alex Bugden collecting a sample.

released. This work occurred in conjunction with regional till and heavy-mineral-indicator sampling as well as surficial material mapping. The Hopedale study also undertook follow-up examination of bedrock exposures that are proximal to historical, gold-in-lake sediment and till anomalies.

In late August, he teamed up with Dr. Ian Honsberger of the Geological Survey of Canada and spent a week undertaking detailed structural mapping and lithogeochemical sample collection on Antler Gold's Wilding Lake property in central Newfoundland. This study, on the structural evolution of the quartz vein systems, will form the body of the postdoctoral fellowship of Dr. Honsberger. Interpretation of the lithogeochemical results and follow-up microscopy will help provide insight into the origin and tectonic setting of this significant auriferous mineralization.

### Iron-ore Deposits

Research related to iron-ore deposits in western Labrador continued under the direction of **James Conliffe**. He is currently compiling a major report on the iron-ore deposits in the Labrador City and Wabush area of southwestern Labrador. This report will summarize the regional geology and the results of exploration for new deposits undertaken over the past 20 years. It is anticipated that this report will be published in early 2019, and will provide a guide for future exploration in this world-class mining district.

In addition, he is continuing his research into the stratigraphy and geochemistry of taconite deposits in the Labrador Trough. This project is in collaboration with Prof. Michael Babechuk of Memorial University; Gabriel Sindol, a M.Sc.



student at Memorial University will research the genesis of these taconite deposits by applying a novel combination of mineralogical and ultra-trace element and isotopic geochemical analyses.

### Industrial Minerals

**Zsuzsanna Magyarosi** continued her work on the fluorite mineralization in the St. Lawrence area. The focus of the fieldwork this summer was the recently discovered AGS deposit, operated by Canada Fluorspar Inc. (CFI). The AGS deposit is a structurally controlled vein system consisting of several veins along its strike. She and her field assistant, **Alex Bugden**, completed detailed mapping and sampling of some of the veins that have been exposed by CFI. A number of days were also spent sampling the St. Lawrence granite that is spatially and genetically associated with the fluorite mineralization in the St. Lawrence area. Samples were collected for geochemical analysis, petrography, fluid inclusion studies and LA-ICP-MS (Laser Ablation

Inductively Coupled Plasma Mass Spectrometry). A **Current Research** article will be published in 2019 on the findings of this study. Fieldwork was supported by the staff at CFI including Barry Sparkes (Senior geologist), Melissa Lambert (Project geologist), Greg Pittman (Geologist) and Daron Slaney (Geological technician).

She also conducted fieldwork in the Snowshoe Pond area to determine the source of high fluorine anomalies in till samples recently collected by **Jennifer Organ** and **Heather Campbell** (GSNL). Pegmatite dykes were located at some of the sites. Pegmatites are a very likely source of the anomalies because they are commonly very high in F. They may also carry economically significant amounts of rare earth elements (REE). Samples of pegmatites and surrounding granitic rocks were collected for geochemistry and petrographic analysis. Findings of this study will be published as they become available.



Sample from the AGS deposit showing several phases of fluorite mineralization.

## Regional Geology Section

The Regional Geology Section (**Alana Hinchey**, Senior Geologist) is responsible for bedrock mapping in the province. There was one active field program for 2018. **Jared Butler** continues a multi-year mapping project in the eastern Churchill Province of western Labrador. **Anne Westhues**, **Andrea Mills**, **Bruce Ryan**, **Tim Van Nostrand**, **Ian Knight** and **Doug Boyce** focused on data compilation, report writing, and office-based studies, and limited fieldwork to investigate specific geological relationships in their map areas. **Monica Squires** provides assistance to the project geologists.

**Jared Butler** completed the second part of a multi-year 1:50 000-scale bedrock mapping project in western Labrador (Andre Lake, NTS 231/12). The map area sits in the hinterland of the New Québec Orogen, where Paleoproterozoic supracrustal rocks of the Kaniapiskau Supergroup (KS) were tectonically juxtaposed with mostly Archean rocks of the McKenzie River domain (Core Zone) during ca. 1.8 Ga continent–continent collision. The western part is underlain by north–south striking rocks of the KS, mainly metasandstones and phyllites, metamorphosed at (sub-)greenschist facies. In the centre of this supracrustal belt, sits a vast expanse of poorly exposed basement rocks, including Archean orthogneisses, late granitoids, and garnet amphibolites. Contacts between the KS and this apparently north-plunging basement dome are tectonic, and have steep ductile lineations, but

of uncertain kinematics. To the east of the KS lies the McKenzie River domain, an assemblage of Archean orthogneisses, amphibolite pods, and late granitoids ranging from pre- to post-collisional. The KS and McKenzie River domain are separated by the north–south trending Ashuanipi River shear zone, which shows evidence of both west-directed thrusting and dextral shearing related to plate-scale transpression between the Superior margin, represented by the KS and its basement, and the Core Zone during Hudsonian collision. Future analytical work will further constrain the provenance and the pre- to syn-collisional tectonic histories of these domains. Notable mineralization in the area is limited to the KS, and includes iron formation (Sokoman Formation), and copper mineralization developed within the shales and sandstones of the Menihek Formation.

**Anne Westhues** continued the data interpretation for the 1:50 000-scale bedrock mapping project in the Bay d’Espoir area of the St. Alban’s map area (NTS 01M/13), following a detailed airborne geophysical survey of the area. This region on the south coast of Newfoundland includes the boundary between two of Newfoundland’s major tectonostratigraphic zones, the Dunnage and the Gander zones. Dominant rocks of the Dunnage Zone are variably deformed Ordovician clastic sediments and interbedded volcanic rocks of the Baie d’Espoir Group. The Gander Zone consists of the Little Passage paragneiss, intruded by the Silurian megacrystic Gaultois granite to diorite, and by biotite–muscovite granite of the Late Silurian to Devonian Northwest Brook Complex. Several mineralized quartz veins within the Baie d’Espoir Group contain visible arsenopyrite, stibnite, galena and/or chalcopyrite. Assays from the previous field season show that the area has potential for Au mineralization, and continues to be a focus of prospecting and exploration.

