

# DIGITAL MAPPING TECHNIQUES 2023

The following was presented at DMT'23

May 21 - 24, 2023

The contents of this document are provisional

See Presentations and Proceedings  
from the DMT Meetings (1997-2023)

<http://ngmdb.usgs.gov/info/dmt/>



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Ressources naturelles  
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# Geological Data Flow: from field to publication

Étienne Girard May 22, 2023

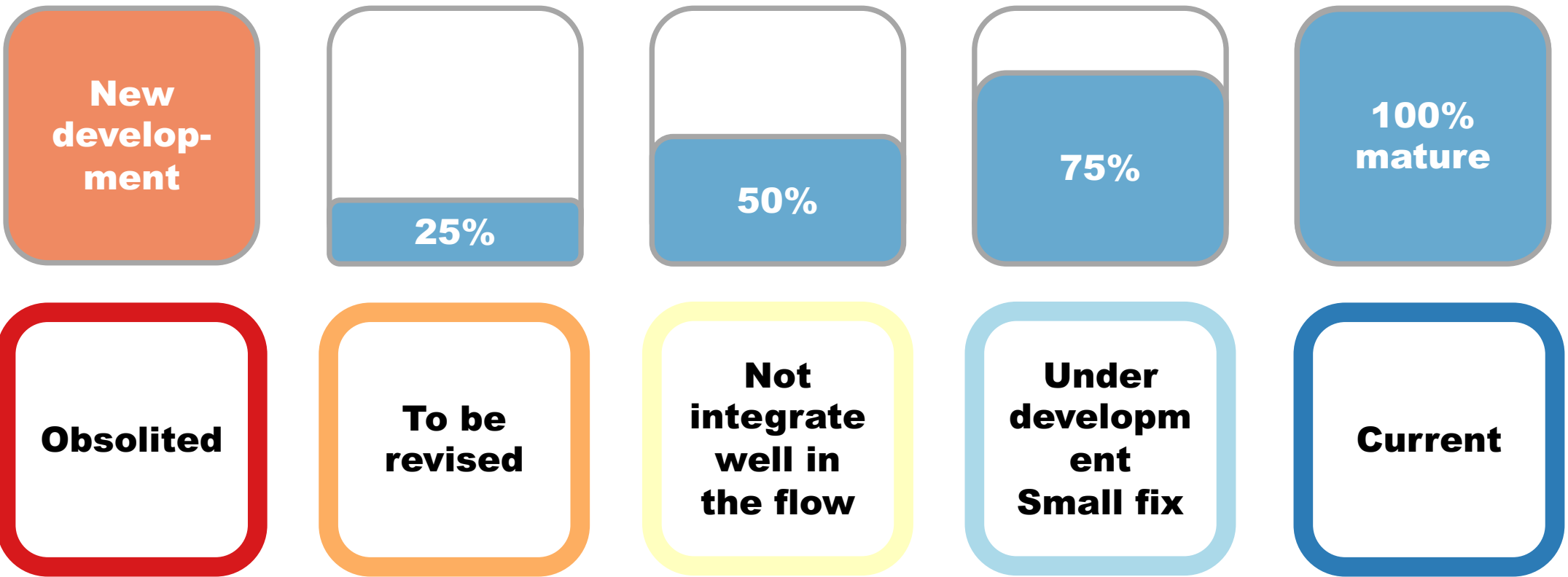
Canada

# Plan

- Context: challenge with maintenance
- Geological Map Flow
  - Acquisition
  - Mapping / interpretation
  - Publishing
- Challenges

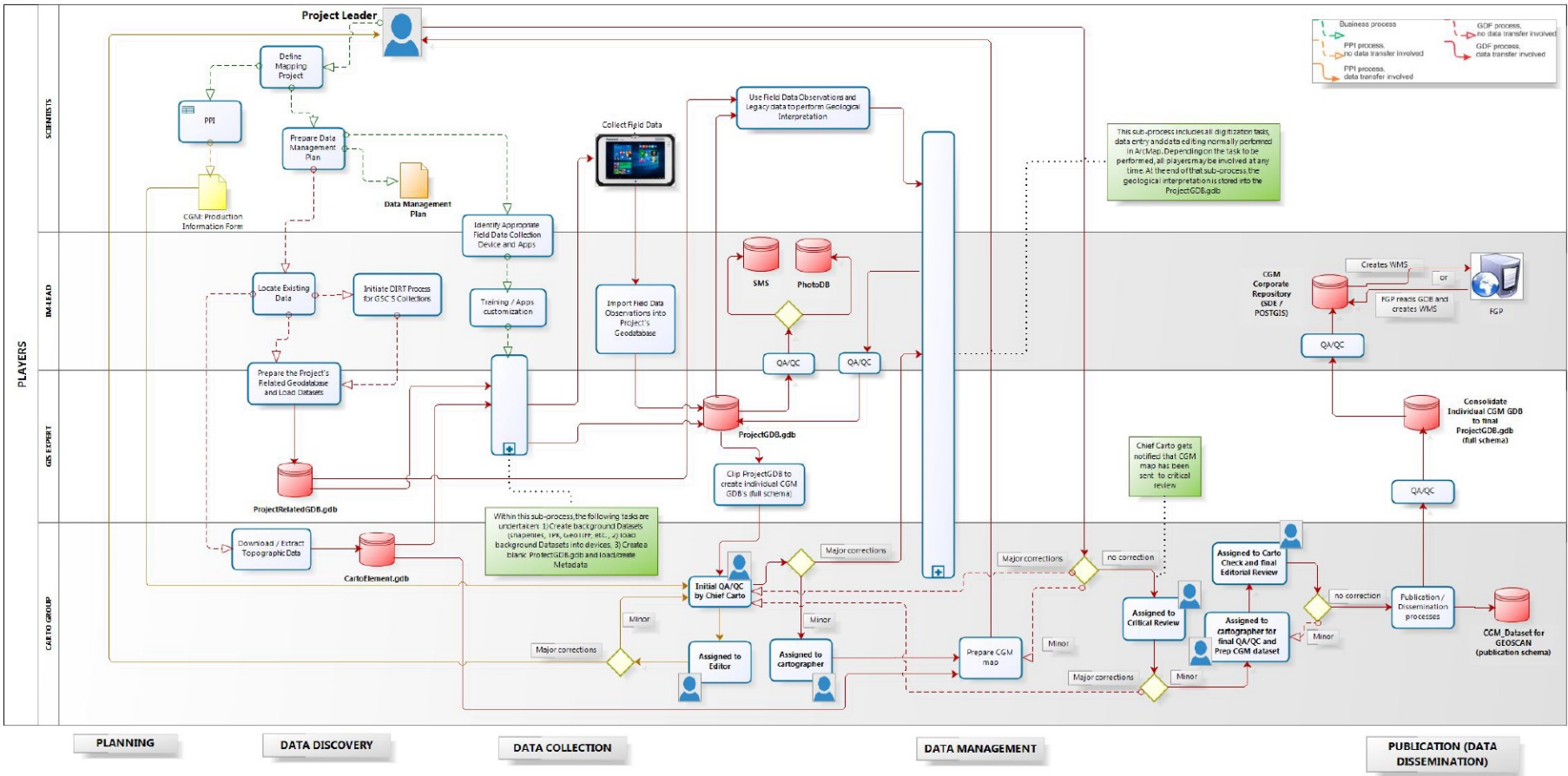


# Level of development and maintenance



[ColorBrewer: Color Advice for Maps \(colorbrewer2.org\)](http://colorbrewer2.org)

