

# PA31-1.0 : SITE INVESTIGATIONS FEEDBACK FROM CEREMA

(KNOWN CONSTRAINTS, NOT NECESSARILY EXHAUTIVE)

P. Boillon (Cerema)

2.11.2021



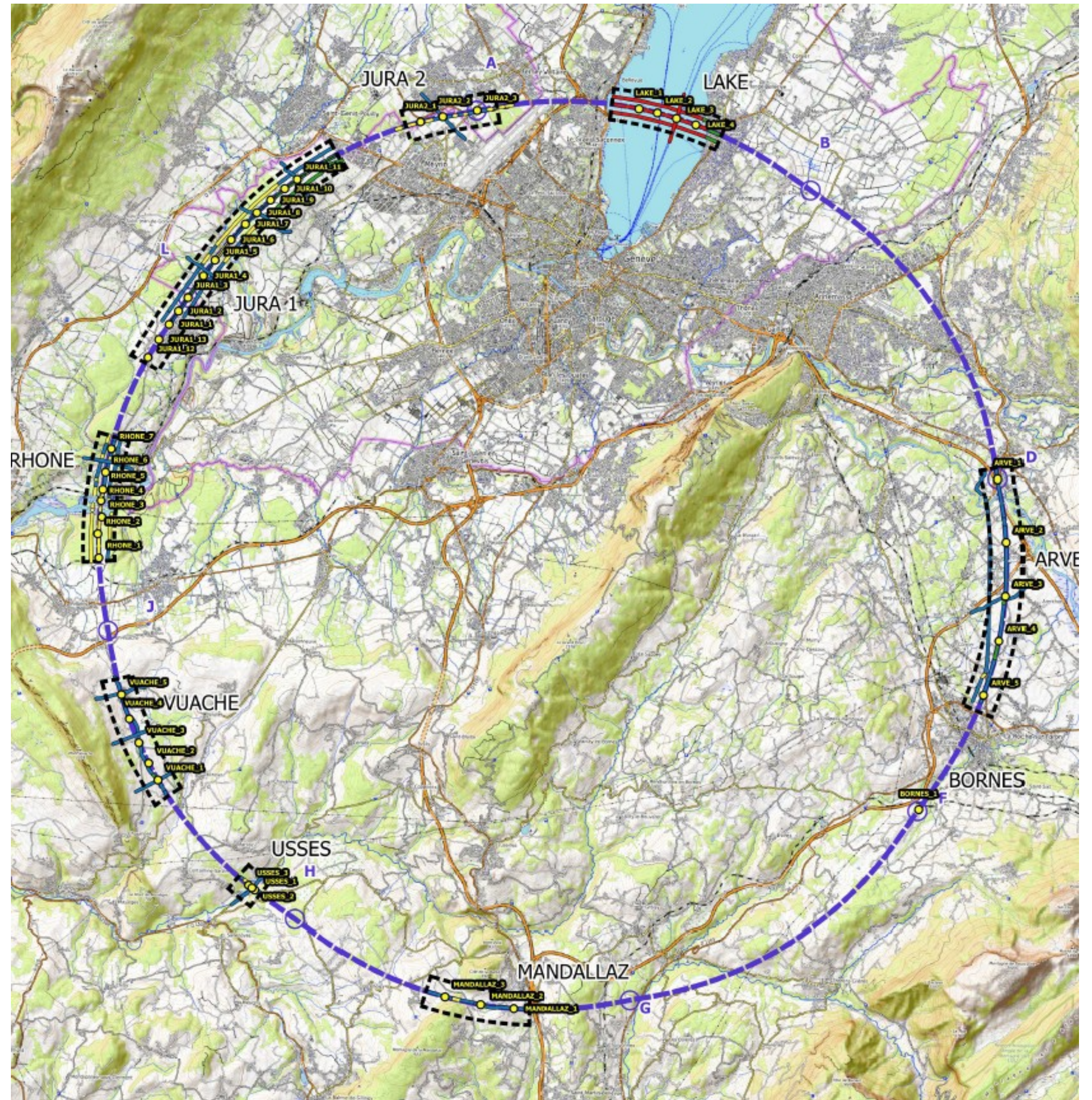
# PA31-1.0 : site investigations

## Contents :

- Feedback on constraints
- To be precised with DDTS, DREAL
- Feedback from geologists and hydrogeologists

