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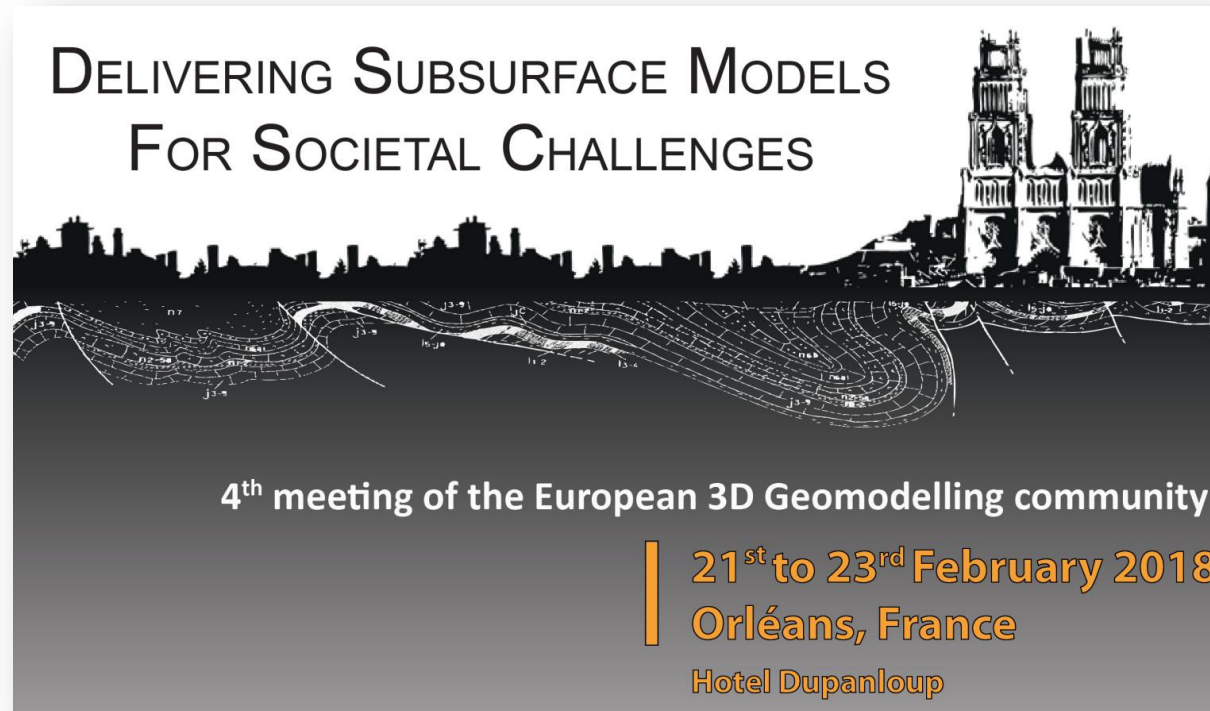


