

National Dialogue on Groundwater

GROUNDWATER RESOURCES MANAGEMENT IN QUEBEC

Direction de l'eau potable et des eaux souterraines

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Ministère de l'environnement et de la lutte aux changements
climatiques (MELCC)

OUTLINE

1. Provincial legal and regulatory framework
2. Groundwater management activities in Quebec
3. Next step
4. Collaboration within the NDGW

1. PROVINCIAL LEGAL AND REGULATORY FRAMEWORK

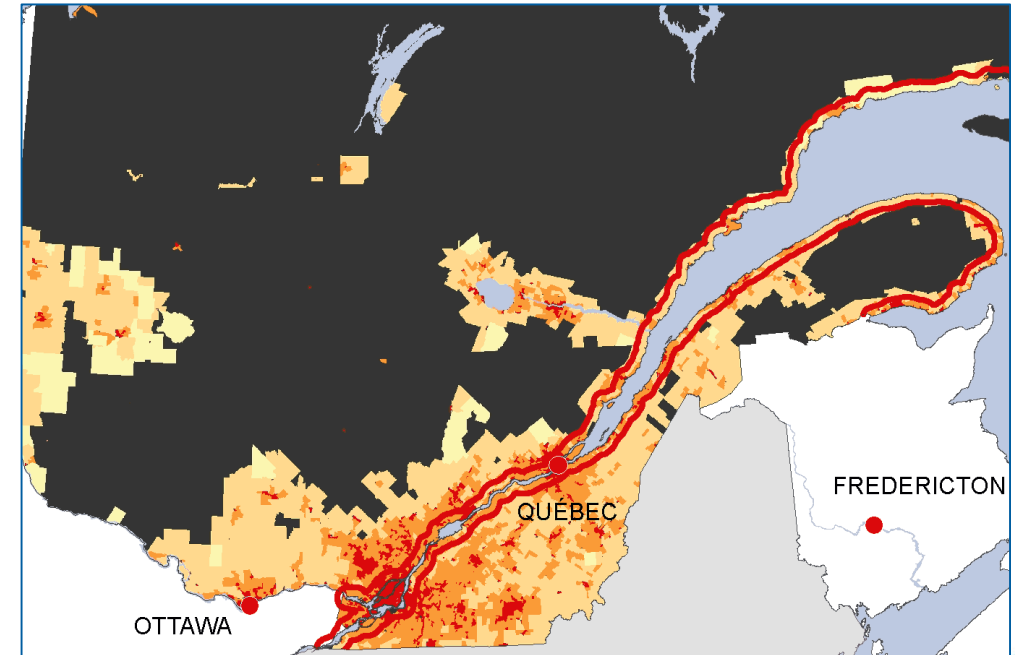
- *Act to affirm the collective nature of water resources and to promote better governance of water and associated environments*, amended in 2017
- *Environmental Quality Act (EQA)*, amended in 2018
 - Article 22 – Request a ministerial authorization for :
 - any water withdrawal ≥ 75 m³/day and/or if the water supplies more than 20 people (drinking water)
 - Article 31.76 - Authorization may be granted if the withdrawal :
 - is exercised so as to ensure the protection of water resources, particularly by fostering sustainable, equitable and efficient management of the resources in light of the precautionary principle and the effects of climate change
 - satisfies public health, sanitation, civil protection and drinking water supply needs, and must also aim to reconcile the protection needs of aquatic ecosystems and the needs other human activities
- *Water Withdrawal and Protection Regulation, 2014 (Q-2, r. 35.2)*

2. GROUNDWATER MANAGEMENT ACTIVITIES IN QUEBEC

- Main activities to achieve the ministerial objectives for sustainable management of groundwater resources:
 - 2.1 Regional hydrogeological mapping
 - 2.2 Assessment of climate change impact on groundwater
 - 2.3 Water withdrawal authorization process
 - 2.4 Information collection and dissemination

2.1 Regional hydrogeological mapping

- Objective:
 - Regional hydrogeological mapping of most of the municipal territory of southern Quebec
- Mapping carried out in distinct phases

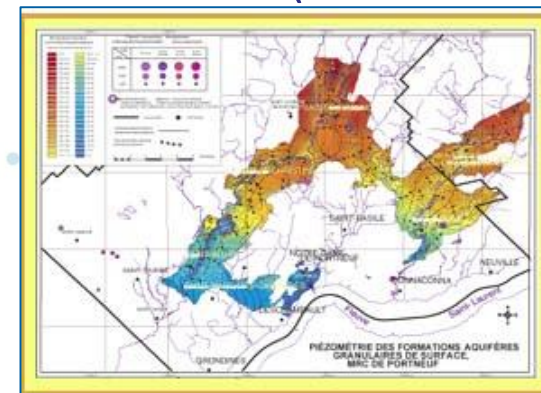


Density of population

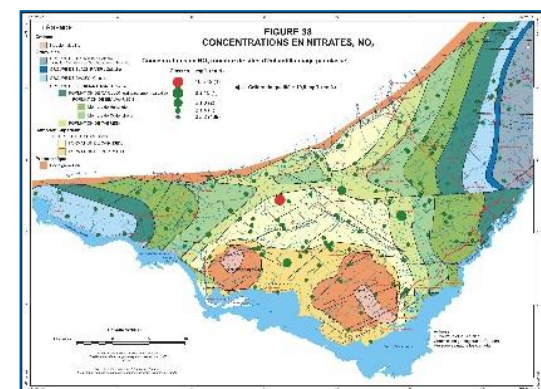
2.1 Regional hydrogeological mapping

- 1970-1985
 - Mostly summary studies to assist groundwater exploration (inventories)
- 1996-2006
 - Studies by the Geological Survey of Canada:
 - *Characterize aquifers with potential for conflicts*
 - *Develop methodologies for mapping regional groundwater resources*
 - *With the MELCC and universities*
 - Beginning of the regional hydrogeological studies carried out by the MELCC (Châteauguay, 2003)

