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Overview of the 2018 Mineral Exploration Best Practices Guidelines

CIM MES Discussion Group, April 24, 2019

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About RPA

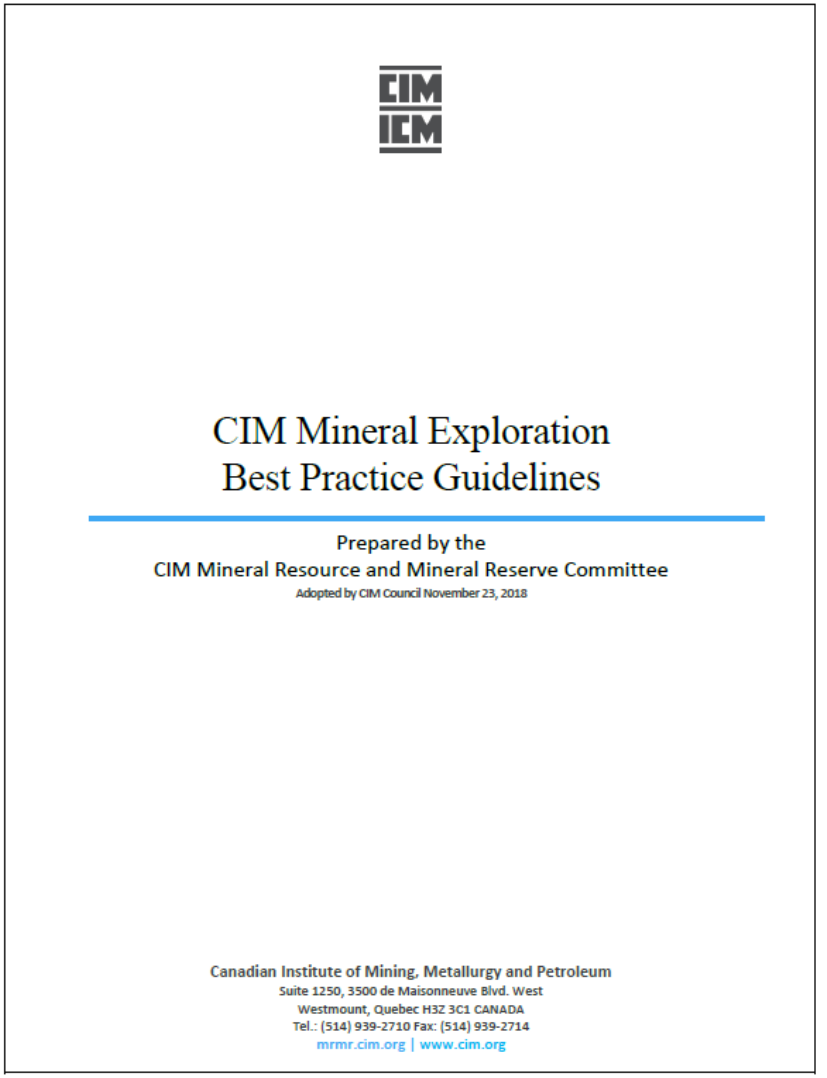
- Providing advice to the mining industry for over 30 years
- *The specialty firm of choice for resource and reserve work*
- All stages:
  - exploration and initial resource estimation
  - scoping, prefeasibility and feasibility studies
  - financing, permitting, construction, operation, closure and rehabilitation.
- Clients are financial institutions, governments, major mining companies, exploration and development firms, law firms, individual investors, and private equity ventures
- Offices in Canada, United States and United Kingdom. Head office in Toronto
- At RPA, we:
  - Deliver what we promise
  - Provide unsurpassed quality
  - Communicate effectively with clients and other stakeholders

Agenda

https://mrmr.cim.org/en/best-practices/exploration/

(November 23, 2018)

- Introduction and Concepts
- Review of Exploration Best Practices Guidelines
- Closing Thoughts



Introduction & Concepts

MRMR Best Practice Committee - Guidelines

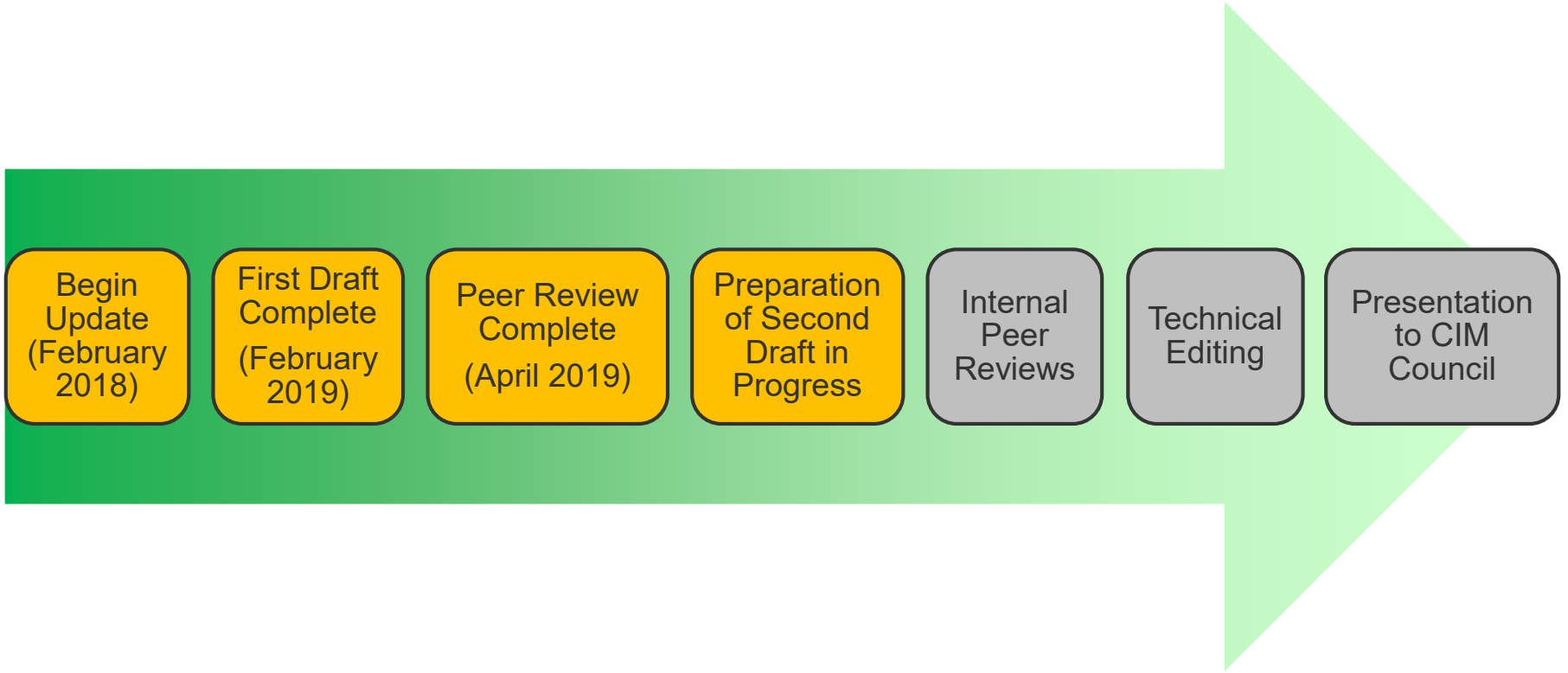
Mineral Exploration

- Original Text (August 20, 2000)
- National Instrument 43-101 (October 19, 2001)
- Updated Text Accepted by CIM Council on November 23, 2018