Setting interoperability between BIM and Geomodelling

106th OGC Technical Committee, GeoScience DWG session
Orléans, France

Mickaël Beaufils (BRGM), on behalf of the UC8-GT team
22 March 2018

Foreword



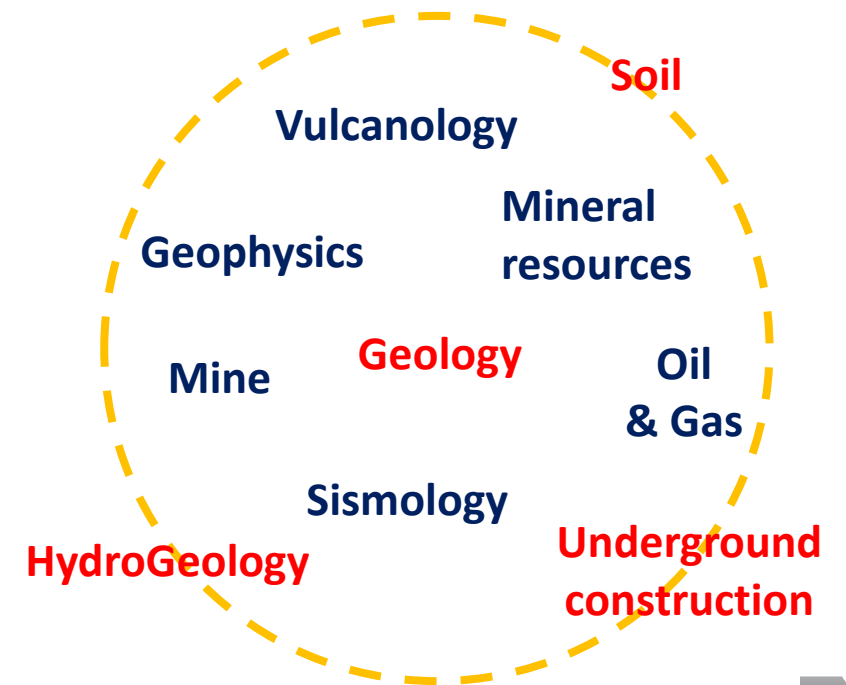
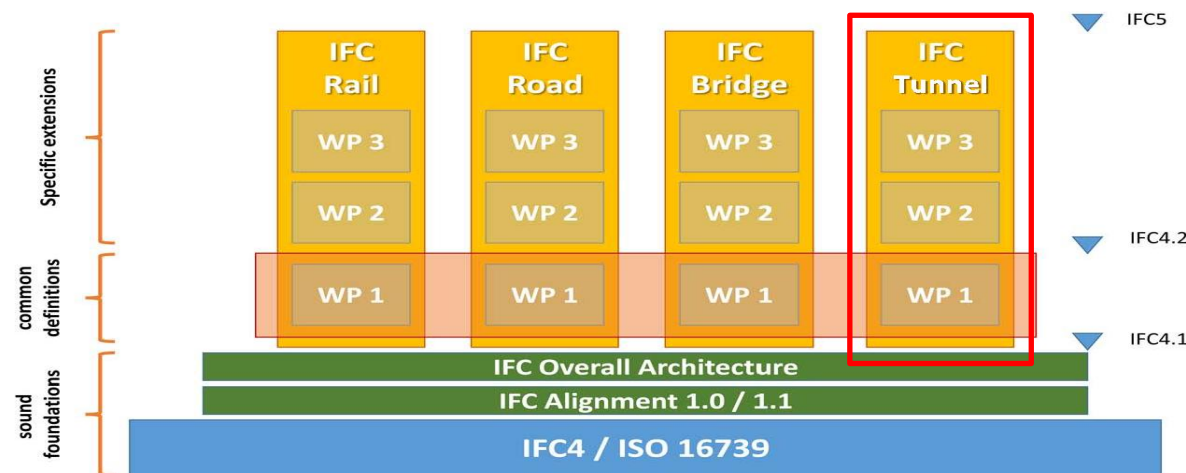
Building Information Modeling (BIM) is a hot topic
Connection to BIM is part of geological surveys strategy

How to do that connection?

- › Interoperable Information Model for Sustainable Infrastructures
- › A French collaborative program to extend BIM methods and standards from building to infrastructure modeling
 - 67 partners
 - Several use cases (type of infra) and themes (cross-domain)

› Objectives

- Propose extensions to bSI and OGC standards
- Set Memorandums of Understanding: MIN^ND-bSI / MIN^ND-OGC
- ISO/CEN Normalization



- › Use Case dedicated to Underground Infrastructure modeling
- › 18 month project: June 2017 – September 2018

› 14 partners :



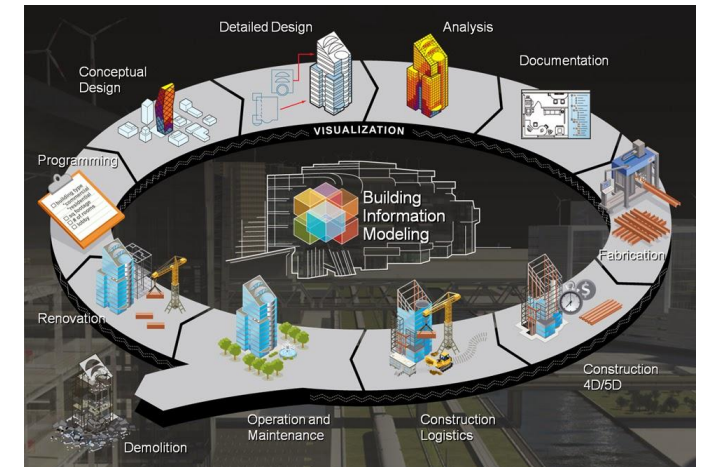
› 2 groups :