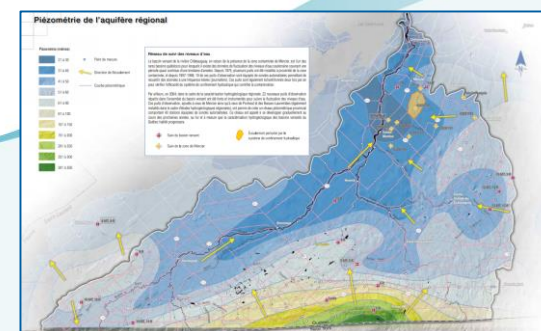
Portneuf (1996 – 1999)



Mirabel (1999-2003)

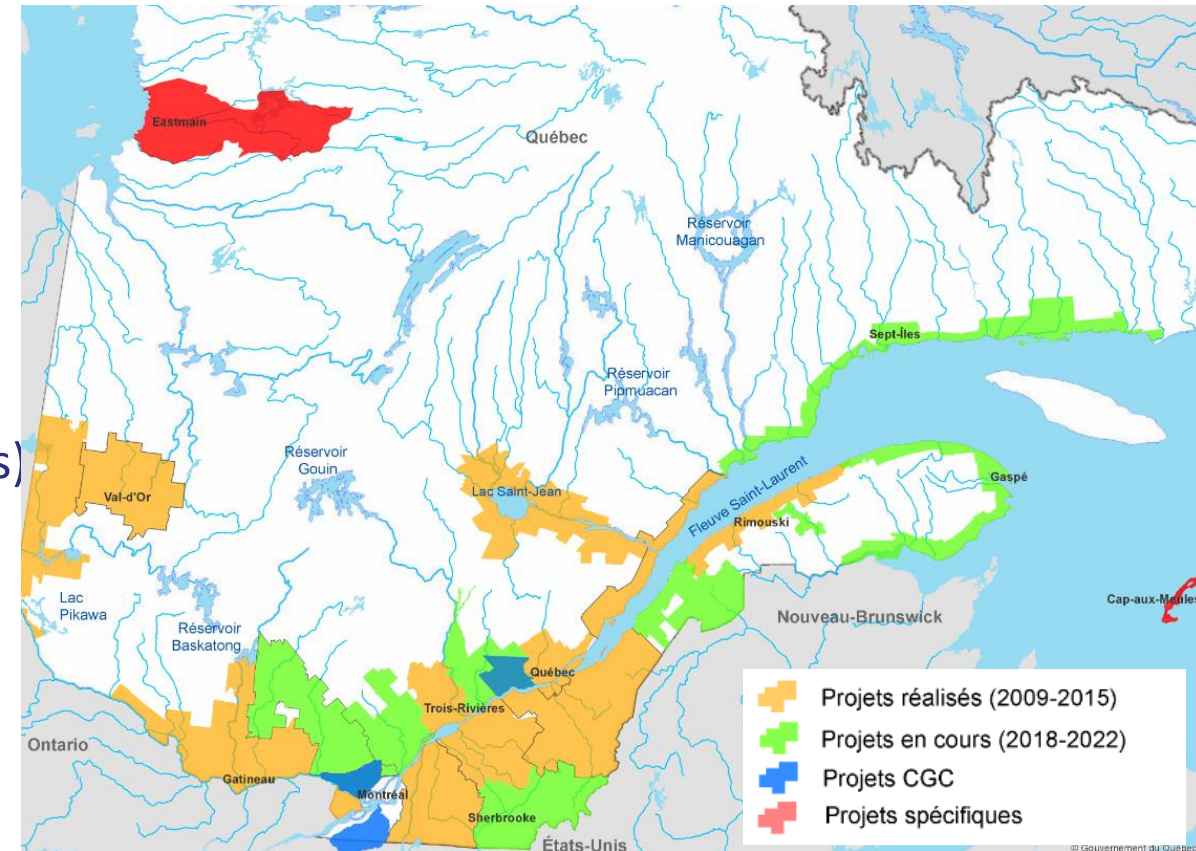


Châteauguay (2003-2006)