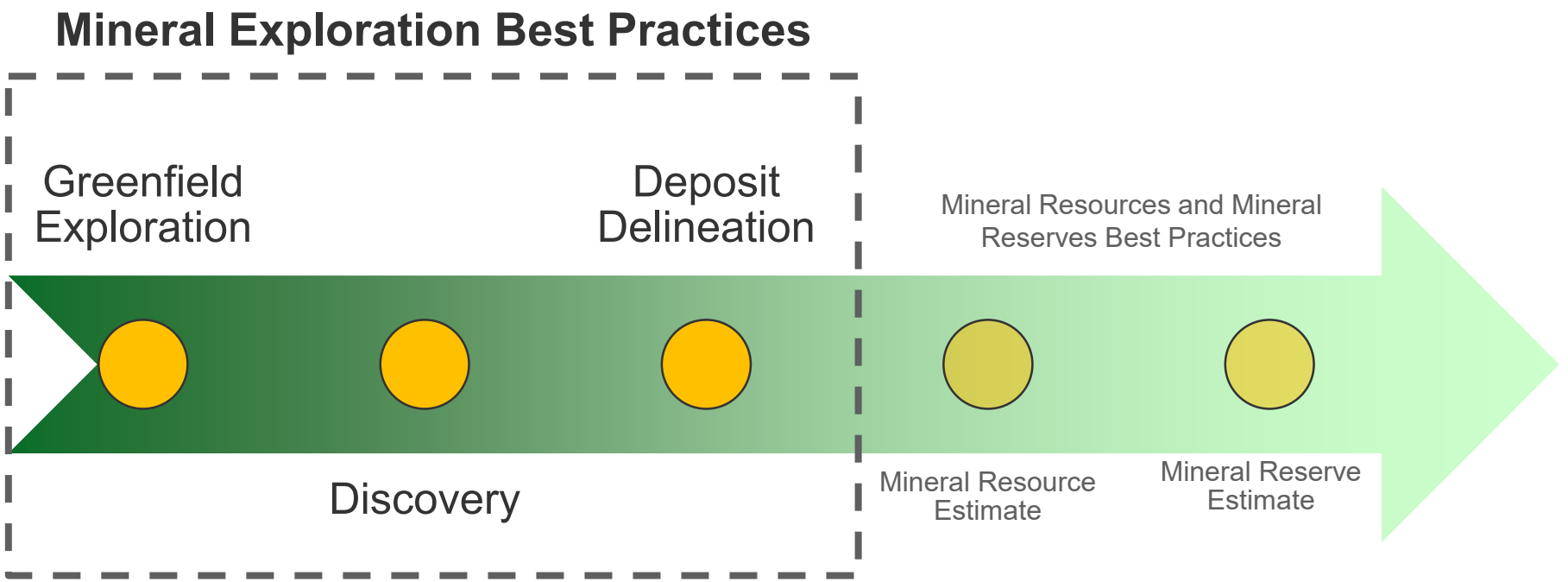
Estimation of Mineral Resources and Mineral Reserves

- **General Guidelines (Update in progress**)
- Coal
- Industrial Minerals (in progress)
- Lithium Brines (in progress)
- Placer Deposits
- Potash
- Rock-Hosted Diamonds
- Uranium

MRMR Best Practices Guidelines - Update

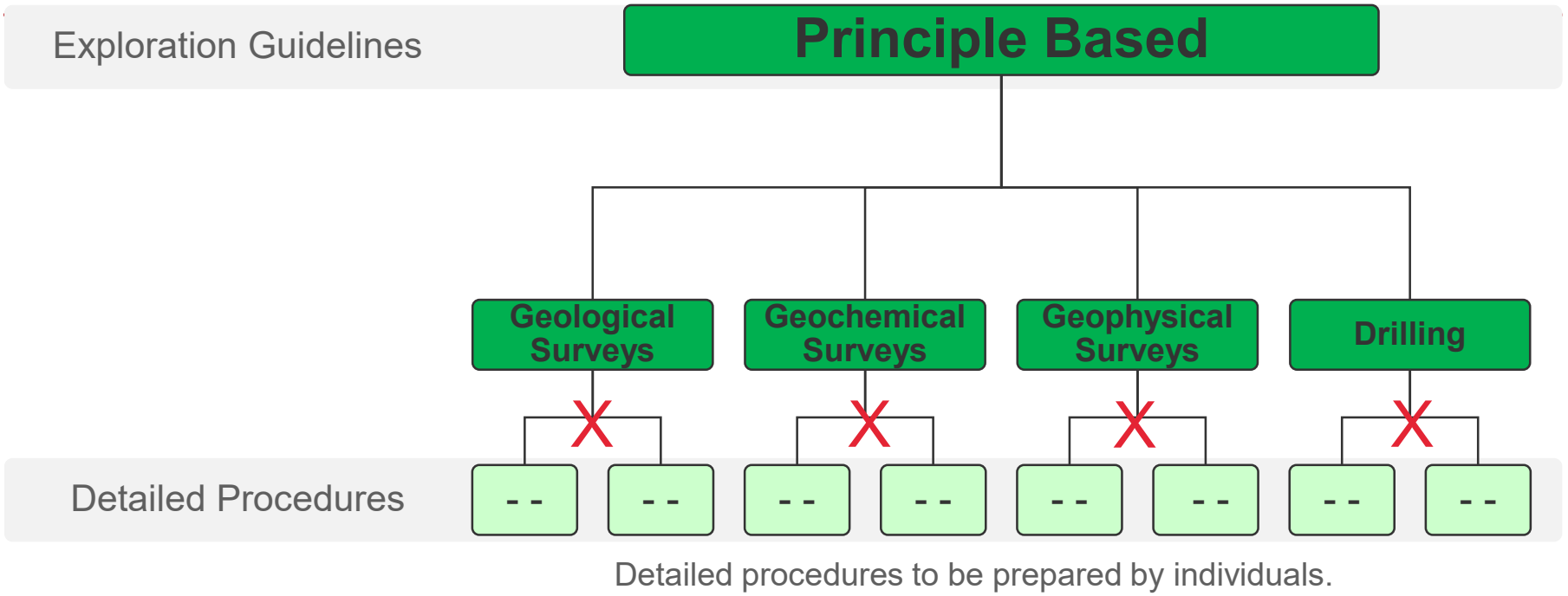


Mineral Exploration BP Guidelines - Scope



- Mineral Exploration Best Practice Guidelines are addressed towards the early stages of the mining cycle.

Mineral Exploration BP Guidelines - Goals



Detailed procedures to be prepared by individuals.

- Mineral Exploration BP Guidelines are designed to provide common, principle-based guidance only.