- Group GC : Building part modeling
- Group GT : Environmental part modeling

› UC8-GT : First tentative in MIN^ND to study geomodelling connection with BIM

› Building Information Modeling is a philosophy

- It is about having a model that mimic the real building / infrastructure at each moment of its life



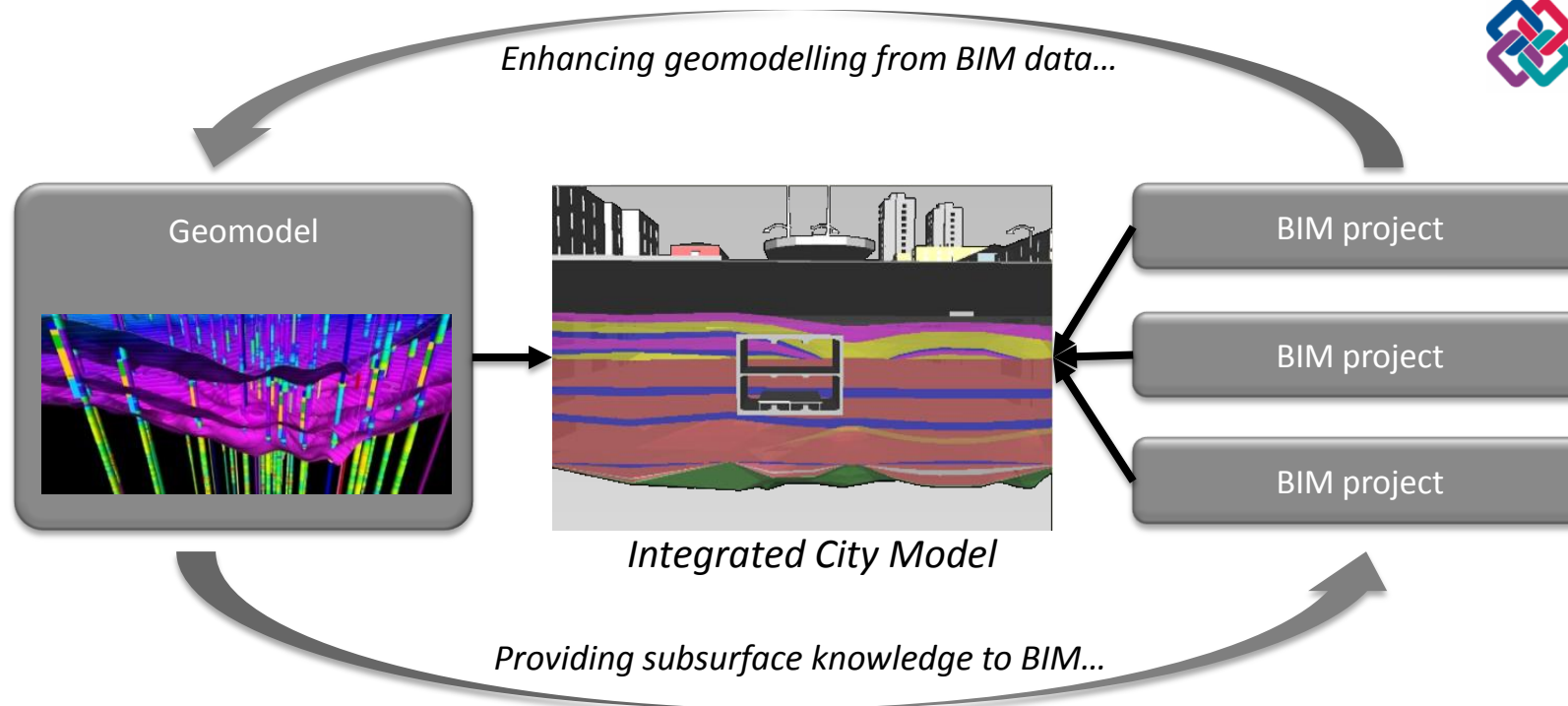
› Applying BIM philosophy to geomodelling