**Tim van Nostrand** is continuing compilation of 1:50 000-scale bedrock mapping of the northern Archean Ashuanipi Complex in western Labrador, including all or parts of NTS map areas 23J/02, 03, 04, 05, 06, 07, 10, 11, 14 and 23O/03.



Student assistant Benjamin MacDougall collecting a sample in western Labrador.





Participants of the GAC NL Fall Field Trip to Bonavista in September of 2017.

The rocks consist of older, granulite-facies metasedimentary and tonalitic gneisses and subordinate gabbro to pyroxenite cumulate sills and oxide facies iron formation lenses. These units predate extensive migmatitic diatexite, variably deformed granite, syenite and tonalite plutons and granite pegmatite. The region has the potential for hosting gold, base metal, platinum group elements and radioactive mineralization in several different rock types. Numerous gossan zones containing bornite  $\pm$  pyrrhotite  $\pm$  arsenopyrite  $\pm$  chalcopyrite mineralization, some with elevated Au, Ag, Cu, Pb, Ni and Cr occur within migmatitic gneiss, foliated granitoid rocks, diatexite, mafic to ultramafic intrusions and iron formation. Current exploration efforts by Labrador Gold Corporation have outlined two district-scale gold anomalies associated with magnetic highs in the region. In addition to gold and base-metal potential in these rocks, late-stage pegmatite intrusions and granite plutons have local anomalous Th, U, REE, Mo and W contents. Limited exploratory work has been conducted in the Ashuanipi Complex of Labrador

and the overall economic potential for the region remains largely untested.

**Andrea Mills** continues to compile 1:50 000-scale bedrock maps covering the Bonavista Peninsula (NTS map areas 2C/05, 06 and 11). This bedrock mapping project, now nearing completion, compiles



Undergraduate geology students from Cambridge University conducted field mapping in the Trinity, Port Rexton and New Bonaventure areas in 2018.



all previous work, as well as new structural, geochemical and geochronological studies to gain a better understanding of the geology of the peninsula. Field-based studies extended to the northwest in 2017, whereas work focused on data and map compilation in 2018. Coordination with six undergraduate students from Cambridge University was undertaken in 2018 to conduct detailed bedrock mapping in three areas of the Trinity map area (2C/6). Rocks of particular interest on the Bonavista Peninsula include ash-covered marine turbidites hosting Ediacaran biota, ancient glacial deposits, diverse volcanic assemblages and cupriferous rocks having potential economic significance. Economically significant rocks include the Blue Point, Copper Gulch and Tickle Cove in the Keels-Tickle Cove areas. These showings are hosted by reduced horizons within the terrestrial redbeds of the Crown Hill Formation and were discovered in the early 2000s. Further copper occurrences have been discovered in the Trinity-Port Rexton areas, including the Trinity Pond and Fifields Pit occurrences. These are hosted within primarily siltstone and fine-grained sandstone of the Rocky Harbour Formation and have yielded up to 1.06% copper. Mineralization associated with these marine siliciclastic rocks is reportedly “fracture-controlled”, and sets of N-, NW- and NE-trending regional faults provide possible conduits to focus mineralizing fluids. Recent work in the Sweet Bay area has yielded up to 1% copper in mafic volcanic rocks, and may also be linked to regional faulting in the area.

**Doug Boyce** has completed the detailed systematic description of Middle Cambrian (Delamarian) *Glossopleura* Zone trilobites from



Discovery cranium of *Glossopleura* from the Hawke Bay Formation, south coast of Port au Port Peninsula (~ 2 cm wide, collected by Dr. I. Knight, 1998).

the Hawke Bay Formation (Labrador Group) of the southern Port au Port Peninsula. The ongoing collaboration with Drs. **Ian Knight**, Christian B. Skovsted and Uwe Bathasar saw two Forteau-related publications released in late 2017. In a week-long, June 2018 reassessment of late Early Cambrian (Dyeran) trilobite taxa with Dr. Mark Webster (University of Chicago), it was concluded that many of the olenellids need further revision; this joint work has commenced.

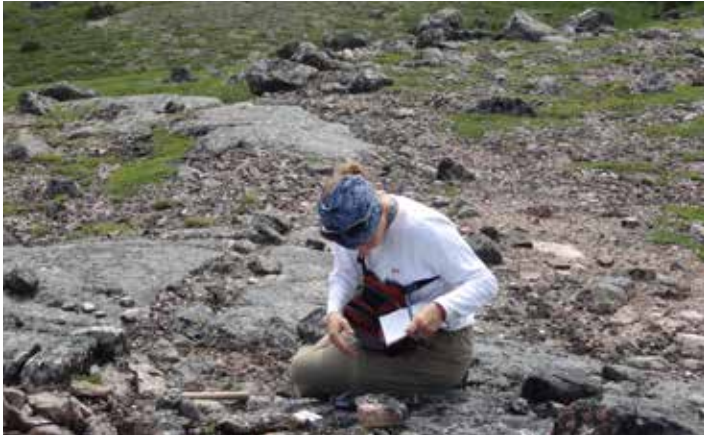
**Alana Hinchey** continued a collaborative targeted research project as part of the joint GSC-GSNL-Nunatsiavut effort in upgrading geoscientific knowledge and stimulating mineral exploration in Labrador. This project is supported by the Geomapping for Energy and Minerals (GEM-II) program at Natural Resources Canada. The project targets specific areas of the Nain Province to improve knowledge of the Saglek and Hopedale crustal blocks, their mutual boundary, and



Deanne VanRoyan collecting data in the Hopedale area.

potential correlations with southwest Greenland; field work occurred during the summer of 2018. With **Gillian Roberts**, she is also participating in a pilot project to migrate the Geoscience Atlas to a more user friendly platform. Other collaborative projects include working with the Department of Tourism, Culture, Industry and Innovation, and local partners on a variety of geotourism projects,





Collecting geochronology samples in the Hopedale area.

including the Aspiring Discovery Geopark on the Bonavista Peninsula and the Aspiring Cabox Geopark in the Bay of Islands region. She is also involved with several geoheritage projects in collaboration with **Gillian Roberts**.