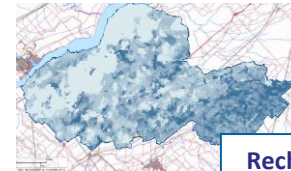
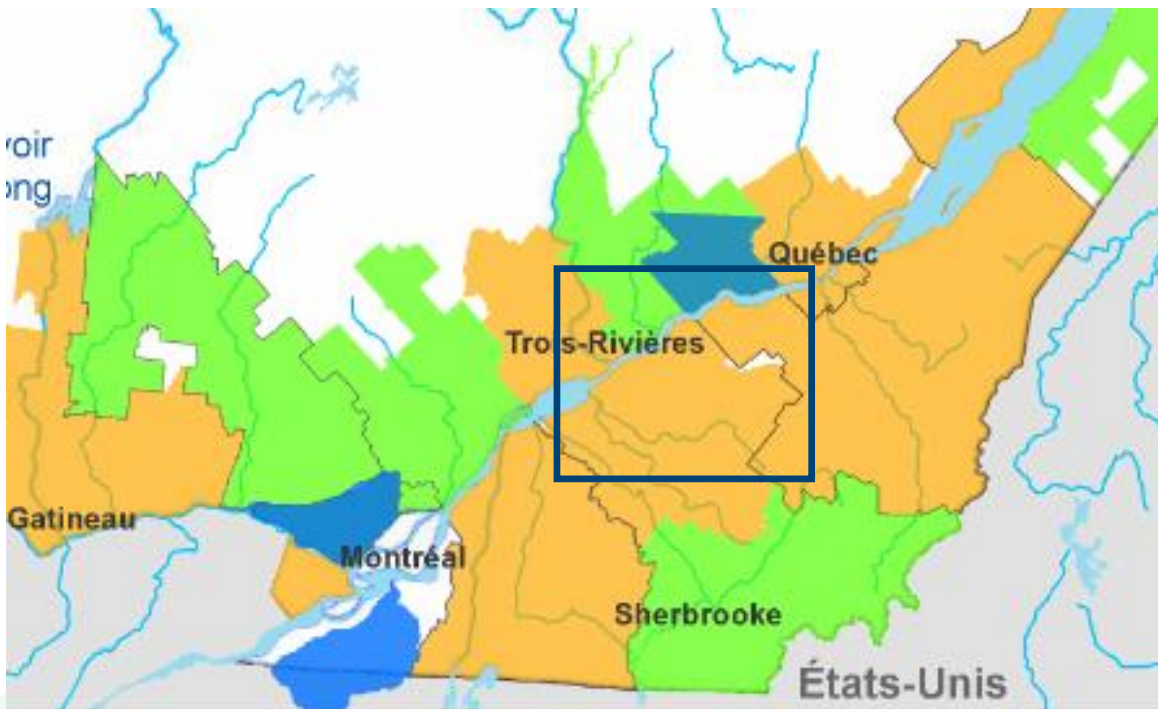
2.1 Regional hydrogeological mapping

- Groundwater Knowledge Acquisition Program (*PACES in French*):
 - 22 regional studies
 - 2 specific studies:
 - Îles-de-la-Madeleine (seawater intrusions)
 - Cri Nation territory, Eastmain (pilot-project)
 - 23 M\$ + contributions from various partners (MRC, municipalities, watershed organizations)
 - 7 universities, and ± 60 graduated students
- 2009-2015 (phases 1, 2 and 3)
- 2018-2022 (phase 4)