- It is about building an interoperable information system able to store / provide / link geoscience data and results
- To indicate on which data and interpretation infrastructure are built

› Key challenges are information description, lineage and update

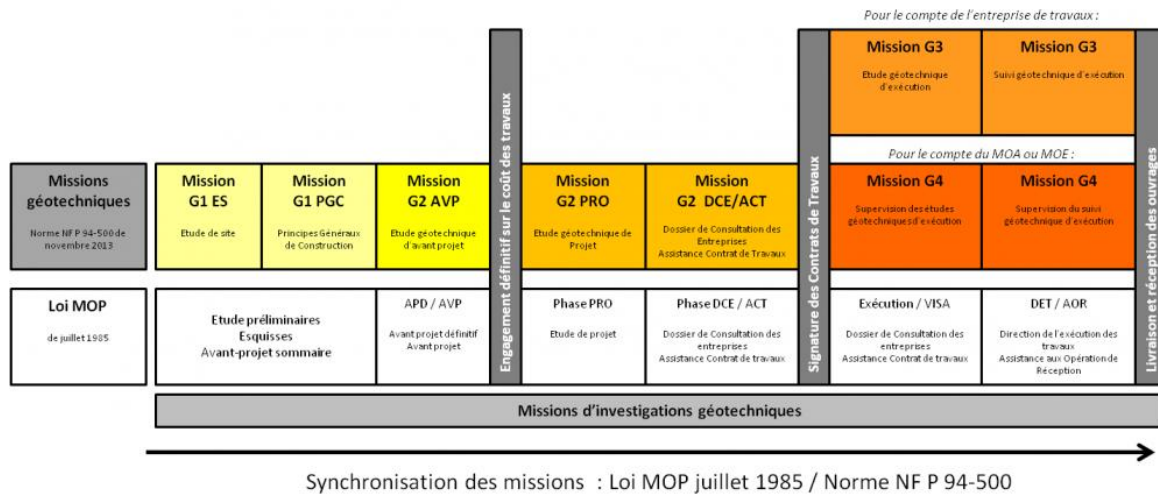
› Using standards

- To be able to reuse and aggregate projects data
- To be able to build sustainable Integrated City Models



› Bibliography

- AFNOR Standard: NF P 94-500:2013 on Standardization of Geotechnician Missions
- AFTES recommandations (GT43) on NF P 94-500:2013 application
- Partners experience