**Bruce Ryan** has recently completed compilation of two 1:50 000 scale geological maps covering his and Don James' (Nova Scotia Geological Survey) regional survey work in the Nain area. The maps were released in Open File format in May, and a complementary report is in progress. He attends to periodic inquiries from prospectors and others having interest in mineralization in Labrador and on the island of Newfoundland, as well as fielding questions from local and international persons having a general curiosity about Labrador geology and geography.

**Monica Squires** provides vital support to the Regional Geology Section, including integration of digital data for project geologists and preparation of display and print materials for Mineral Resources Review. She is also responsible for the management and maintenance of collections at the Geological Survey's permanent rock-storage facility.

### Retirement

2018 saw the retirement of project geologist **Ian Knight** following over 40 years with the Geological Survey. Ian contributed greatly to our knowledge of the stratigraphy of western Newfoundland. His most recent work was on the stratigraphic and regional variations of Early

to Middle Cambrian Forteau and Hawke Bay formations, Labrador Group, as well as research on the Tournaisian terrestrial sedimentary rocks of the Fisher Hills succession of the Carboniferous Deer Lake Basin.

## Terrain Sciences and Geoscience Data Management Section

Geoscience data management, geochemistry, geophysics, Quaternary geoscience and climate-change geoscience all make up the diverse responsibilities of this section (**Steve Amor**, Senior Geologist).

### Geoscience Data

**Pauline Honarvar** is responsible for the online delivery of geoscience information through the web-based Geoscience Atlas ([gis.geosurv.gov.nl.ca](http://gis.geosurv.gov.nl.ca)), online data standards and integration of information. Pauline updated the Geoscience Atlas Index of Geochemical Surveys with an additional 12 surveys that link to recent open-file reports. In the fall of 2018, Pauline and **Gillian Roberts** will update ten layers in the Geoscience Atlas and add five new layers. She also reviewed 29 geochemistry datasets for four open-file geology reports. Also work continues preparing Dr. Charles Gower's memoir for publication; it has 35 datasets, of which 19 are GIS-based.

**Loretta Crisby** continues working on the development of a new framework for the bedrock geology database for the province. The database incorporates digital vector files with the legend attribute tables. Map preparation support is provided to Geological Survey field projects, industry and academia. The results of bedrock-mapping projects are incorporated into the bedrock-geology database. A GIS layer of geochronological results has been added to the web-based Geoscience Atlas ([gis.geosurv.gov.nl.ca](http://gis.geosurv.gov.nl.ca)). This layer provides sample location, description, age-dating methodology and interpretative information for all geological rock units in the province whose ages have been determined. **Gillian Roberts** is investigating new ways of visualizing and presenting geospatial datasets; creating orthophotos and highly accurate

digital elevation models from UAV surveys, and experimenting with different programs to present data-in-motion and 3-D, while providing GIS support for various projects in the survey. She provides project geologists with the data required for their field work, along with ensuring all equipment is tested and field ready. She has extended her expertise in UAV surveying and post-processing to the Royal Newfoundland Constabulary through knowledge transfer. She also continues her successful collaborations with **Alana Hinchey** (Geotourism) and **Melanie Irvine** (Coastal Hazards), post-processing the datasets and integrating them seamlessly into digital products. Along with **Melanie Irvine** and **Heather Campbell**, Gillian presented a paper on, “Applications of 3D imagery acquired by UAVs” at a 3D Data Workshop in Lawrencetown, NS, January, 2018. Archival material from retired geologists continues to be compiled, including field notebooks, thin sections, and field traverse maps.

### Laboratory Services

The Geochemical Laboratory fulfills all analytical requirements of the Geological Survey. The laboratory is located in the Howley Building, Higgins Line, St. John's: Laboratory Director (**Chris Finch**), Mineral Laboratory Chemists **Jennifer Toope**, **Rosauro Roldan** and **Lisa Walsh**. The lab carries out analyses of rocks, stream and lake sediments, till and soil samples, and well and lake waters for approximately 65 elements; over 200 000 determinations are done annually. Most of the analyses for trace and major elements are carried out using Inductively Coupled Plasma-Emission Spectrometry (ICP-ES) and Inductively Coupled Plasma-Mass Spectrometry (ICP-MS). Other selective methods for loss-on-ignition (LOI), FeO, Fluoride, Conductivity and pH are also applied. Doing these analyses in-house has been shown to provide significant savings over having them done commercially. A detailed description of the currently applied sample-preparation and analytical methods was released as an open file (NFLD/3316 - Analytical Methods for Chemical Analysis of Geological Materials) in January, 2018; this will provide a useful source reference in any survey reports that incorporate analytical data.

### Geological Hazards and Climate Change

**Melanie Irvine** carried out fieldwork across Newfoundland as part of the ongoing landscape hazard and coastal-monitoring program. Approximately 25 coastal cliff and beach sites were surveyed by drone and RTK, obtaining accurate topographic data and orthophotos. Analysis of the data will allow for the quantification of rates of cliff erosion and landscape modification in areas prone to slope movement, and generation of flood-risk maps from sea-level rise and storm-surge events. Three-dimensional models are being created, which aid in stratigraphic mapping of unconsolidated cliff faces and in visualizing landscape processes. Along with **Gillian Roberts**, Melanie travelled to Deer Lake in January to investigate the flooding in the Humber River. She has also made presentations at numerous events, and offers support to numerous NGOs.