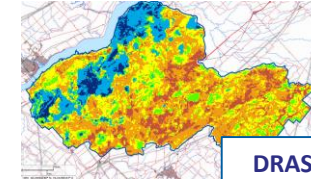


2.1 Regional hydrogeological mapping

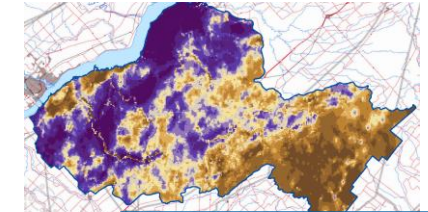
Example: PACES - Bécancour



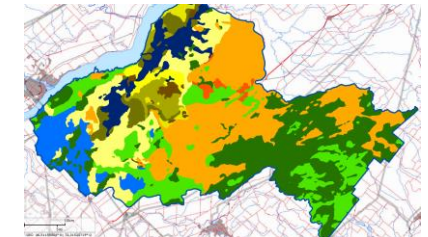
Recharge



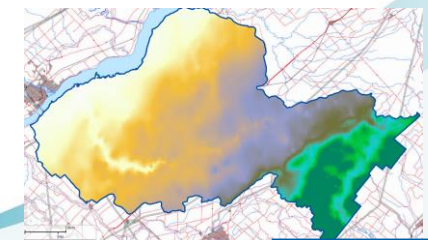
DRASTIC



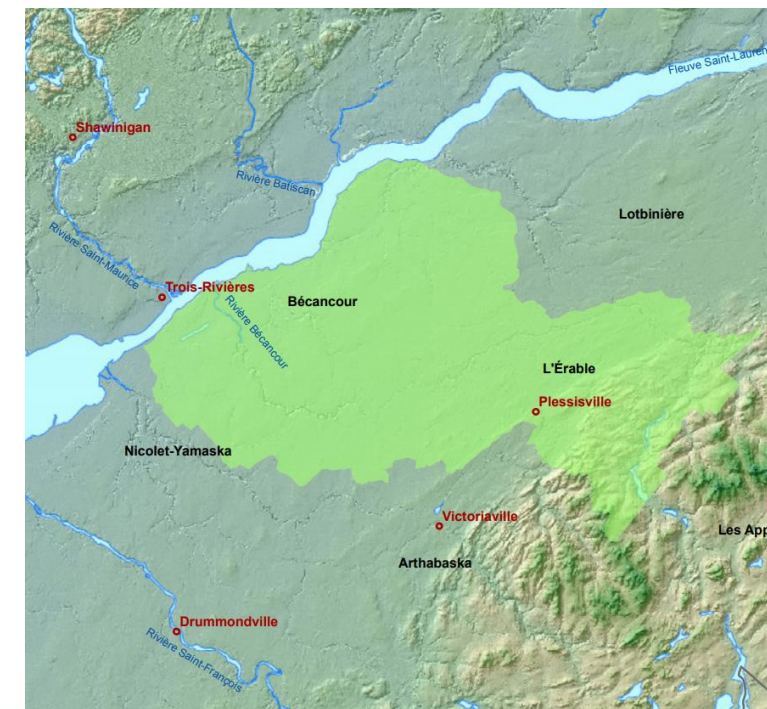
Overburden thickness



Hydrogeological setting



Piezometry



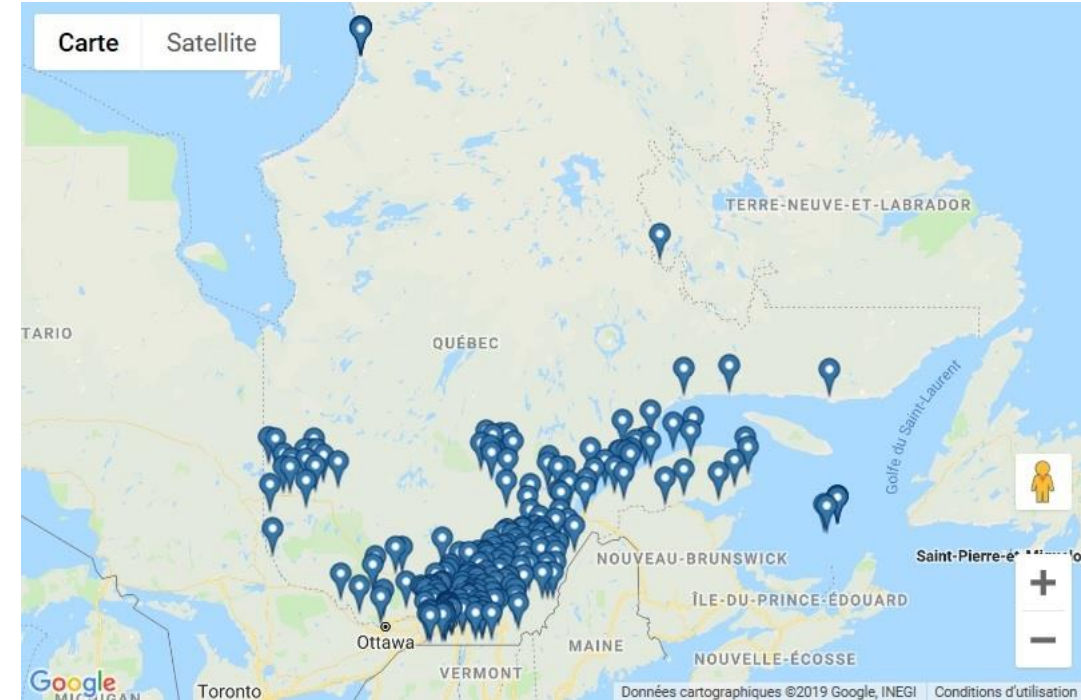
2.2 Assessment of climate change impact on groundwater

- Objective:
 - Assessment of climate change influence on groundwater resources
- 2006-2012 and 2013-2020 Quebec Climate Change Action Plan (*PACC in French*):
 - **Action 30.2** : Consolidation of hydrometric and hydrological monitoring, surveillance and forecasting systems, and public dam management adaptation
 - **Action 30.3** : Surface and groundwater management adaptation in a context of climate change: monitoring and intervention



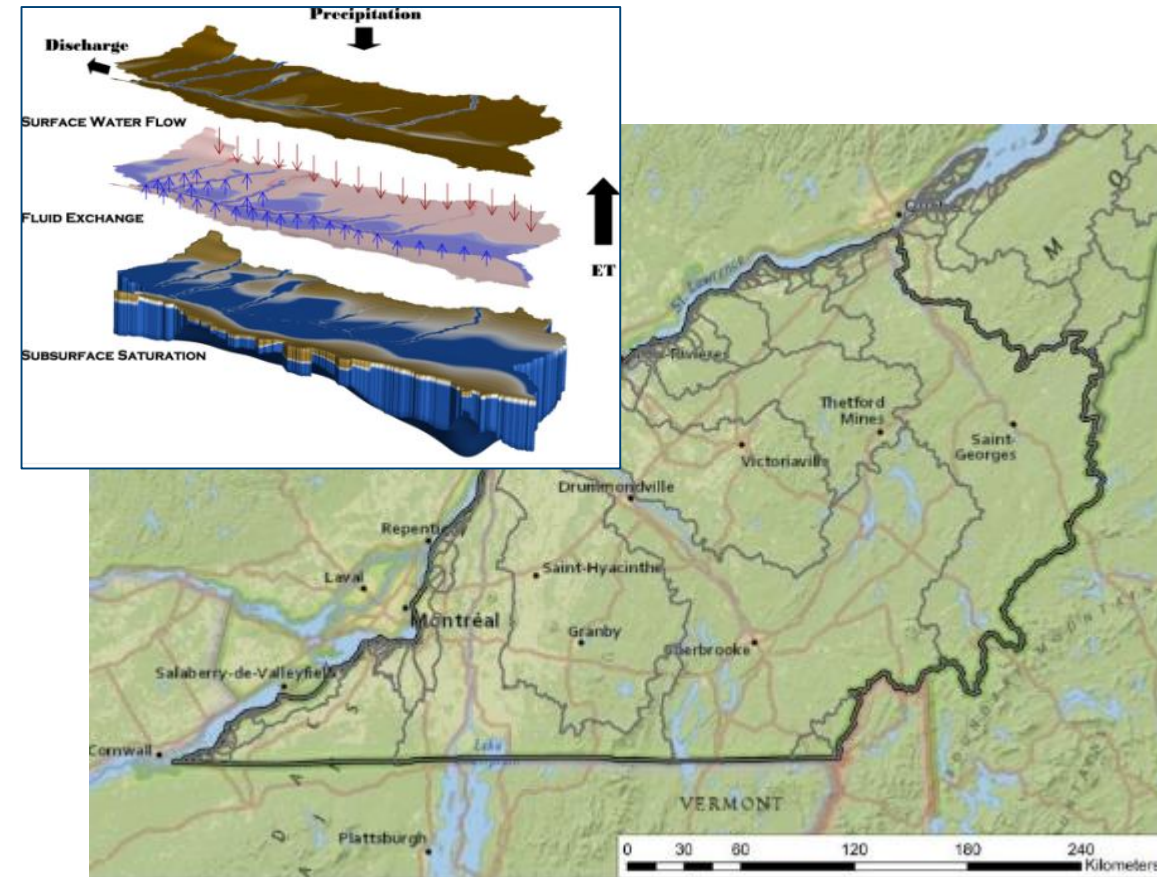
2.2 Assessment of climate change impact on groundwater

