



RÉGION WALLONNE

Ministry of the Walloon Region –
Direction Générale des Ressources
Naturelles et de l'Environnement
Avenue Prince de Liège, 15, B-5100
Namur, Belgium



Luxembourg University Foundation - Faculty of Applied Sciences of Mons
- Laboratory of Hydrous Resources - Fundamental and Applied Geology
- Hydrogeology Cell -



University of Namur
- Department of Geology -

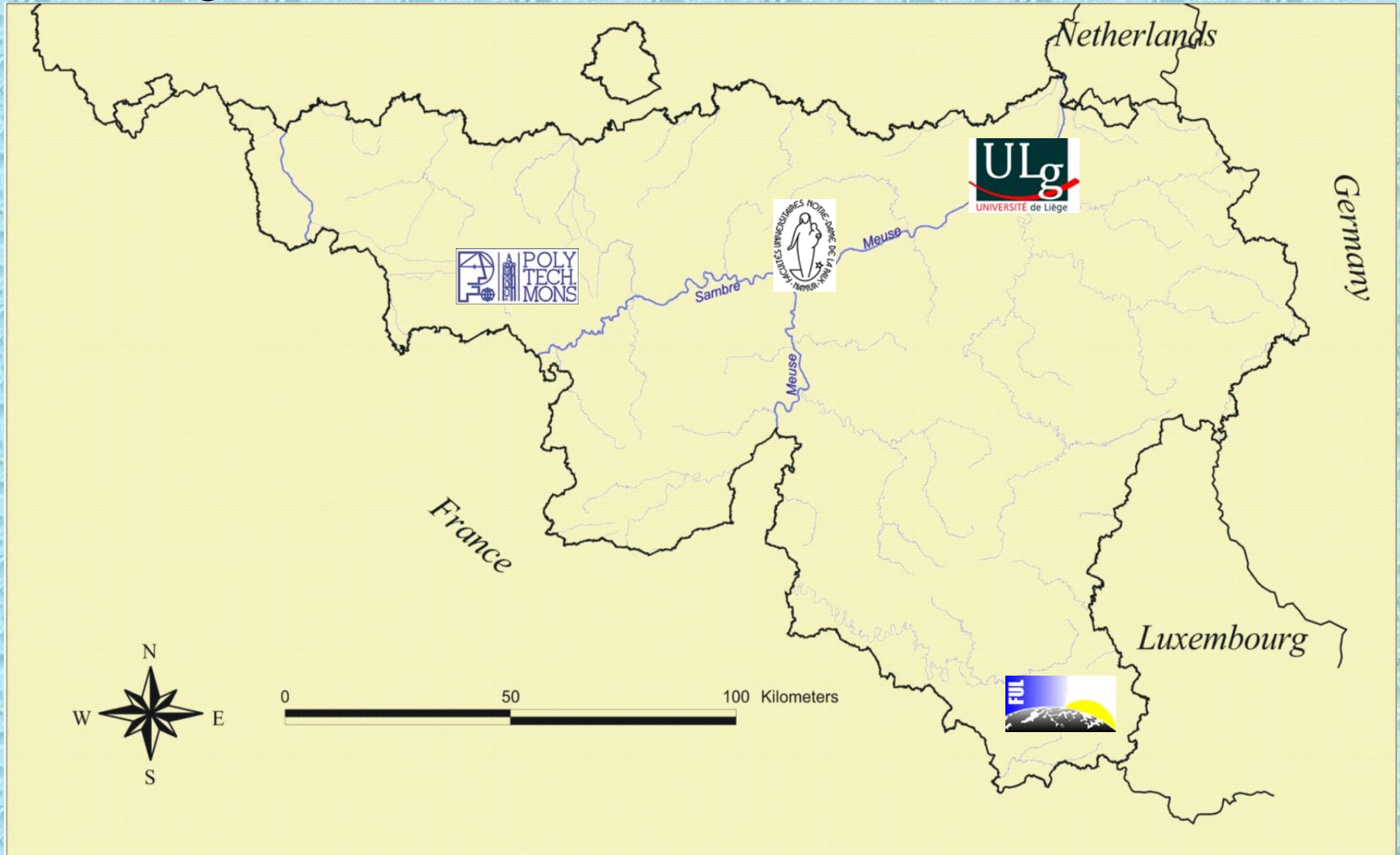


University of Liège
- Geomac Department -

GIS AND HYDROGEOLOGICAL MAPPING OF THE WALLOON REGION (BELGIUM)

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Habils Frédéric (FPMs),
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Ruthy Ingrid (ULg)

- 1999 : first Belgian hydrogeological mapping program, involving four universities



Potentials fields of application :

- qualitative and quantitative management for groundwater resources
- evaluation of risks of pollution
- land-use policy
- establishment of new water catching points
-