### Quaternary Geoscience

**Heather Campbell** participated in the GEM-II integrated bedrock and surficial mapping and sampling program west of Hopedale, Labrador (NTS map areas 13N and 13M). Collaborators on the project included **Hamish Sandeman** and **Alana Hinchey** (GSNL), David Corrigan and Etienne Girard (GSC), Dianne Van Rooyen (Cape Breton University), and Christopher Power and Alex Blagdon (MUN). The survey mapped glacial sediments, and recorded erosional landforms,



Streamlined bedrock landform northwest of Pants Lake. Landform tapers to the east-northeast, indicating ice-flow direction.



on the ground and with the aid of UAV imagery. Targeted till sampling was conducted over the Hunt Lake Archean greenstone belt, south and southwest of the Flowers River Igneous Suite and between Triangle Lake and the Lac Lomier complex. Routine till samples were collected for geochemical analysis of the 63 micron fraction, and bulk samples for indicator-mineral analysis. Continued cross-disciplinary collaboration with associates at the GSNL and GSC will provide the necessary framework for efficient till sampling and mapping studies in the area. Heather has also been working on a till-geochemical data release for NTS map areas 12A/08 (Great Burnt Lake) and 02D/05 (Burnt Hill) and adjacent areas in central Newfoundland.

**Sarah Hashmi** initiated surficial mapping in the Northern Peninsula, focussing on the St. Anthony, Quirpon and Raleigh map areas (NTS 02M/05, 02M/11 and 02M/12). The Northern Peninsula has a complex glacial history, as it has been affected by glacial flow from both the Newfoundland Ice Cap, and the Laurentide Ice Sheet centred on Labrador. Further, this area



Striae mapping at Sail Pond property's South Zone.

has potential for Pb-Zn mineralization and has seen increased exploration activity, with more than 2000 claims staked since the beginning of 2017. Detailed till sampling and striae mapping were also completed in exposed trenches in the North and South zones of Altius Minerals' Sail Pond property, in the St. Julien's map area (NTS 02M/04). The main objective of the mapping and



Frost polygons in the Raleigh map area.





Eroded till blanket in valley on the Topsails. Meltwater channels are indicated by lighter colours.

sampling at the property was to take advantage of the exposed trenches, before their backfilling at the end of the 2018 field season. A report on the initial findings of the 2018 survey will be published in Current Research 2019-1.

**Jennifer Organ** continued the surficial mapping and till-sampling program of NTS map areas 12A/11 and 12A/14 in central Newfoundland. More than 200 sites were sampled in a helicopter-supported program, at a density of one per 4 km<sup>2</sup>. Thick deposits of glacial diamicton form blankets, plains and hummocky terrain, interspersed by bogs. Numerous meltwater channels have been eroded into the thick glacial diamicton, and are evidence of copious amounts of water produced during the late stages of deglaciation. Road-based surficial mapping and sampling, at a density of one sample per linear kilometre, commenced on adjacent NTS map area 12A/05, on the Burgeo Highway. Glacial diamicton over much of this area is generally thinner than that of the areas to the north, forming a veneer over bedrock. There are also isolated areas of both blanket and hummocky

diamicton, with sandy to gravelly glaciofluvial deposits concentrated primarily within the large river valleys or associated with eskers. Helicopter-supported mapping and till sampling will continue on NTS map area 12A/05 in 2019. An open-file report comprising till analyses from both areas, along with a surficial map of NTS map area 12A/14, are expected in 2019.

The integration of digital data into the Geoscience Atlas is the responsibility of **David Taylor**. Currently, there are 111 digital surficial maps for the island of Newfoundland, and 38 for Labrador. New striation data collected during the 2018 field season are being edited and will be added to the striation dataset. Updates to the till-geochemistry dataset include new datasets for the Sheffield Lake/Springdale and Topsails/Rainy Lake areas. Similar updates, to include the most recent data, have been made to the surficial landform dataset. A new initiative begun in 2015, to scan and rectify approximately 2000 1:15 840 scale Peatland inventory maps for the island of Newfoundland, is now complete. A new surficial Index layer has



been compiled showing the most recent digital surficial mapping, and is ready for inclusion in the atlas. The Carbon-14 dataset has been edited, and includes the addition of 272 new dates bringing the total number of entries to 1540.

### Geophysics

**Gerry Kilfoil** continues to generate standardized, high-quality imagery and map products amenable to desktop mapping software from geophysical survey data collected by the private sector. An index of airborne surveys, available through the online Geoscience Atlas, is maintained and continuously updated. Geophysical guidance is provided to prospectors and mineral exploration companies, as well as quality assurance for geophysical data submissions as part of mineral assessment. During the 2018 field season, ground geophysical surveys were conducted adjacent to recent coastal landslides near Daniel's Harbour

and Sally's Cove, western Newfoundland. The objective of this investigation is to characterize subsurface sediments, and thereby help predict areas most susceptible to accelerated erosion. For comparison, these surveys were also deployed at other coastal sites, not prone to landslide erosion. Airborne VLF-EM data, acquired during the 2015 St. Alban's survey, are being released. These results highlight the predominant NE-SW linear fabric observed in the Baie d'Espoir Group (layered volcanic and metasedimentary rocks) that underlie the north-central part of the survey, an area actively being explored for gold.

### Geochemistry

The Geochemical Atlas of Northeastern Québec and adjacent areas in mainland Newfoundland and Labrador was published by the Geological Survey of Canada in March 2018. Authors are **Steve Amor**; Martin McCurdy, Bob Garrett and David



Checking the recorded profile during ground penetrating radar (GPR) survey at the Daniel's Harbour landslide site.



Corrigan of the GSC; and Fabien Solgadi of the Québec MRNF. The first three authors have also submitted a paper describing the Atlas' creation for publication by **Geochemistry: Exploration, Environment, Analysis** (GEEA). Along with the staff of the Geochemical Laboratory, Steve co-authored Open File NFLD/3316 (Analytical Methods for Chemical Analysis of Geological Materials) and is preparing a data release of all Newfoundland till fluoride analyses to date.