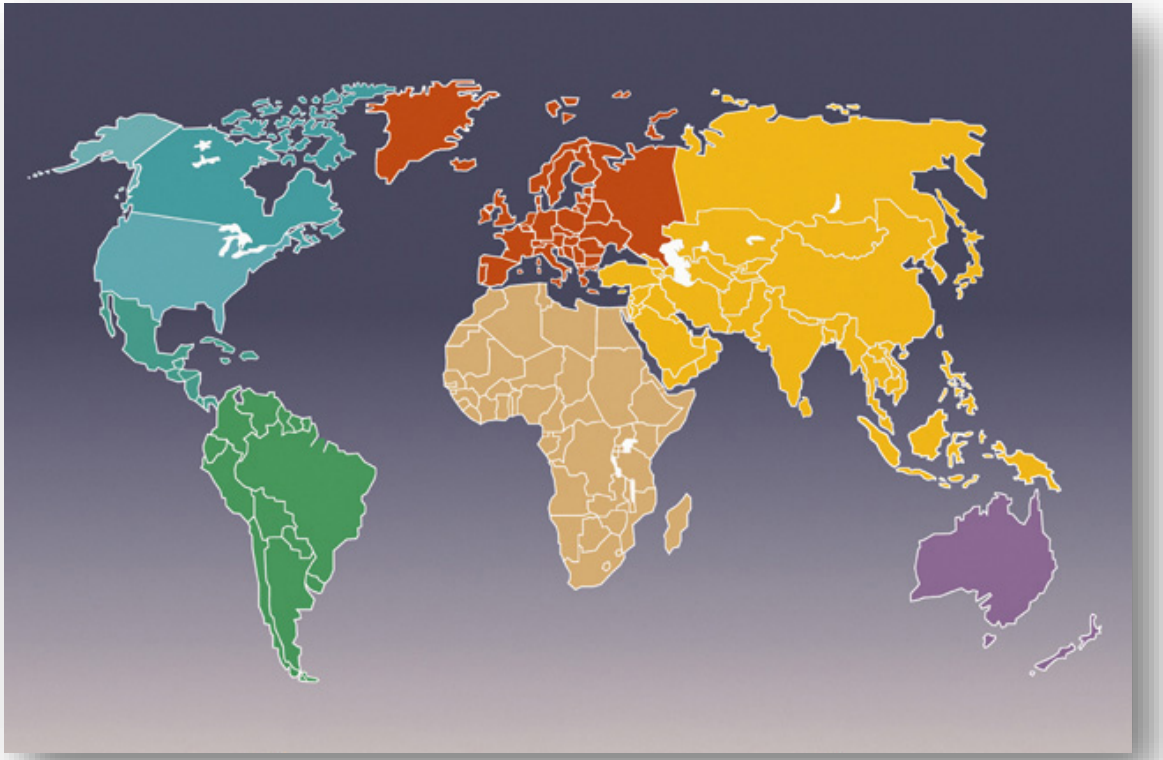
- Detailed procedures can be prepared to suit the specific situations of each Practitioner.

- The detailed procedures will vary between Practitioners, but all will comply with the Guidelines.

Mineral Exploration BP Guidelines - Goals

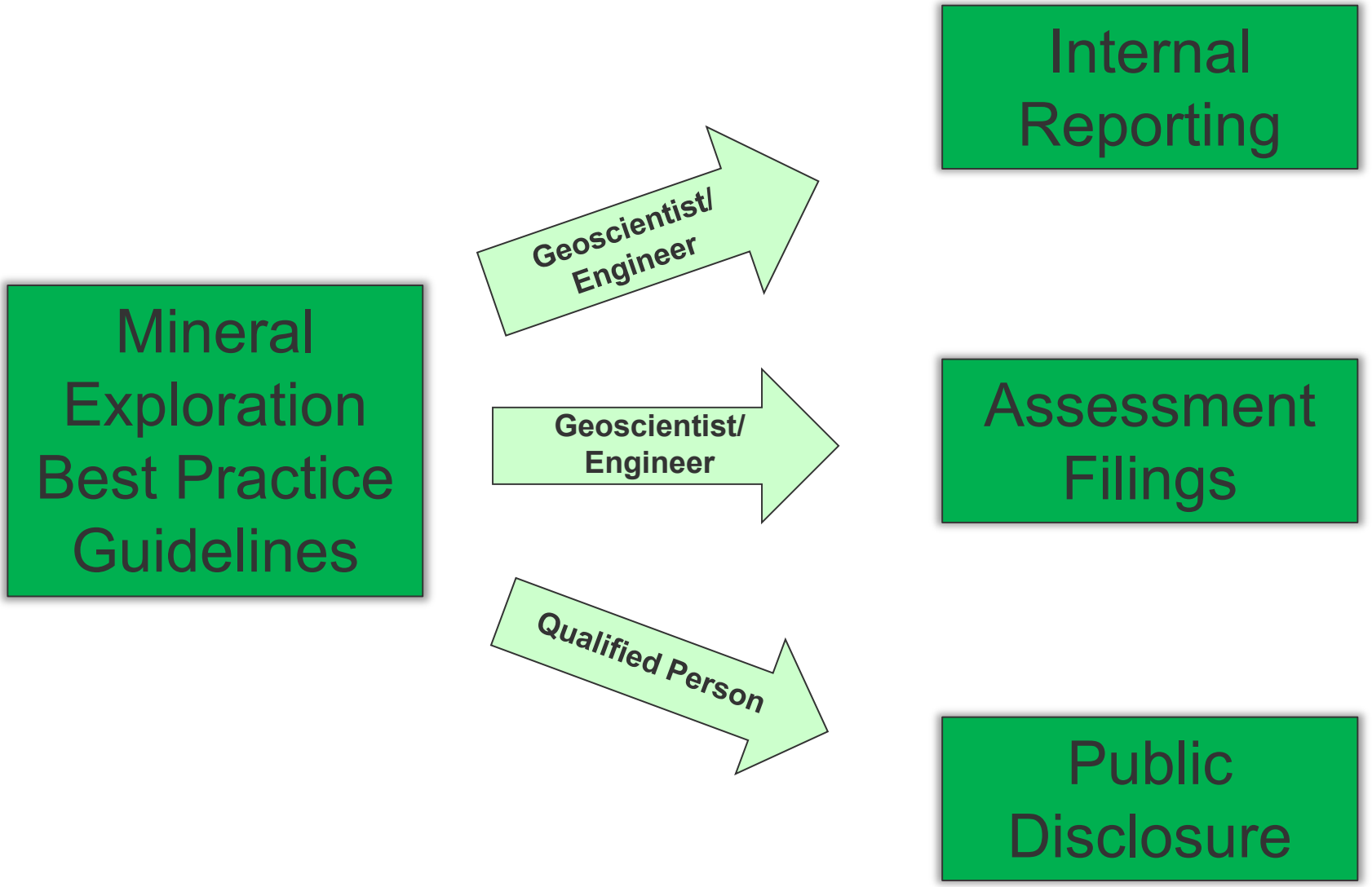
- The goal of the Mineral Exploration Best Practices Guidelines is to provide **general guidance** in a number of areas relevant to Mineral Exploration.
- For those areas that require more detailed discussion (“rabbit holes”), additional guidance is provided via a list of reference documents.