Documents strongly required by environmental research and management actors

Walloon Region Administrations

Belgian Geological Survey

Water supply companies

Environmental agencies

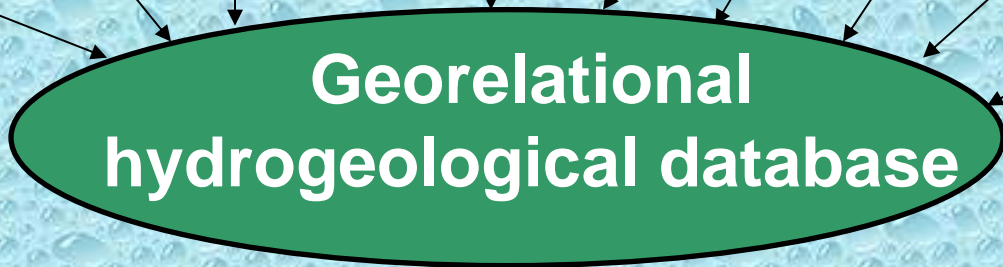
Public and Private institutions

Geological consultants

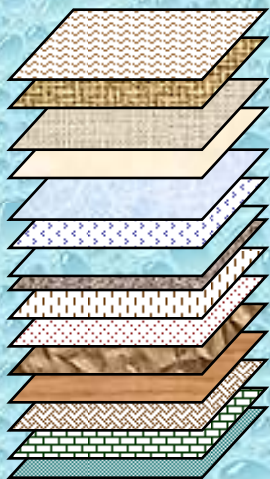
Farmers

Field work

Industries

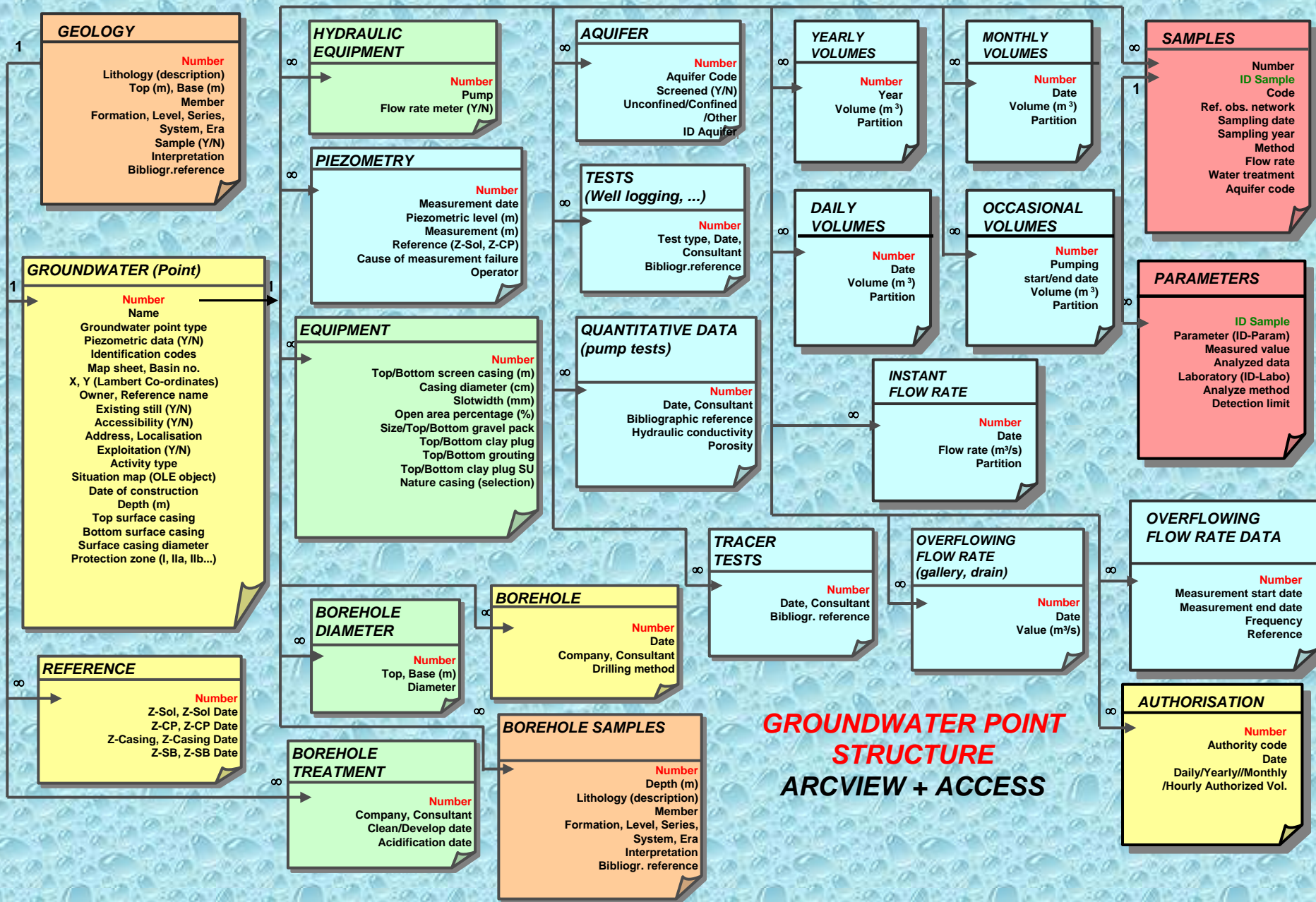


Primary Data



- Topography
- Geological map
- Map of soils
- Lakes and ponds
- Hydrological basins
- Hydrological network (rivers)
- Irrigation drains
- Surface water (point information)
- Climatic stations
- Groundwater (point information)
- Quarries and mines
- Water supply galleries and drains
- Protection zones
- Hydrogeologic cross-sections
- Sewer network system
- Karst geomorphology atlas
- Land-use map

Organized scheme for capturing, storing, editing and displaying data



GROUNDWATER (Point)

Number

Name

Groundwater point type

Piezometric data (Y/N)

Identification codes

Map sheet, Basin no.

X, Y (Lambert Co-ordinates)

Owner, Reference name

Existing still (Y/N)

Accessibility (Y/N)

Address, Localisation

Exploitation (Y/N)

Activity type

Situation map (OLE object)

Date of construction

Depth (m)