## Geoscience Publications and Information

### Publications and Cartographic Services

The Publications and Cartography group includes editorial (**Chris Pereira** and **Des Walsh**), cartographic/GIS (**Kim Morgan**, **Terry Sears** and **Neil Stapleton**), and desktop publishing (**Joanne Rooney**). They are responsible for report, map preparation, and production for the GSNL, and provide cartographic, basic geoscience graphic artwork and desktop publishing services to other divisions and branches of the department, as needed. In the past year, the GSNL published in excess of 14 maps, final project reports, open-file releases, and other related documents including

the annual **Current Research** volume. Staff provided geoscience editing, graphic and related cartographic support for trade magazines, a wide variety of branch presentations, prospector-property posters for promotions and investment initiatives at mining trade shows, conferences and symposia, and for the outreach projects. Updates of the Mines Branch area of the website and the web-based release (timed and otherwise) of all GSNL publications are also handled by this group.

### Promotion, Geoscience Marketing and Investment Attraction

**Crispin Pike** and **Phil Saunders** are responsible for a wide array of promotion and investment-attraction initiatives designed to encourage growth in the mining and mineral-exploration sectors. They provide technical information on current exploration activity, geological context of exploration trends, opportunities for new project generation, and information on Mines Branch programs to support the industry. Their mineral promotion initiatives in emerging markets also include information on Canadian business culture and best practices within the mining and exploration sectors.



Newfoundland and Labrador pavilion at PDAC 2018.



They organize and deliver promotional initiatives at Mineral Exploration Roundup, PDAC and Xplor, as well as at local venues such as Mineral Resources Review. The Mines Branch promotions group continued to use and improve the new Newfoundland and Labrador Pavilion, introduced in 2014, at PDAC and Roundup. At both venues, the promotions group collaborated with Mining Industry NL and assisted Newfoundland and Labrador prospectors and junior company representatives in attendance.

The promotions team regularly meets with visiting investors from around the globe, to promote the mineral potential of the province and to highlight specific investment opportunities, where appropriate. In 2018, for example, Phil made presentations to visiting investors from India and China on separate occasions. The team also attended the Canada–China mineral investment forum held during the PDAC conference in Toronto.

Throughout the year, staff developed and updated a wide array of technical promotions materials, many of which are also available in Mandarin and French. Web-based promotional initiatives continue to target both traditional and emerging markets. The ‘Explore Newfoundland and Labrador’ and the ‘Asian Investment Initiatives’ areas of the website (available in both English and Mandarin) were updated to encourage and facilitate industry participation in this area.

### **Industry Information and Client Services (Mineral Exploration Consultant)**

The Mineral Exploration Consultant’s office (**Phil Saunders, Crispin Pike** and **Stephanie Neary**) represents the initial point of contact for most clients of the GSNL, and for the Mines Branch. It provides information and consultation services to a broad client base including companies, prospectors, industry associations, other government departments and agencies (both federal and provincial) and the general public. The office has a close working partnership with the Matty Mitchell Prospectors Resource Room and with Geofiles staff. It collectively handles a large volume of requests for information, help and advice made through office visits, phone calls and emails.

As Mineral Exploration Consultant, **Phil Saunders** provides independent advice and information to clients relating to mineral exploration. He maintains a key role as industry liaison, tracks exploration trends and activities in support of promotional activities, and provides strategic advice to clients.

**Crispin Pike**, as the Exploration Services Geologist, provides information and advice to prospectors and new companies that are exploring in the province; he also helps prospectors to compile and display their pre-existing data on compilation maps.

The exploration team regularly holds in-house meetings with prospectors to provide advice on new or ongoing projects, and with companies (especially those new to the province) to introduce them to the many services and sources of information available from the Geological Survey. Survey geologists often sit in on these meetings, to provide expertise on specific topics.

Our clients are advised that we have moved our offices from the first floor to the second in the Natural Resources Building. Visitors are always welcome, but are advised to call first to arrange a meeting.

### **Geoscience Documents Collections and Databases**

The Geofiles and Library collections, with related metadata, are maintained by staff of the Geoscience Publications and Information group (**Cindy Saunders, Paula Bowdridge** and **Desiree King**).

The Geofiles collection is a growing, digital and hard copy collection of private- and public-sector mineral exploration and geotechnical/geoscientific documents (currently 24 800+ items) relating to the province. Many of these documents are exclusive to this collection.

The Geofiles collection includes over 12 100 non-confidential mineral exploration assessment reports, and 99% of these are now available online in .pdf format. The Mines Branch is now receiving and archiving most assessment files in digital-only format. The Geofiles collection also includes Geological Survey (and predecessor organizations)

publications dating from 1873 to the present. Metadata for these 5100+ documents (including articles in volumes such as Current Research) are searchable online; 54% of these documents are also available online as .pdfs.

The Geofiles database also contains records for, and links to, documents that we do not physically hold in our collection. These are mainly Geological Survey of Canada publications, and Memorial University of Newfoundland M.Sc. and Ph.D. theses that are related to Newfoundland and Labrador. In total, there are over 27 200 records online. These records are searchable at [gis.geosurv.gov.nl.ca/minesen/geofiles/](http://gis.geosurv.gov.nl.ca/minesen/geofiles/).

Many of our documents, especially assessment files, were originally posted online in pieces (e.g., a report with linked large maps or appendices). During the past year, we have continued to consolidate all parts of a Geofile into a single large file. This is because most modern web browsers now come with built-in pdf viewers that do not allow for viewing internally linked maps and appendices. This project is ongoing. A summer student participated in this project and also continued to scan maps and documents that are not yet online. This year, spurred by our move to a smaller office space, we began to remove hard copies of documents from our collection where there are good quality online (digital or scanned) versions. This process is on-going.

Geofiles staff provide customized searches of the Geofiles, Library, Pfiles and various in-house databases, and also assist clients (in-house and by phone) doing their own online searching.

### **Matty Mitchell Prospectors Resource Room**

The Matty Mitchell Prospectors Resource Room is a private-public partnership with funding, and in-kind support, provided by the Mines Branch and Mining Industry NL. The project is overseen by a joint government-industry committee chaired by the Director, Geological Survey. Resource Room Geologist, **Pat O'Neill**, is responsible for the daily operation of the project.