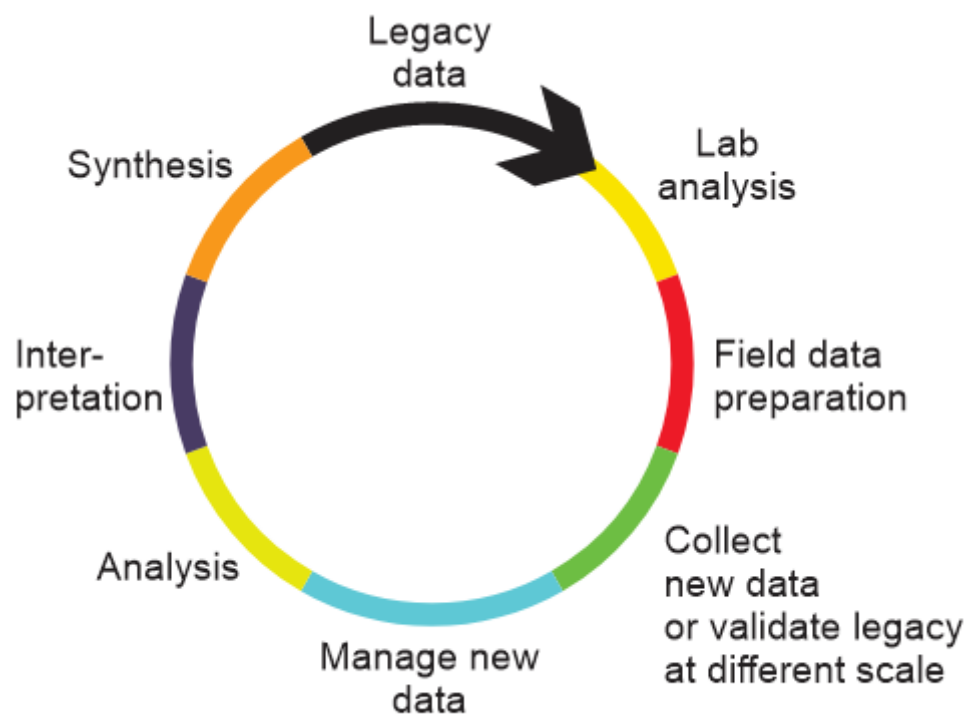
# Geological Data Flow



# Geological Map Flow



# Another way to look at: Geological Data Flow



# Collect new data

## GSC Field App

Windows 10 application

Develop in C#

GeoPackage

TilePackage

Multiple project

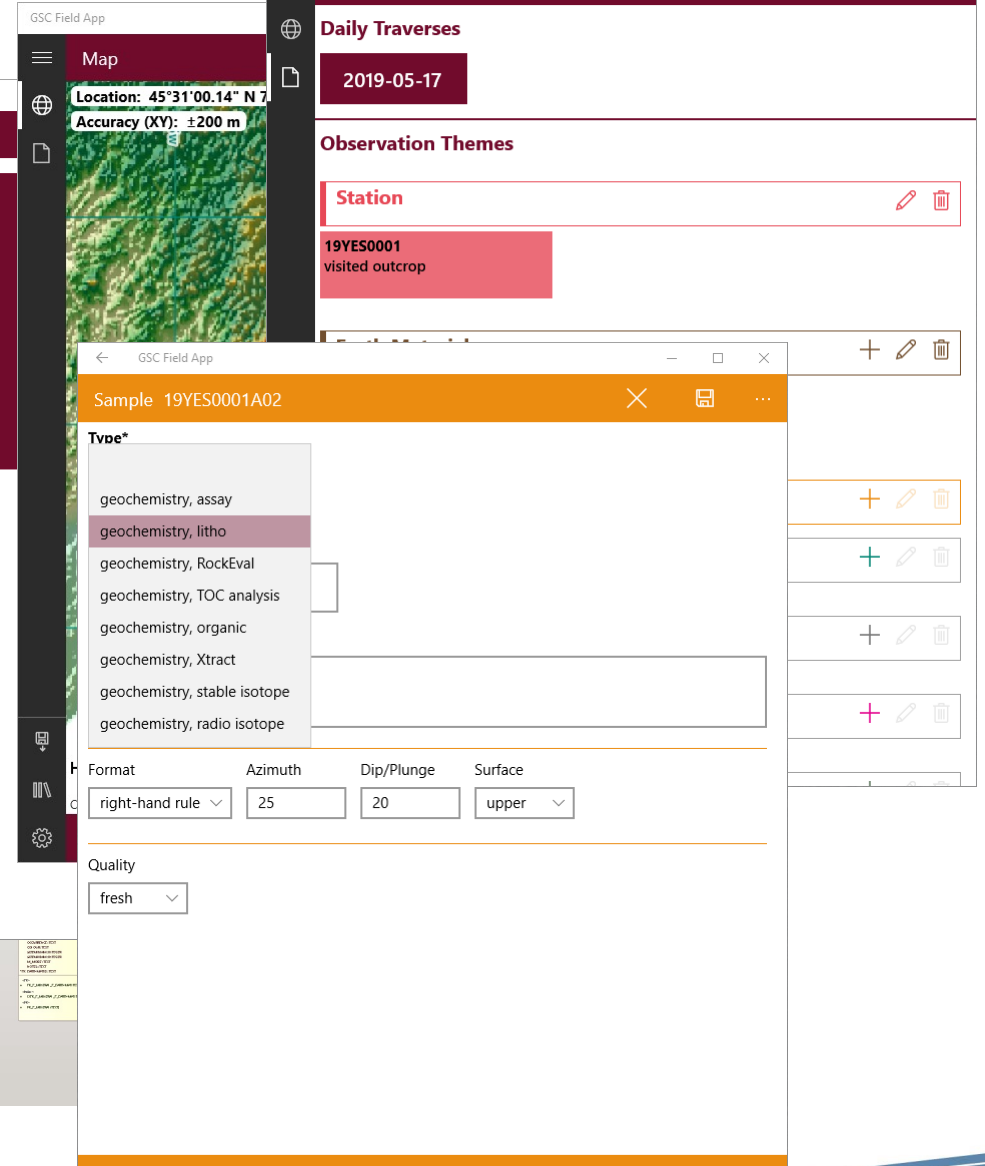
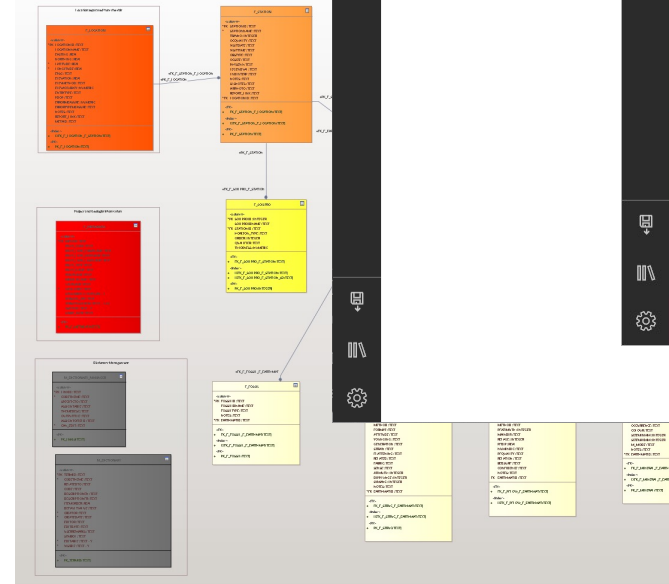
Spatial information

Geologic information

Dictionnaire

100%  
mature

GSCField App (June 18th 2019) version 1.44 in pro  
lien F\_METADATA et F\_STATION



[GitHub - NRCan/GSC-Field-Application-3](https://github.com/NRCan/GSC-Field-Application-3): Geological Survey Canada on site data collection for geologists.