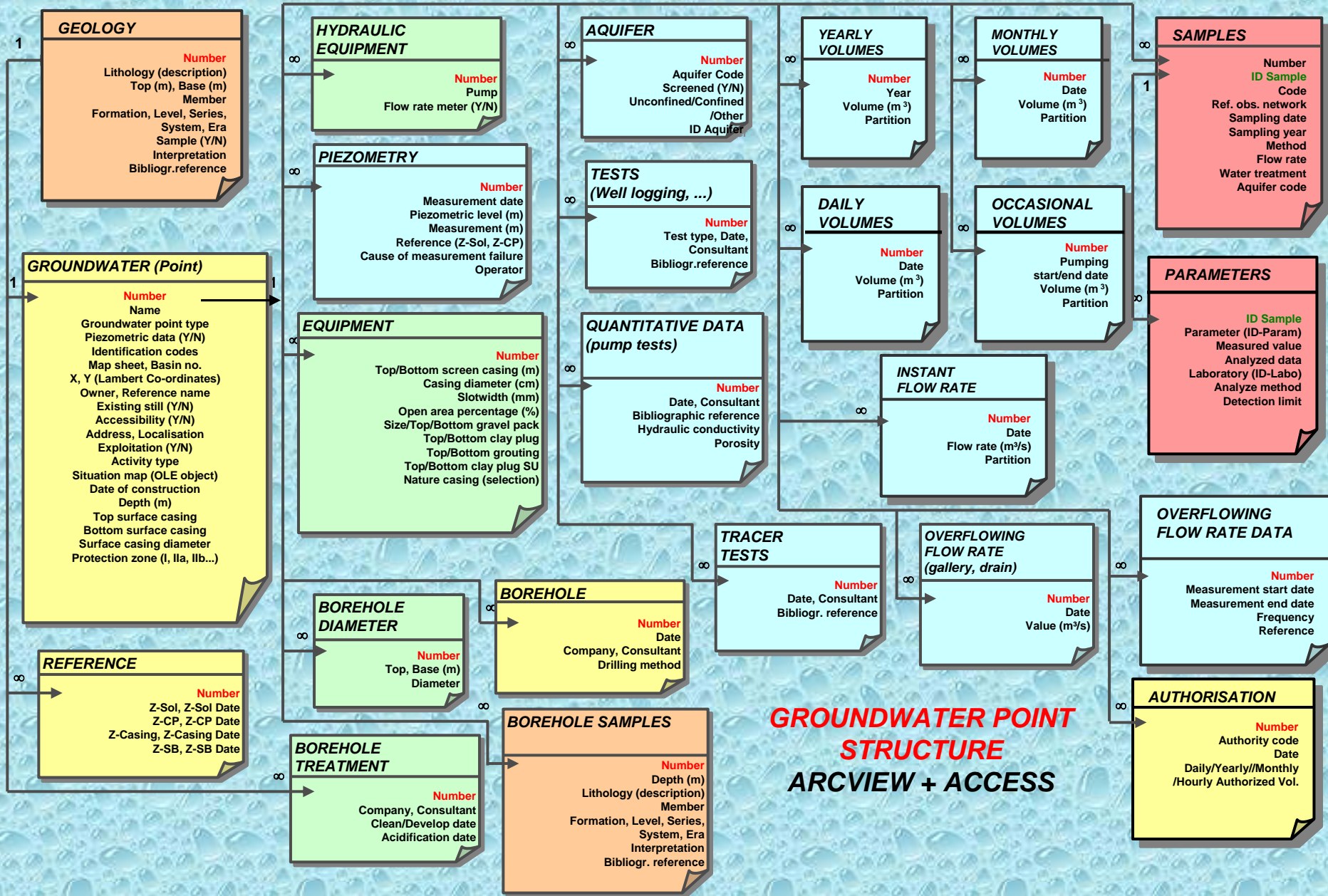
Top surface casing

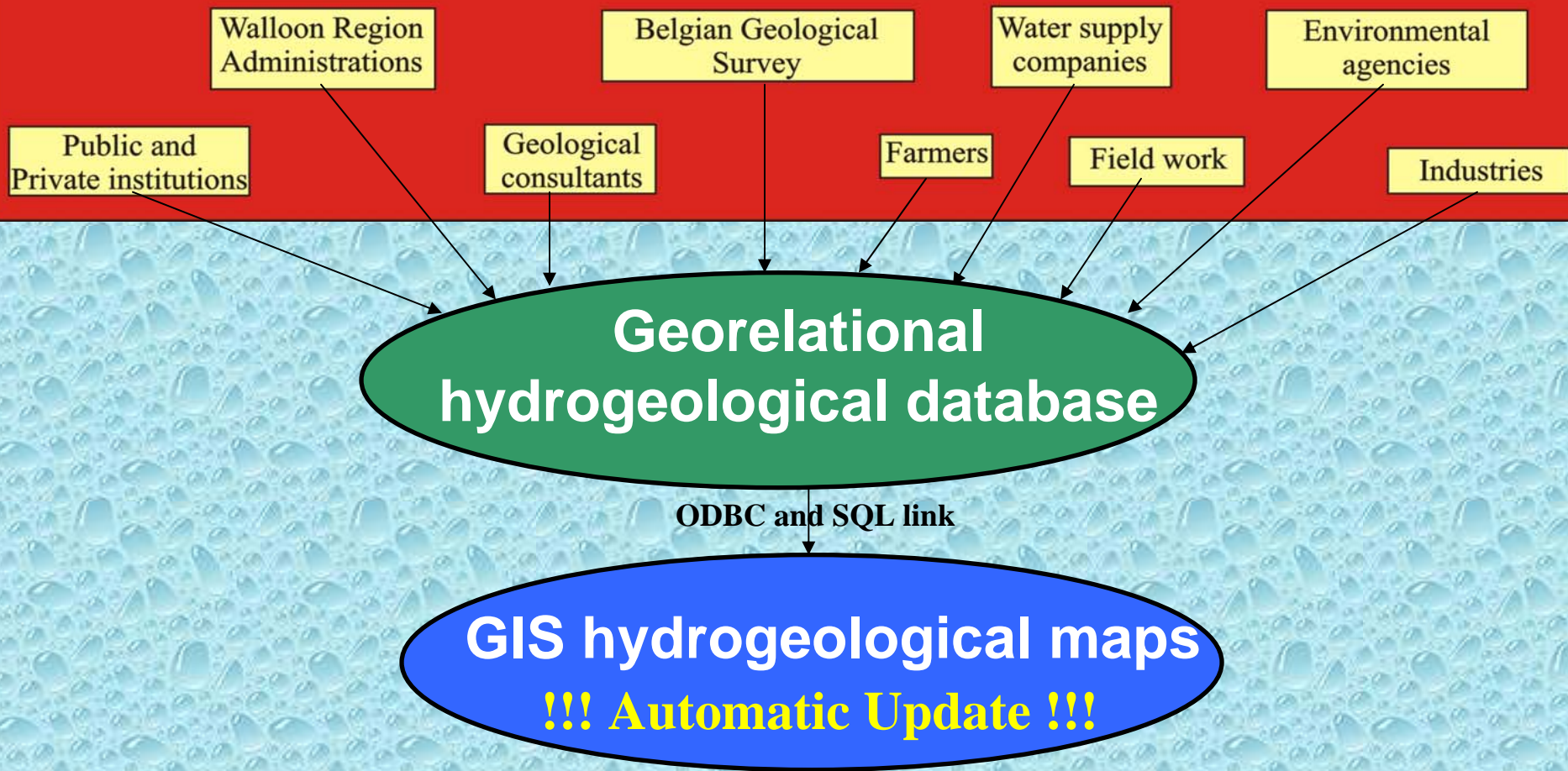
Bottom surface casing

Surface casing diameter

Protection zone (I, IIa, IIb...)

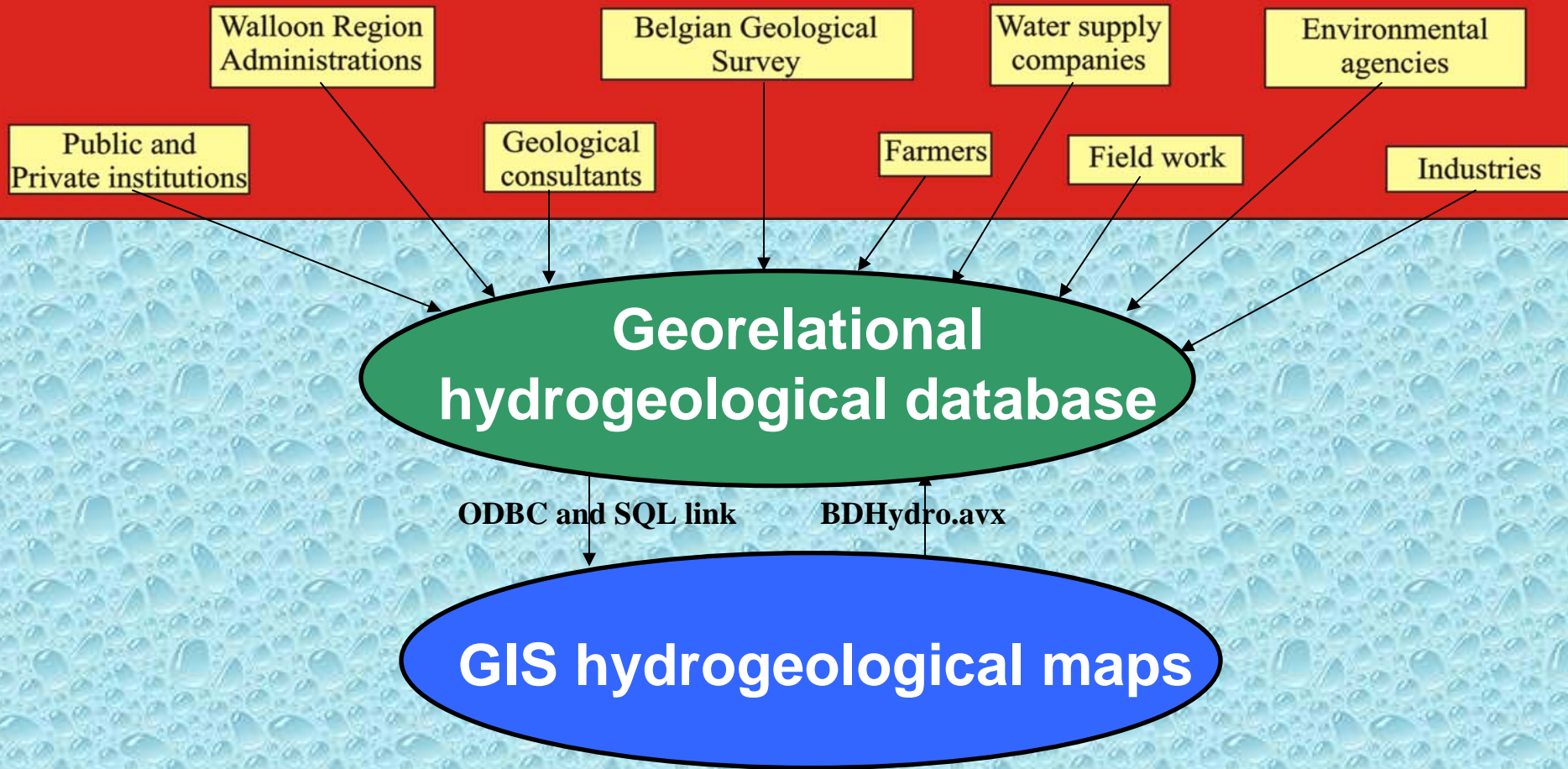
Geographical reference : Lambert co-ordinates (Belgium
Lambert Conformal Conic Projection)