- Groundwater Monitoring Network (*RSESQ*):
 - Funded through the PACC
 - Southern and Northern Quebec, Magdalen Islands
 - 258 monitoring stations
- Previous network, 1970-1985:
 - Monitoring network to characterize regional environment and examine local issues
 - Abandoned in 1994
- Data:
 - From 1968 to today (continuously, since 2009)



2.2 Assessment of climate change impact on groundwater

- Groundwater research projects (3) in the southern part of Quebec (36 000 km²), and funded within the PACC (expected to conclude in winter 2021):
 - Optimize of the RSESQ and improve the use of its data (representativeness, statistics, trends, predictions)
 - Develop integrated modeling tools (surface water and groundwater) at the watershed scale
 - Improve the understanding of aquifer recharge and the contribution of groundwater to surface water in the context of climate change



Regional scale

Ref.: Laval University, 2020 (unpublished preliminary report)

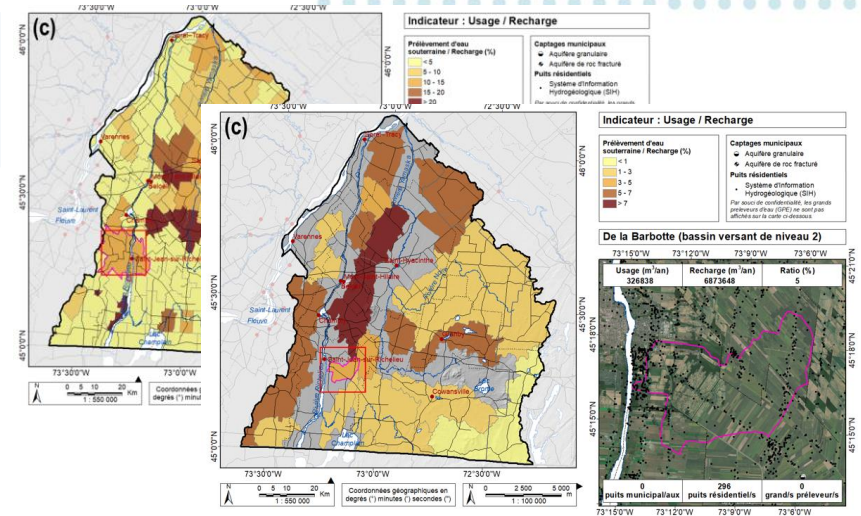
2.3 Water withdrawal authorization process

- Per section 22 of the *Environmental Quality Act*
- Management tool: *Water withdrawal and protection regulation*
- Groundwater Division provides technical advices to regional offices on various groundwater issues within the authorization process:
 - Interpretation of the regulation
 - Construction standards
 - Specific groundwater setting
 - Issues related to the sustainable development of resources (cumulative and climate change effects)

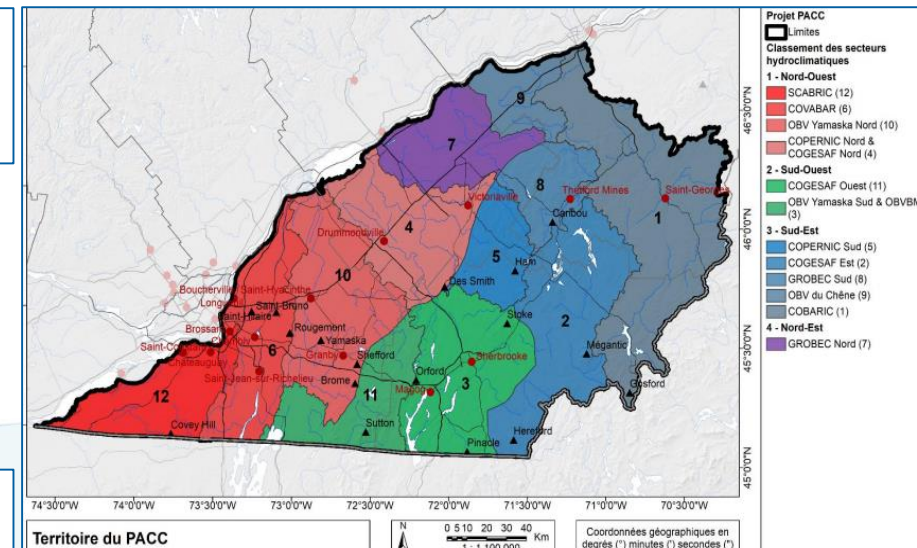
2.3 Water withdrawal authorization process

- Per section 31.76 of the *Environmental Quality Act*
- Review of the groundwater allocation process for sustainable groundwater resource development:
 - Development of tools for regional analysts, notably groundwater sustainability indicators, to facilitate the approval of groundwater withdrawal requests, in regard to cumulative and climate change effects

Water stress:
municipal vs sub-
watershed levels



Hydroclimatic zones
(hydrogeology and
climate)

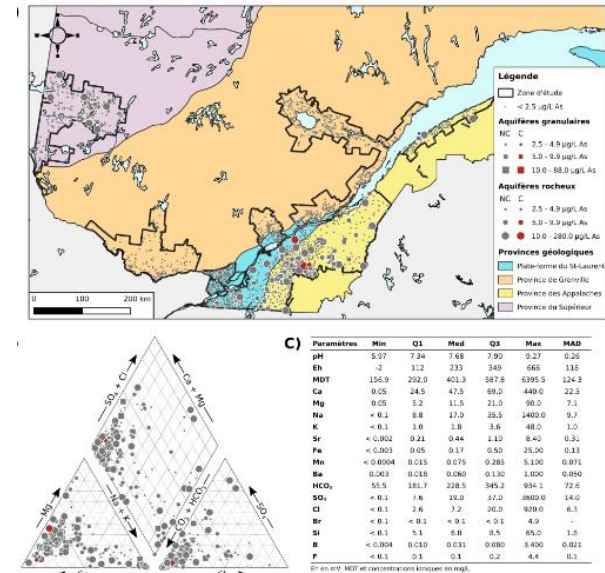


Ref.: INRS, 2020 (unpublished preliminary report)