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# Collect new data

## GSC Field App – To be rebuild

Now	Problem	Next step
Windows 10 OS	Windows 11 is not support screen smaller than 9 inch	Android OS
Windows Hardware	Ruggedized is very expensive and it will not be available anymore at smaller than 9 inch	Android ruggedized tablet or Android phone...
GeoPackage 1.3	Not editable in ArcMap	No change will move to ArcPro
Universal Windows Platform (UWP), Visual studio 2016-2023	Only Windows	<a href="#">.Net MAUI and XAML</a> for Android – IOS and Windows...
Tile Package		MBTiles
Esri development (free version)		Not anymore

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[GitHub - NRCAN/GSC-Field-Application-3: Geological Survey Canada on site data collection for geologists.](#)



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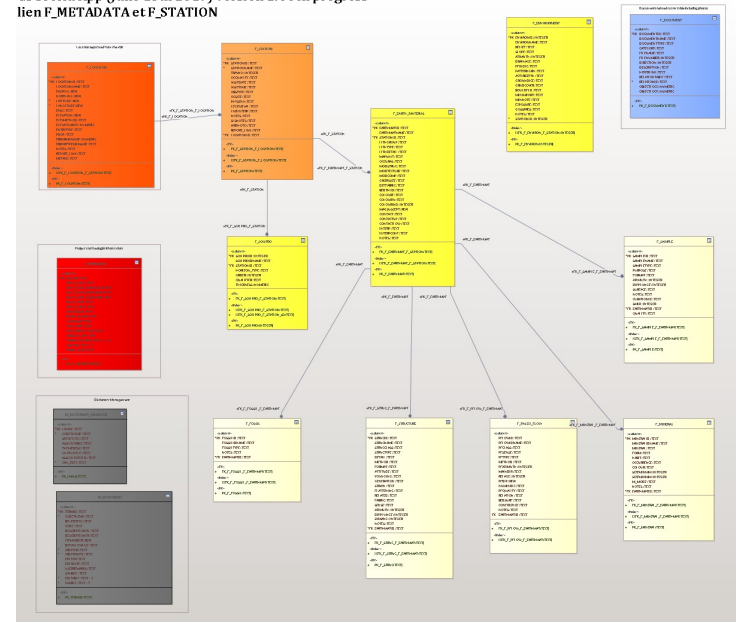
# Collect new data GSC Field App

Why we develop our application

Control of schema and dictionaries

Data will be transfer to other corporate database

GSC Field App (June 18th 2019) version 1.44 in progress  
lien F\_METADATA et F\_STATION



FODR



SMS



Image DB



Project Database



# Collect new data

## Desktop tools

Python script

No interface

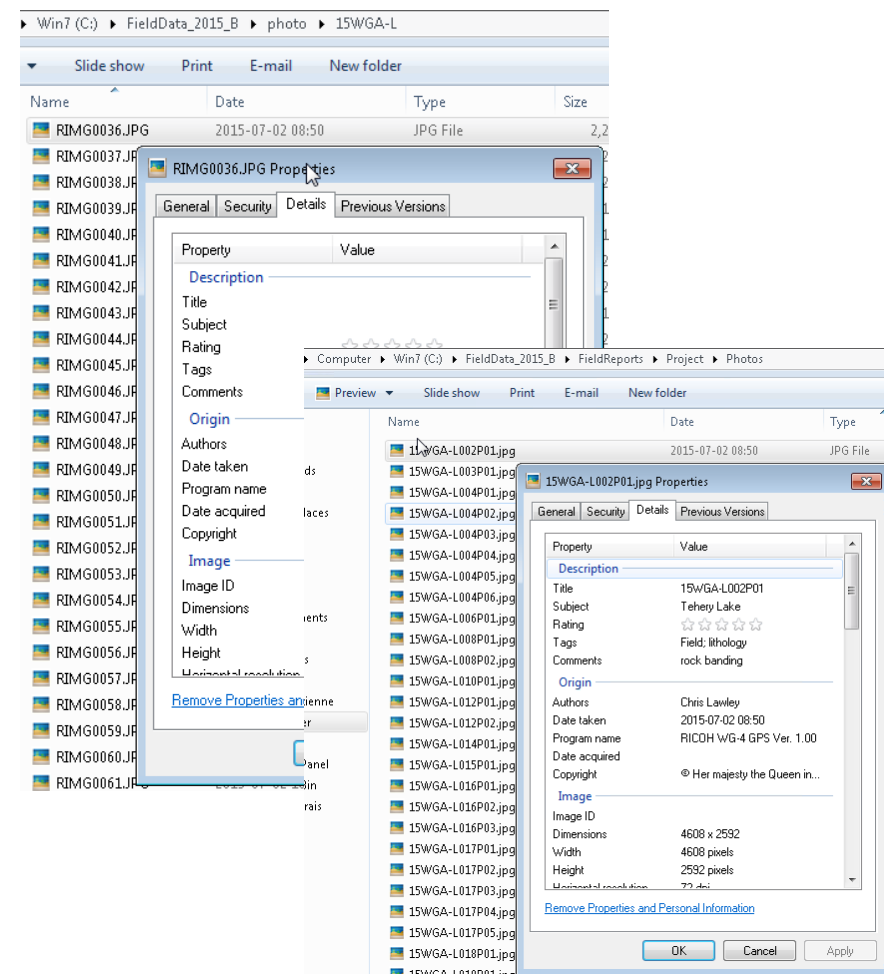
Few parameters

Tools for Exif Header

Metadata to include in photos

Geotag photos

- 1\_Setup.py
- 2\_Add\_Spatialite\_Extension.py
- 3\_Create\_Spatial\_Tables.py
- 4\_Backup\_Photos.py
- 5\_Merge\_Field\_Data.py
- 6\_Rename\_Photos.py
- 7\_Create\_Field\_Reports.py
- 8\_Plan\_Traverse.py
- 9\_Sample\_Reports.py
- 10\_Create\_GoogleEarth\_Report.py
- 11\_Geotag\_Photos.py
- Environment.ini
- Tools to manage data in the field.docx