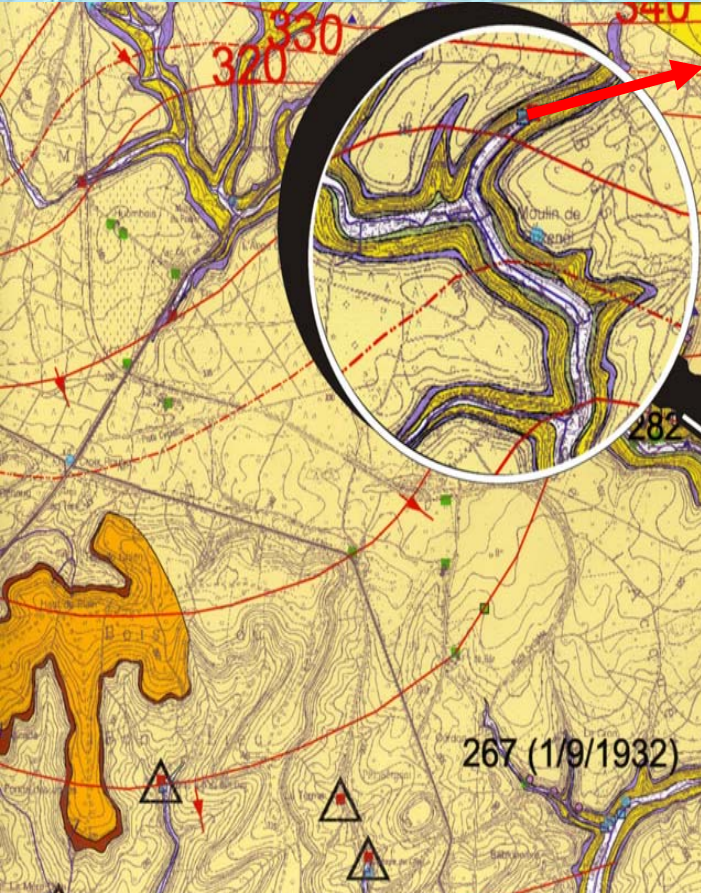


Link between the georeferenced database and a Geographical Information System (Arcview 3.2a, ESRI ©)

- Open DataBase Connectivity (ODBC)
- Standard Query Language (existing SQL GIS function)



Extension BDHydro (Avenue, ESRI ©)



Interrogation de la Base de Données : HYDROGEOLOGIE

Numéro : N° de la carte : Code RW : Code SGB : Accessibilité
 X : Y : Cote du Sol : Profondeur : Exploitation

Titulaire : Type d'ouvrage : Piézomètre

Nom de l'ouvrage : Date de Construction :

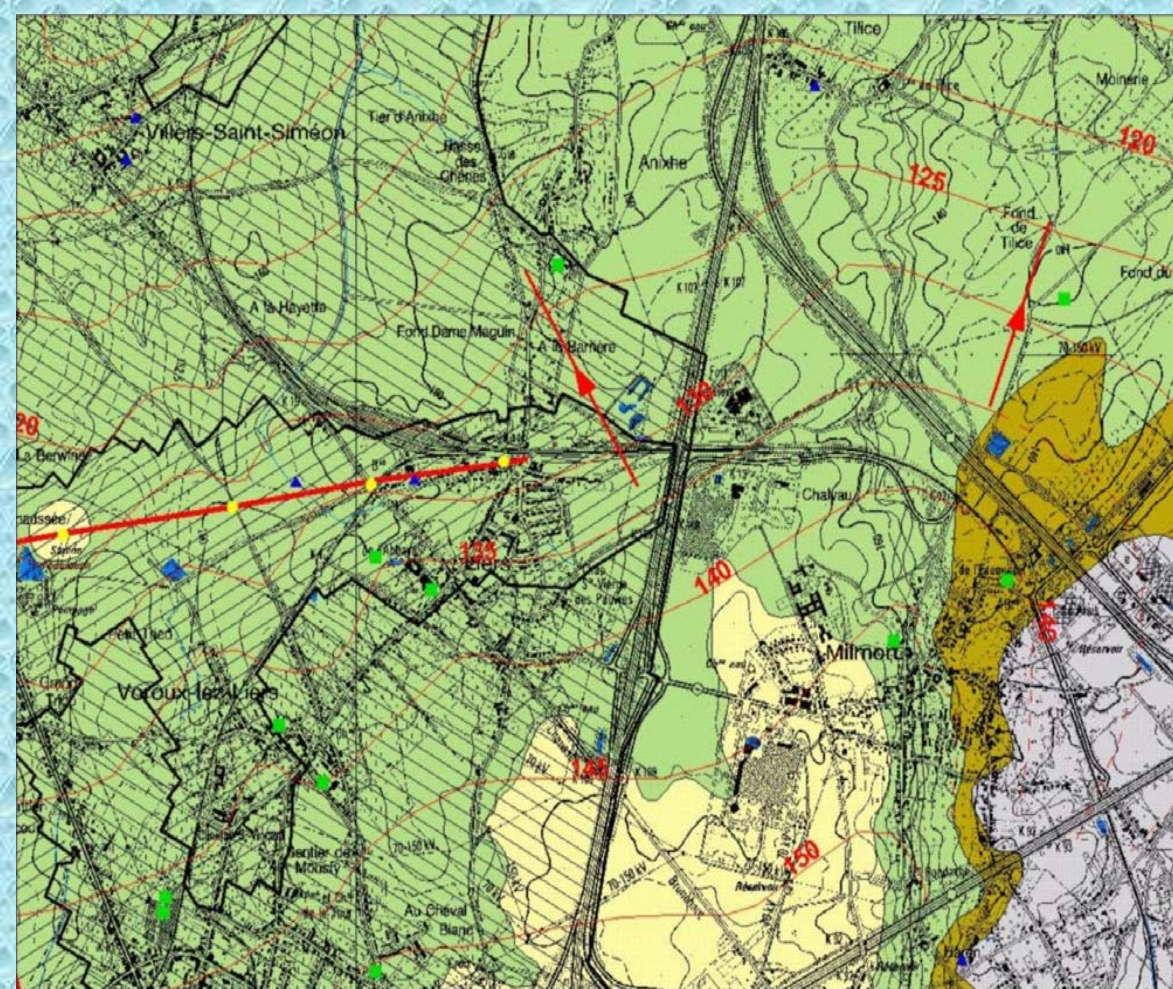
Adresse : Localité :