RECOMMANDATION DE L'AFTES N°GT43R1F1

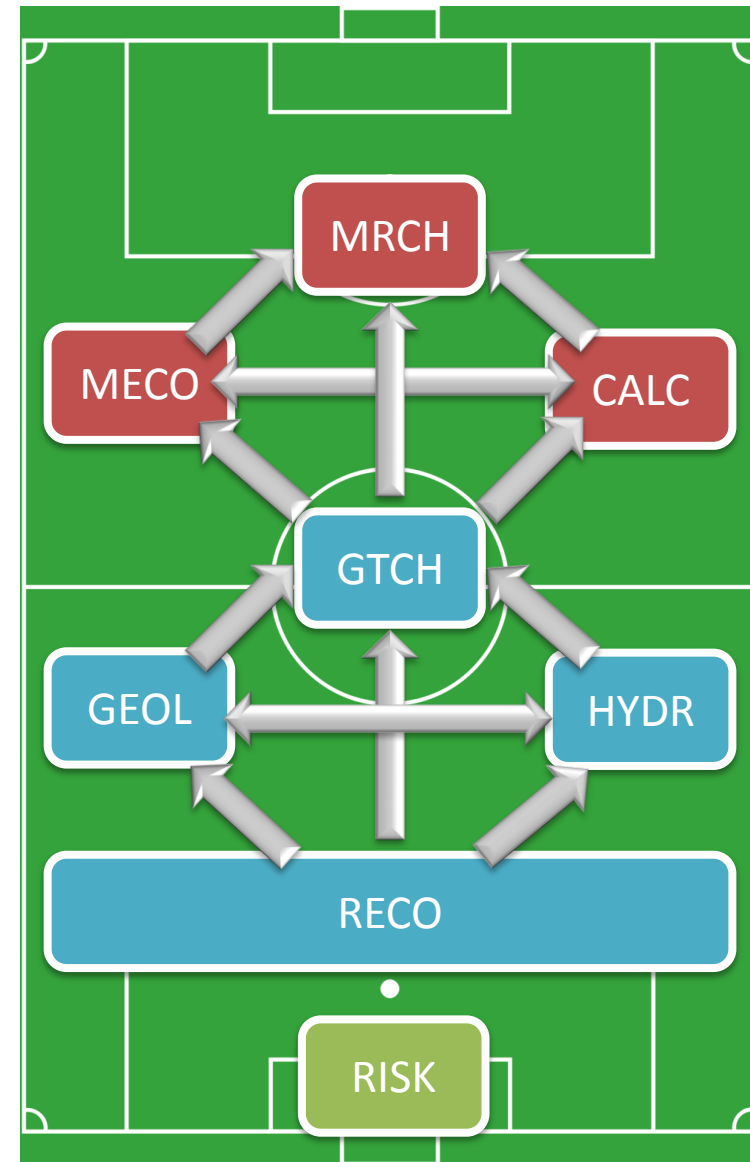
	Mission d'un AMO spécialisé en géotechnique et ouvrages souterrains	
Problématique	EP – G1 (ES et PGC 1 ^e itération)	EP – G1 (PGC 2 ^e itération)
Programme du MOA		
Programme	- expressions des besoins du MOA	- programme du MOA (finalisé à l'issue de l'enquête) - étude des variantes
Recueil des données factuelles (cahier A1) et Mémoire de synthèse géotechnique (cahier B1)		
Géologie, hydrogéologie et géotechnique	- visite du site - enquête documentaire géotechnique - identification du comportement des terrains - identification préliminaire des nappes, des sens d'écoulement, des variations saisonnières	- conduite du programme de reconnaissances (sondages, mesures piézométriques, recueil de données de pluie, ...) : avis sur les offres techniques, surveillance, analyse, interprétation, confrontation
Modèle géologique et hydrogéologique et incertitudes	- modèle géologique et hydrogéologique préalable - analyse de la fiabilité du modèle - première identification des incertitudes	- actualisation du modèle géologique hydrogéologique et établissement du profil en long géotechnique prévisionnel - analyse de la fiabilité du modèle - établissement du registre des incertitudes

Designation	Id
Structure sizing and definition of the geotechnical influence zone	CALC
Construction methods	MECO
Contractual documents	MRCH
Risk and uncertainty assessment	RISK
Observations and Measurements	RECO
Geological modeling	GEOL
Hydrogeological modeling	HYDR
Geotechnical modeling	GTCH
Anthropic environment impact	AVOI
Environmental impact	ENVI

What builders want to get

What results are based on

Constraints



ENVI

AVOI

Information Delivery Manual (IDM)