Audience

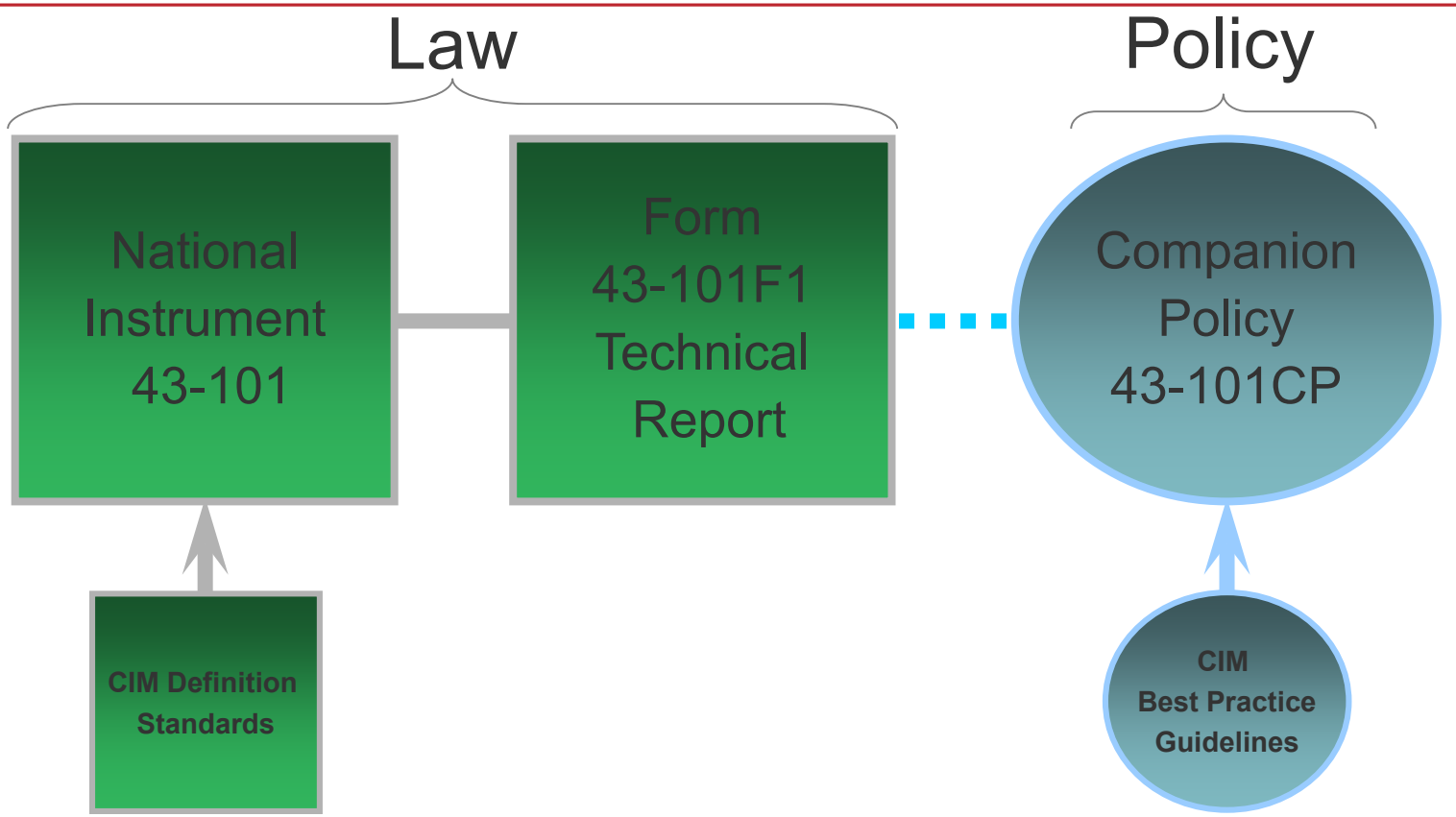


- The scope of the Mineral Exploration Best Practices Guidelines is focused towards work conducted or supervised by geoscientists in Canada.
- Completion of general guidance for exploration programs carried out globally would be an enormous undertaking.

Audiences & Responsibilities



3 Parts to NI 43-101 – the "Mining Rule"



CIM Definition Standards are law.

CIM Best Practice Guidelines are policy documents, not law.

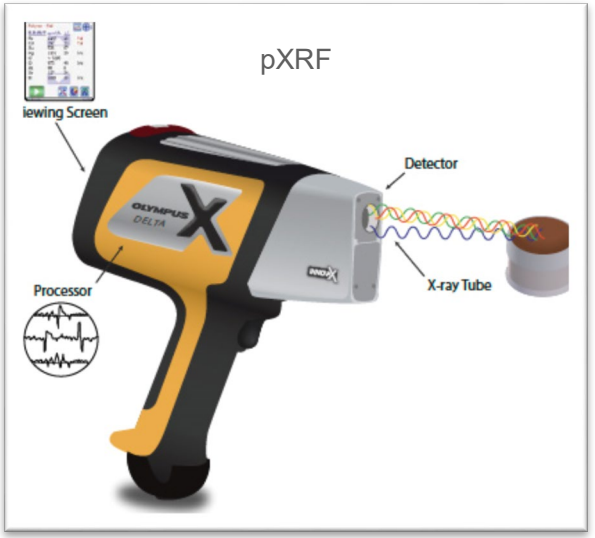
Regulators may query disclosure that does not appear to comply with good practices.

Source: OSC Presentation, March 5, 2014

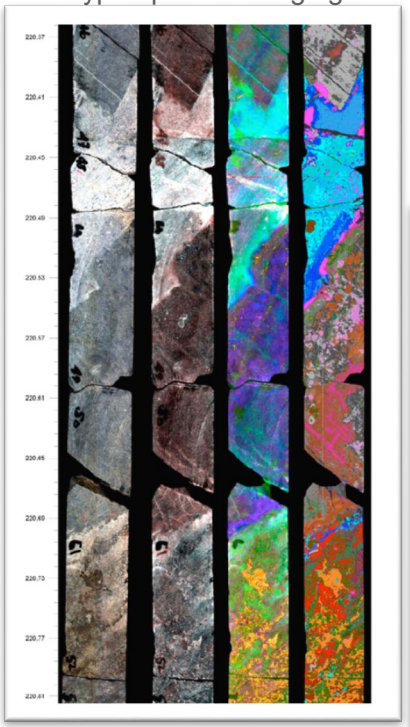
Mineral Exploration BP Guidelines - Innovation

Mineral Exploration BP Guidelines do not inhibit original thought or application of new technologies. On the contrary, innovation and original thought are the key stones of exploration programs.

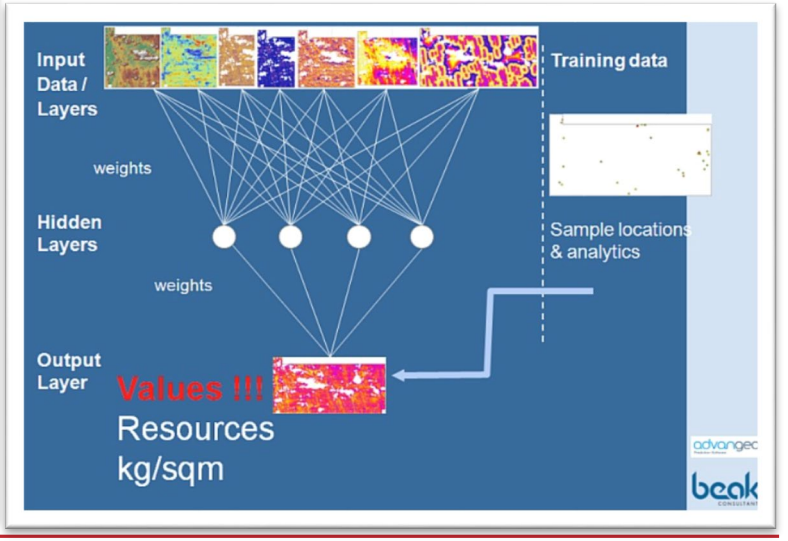
However, in all cases the Geoscientist/Engineer/Qualified Person is responsible for all aspects of the exploration methods used.



Hyperspectral Imaging



Machine Learning



Mineral Exploration BP Guidelines

- The updated Guidelines build upon the information presented in the previous document.

- The 2018 Guideline document is organized to provide guidance in eight areas.

- The areas covered are organized in a logical work flow that is typical of an exploration program.

- The areas covered range from initial planning, through execution, to reporting.

Contents

Mineral Exploration BP Guidelines




- Mineral exploration programs are carried out for a large number of commodities, deposit types, and settings.