Remarques :

Titulaire	Hydraulique
Aquifère	Référence
Autorisation	Piézométrie
Chimie	Géologie
Forage	Vol Ann
FPMs	Vol Jour

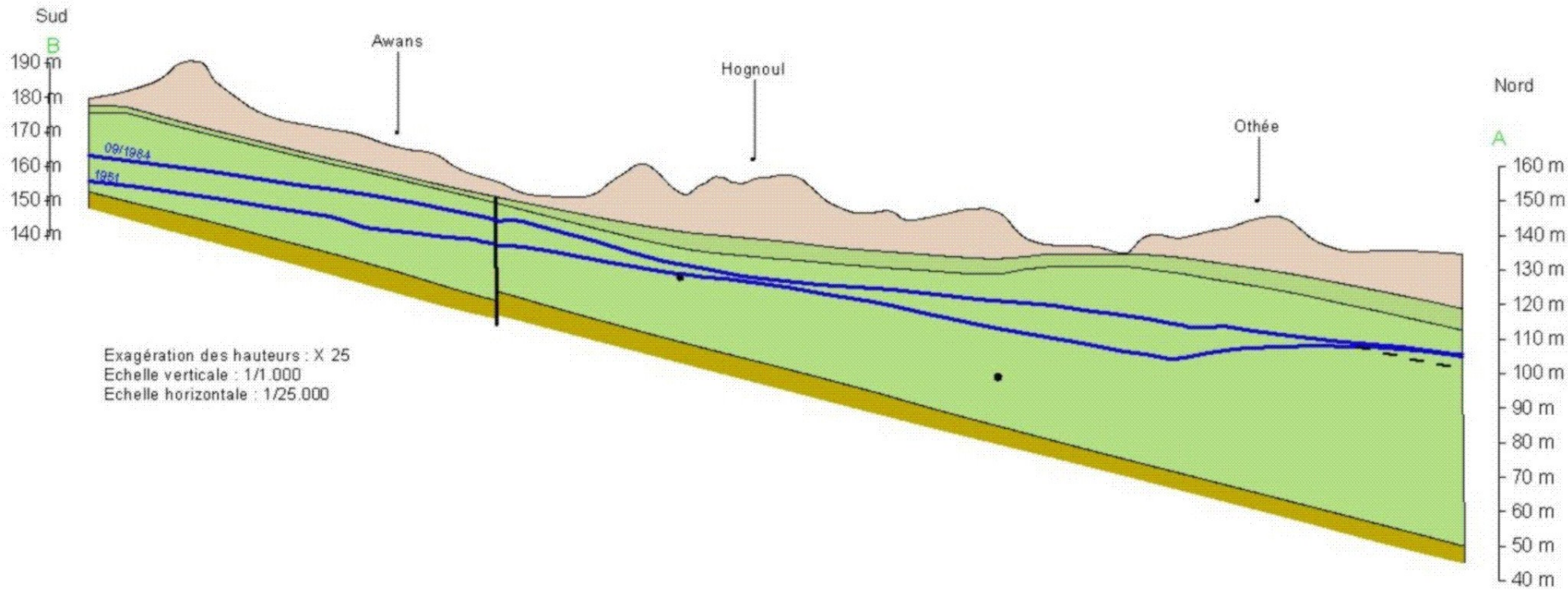
descr	expr	valeur	normes
Conductivité	µs/cm à 25°C	390	2100
Température (in<itu)	° Celsius	23.1	25
pH	unités pH	7.48	6.5<pH<9.2
Dureté totale	° français	20.5	67.5
Alcalinité totale (TAC)	° français	17.65	
Calcium	mg/l Ca	75	270
Magnésium	mg/l Mg	3.6	50
Sodium	mg/l Na	2.08	150
Potassium	mg/l K	0.42	12
Fer (total) dissous	µg/l Fe	<0.001	200
Manganèse	µg/l Mn	<0.001	50
Sulfates	mg/l SO4	18	250
Bicarbonates	mg/l HCO3	215	
Chlore libre résiduel	mg/l	3.8	0.25
Ortho<Phosphates	mg/l PO4	<0.01	
Silice	mg/l SiO2	6	
Nitrates	mg/l NO3	3.3	50
Nitrites	mg/l NO2	<0.01	0.1
Ammonium	mg/l NH4	<0.01	0.5
Résidu sec (biodegradable)	mg/l après séchage à 180 ° C	210	1500
Aluminium	µg/l Al	0.23	
Antimoine	µg/l Sb	<2	200
Argent	µg/l Ag	<2	10
Arsenic	µg/l As	<0.3	10
Baryum	µg/l Ba	<2	50
Béryllium	µg/l Be	4	
Bore	µg/l B	<0.1	
Bromures	µg/l Br	27	
Cadmium	µg/l Cd	26	
Cobalt	µg/l Co	<0.05	5
Cuivre	µg/l Cu	<2	
Cyanures (totaux)	µg/l CN	<1	100
Chlorates	µg/l ClO3	<2	10
Chrome (total)	µg/l Cr	<10	
Etain	µg/l Sn	<1	50
Fluorures	µg/l F	<1	
Lithium	µg/l Li	<50	1.5
Mercure	µg/l Hg	3	
Molybdène	µg/l Mo	<0.03	1
Nickel	µg/l Ni	<1	
Plomb	µg/l Pb	<2	50
Selenium	µg/l Se	<1	50
Strontium	µg/l Sr	<2	10
Titane	µg/l Ti	<100	
Vanadium	µg/l V	<1	
Zinc	µg/l Zn	<2	
		<1	200

Main Hydrogeological Map



Topography (source:IGN),
Hydrogeology (based on geology),
Hydrographic network,
Localization of wells, piezometers, sources, galleries, ...
Isopiestic lines,
Probable direction of underground flows,
Protection zones,
Particular phenomena, ...