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# Collect new data UAV



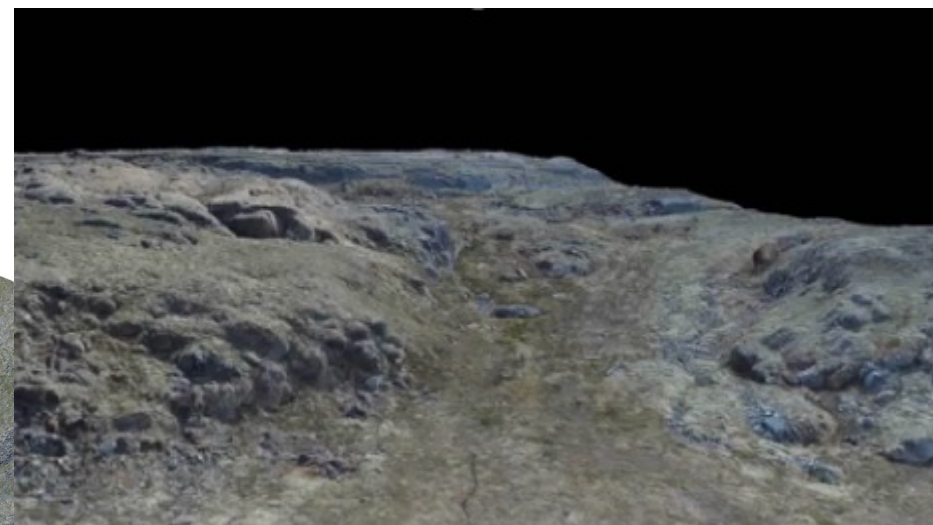
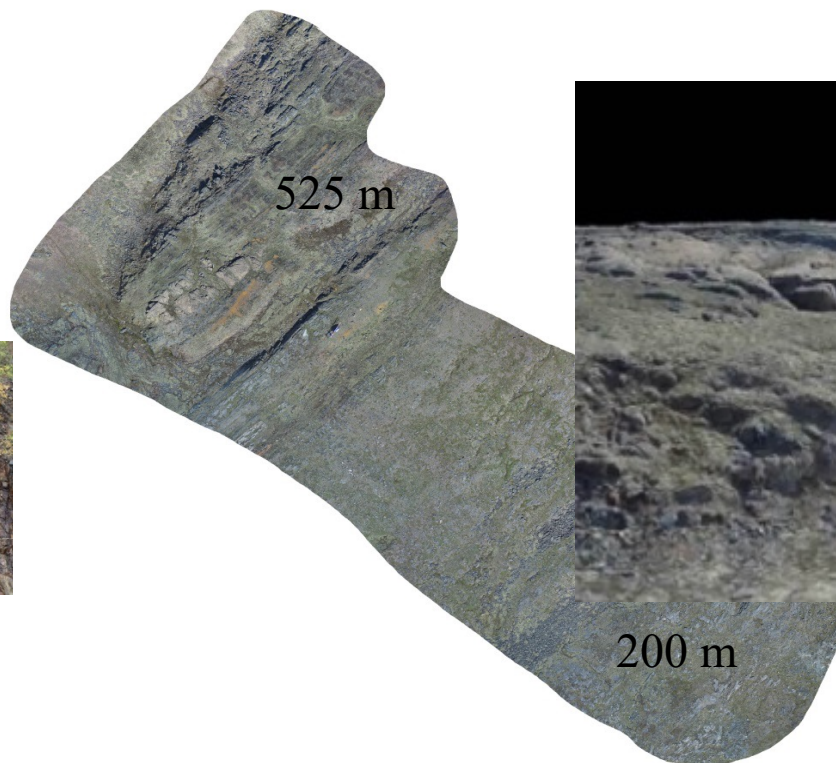
Collect data at another scale

Very high resolution

Derived data

Other sensor (thermal)