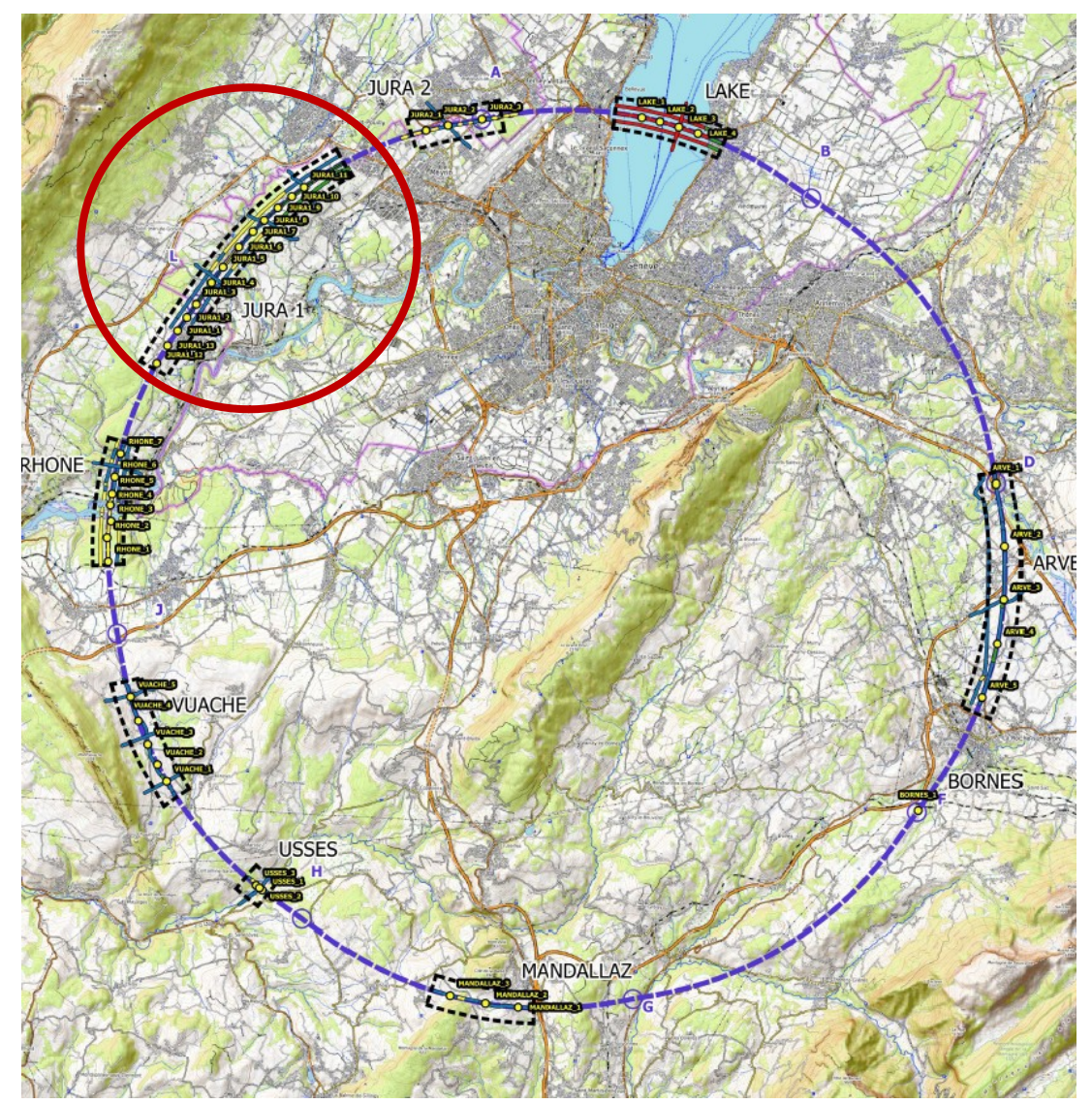
## For site investigations :