An active exploration industry in 2018 was reflected in more than 14 prospector properties being optioned to junior mining companies in Newfoundland and Labrador. Prospectors from all parts of the province continued to avail of the support and mentoring services offered by the Resource Room during 2018. Varying levels of technical support were provided that helped in the discovery, promotion and advancement of their mineral properties.

The Resource Room played a major role in assisting prospectors at Mineral Resources Review (St. John's), Mineral Exploration Roundup (Vancouver) and PDAC (Toronto). Informative property posters were compiled to help prospectors promote their properties at these events. A booklet, maps and flash drives containing information on "Properties Available for Option in Newfoundland and Labrador" were updated several times during the year and pdf versions of these properties are available on the Matty Mitchell website. The Resource Room website is updated throughout the year, and articles are added to the "Educational Tools for Prospectors" section.

The Resource Room continues in its collaboration with the Mineral Incentive Program, whereby prospectors without grants can avail of seed funding to have promising mineralized samples assayed. This service includes rock and mineral identification, and informal discussions about the geology and mineral potential of the particular area of interest. As in previous years, this arrangement has resulted in new mineral discoveries and subsequent claim staking.



# Mineral Development Division

The Mineral Development Division administers the **Mining Act** and is responsible for: the approval of plans for the development, operation and closure of mines; providing support for the development of mineral policy; monitoring and economic analysis of the mining industry; managing the financial incentive programs for exploration; and managing orphaned and abandoned mines. This is the key division for liaison with other federal and provincial government departments on mining matters. **Alex Smith** is the Director.

## Operations

The division is responsible for administering the **Mining Act**, ensuring that mineral resources are responsibly developed, and that end-of-life operations are properly closed and monitored. Also, the division is responsible for rehabilitating orphaned and abandoned mines to ensure they do not present safety hazards.

Through the Mineral Incentive Program, the division encourages the development of the province's mineral resources by providing training and financial assistance to prospectors, and financial assistance to junior exploration companies. It monitors provincial, national and global trends in the industry and provides advice to provincial and federal government agencies that support or assist mining projects.

There are three sections within the division that are identified by major work functions: Engineering Analysis, Mineral Industry Analysis and the Mineral Incentive Program.

## Engineering Analysis

The Engineering Analysis Section is responsible for the administration of the **Mining Act** and the review and development of related guidelines and policies. Mine operators must have their development plan approved and their rehabilitation and closure plan accepted by the Minister prior to the start of mining, as required under the **Mining Act**. New plans are to be submitted every five years, or when there is a significant change to the mining operation.

Financial assurance sufficient to cover full-site rehabilitation is required from operators and is administered by the section.



Geologists at Point Rousse.  
Photo Courtesy of Anaconda Mining Inc.

Since Mineral Resources Review last year, 10 development plans or amendments, 13 rehabilitation and closure plans or amendments, 7 financial assurance proposals and 6 mill licence applications have been submitted to the section for review. The section represented the department on environmental assessment committees for Search Minerals' Foxtrot project; Rambler Metals and Mining Canada's tailings expansion project; Anaconda Mining's Argyle project and Matador Mining's Cape Ray project. The **Mining Act** also requires mine operators



Rambler Employees.  
Photo Courtesy of Rambler Metals and Mining Canada Limited.



Vale Newfoundland and Labrador, Ship Loading at Voisey's Bay.



Former Consolidated Rambler Mine Site, Dam Repairs.

to submit an annual report on the past year's operations, and an operational plan for the coming year. Through review of these annual submissions and inspection of mine sites, the section ensures that operators are developing projects in accordance with approved development plans

and, at the end-of-mine life, that sites are properly rehabilitated in accordance with the accepted rehabilitation and closure plan.

The section also manages the orphaned and abandoned mines in the province and regularly monitors conditions at these sites. The orphaned and abandoned mines represent a significant contingent liability for the province. Some of these sites are a public safety risk and several sites have environmental liabilities estimated in the tens of millions of dollars. These include the former Whalesback, Gullbridge, Buchans, Consolidated Rambler, Hope Brook, and Minworth sites.

Budget 2016-2017 approved a four-year, \$2.4 million, dam-safety program to repair tailings dams at six of the orphaned and abandoned mines. These repairs are needed to meet **Water Resources Act** requirements and the Canadian Dam Association's Dam Safety Guidelines. The overall goal of the program is to have a long



term, sustainable dam safety and maintenance program for all six mine sites. For 2018, contracts have been awarded for the detailed design, construction of repairs and inspections services during construction for an estimated cost of \$676,000 at the Minworth dam and \$412,000 for the Consolidated Rambler West dam.

Engineering Analysis is working to improve the way it conducts business, particularly through two ongoing initiatives: i) creation of new guidelines for development plans and rehabilitation and closure plans and ii) the creation of a risk registry for dams at orphaned and abandoned mines.

Staff members serve on interdepartmental and provincial/federal/territorial committees and working groups. They work closely with mine operators on **Mining Act** regulatory compliance requirements and stay current on the status of mine operations. Staff also work closely with other departments and consultants to address safety concerns and improve environmental conditions at the orphaned and abandoned mine sites.

The section has seven staff positions including the Manager (**Abigail Steel**), four Mineral Development Engineers (**Paul Philpott**, **Sarah Bassler**, **Darren Pittman** and **Muhammad**

**Qureshi**), a Geologist (**Brad Way**), and a Financial Officer (**David Tite**).

### Mineral Industry Analysis

The Mineral Industry Analysis Section maintains an ongoing program of research and statistical tracking of provincial and global mineral industries to provide data that supports policy and program development. Global market trends, events, supply/demand, etc. are analyzed for their impact on existing, developing and potential mineral projects within Newfoundland and Labrador.