Collect water



# Interpretation Surficial

Esri Geodatabase

ArcMap... easy to transfer to ArcPro

Provide with an MXD with template

Scientific Language

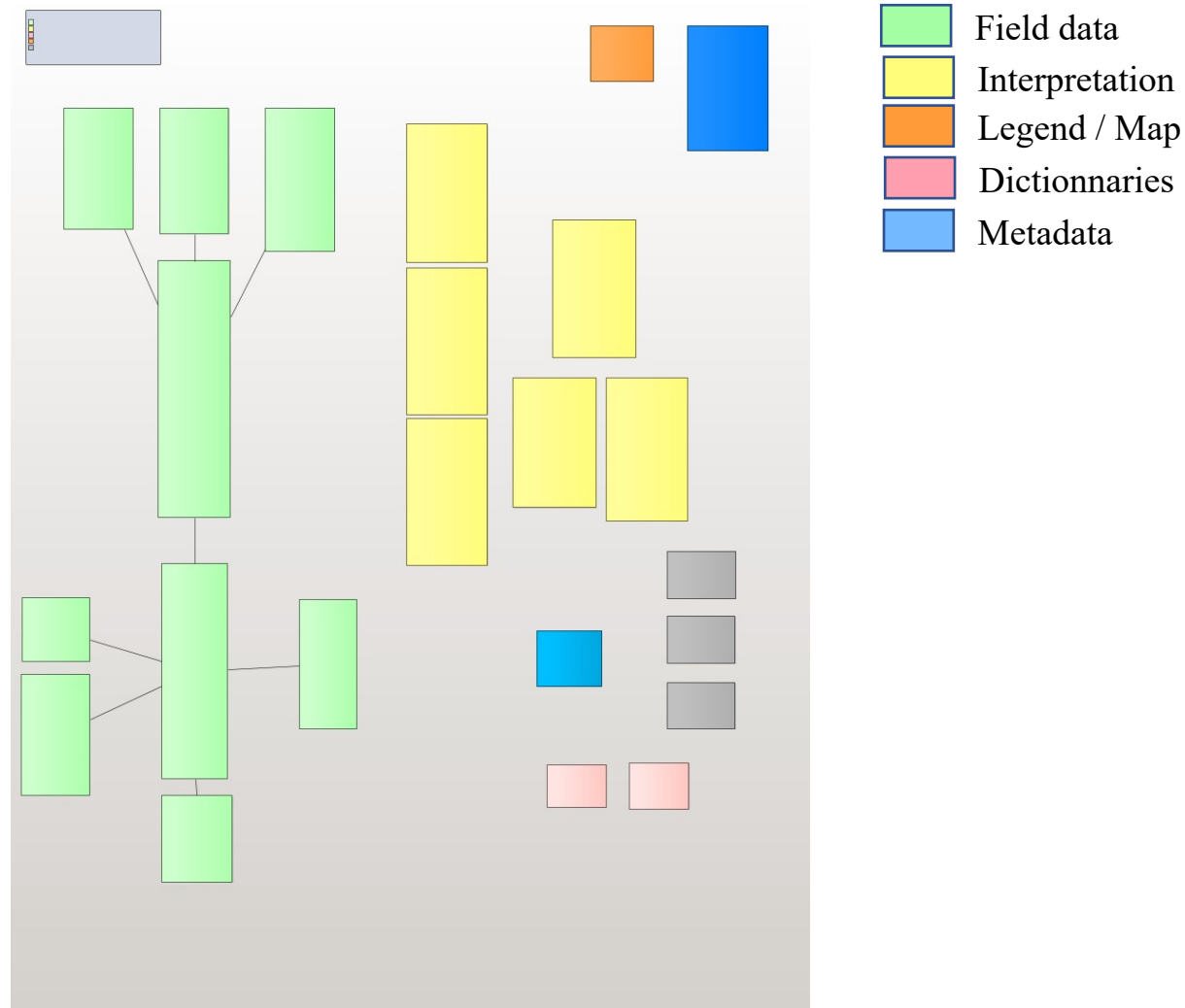
Manage by subtype and domain

Very complex to update

Scientific language is manage in Access database

No tools

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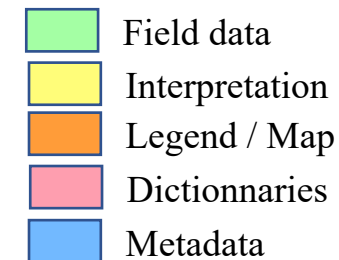
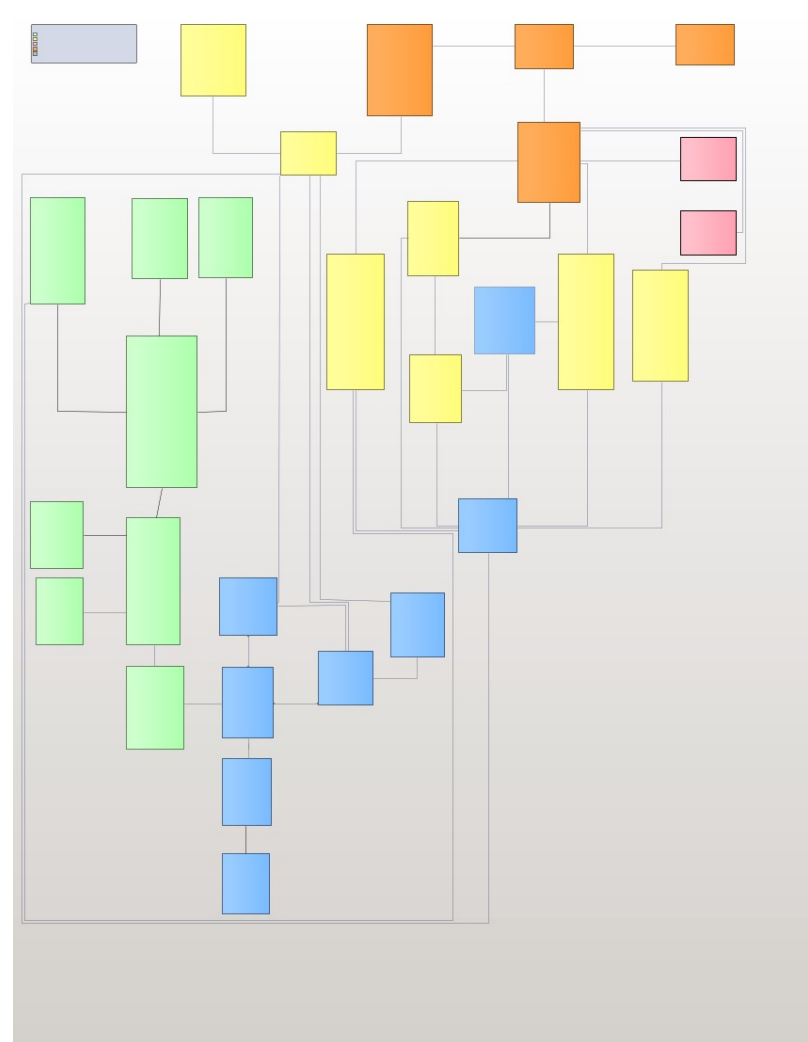
# Interpretation Bedrock

Esri Geodatabase

Good structure

But need tools develop in ArcMap

Very efficient



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# Interpretation Bedrock

Esri Geodatabase

Good structure

But need tools develop in ArcMap

Very efficient

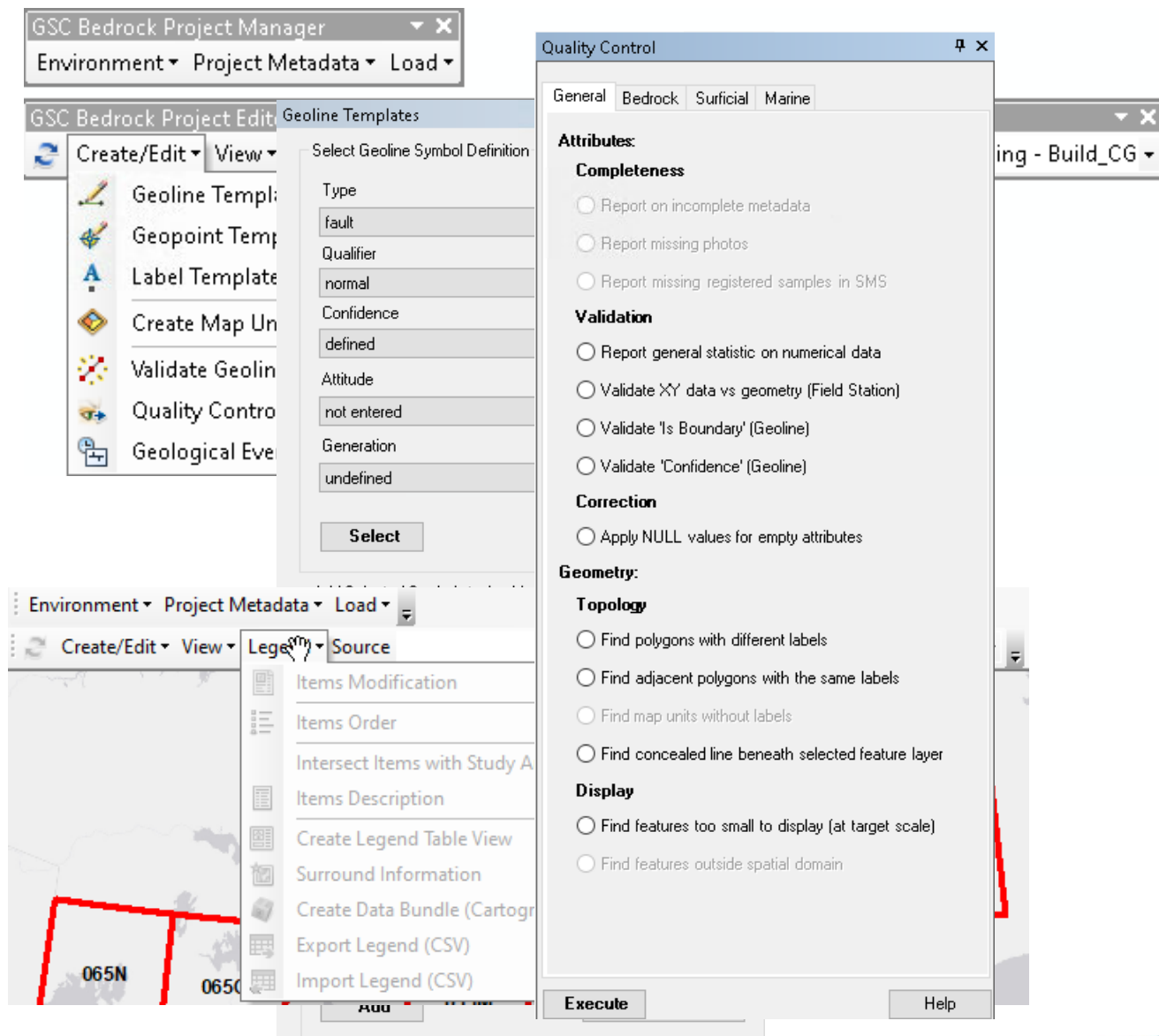
Nice interface

Few QA QC to be done

Scientific language manage with the tools

Not compatible with ArcPro

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# Synthesis

## Legend renderer

Easy to make a legend

Not well integrate in the workflow

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Legend Renderer

Select Legend Table This NOTE legend element is centred on the standard column width and could go on for multiple lines if needed.