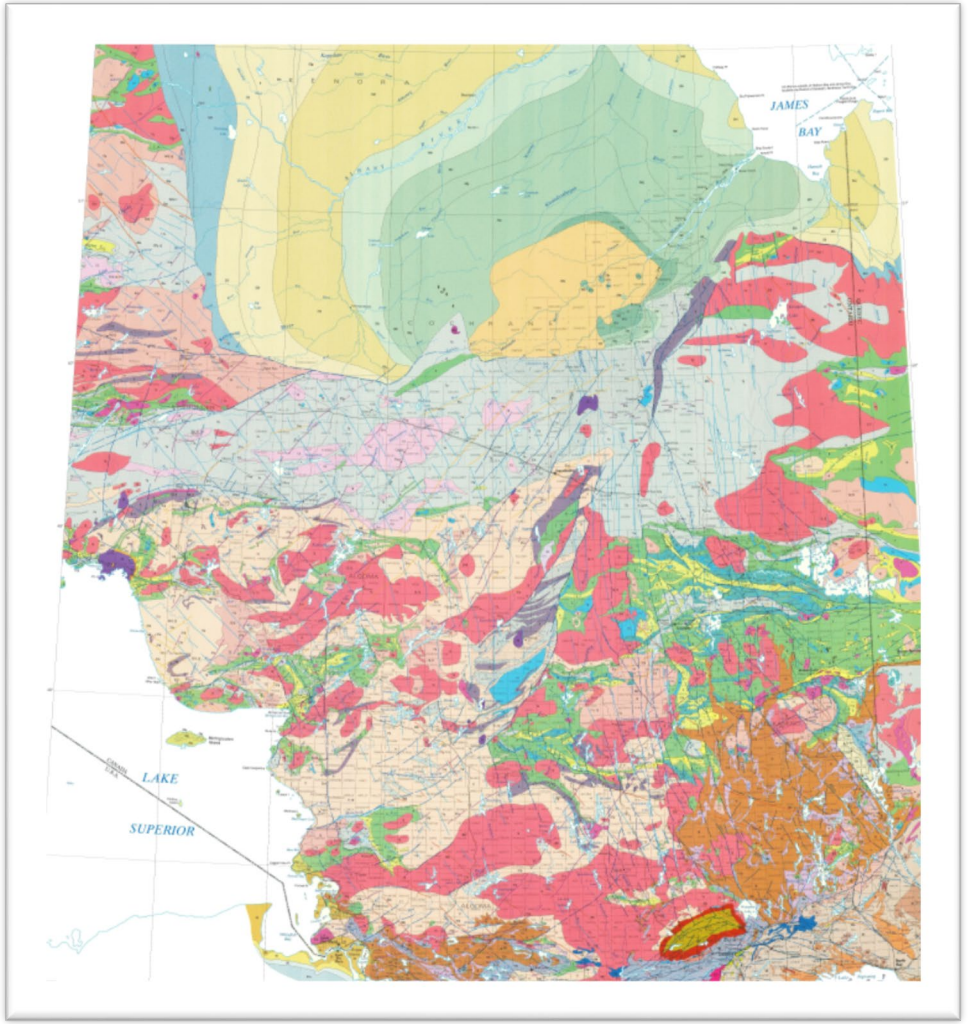
- The document provides high-level, principle-based guidance that is applicable across the spectrum.

Review of Exploration Best Practices Guidelines

Mineral Exploration BP Guidelines

- The content of these Guidelines reflects the collective experience from members of the mineral exploration field.

Geological Surveys-General Guidance

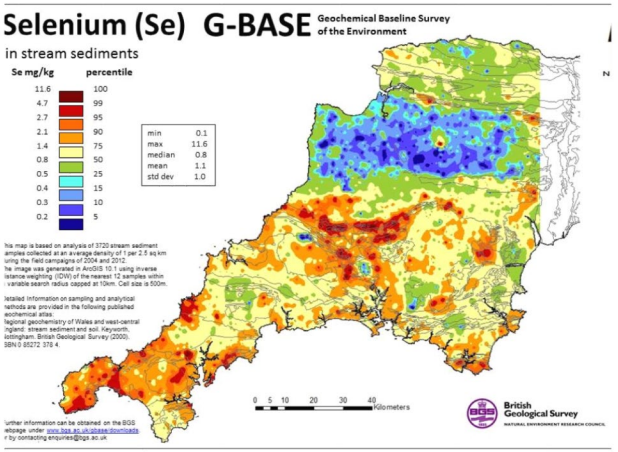


- Descriptions of proper field procedures for preparing geological maps are adequately described in geological mapping manuals and textbooks.
- These documents are readily available from government geological surveys, university and college Earth Science Departments, short courses, or public domain sources.

Geophysical Surveys-General Guidance

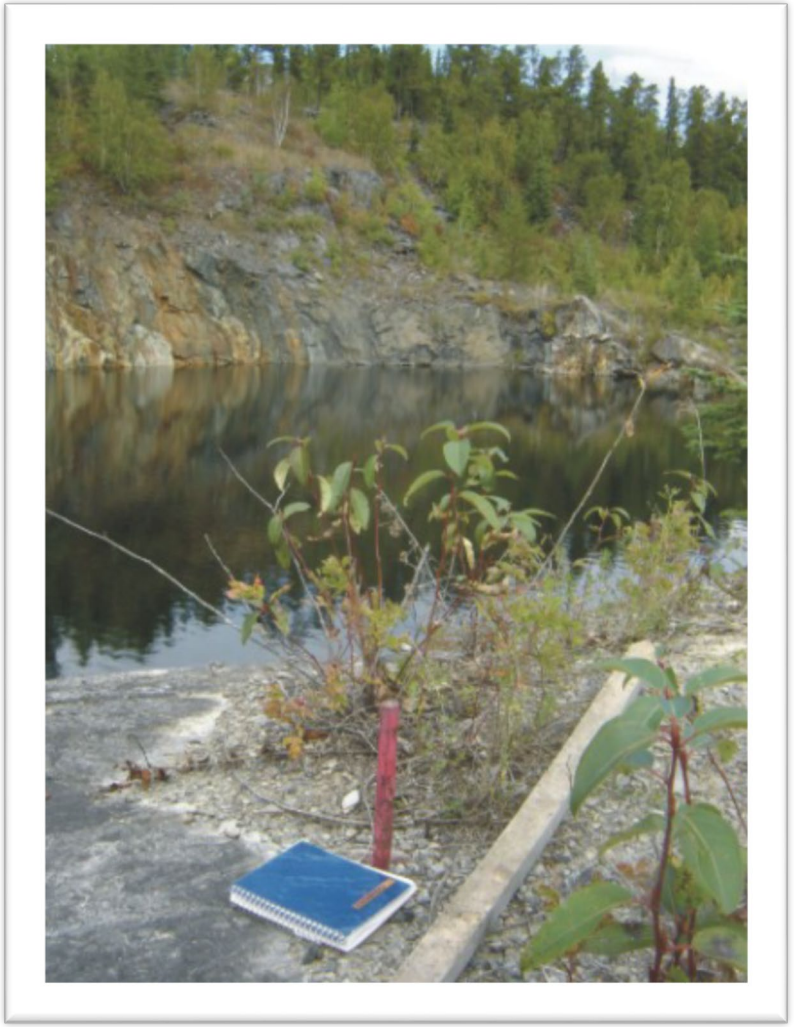
- Many types of geophysical surveys are available for use in a mineral exploration program.
- The geoscientist must have a clear understanding of the geophysical characteristics of the target mineralization.
- The geoscientist should engage a qualified geophysicist for the planning, execution and interpretation of geophysical surveys.
- Each geophysical survey type will have its own set of Best Practices.
- Development of a comprehensive series of geophysical Guidelines was beyond the scope of the current undertaking.