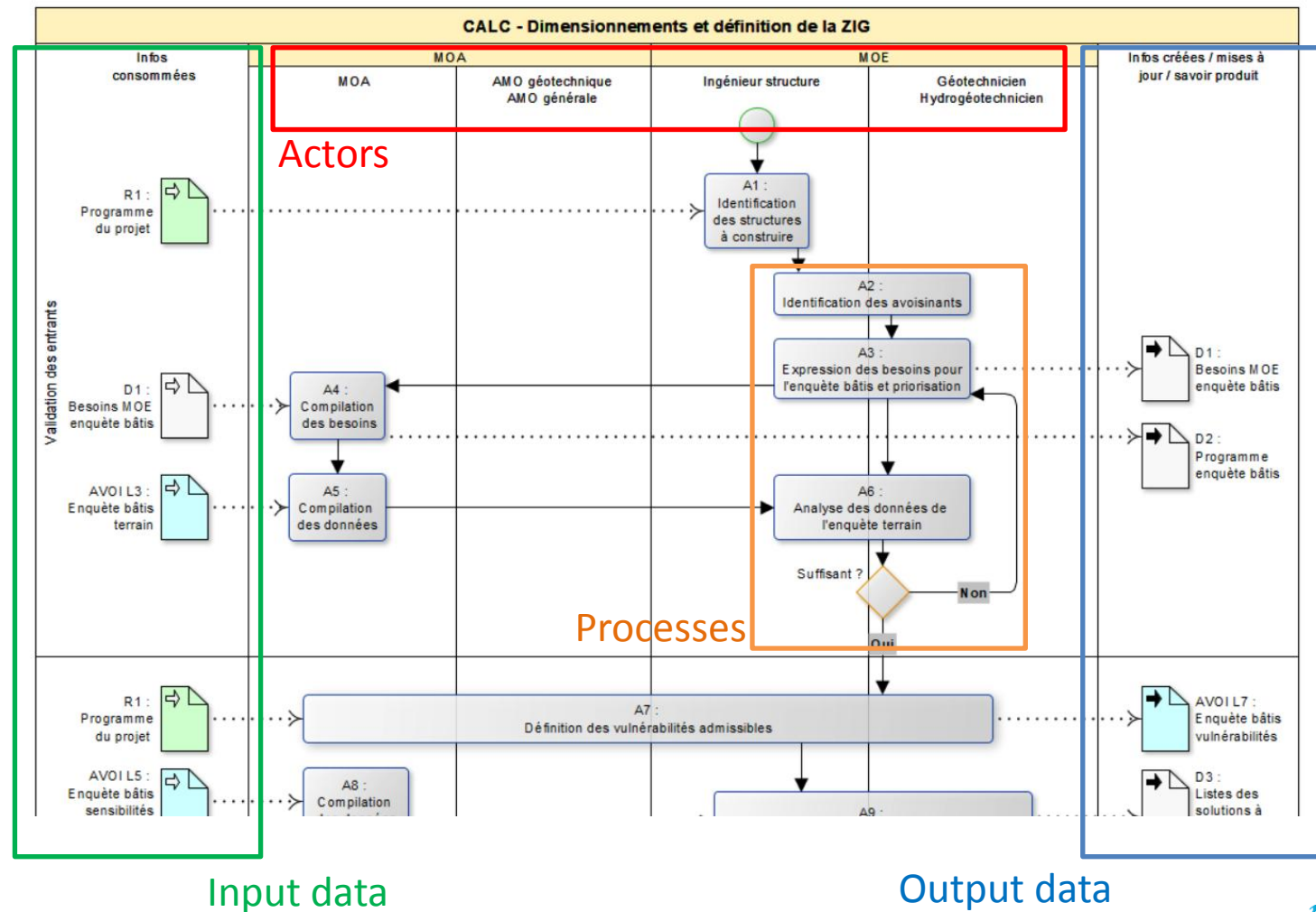
- Workflow description
- ISO 29481-1:2016
- 1 per subject

Highlight basics

- Who does what?
- Which data?
- Which results?

Focus on knowledge construction

- Not methods and tools



- › Many infrastructures projects does not rely on 3D geomodels... but sections
- › Some 3D geomodels are not designed with geomodeling tools... but with CAD
 - « No clear consensus on geomodel definition »
- › Building community do not expressly ask for (3D) geomodels
- › They mainly expect answers to their questions
 - Can I build here?
 - How much would it cost? Considering risk / uncertainty management
- › For them, geomodels are (just) « media » to build the answers