Fields \*

Order

Column

Element

Style 1

Style 2

Label 1

Label 1 Style

Label 2

Label 2 Style

Heading

Description

DEM Image in unit boxes.

Auto-calculate number of columns (CGM only)

Start Cancel

Code	Description
<b>CRE TACEOUS</b>	
LOWER CRETACEOUS	
KH	Hassel Formation: sandstone, mudrock, basalt; minor coal
KC	Christopher Formation: silty shale, siltstone
<b>JURASSIC AND CRETACEOUS</b>	
UPPER JURASSIC AND LOWER CRETACEOUS	
JA	Awingak, Deer Bay and Isachsen formations: sandstone, siltstone, shale; minor coal
<b>JURASSIC</b>	
UPPER JURASSIC	
JRl	Ringnes formation: silty shale, siltstone
<b>TRIASSIC AND JURASSIC</b>	
UPPER TRIASSIC TO MIDDLE JURASSIC	
T.Jss	Barrow, Heidberg and Hiccles Cove formations; mainly sandstone; minor siltstone, shale
<b>NEOPROTEROZOIC</b>	
nPF	FRANKLIN DYKE Diabase, gabbro, or olivine gabbro; medium- to coarse-grained; 10-50 m wide; subvertical to steeply dipping.
nPF	Thin unit, defined.
nPF	Thin unit, inferred.

uTuK Barrow, Heidberg, Hiccles Cove, Ringnes, Awingak, Deer Bay and Isachsen formations: Sandstone, siltstone, shale

QUATERNARY



# Surround CGM tools

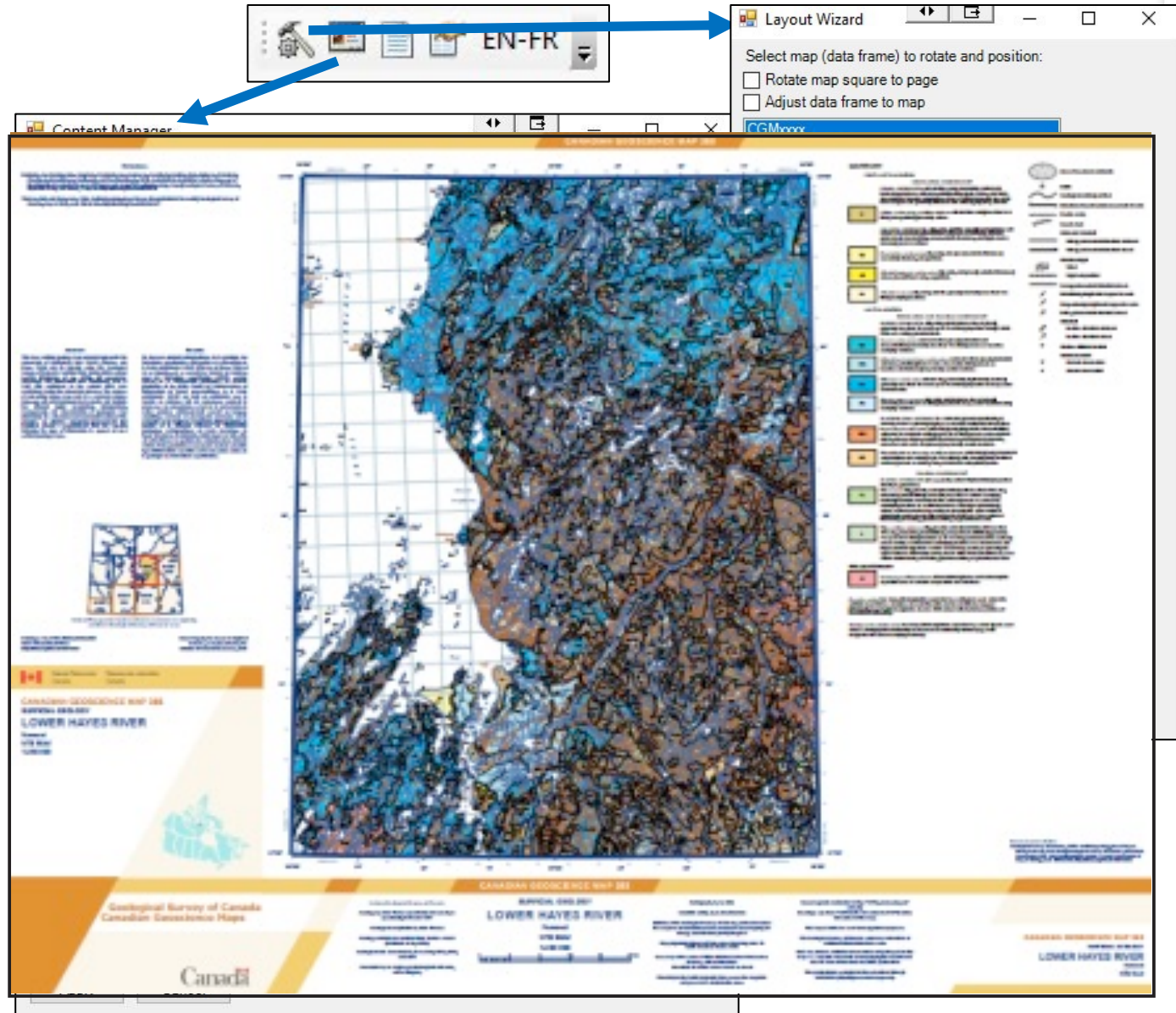
CGM Tools

Create and populate surround information

Integrate in ArcMap

Only in ArcMap...

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# Publishing Dissemination tools

Prepare data to disseminate

Only in ArcMap...

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Disseminate Bedrock Data

Select Database to Process \*

Select Publication XML schema \*

Select Output Folder \*

Map Name \*

Options

Export Field Data

- Stations (F\_STATION)
- Photos and descriptions (F\_PHOTO)
- Lithological Observation (F\_EARTHMAT)
- Mineralisation Alterations (F\_MA)
- Mineral Description (F\_MINERAL)
- Rock Samples (F\_SAMPLE)
- Structural Measurements (F\_STRUC)

Legacy publication?

Replace P\_LEGEND with P\_LEGEND\_GENERATOR?