A semi-annual forecast of mineral shipments and employment levels is compiled via a direct survey of individual mining operators within the province. Forecasted data and property updates are provided to the Department of Finance as part of the provincial budgetary process. Mineral Industry Analysis also works with Finance to provide information and analysis on mining related issues and projects to identify provincial fiscal impacts. Maintenance and publication of the mineral statistics database of shipments and employment is a responsibility of the section as acquired statistics are reviewed, analyzed and compared to mineral industry census data obtained from Natural Resources Canada, security/exchange filings and **Mining Act** filings. Through an ongoing process of



Muhammad Qureshi, Mineral Development Engineer at Beaver Brook's Tailings Pond.



Tata Dome with train.  
Photo Courtesy of Tata Steel Minerals Canada Limited

communication, data gaps and discrepancies are resolved to maximize statistical integrity.

Data and analysis are provided to departmental executive, and contribute toward the development of mineral policy and regulations. The section prepares regular reports such as a daily commodity price list, and issues specific briefing notes. Analysis of trends in the industry, and emerging issues and challenges is ongoing. This work is completed for projects operating provincially, as well as, those operating globally that potentially impact the provincial mining industry. The section evaluates issues and trends to determine if policy action is required. If policy action is required, the section will complete the necessary policy development steps either as the lead or in cooperation with another section.

Mineral Industry Analysis has taken the lead in providing support for the development of the Provincial Mineral Strategy: **The Way Forward on Mining**. As part of Phase 3, **The Way Forward: Building for Our Future**, the department, in collaboration with the mining industry and community stakeholders, have developed a strategic framework for growing the provincial mining industry. The section has compiled research and completed analysis on industry data to assess the provincial industry's position and trends and assisted with engagement sessions with specific stakeholders and broader workshops with varied industry representation.

Section staff represent the province on industry committees, intergovernmental and federal/provincial/territorial working groups and help collect and disseminate industry information. The section provides executive support for



conferences and national meetings, such as the annual Energy and Mines Ministers' Conference (EMMC) where ministers discuss shared priorities for collaborative action to advance energy and mining development across the country. The main deliverable coming out of the EMMC this year is the Canadian Minerals and Metals Plan. The section has contributed significantly to this process by providing data and feedback to incorporate the provincial perspective on proposed federal policy directions and initiatives through participation in the Mines Intergovernmental Working Group.

The section liaises with the public providing information on existing mining operations in the province. "Mining in Newfoundland and Labrador" and "Minfo" publications are produced and distributed at conferences and via an email distribution list. These documents are also published on the department's website along with other industry information maintained by the section.

The section has five staff positions including the Manager (**Keith Bradbury**), three Mineral Industry Analysts (**Grant Taylor**, **Bernadine Lawlor** and one vacant position) and Administrative Support (**Bernie Brazil**).

### Mineral Incentive Program

The operating budget for the Mineral Incentive Program (MIP) remains at \$1.7 million for the 2018-19 fiscal year. The table below summarizes program spending from 2016-17 to the present.

The number of prospecting grant applications processed in 2018-19 is comparable to previous years. Total expenditures by the prospecting community are expected to be on par with 2017-18. The Mineral Incentive Program continues to support prospector promotion through its annual \$40,000 operational grant to the Matty Mitchell Prospector Resource Room, and grants to Mining Industry NL to fund prospectors who are selected to travel to national conferences (i.e., AME Roundup and PDAC).

Program	2016-17	2017-18	2018-19 (projected)
<b>Prospector Assistance</b> Grants approved	52	50	48
Amount	\$241,410	\$283,372	\$288,304
<b>Junior Exploration</b> Number of grants	22	28	35
Amount	\$1,389,979	\$1,390,000	\$1,300,000
<b>Prospector Training</b> Number of attendees	12	14	TBD

The annual two-week prospector training course was to be offered from October 15–26, 2018 at College of the North Atlantic's Prince Philip Drive Campus in St. John's. The course did not go ahead due to insufficient enrollment. The course will return to Stephenville for the 2019-20 offering at its traditional timing in the spring.

The Junior Exploration Assistance Program received forty-one letters of intent by the June deadline and it is anticipated that the program will be fully subscribed for 2018-19.

Field visits to prospector and junior exploration company work sites will be the focus of the program from November through December. Review of technical reports from grant recipients and arrangement of final grant payments will take MIP personnel through the end of the fiscal year.

The Mineral Incentive Program has three staff positions including the Manager (**Dale O'Reilly**), a Geologist (**Robyn Constantine**) and Administrative Support (**Sharon Tracey**).

### Staffing

The division has one vacant Mineral Industry Analyst position. This position will be advertised in the near future.

# Mineral Lands Division

The Mineral Lands Division is responsible for the regulatory functions and information services that facilitate the orderly discovery and development of the province's mineral resources. These functions and services fall under four program areas: Mineral Rights, Exploration Approvals and Inspections, Core Storage, and Quarry Rights. The division has extensive contact with other departments and levels of government through its involvement in various review processes and application referrals, and represents the Mines Branch on the Interdepartmental Land Use Committee and coordinates referrals for projects requiring environmental assessments on behalf of the Mines Branch. The division's main office is in St. John's and there are also two satellite offices in Grand Falls-Windsor (Quarry Compliance Officer and Core-Storage Geologist) and Pasadena (Quarry Compliance Officer).

## Staff Changes

There are currently two vacancies in the division: a Quarry Compliance Officer position in Grand Falls-Windsor satellite office and an administrative position in the St. John's office. The Quarry Compliance Officer vacancy is due to William Oldford taking on the role of Core-Storage Geologist in Grand Falls-Windsor following a competition earlier this year.

After ten years as a Geological Technician, Charles Newhook left the department to take a position with the Public Procurement Agency. Charmaine Winter is now the Geological Technician, coming to the Division from the Department of Fisheries and Land Resources.

Following a year of leave, Trina Adams returned to her position of Mineral Assessment Report Review Geologist on January 29, 2018.