Geochemical Surveys-General Guidance



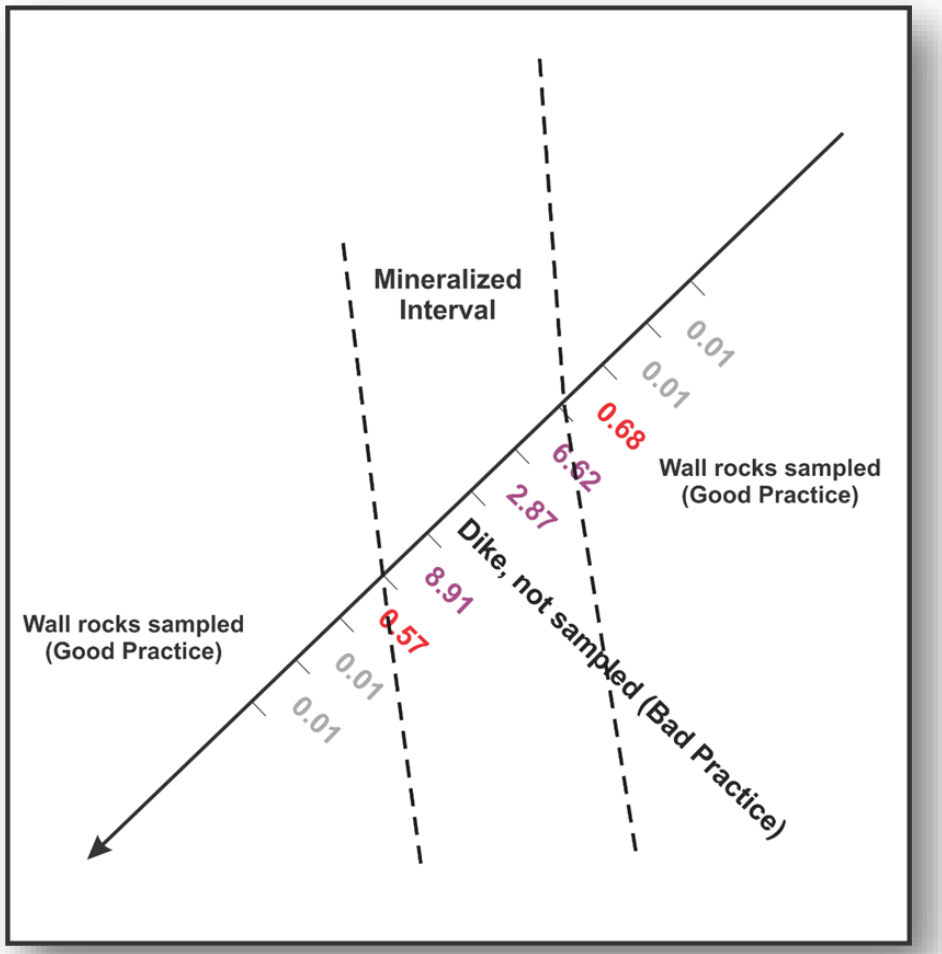
- Geochemical surveys have been used to search for many mineral deposit types and in many terrains.
- Understanding the many survey options and the target deposit type is important for choosing the proper sample medium, spacing, preparation, and analysis.
- The geoscientist should engage a qualified geochemist for the planning, execution and interpretation of geochemical surveys.
- Development of a comprehensive series of geochemical Guidelines was beyond the scope of the current undertaking.

Mineral Exploration BP Guidelines - Examples



- Determination of the surface location of the drill holes by chaining or by use of hand-held GPS units may be appropriate for exploration stage properties.
- These methods may not have the necessary level of accuracy for properties at the discovery or deposit delineation stages.
- Establishing a network of survey control points for properties at the discovery or deposit delineation stages is considered as Best Practice.
- The drill hole collar locations should be determined using survey methods and equipment with a high degree of accuracy and precision.

Mineral Exploration BP Guidelines - Examples



- Drill hole sampling best practices include collecting a sample of all potentially economic mineralization.
- Sample coverage should be continuous across the full width of the mineralized zone.
- Sampling of the adjacent wall rocks to the mineralized zone will be of great benefit at the Mineral Resource estimation stage.

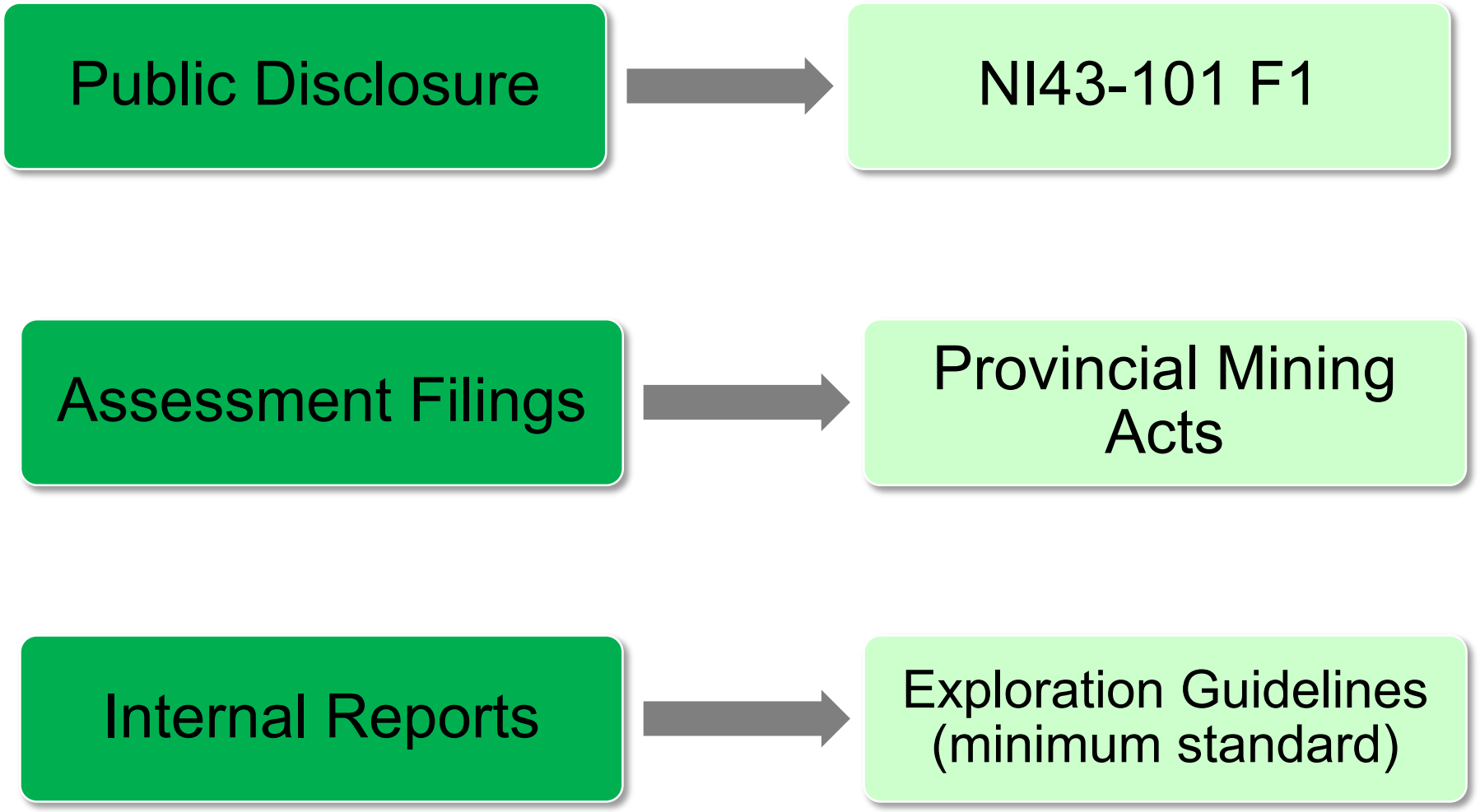
Mineral Exploration BP Guidelines - Examples

- Quality Assurance and Quality Control (QA/QC) procedures extend beyond assays only.
- The procedures include all measurement types, such as the determination of the bulk densities of the mineralized intervals and wall rocks.
- QA/QC procedures can also include the processing, recording and storage of exploration information.