Run



# Synthesis GSC Metadata Editor

Postgres database

HNAP *Harmonized North American Profile (HNAP) - ISO 19115*

Interface with PHP Runner

Send info to FGP

Send info to Geoscan

Including link to the publish geodatabase and shapefile

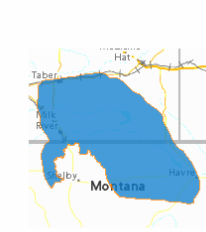
Quick metadata filter

Metadata ownership	Office	Data domain	Metadata status	Metadata compliance	FGP publication Status	GIN publication status
All	All	All	All	All	All	All

1 of 208 page(s)

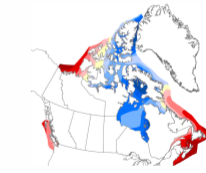
Enregistrement de métadonnées — Metadata Record

Dataset title	Key aquifers of Canada					
Titre jeu de données	Principaux aquifères du Canada					
Manage metadata	Show complete metadata and Manage ownership, thumbnail, contacts, keywords, lineage, quality and access Change ownership of the metadata					Edit General MD: Duplicate: Delete: Export Text:
View metadata	XML NAP/HNAP output: <a href="#">XML(en)</a>   <a href="#">XML(fr)</a> HTML output: <a href="#">HTML(en)</a>   <a href="#">HTML(fr)</a>					View 2 comment(s):
Metadata UUID	5f130a20-123a-11de-8c30-0800200c9a66					
Compliance with GSC metadata profile	Compliance assessment based on the GSC Metadata Profile General Metadata Group: <span style="color: green;">█</span> Thumbnail: <span style="color: green;">█</span> Contacts: <span style="color: green;">█</span> Keywords: <span style="color: green;">█</span> Assoc.: <span style="color: green;">█</span> Lineage: <span style="color: green;">█</span> Quality: <span style="color: green;">█</span> Data Acc.: <span style="color: green;">█</span>					
Metadata publication	Request for publication of metadata completed for FGP or GIN		Edit FGP and GIN Publication Status: <span style="color: green;">+fgp</span>		FGP and GIN status: <span style="color: red;">FGP !!</span> <span style="color: grey;">GIN -</span>	



Enregistrement de métadonnées — Metadata Record

Dataset title	Projected Relative Mean Sea-level Change for the Coastal Regions of Canada (PDF)					
Titre jeu de données	Évolution projetée du niveau relatif moyen de la mer pour les régions côtières du Canada (PDF)					
Manage metadata	Show complete metadata and Manage ownership, thumbnail, contacts, keywords, lineage, quality and access Change ownership of the metadata					Edit General MD: Duplicate: Delete: Export Text:
View metadata	XML NAP/HNAP output: <a href="#">XML(en)</a>   <a href="#">XML(fr)</a> HTML output: <a href="#">HTML(en)</a>   <a href="#">HTML(fr)</a>					View 2 comment(s):
Metadata UUID	8c4e8f29-5a58-2f6f-9aa3-a823c0852b1d					
Compliance with GSC metadata profile	Compliance assessment based on the GSC Metadata Profile General Metadata Group: <span style="color: yellow;">█</span> Thumbnail: <span style="color: green;">█</span> Contacts: <span style="color: green;">█</span> Keywords: <span style="color: green;">█</span> Assoc.: <span style="color: green;">█</span> Lineage: <span style="color: green;">█</span> Quality: <span style="color: green;">█</span> Data Acc.: <span style="color: red;">█</span>					
Metadata publication	⚠ The General metadata group is compliant but some content is incomplete. Please review before requesting publication to FGP or GIN. To publish on FGP / GIN, please add GSC keywords profiles, data access options.					



FGP

Geoscan

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# Following publication

## Publication Management Tool (PMT)

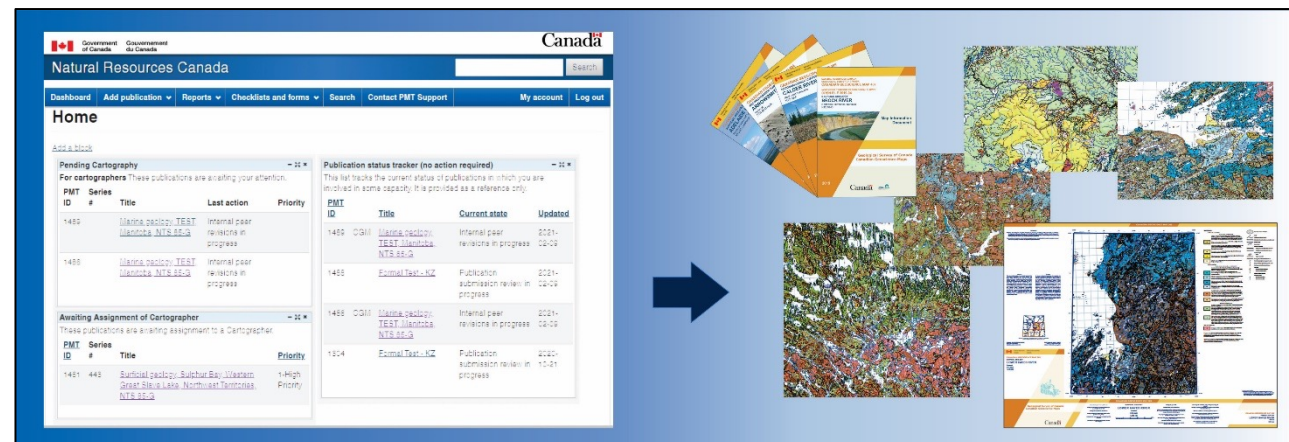
### Purpose

- To track the Canadian Geoscience Map (CGM) through the publication process
- Allows easy access and sharing of publication information
- Expedites approval process for managers
- Facilitates flagging any sensitive information to upper management, Intellectual Property Advisors, as well as Communications and Portfolio Sector Advisors

### Functionalities

- Easy to use, web-based, native support of English (French coming)
- Enter, upload, and update publication information
- Searches based on various filters, export a CSV file with results
- Workflow tracking through dashboard
- Access to the publications full workflow history
- Website support through an integrated ticketing system
- Automatic email notifications and reminder

100%  
mat



Not well implemented in the workflow

External development - \$\$\$

Develop with Drupal 7 – update to Drupal 9 is hard...  
and now 10 (easier from 9)

# Manage at all step: Data Management Plan

Postgres database

Interface with PHP Runner

Read from Geoscan for publication

Under integration at the beginning of the process of a project proposal



**GSC DMP Tool**  
Build your Data Management Plan

Project Summary | Study Area | Publications | Field Work | Sampling Campaigns and Samples | Lab Analysis | Geospatial Data  
 General Datasets | Geodata Management | Data Sharing | Storage and Archives | Data Responsibilities | Data Integrity | Legal Compliance  
 Training Needs | Management pages ▼