Following Joanne Janes' retirement from the Clerk IV (Quarry Materials Section) position in 2017, Anne-Marie Woolridge held this position on a temporary basis until the position was filled permanently by Julie Kearley on June 4, 2018. Julie is new to the department, coming from Service NL's Government Services Branch.

Andrea Devereaux is currently on a temporary assignment in the division as Quarry Legislation Review Lead and responsible for coordinating the revisions to the **Quarry Materials Act** and **Quarry Materials Regulations**. In her place, Jessica Rideout is in a temporary position of Quarry Compliance Officer following a temporary administrative support role in the Mineral Rights Section.

The division hosted four students in 2018 in support of the Core Storage, Quarry Materials, and Mineral Exploration Inspection activities. Kele Miguel, Miguel Shano and Riley Wareham supported the Core-Storage Program, and Victoria Currie provided assistance to the other two programs.

## Mineral Rights

The Mineral Rights Section administers all aspects of the acquisition, maintenance and regulation of mineral rights in the province, mainly under the Mineral Act and Mineral Regulations. Many of these functions are performed through the Mineral Rights Administration System (MIRIAD). MIRIAD provides real-time, online, map-based claim staking, and integrates mineral rights information with the province's geographic information and financial management systems. The section is currently working with the Office of the Chief Information Officer to develop an updated version of MIRIAD that will provide a significantly enhanced user experience. It is expected that the new MIRIAD application will be available to the general public in the latter half of 2019.

Mineral rights are further managed through several hardcopy registries, which record transfers, confidential agreements, mineral licenses issued, and mining and surface leases, that, together comprise over fifty volumes of documents. These documents are used extensively by the legal community and the exploration and mining industry generally. Work continues on a project to digitize all of these records and make them available to the general public via a web-based application. The section monitors exploration activity and expenditures in the province. Expenditures are surveyed semi-annually by Natural Resources Canada and the survey results shared with



the province. The results are analyzed internally and aggregate results are reported to various branches of government and cited in publications.

The section is also responsible for the review of municipal plans and various land-use proposals to ensure that these do not have a negative impact on the mineral and aggregate resource industries of the province. The development of the Environmental Guidelines for Mineral Exploration document continued in 2018. Implementation of this document is anticipated prior to the end of 2019.

## Exploration Approvals and Inspections



Fall drilling on the White Hills property, Port au Port Peninsula.

All exploration work requires approval from the department. This involves a referral process whereby relevant government and non-government agencies are notified of work intent and scope, and are given the opportunity to provide feedback. Standard conditions and those derived from the referral process are included in the approval document.



Trenching and Drilling, St. Lewis, southern Labrador.



Inspections at drill site, South Voisey Project.

There have been 307 applications for exploration approval processed, so far, in 2018, compared to a total of 332 by year-end, 2017. Exploration-site inspections are conducted on a full-time basis, and companies are advised to be diligent in following all regulations and conditions governing their exploration approvals. Onsite inspections of 29 exploration project sites (as of August 31) have been carried out in various areas of the province. Inspections in Labrador Inuit Lands included participation by an inspector from Nunatsiavut Government's Department of Lands and Natural Resources.

## Core Storage



Students assisting personnel from Sokomon Iron Corp in the viewing lab in Buchans, 2018.

The Core-Storage Program is responsible for six core-storage facilities located in Pasadena, Baie Verte, Buchans, Springdale, St. John's and Goose Bay. Seasonally, the program is supported by summer students, normally from the geology program at



Buchans Resources Limited Personnel Inspecting Drill Core at the core storage facility in Buchans, 2018

Memorial University. The core-storage area houses approximately 1.5 million metres of drillcore samples from nearly ten thousand drill holes collected from various exploration projects within the province. Samples are available for inspection and are used extensively by the mineral exploration industry, government, and academia. Sampling of core is permitted where sufficient core is available to allow removal of some material and with the conditions that all unused material is returned to the core library along with copies of analytical results. The core-storage database is available online via the Geoscience Atlas.

The core-storage facilities, particularly Buchans, were very active in 2018 following a shortened summer season in 2017 due to structural engineering inspections of the core-storage racks. The inspections were completed and resulted in access limitations to some of the core storage racks in Buchans, Pasadena, and Baie Verte.

There have been 36 visits to the core-storage facilities thus far in 2018. Industry personnel have spent 98 days, over 200 person days, inspecting more than 33 000 m of drill core at the core storage facilities. Persons interested in accessing the core-storage areas are asked to contact the core-storage geologist prior to planning a visit, to ensure the drill core of interest is available.

## Quarry Materials

The Quarry Materials Section is responsible for the administration and enforcement of the Quarry Materials Act and Quarry Materials Regulations in support of various provincial, municipal, and local infrastructure projects in the province. Quarry inspectors are stationed in Pasadena, Grand Falls–Windsor (Vacant) and St. John's, with each inspector having their own geographic area of responsibility to conduct compliance inspections, respond to complaints, and attend stakeholder meetings. Other staff provide in-office administrative support for the section, such as maintaining databases, carrying out referrals for quarry permits, quarry leases, quarry materials exploration licence applications, issuing approvals and addressing public and stakeholder concerns. The section issued 2344 quarry permits in 2018.

## Divisional Initiatives/Updates

- Review of administrative processes underway to develop standards for appropriate Program areas
  - Quarry Program permit standards developed and implemented
    - Other program areas in progress
  - Development of retention schedules process underway for the four program areas
- Upgrade of MIRIAD system in progress
- Review of Quarry legislation underway
- Planning for the procurement of services to carry out upgrades of the core-storage racks to address 2017 structural inspections
- Online payment option made available for mineral licence renewals and payment of Condition 2 extensions
- Updates to application for exploration approval document
  - Applications for prospecting that specify the use of back-pack drills are exempt from the requirement of a water-use licence
  - Review of water-use criteria underway to determine need for water use licence based on scope of exploration work
- Development of a scheduling system for clients wishing to access the core-storage facilities



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# 2018 PROJECTS

## Newfoundland and Labrador