Hydrogeological Cross-Section



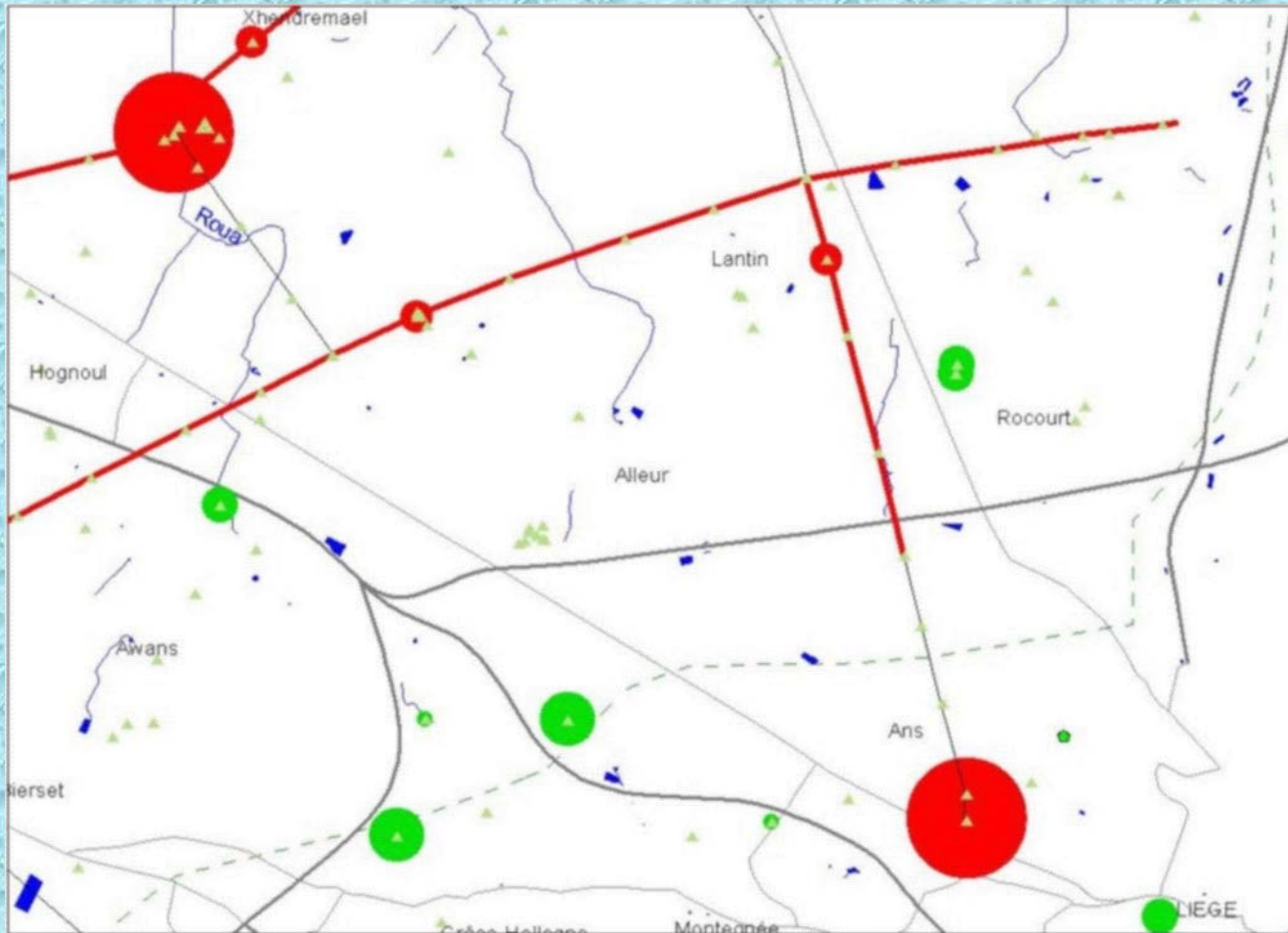
Geological structure and the saturation level depth

Lithostratigraphic Table

Groupe	Système	Série	Étage	Assise	Lithologie (description de 1902)	Abréviation carte géologique N°121 (1902)	Hydrogéologie
QUATERNAIRE	QUATERNAIRE	HOLOCENE			Alluvions modernes des vallées	alm	Aquifère
		PLEISTOCENE	Hesbayen		Limon, cailloux, gravier, sable	q3	Aquifard
			Campinien		Amas de cailloux, sables et argiles tertiaires remaniées	q2	
			Moséen		Limon des hauts plateaux de la Sambre et de la Meuse	q1	
TERTIAIRE	OLIGOCENE	OLIGOCENE	Dépôts supérieurs continentaux		Sables graveleux, glaises plastiques, amas et traînées de cailloux blancs	Ona, Ons, Onx	Aquifère
			Dépôts inférieurs manns Tongrien ?		Sables quartzeux, fins, pailletés, homogènes	Om	
					Conglomérat à Silex (argile, sable, silex)	Sx	Aquifère
SECONDAIRE	CRETACE	SENONIEN	Maastrichtien		Tuffeaux et calcarénites	M	Aquifère des craies de Hesbaye
					Craie turée, bancs de silex	M	
				Hardground de Froimont	Craie grise	M	
					Craie indurée	M	
			Campanien	Spiennes	Craie à silex	Cp4	
				Nouvelles	Craie blanche à silex, craie glaucenifère	Cp3	
		Herve	Argile marneuse	Cp2	Aquiclude		
PRIMAIRE	CARBONIFERE	HOULLER	Houiller proprement dit		Grès, schistes et psammites. Houilles variées	H2	Aquifères locaux dans les grès, phanites et psammites du Houiller
			Houiller inférieur		Grès, arkose, psammites, schistes, Houille maigre	H1	