2.4 Information collection and dissemination

- Sustainable groundwater management research project supervision and funding :
 - Riverbank wells
 - Synthesis of hydrogeochemical data collected within PACES
 - Isotope use for vulnerability assessment
 - Impacts on wetlands and groundwater-dependant ecosystems, etc.
- Knowledge transfer through workshops organized by the Université du Québec à Trois-Rivières (UQTR) in collaboration with the *Réseau québécois sur les eaux souterraines* (RQES)
- Most of the information collected in the course of the regional hydrogeological projects is available online at

<http://www.environnement.gouv.qc.ca/eau/souterraines/programmes/acquisition-connaissance.htm>



Ref.: UQAT (final report, 2019)

2.4 Information collection and dissemination

- Hydrogeological Information System (*SIH – système d'information hydrogéologique*):

- Well and borehole logs (regulatory since 1967)
- Search by site coordinates or municipality
- 225,000 wells and boreholes

<http://www.environnement.gouv.qc.ca/eau/souterraines/sih/index.htm>

- PACES – 13 completed projects:

- Scientific reports
- General public reports (syntheses)

<http://www.environnement.gouv.qc.ca/eau/souterraines/programmes/acquisition-connaissance.htm>



Environnement
et Lutte contre
les changements
climatiques
Québec

Accueil Plan du site Courrier Portail Québec A propos du site Recherche English

Paramètres de l'extraction

Nom de la municipalité : MRC

Abercorn:Brome-Missisquoi
Acton Vale:Acton
Adstock:Les Appalaches
Akwasasne:Le Haut-Saint-Laurent
Albanel:Maria-Chapdelaine
Albertville:La Matapédia
Alleyne-et-Cawood:Pontiac

Projection cartographique

☒ Coordonnées géographiques (Lat-Long)
☐ Universal Transverse Mercator (UTM)
☐ Modified Transverse Mercator (MTM)

Champs d'information disponibles

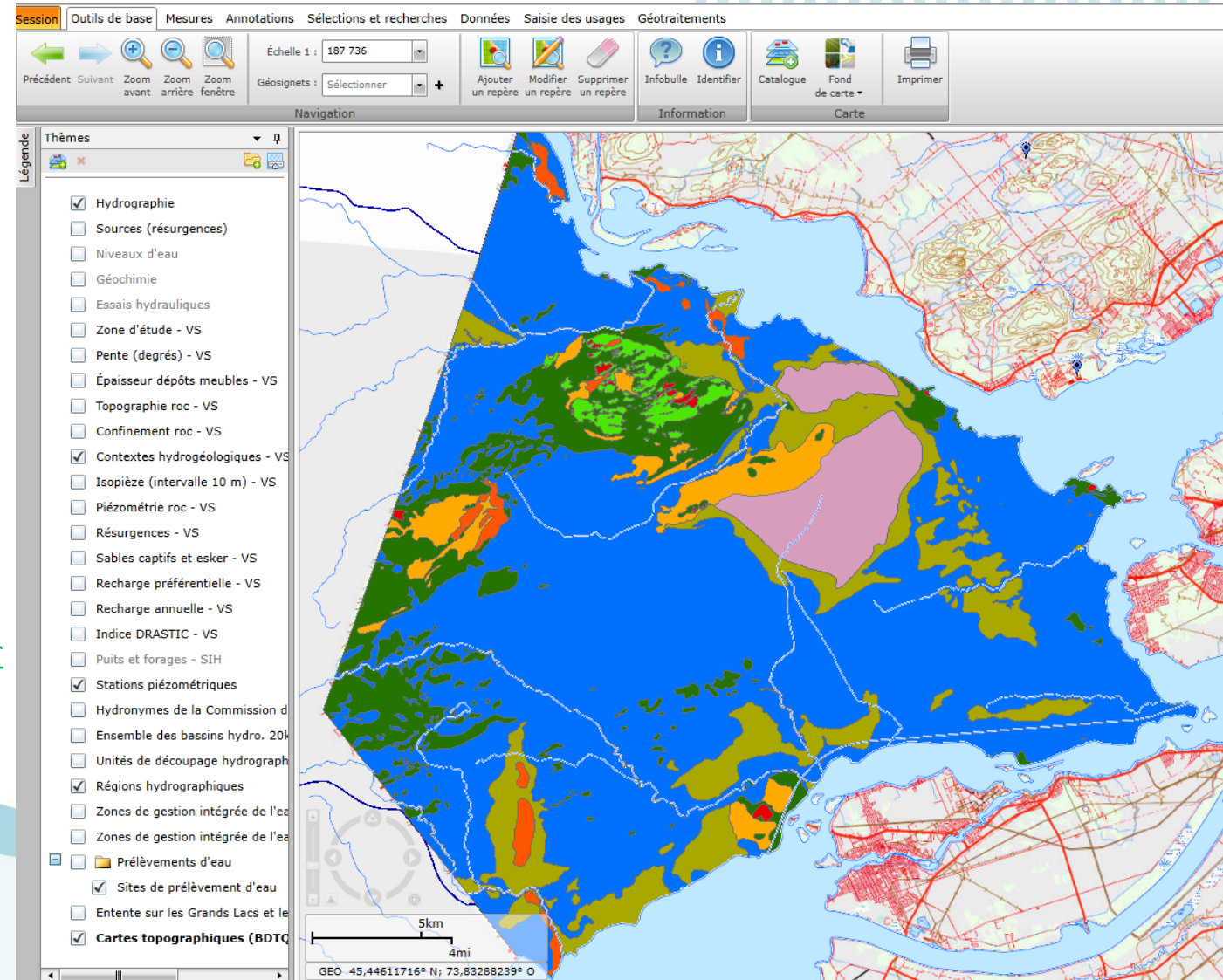
- ☐ Propriétaire initial
- ☐ Adresse (adresse, ville et code postal)
- ☐ Diamètre du puits
- ☐ Profondeur du puits
- ☐ Matériau du tubage
- ☐ Longueur du tubage
- ☐ Niveau d'eau à la fin des travaux
- ☐ Date du pompage
- ☐ Durée du pompage
- ☐ Débit
- ☐ Méthode de forage
- ☐ Numéro de puisatier
- ☐ Description des lithologies