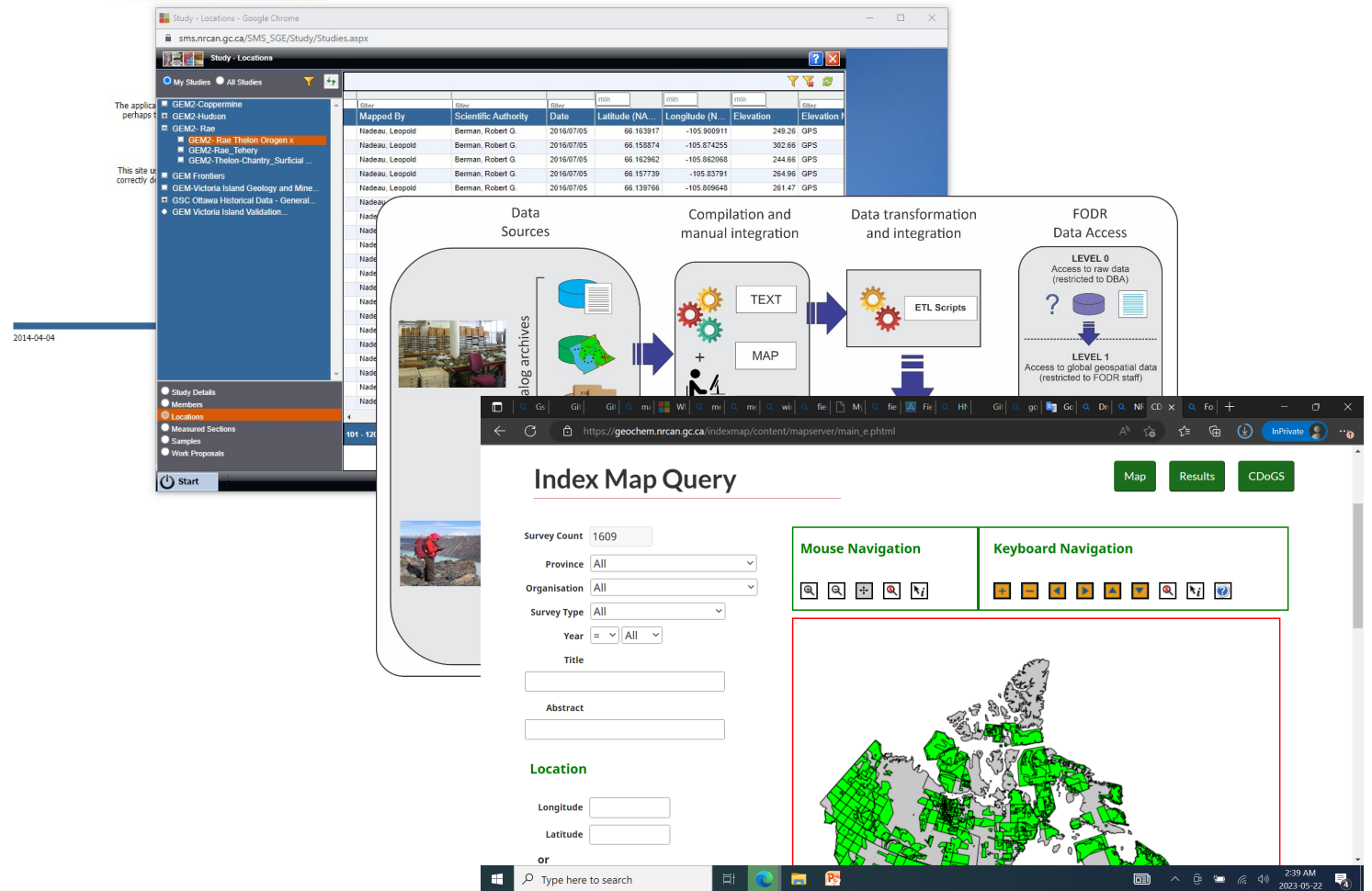
- Project Summary**: General information about the projects. EGP Program | GGP Program | GEM Program | TGI Program | Critical Minerals Program
- Study Area**: List, description and location of related studies areas for the project. Contextual information for the DMP.
- Publications**: List, description, status and access to publications related to the project.
- Field Work**: List, description, planning, location and status of field work activities. Status and management of field observation data and photos.
- Sampling Campaigns and Samples**: List, description, planning, location and status of sampling campaigns. Status and management of sample data.
- Lab Analysis**: List, description, planning, and status of laboratory analysis and its associated data.
- Geospatial Data**: List, description, planning, location and status of geospatial datasets related to the project.
- General Datasets**: List, description, planning and status of general datasets and analytical results related to the project.
- Geodata Management**: General geospatial data production and management requirements for the project.
- Data Sharing**: Data sharing strategy and listing of data formats for the project.
- Storage and Archives**: Data storage and archiving plan. Samples storage and conservation considerations.
- Data Responsibilities**: Current and post-project data management responsibilities.
- Data Integrity**: Data integrity and data loss risk assessment for the project.
- Legal Compliance**: Confidentiality and legal considerations for the data related to the project.
- Training**: Identification of training requirements related to data collection, production and management related to the project.
- User Access**: Grant create and edit rights to additional users for a specific project. Only the original owner of a project can perform this action.





# Other databases

- Sample Management System / SAMS
  - Oracle database
- Image DataBase
  - Oracle Database -> Postgres database
  - No interface
- Field Observation Data Repository
  - Postgres database / PHP runner
- [CDoGS - Geochem Database](#)
  - Access database
- Geochron Database
  - FoxPro database
- [Link to database for external](#)



The image shows a screenshot of the SAMS web application interface. The main window displays a table of study locations with columns for Mapped By, Scientific Authority, Date, Latitude (NA), Longitude (N), Elevation, and GPS. The table contains several rows of data, including entries for Leopold Berman and Robert G. Berman. A sidebar on the left shows a navigation menu with options like 'My Studies', 'Locations', 'Measured Sections', 'Samples', and 'Work Proposals'. Below the table, there is a diagram illustrating the data flow process: 'Data Sources' (including 'log archives') feed into 'Compilation and manual integration' (involving 'TEXT' and 'MAP' files), which then leads to 'Data transformation and integration' (using 'ETL Scripts'), and finally to 'FODR Data Access' (providing 'LEVEL 0' and 'LEVEL 1' access to raw and global geospatial data). The bottom part of the screenshot shows a browser window displaying the 'Index Map Query' page, which includes search filters for Survey Count, Province, Organisation, Survey Type, Year, Title, Abstract, and Location (Longitude, Latitude), along with a map of Canada showing green highlighted areas.

# Challenges with old projects

- Tools development
  - Software reliance
- OS change
  - Windows 11 and 9 inch screen to collect field data
- Go to Open software
  - Willingness to use open software
  - Real problem is more the data format
- Go to Open data
  - Real challenge is the schema and metadata
- Go to Cloud
  - New approach to manage and deliver data
    - Not a big hard drive
    - How to integrate those new tools available through the cloud



# Challenges with old projects

- Tools development
  - Software reliance
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  - Windows 11 and 9 inch screen to collect field data
- Go to Open software
  - Willingness to use open software
- Go to Open data
  - Real challenge is the format, schema and metadata
- Go to Cloud
  - New approach to manage and deliver data maybe
    - Not a big hard drive
    - How to integrate those new tools available through the cloud





# Challenges in a new environment

- **New Political Relationship**
  - **Provinces and Territories (Partner and Sample already collected)**
  - **Indigenous group (Partner, Field and Sample already collected)**
- **New Security Policy**
  - **“Software” Development must follow strics rules (paper more)**
- **FAIR**
  - **Findable, Accessible, Interoperable and Reusable**



# Canada

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