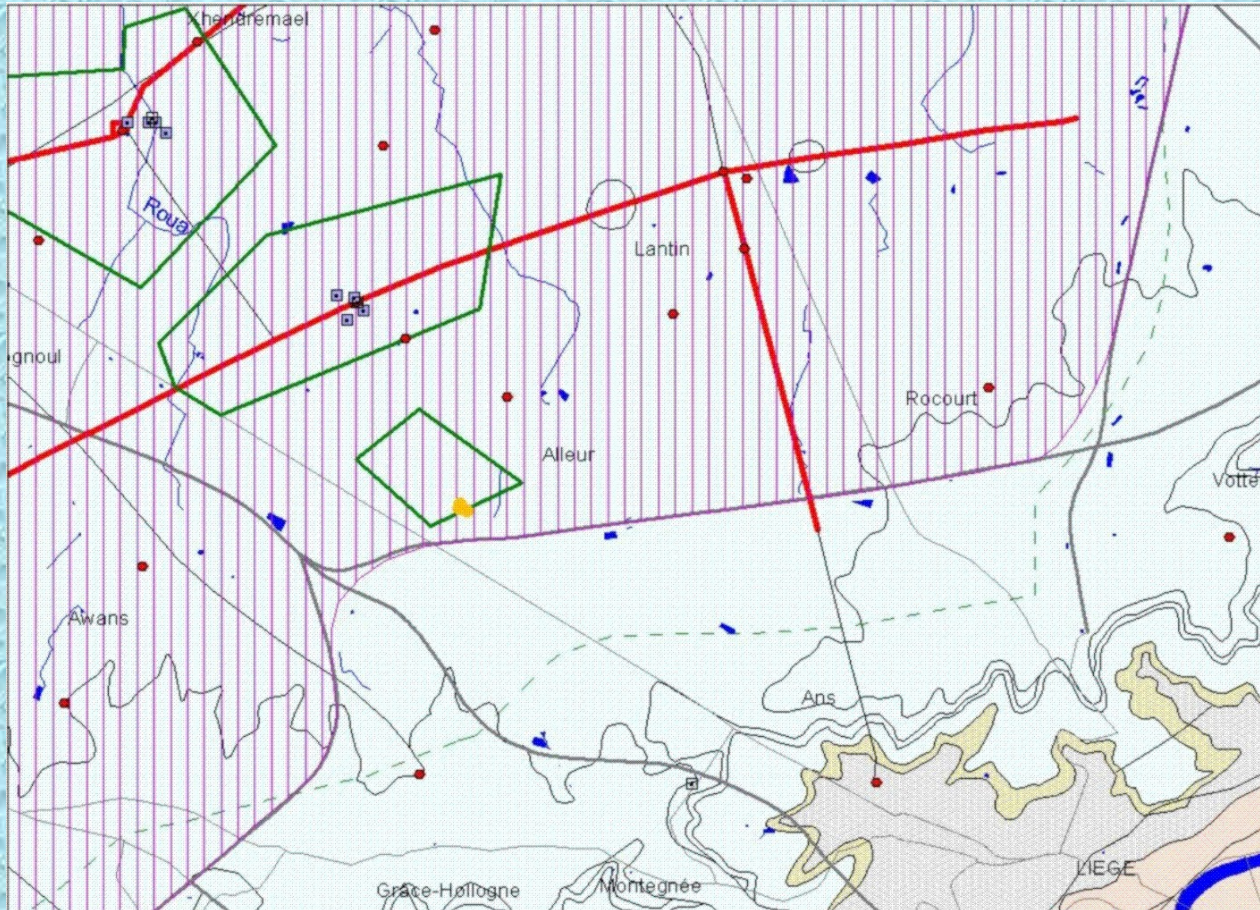
Correspondence between geological formations and hydrogeological units on a lithological basis

Thematic Map



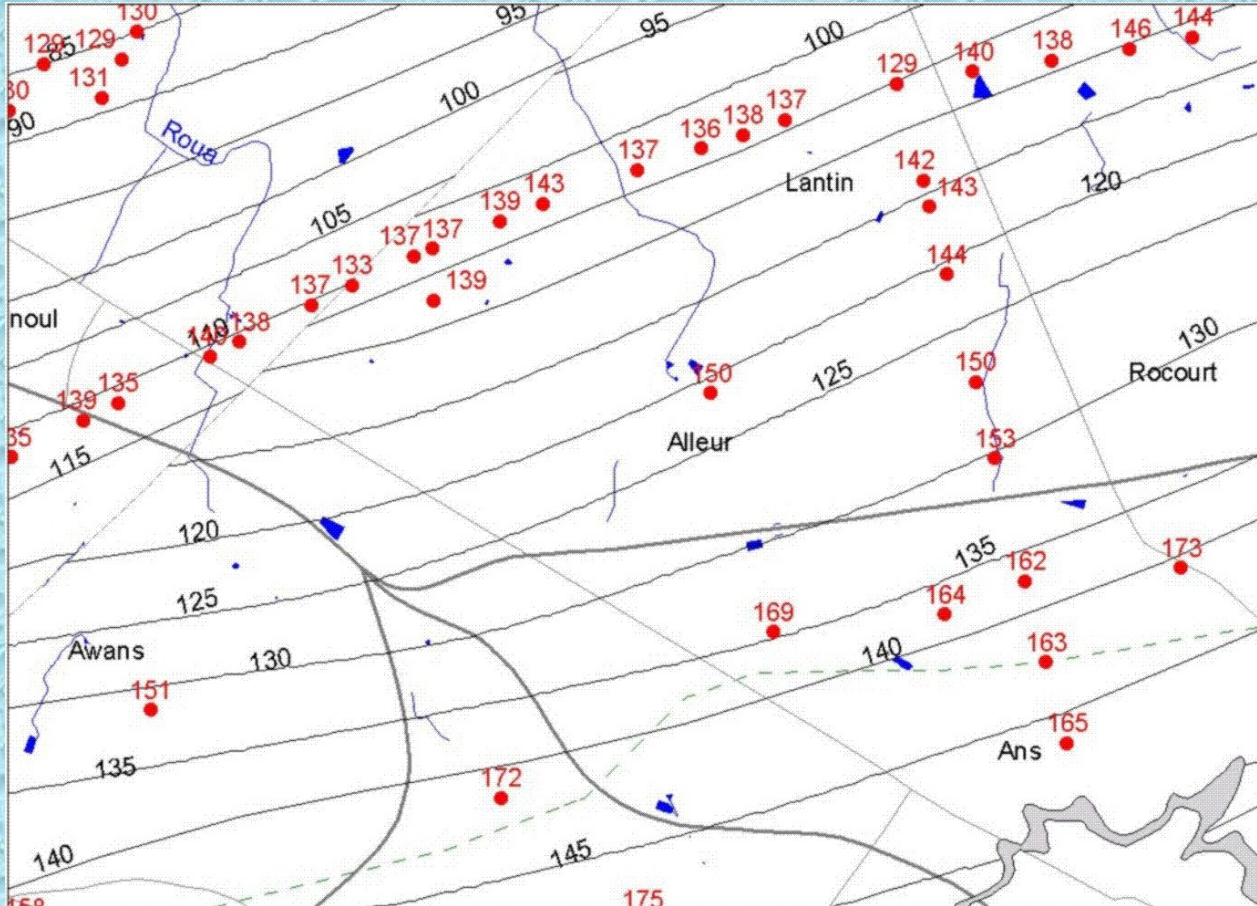
Exploited
volumes,
Aquifers
occured by
wells,
piezometers, ...