Soumettre la requête

2.4 Information collection and dissemination

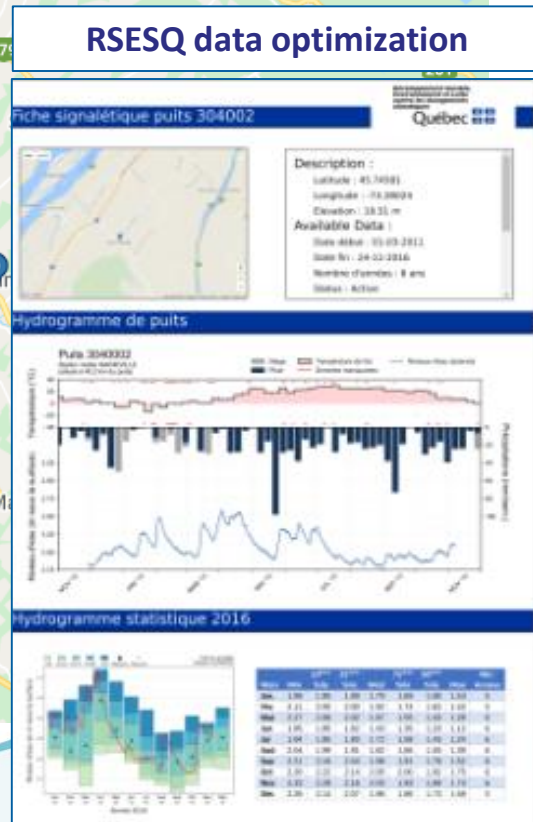
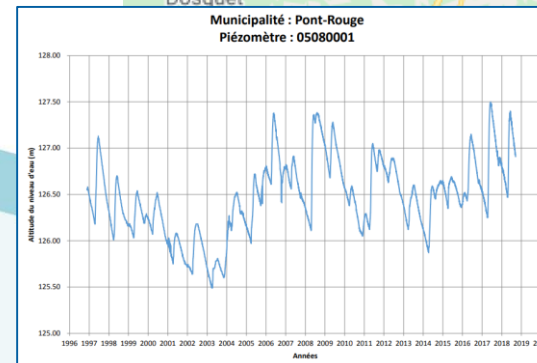
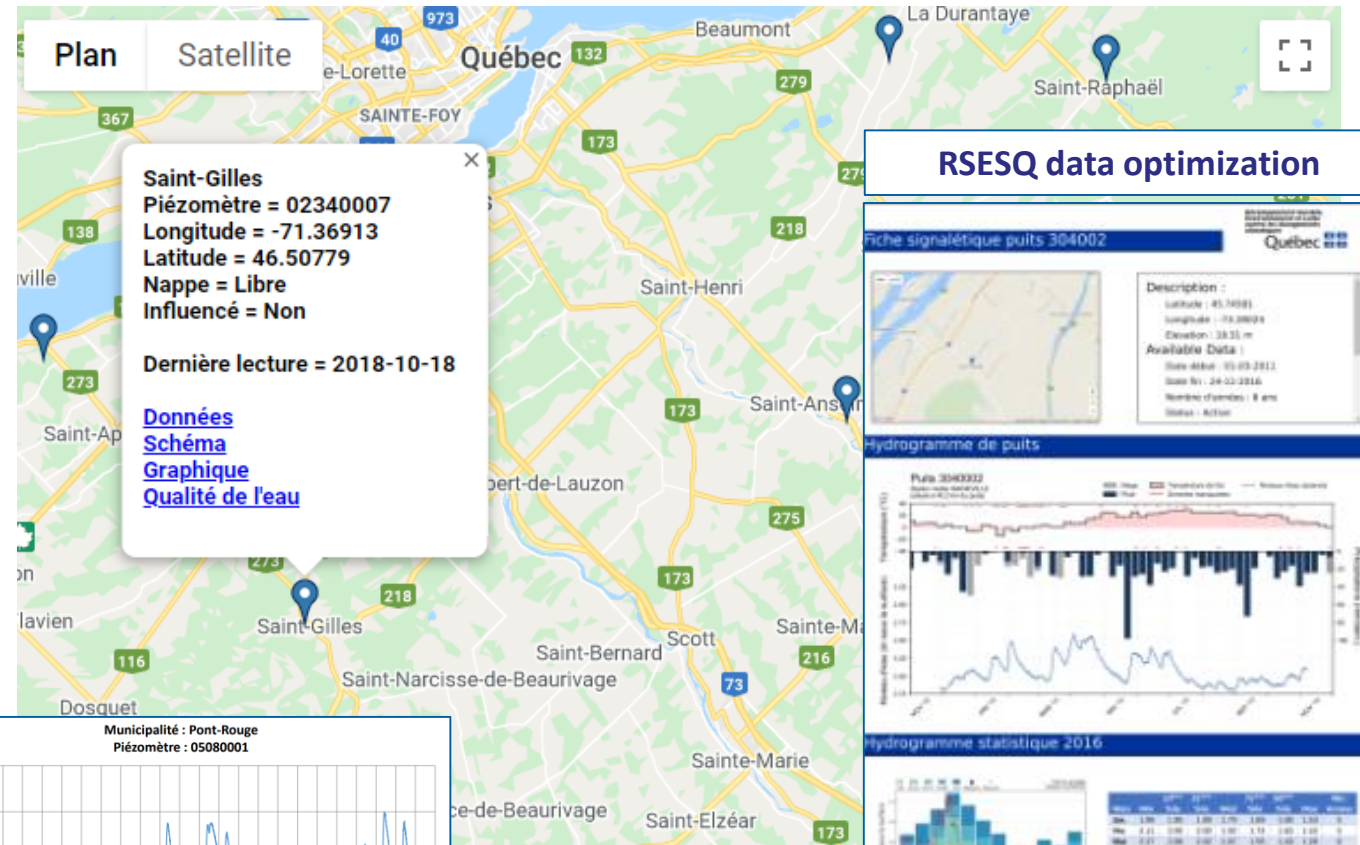
- Map Navigator (online Atlas)
 - ± 500 data layers
 - Includes PACES results
 - Field data : drilling, piezometric levels, hydrogeochemistry, hydraulic testing, etc.
 - Map data : stratigraphy, confinement, overburden thickness, piezometry, recharge, DRASTC vulnerability, etc.