Mineral Exploration BP Guidelines - Examples

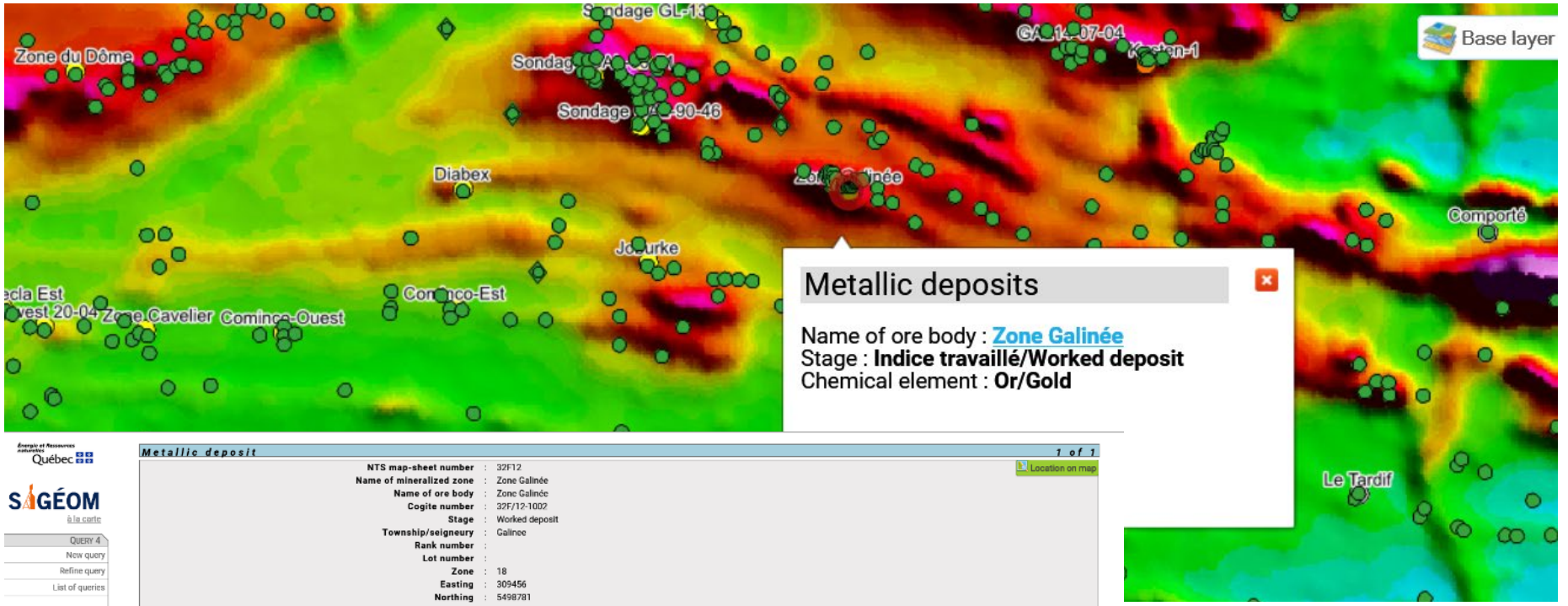
- Drill core and unused sample material is often retained for future reference purposes.
- In some jurisdictions, the ultimate disposition of these materials is not specified.
- In other jurisdictions the ultimate disposition of these materials is governed by local mining statutes.
- Consideration of potential future needs (such as metallurgical, geotechnical, or environmental testing) is recommended.