Thematic Map



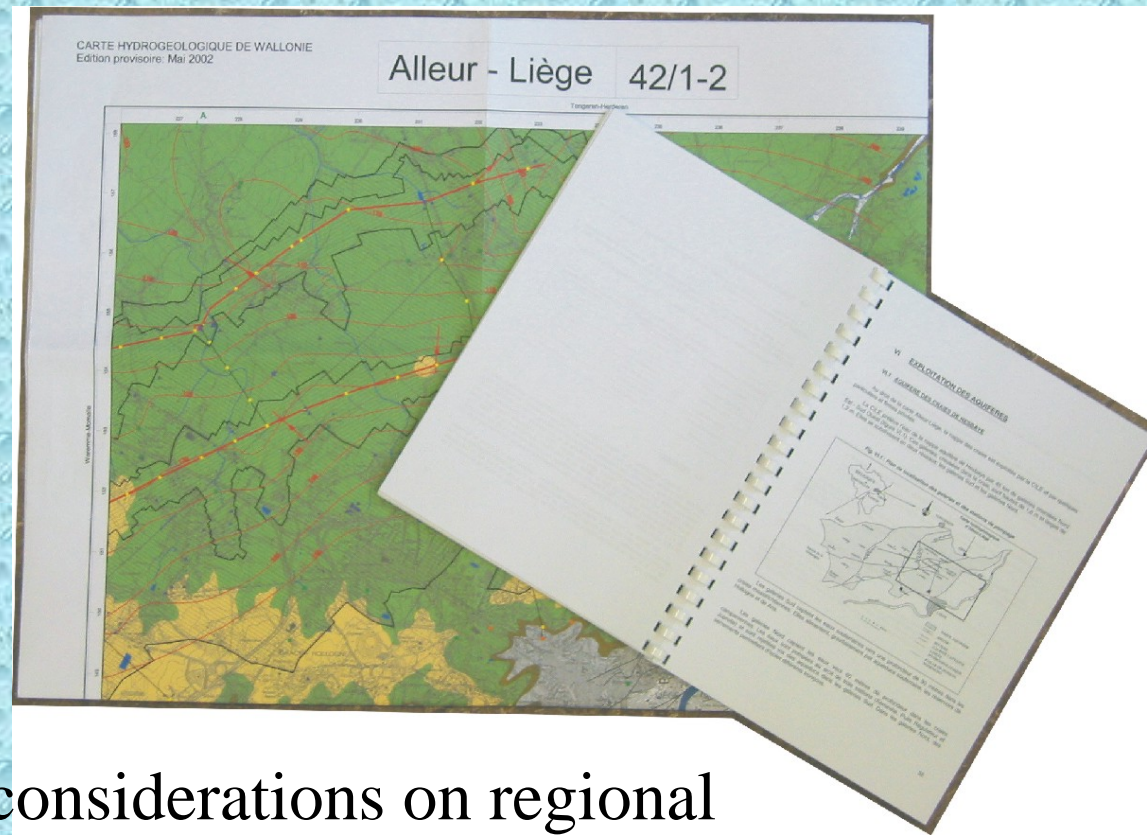
Confinement of
the aquifers,
Hydrochemical
analysis's,
Pumping, tracing
and well-logging
tests,
Geophysical
investigation
zones

Thematic Map



Thickness of main
aquifers

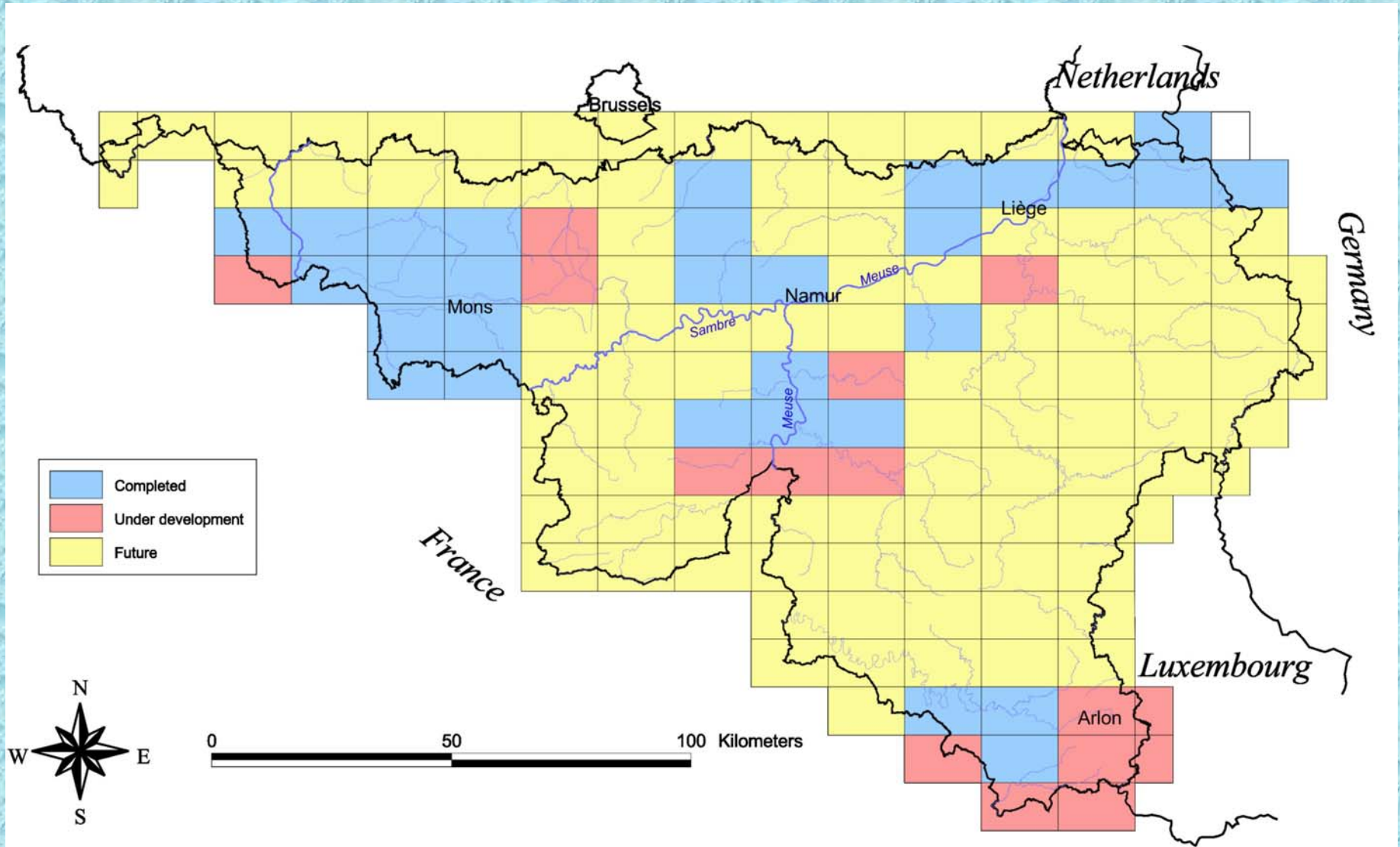
Explanatory Leaflet



General considerations on regional geography, geology and hydrogeology

Focus on specific hydrogeological aspects : local behaviour of the water table, hydrochemistry, hydrodynamic parameters and particular phenomena

Hydrogeological coverage of Wallonia completed in 2010



Final aim : maps and database on the Web, under restricted access