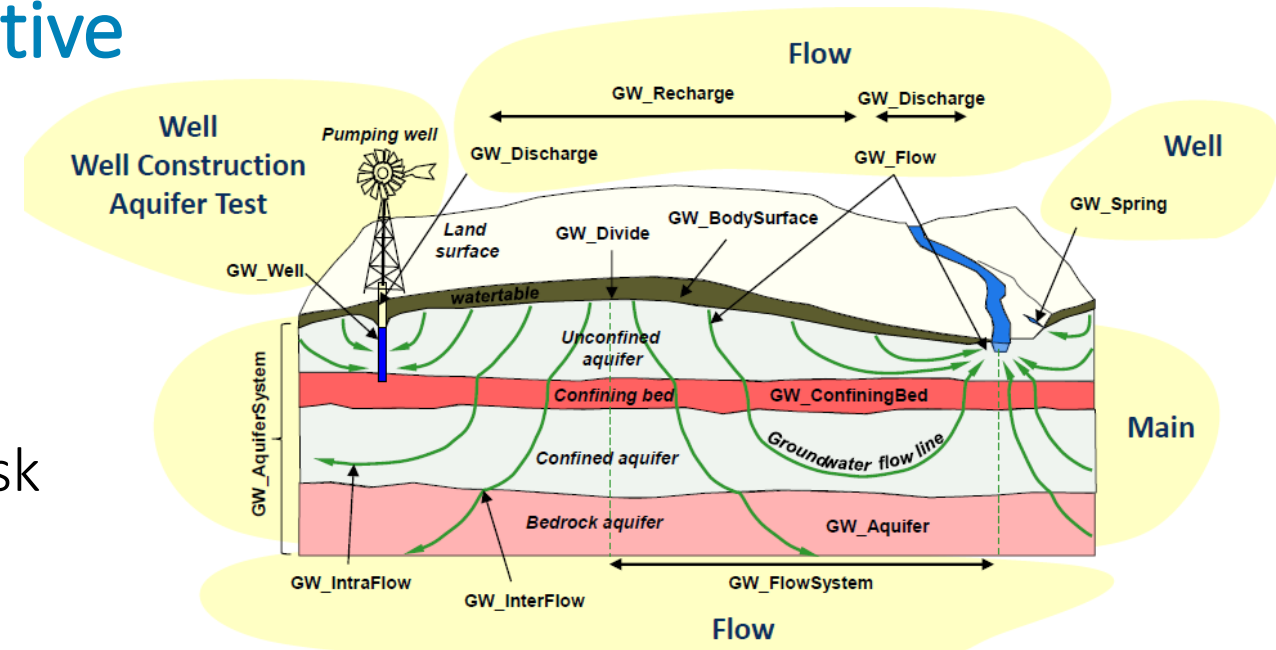
« How can we put some standardization in this? »

	RECO Surveys	HYDR Hydrogeological Modelling	GEOL Geological modelling	GTCH Geotechnical modelling
Expression of recommended surveys		X	X	X
Definition of survey program	X			
Description of the survey (borehole, onfield observation, laboratory analysis, geophysics)	X			
Raw result expression	X			
First interpretation of result	X			
Analysis or reinterpretation of the result		X	X	X
Compilation and model scale interpretation		X	X	X
Model building (with geomodelling software)		X	X	X

« A serie of linked observations / measurements / interpretations »
 > We have OGC standards for this!

› Conceptual Model building tentative based on OGC standards

- Observations & Measurements
 - For surveys data, and successive interpretations
 - For results of infrastructure sizing, risk assessment
 - To describe geomodels themselves
- GeoSciML and GroundWaterML
 - To provide appropriate semantics
 - Identify potential needs for extensions to describe geotechnics

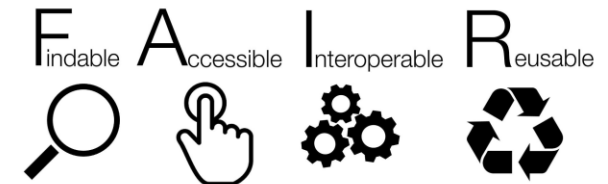


Some GroundWaterML 2.2 concepts

- › **MINⁿD is not focusing on integrating buildings in geomodels (or vice versa)**
 - It is mostly about increasing geoscience data quality and interoperability to make it reusable
- › **3D geomodels are not systematically built during infrastructure construction**
 - Not the first thing to standardize

› **Consensus on geotechnical knowledge construction**

- We will work on lineage
- Finally a linked data topic



› **Cities want to know what they have below their feet**

- cf Underground Infrastructure Pilot projet
- Being able to collect high data quality from building community would greatly contribute to build 3D urban geomodels, and maintain them!
- Opportunities of collaboration between cities, construction community and geological surveys

Thanks for your attention!



- Contact:

- m.beaufils@brgm.fr

- Useful links:

- MINⁿD website : <http://www.minnd.fr/en/>

- GeoScienceDWG home page :

- http://external.opengis.org/twiki_public/GeoScienceDWG/WebHome