<http://www.environnement.gouv.qc.ca/eau/souterraines/diffusion-carto-hydrogeologique.htm>



2.4 Information collection and dissemination

- Groundwater Monitoring Network (RSESQ):
 - Groundwater elevation
 - Well log
 - Data presented in a graph
 - Baseline water quality
- Work in progress to improve data interpretation (PACC)

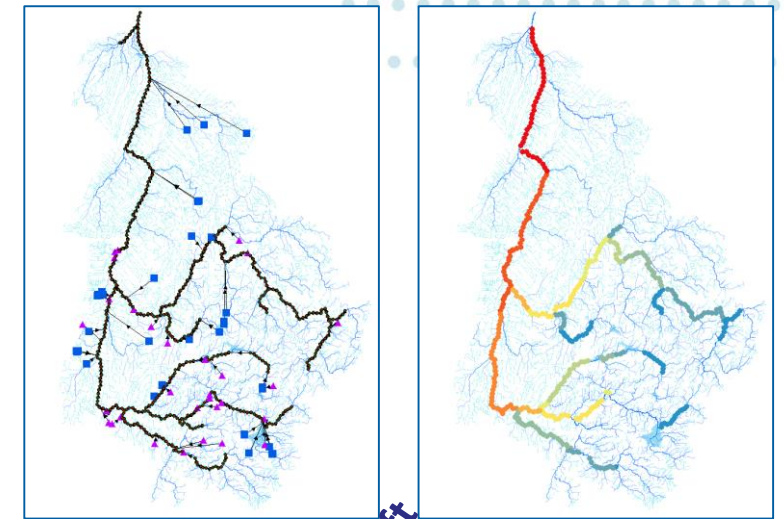


3. NEXT STEP

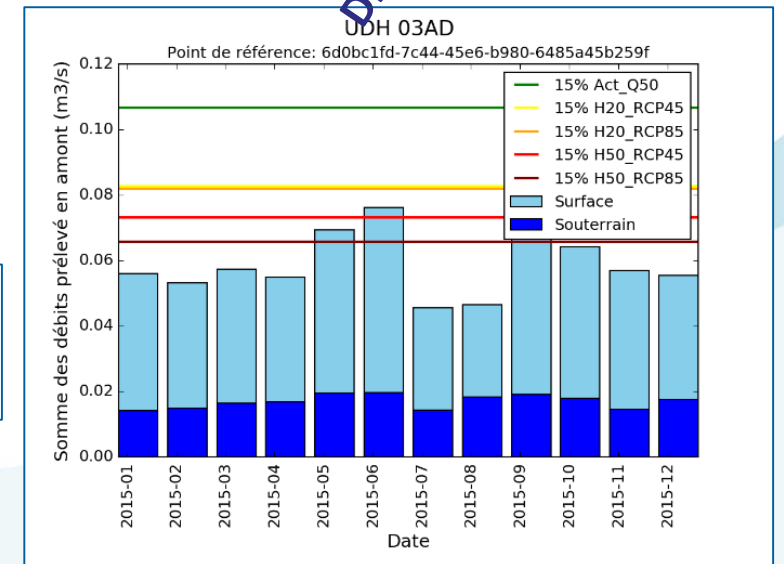
- *Newsletter* – Management decision tools - piezometric indicator: hydroclimatic regions, trends, low water
- Integrate groundwater withdrawals into a tool (in development) for calculating the cumulative effects of water withdrawals (DGIE)
- Identify specific current and future hot spots management areas and propose adaptation measures

Tool for the estimation of cumulative surface and groundwater widthdrawals (draft)

Ref.: Unpublished preliminary results



Draft



4. COLLABORATION WITHIN THE NDGW



- Interests:
 - Sharing information and experiences (field methodologies, guidelines, research reports, etc.) with other provincial and federal jurisdictions
 - Discuss:
 - Approaches used for small and agricultural withdrawal inventory (time consuming)
 - Impacts on GDE (riverbank and terrestrial)
 - Climate change impact monitoring approaches for comparison purposes
 - Groundwater sustainable management indicators

THANK YOU!

MELCC – Eaux souterraines:

<http://www.environnement.gouv.qc.ca/eau/souterraines/index.htm>