- SGAR asked to be consulted, and asked CETU to be consulted too



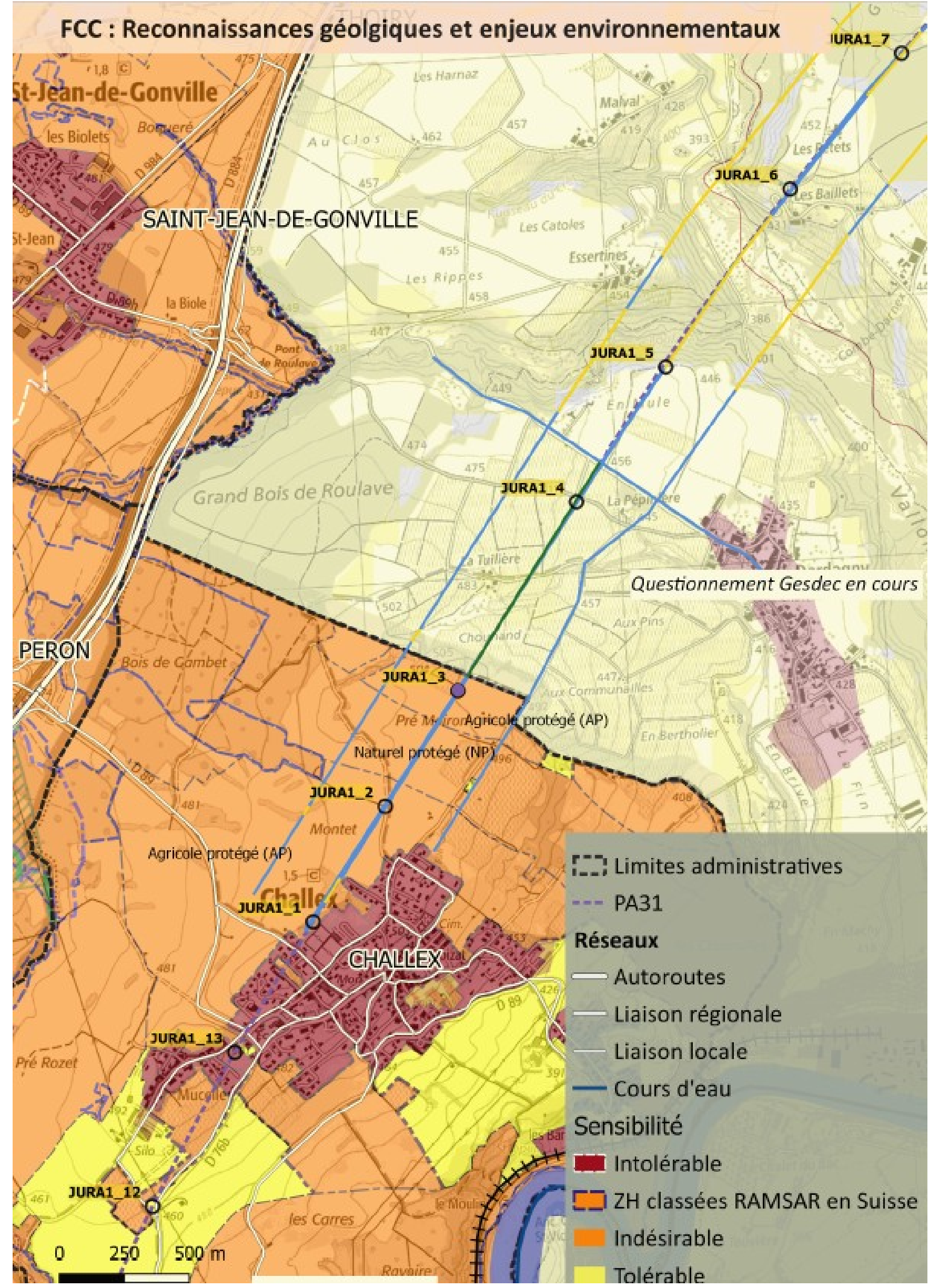


# JURA



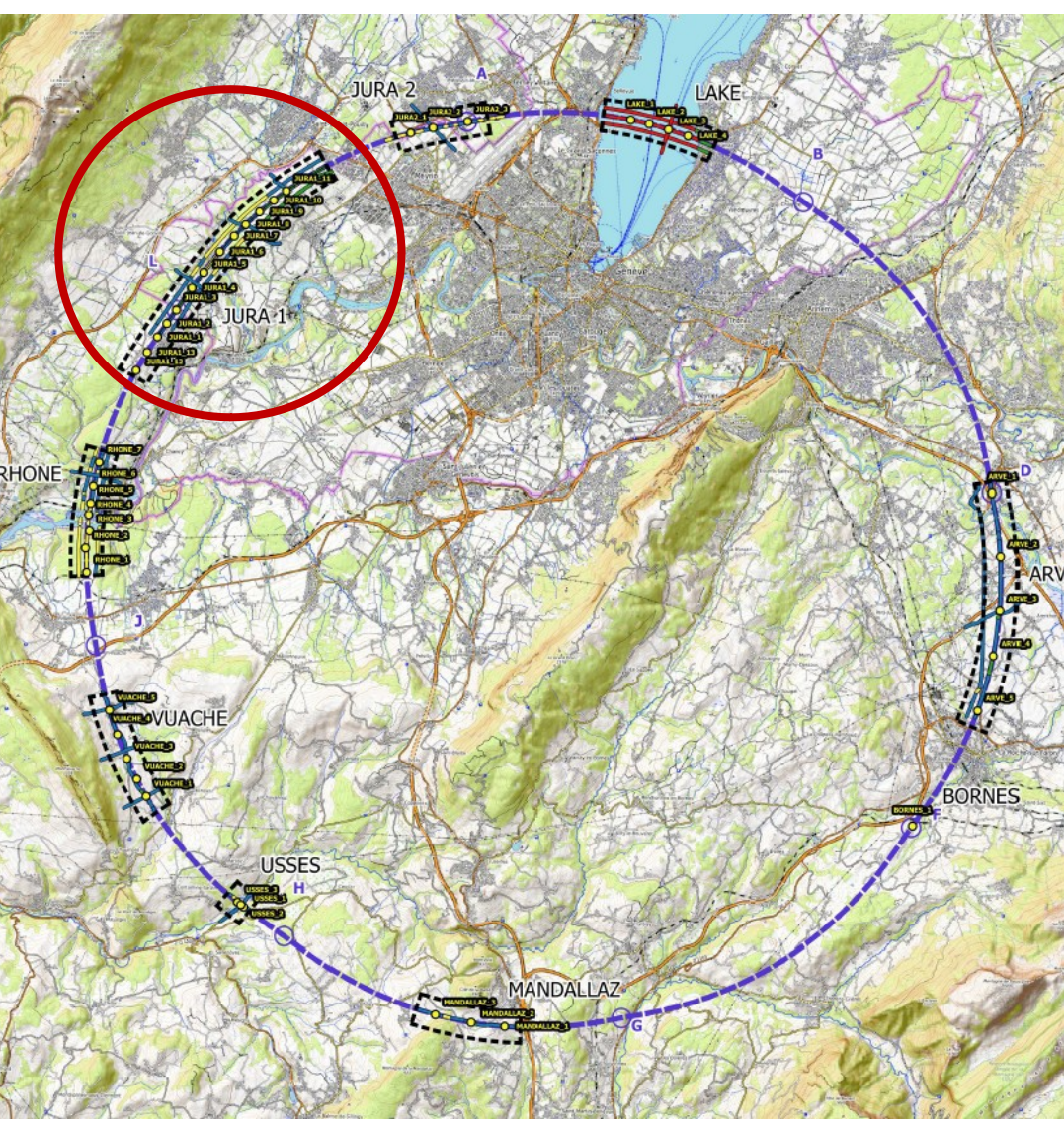
## Context

- Red : zone to be urbanized
- Orange : protected natural area and protected agricultural area
- Zoom on next slide