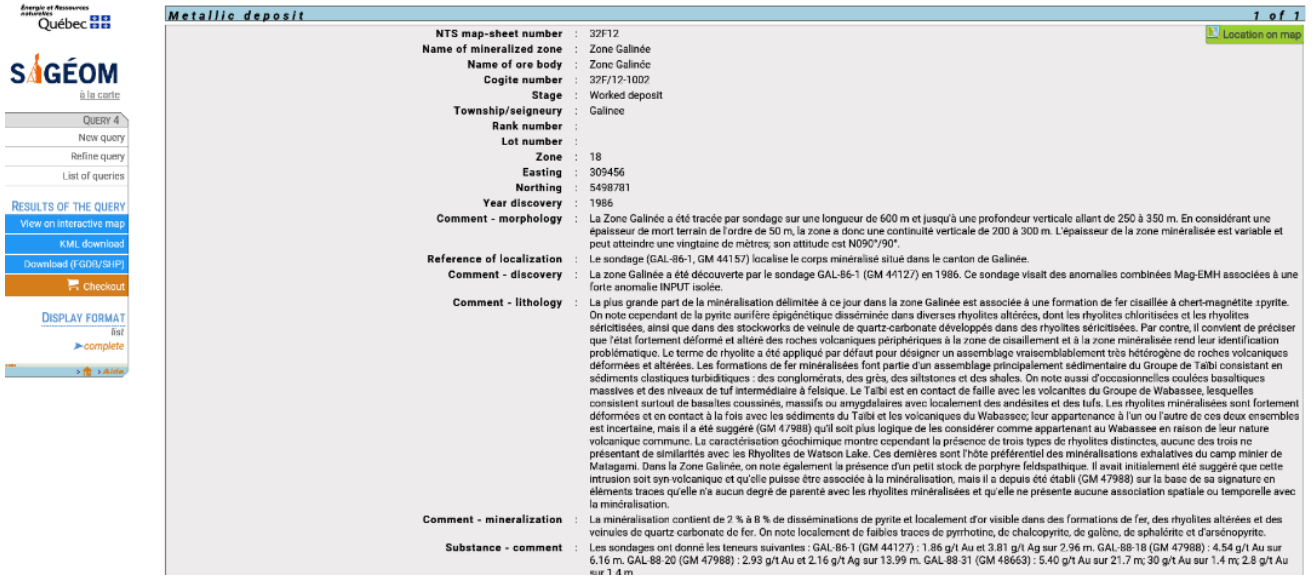
Mineral Exploration Reporting Formats



Closing Thoughts

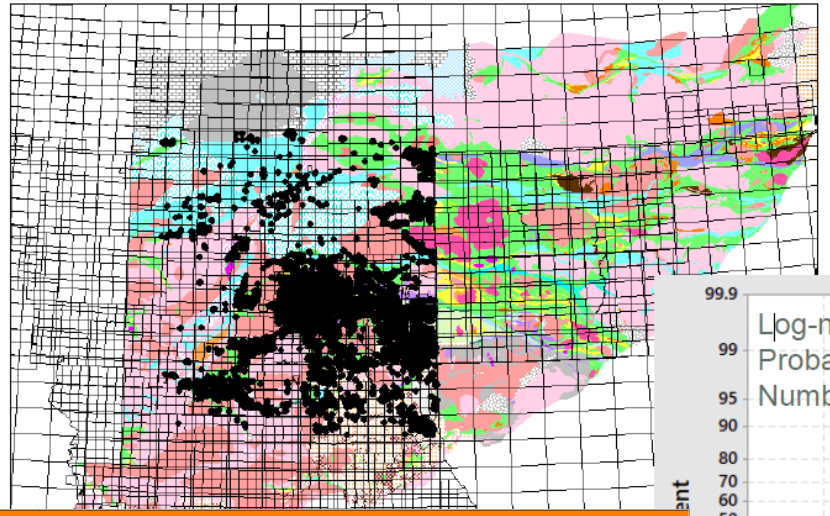
Geoscience Databases - Current



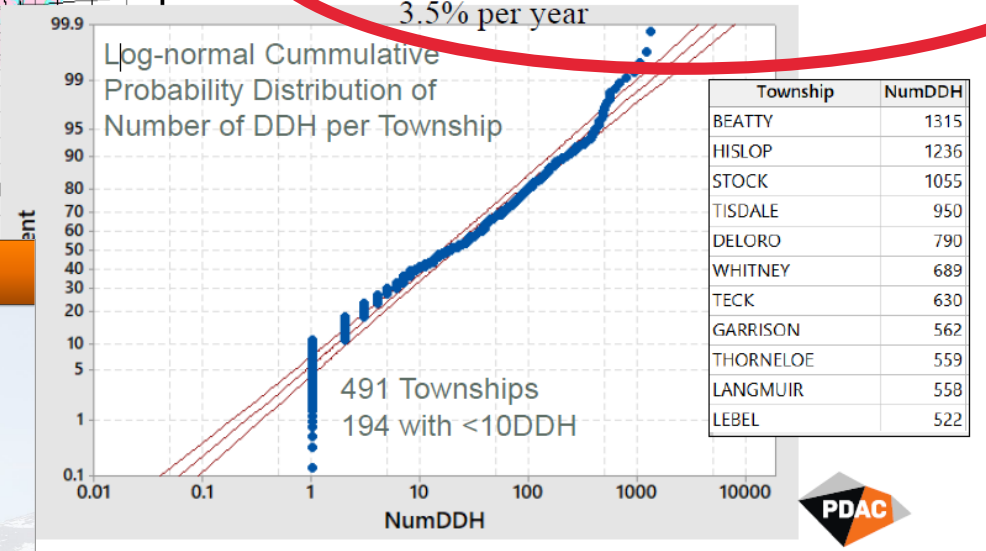


- Canada is one of the countries that collects and maintains publicly available geoscience data. Current databases do not provide for digital information.

The Diamond Drilling Problem



- Up until 2013 5.4M meters drilled (4.9M meters of core) in the 491 townships in Abitibi (Zone17), 15M metres in all of Ontario
- Additional 1.1M meters drilled in Ontario in following 2 years. (we are adding almost half a million meters of drilling per year). Growth of 3.5% per year



Township	NumDDH
BEATTY	1315
HISLOP	1236
STOCK	1055
TISDALE	950
DELORO	790
WHITNEY	689
TECK	630
GARRISON	562
THORNELOE	559
LANGMUIR	558
LEBEL	522

EADDF Team

Members

- **Lead:** Charles Beaudry, Chair of PDAC Geoscience Committee
- **Special Advisor:** Ken Wright, MPH
- **Geology:** Blair Hrabi, Ana Fonseca, SRK
- **Diamond Drilling:** Michael Kociumbas, Vice-President & Corporate Secretary, WGM
- **Geochemistry:** Pim van Geffen, REFLEX Geosciences
- **Geophysics:** Jeremy Brett, Senior Geophysical Consultant, MPH

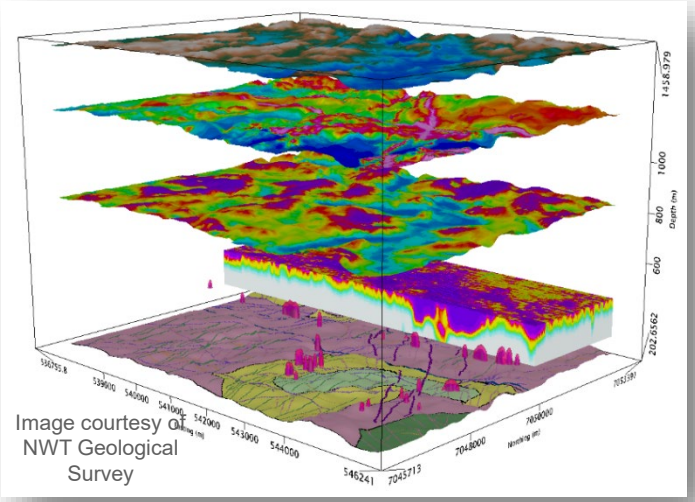
Staff support

- Jeff Killeen, PDAC – Senior Director, Policy & Programs
- Ex-staff Anne Belanger, Nadim Kara and Vida Ramin

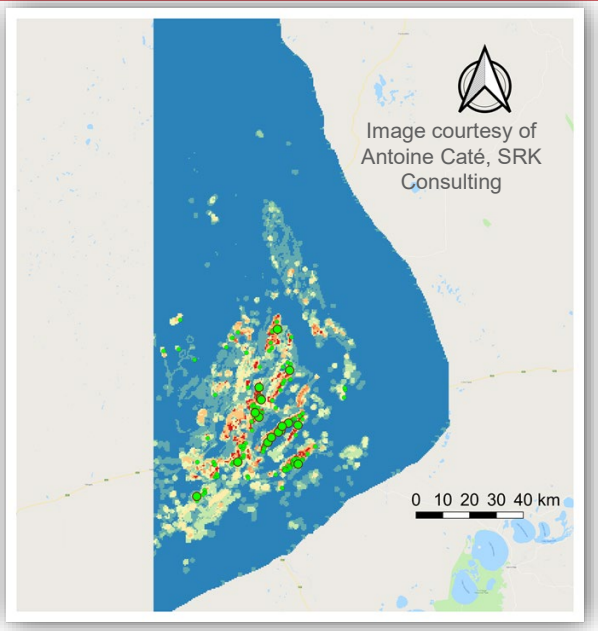
Current Implementations

- BCGS
  - On going implementation. They currently have the ARIS system to upload, store and download digital assessment files (other than pdf's)
  - Developments will include more metadata and a drill hole database.
  - Discussions on going for possible legislative changes to include specific requirements for the submission of digital data in the Mining Act.
- NWT
  - The NWT have initiated a process to implement a standard modeled on EADDF. Initiative has been placed on stand-by or at least slowed down in response to other commitments.
- Quebec
  - The MERN has launched an initiative that is modelled on the EADDF v1.0 and will include loader to bring results in the government database. The objective is to eliminate the current process which requires private contactors to manually capture and compile assessment results.
- Ontario
  - Definitely some interest in this but the launch of MLAS in 2018 has consumed much energy. We expect that 2019 will see some development on this front.

Geoscience Databases – Enhancing the Benefits

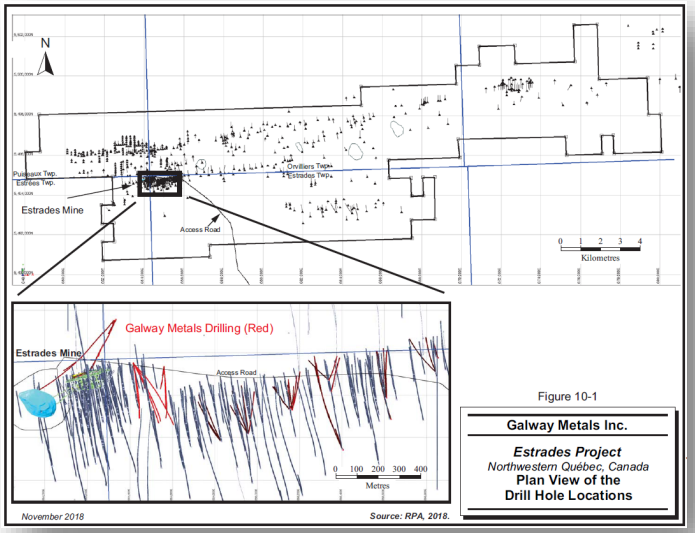


Digital Compilations



Machine Learning-Prospectivity Maps

Digital Drill Hole Data



- The benefits of the geoscience databases to the citizens of Canada can be enhanced by taking the next steps to capture **digital** data.
- Digital data formats will improve the success rate of mineral exploration programs.
- The Mineral Exploration BP Guidelines contribute to this goal.

Questions & Discussion