# JURA



### Borings

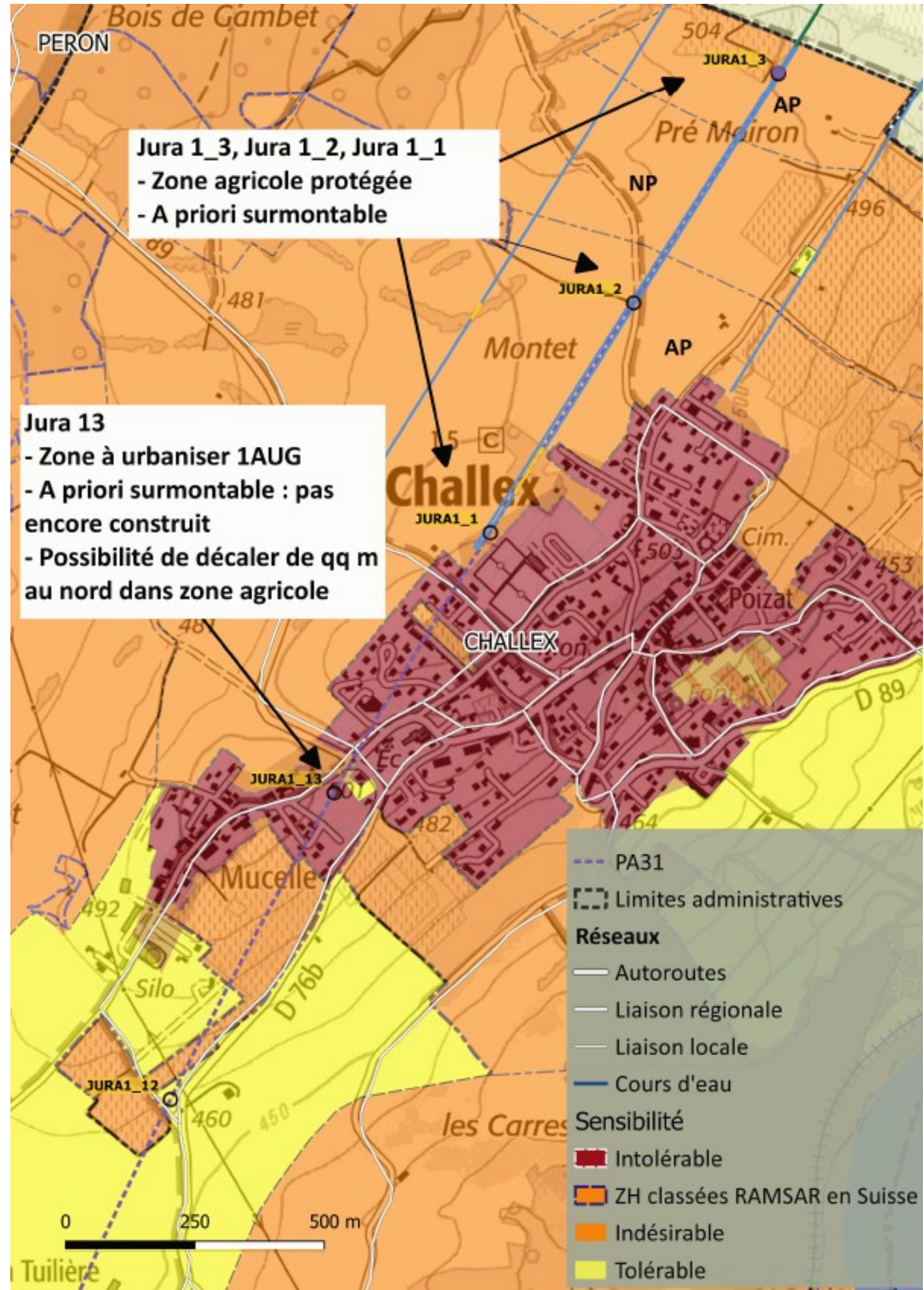
- Protected agricultural area or zone to be urbanized
- Seems overcomeable

### Geophysical investigation

- Protected natural area (NP on the map)

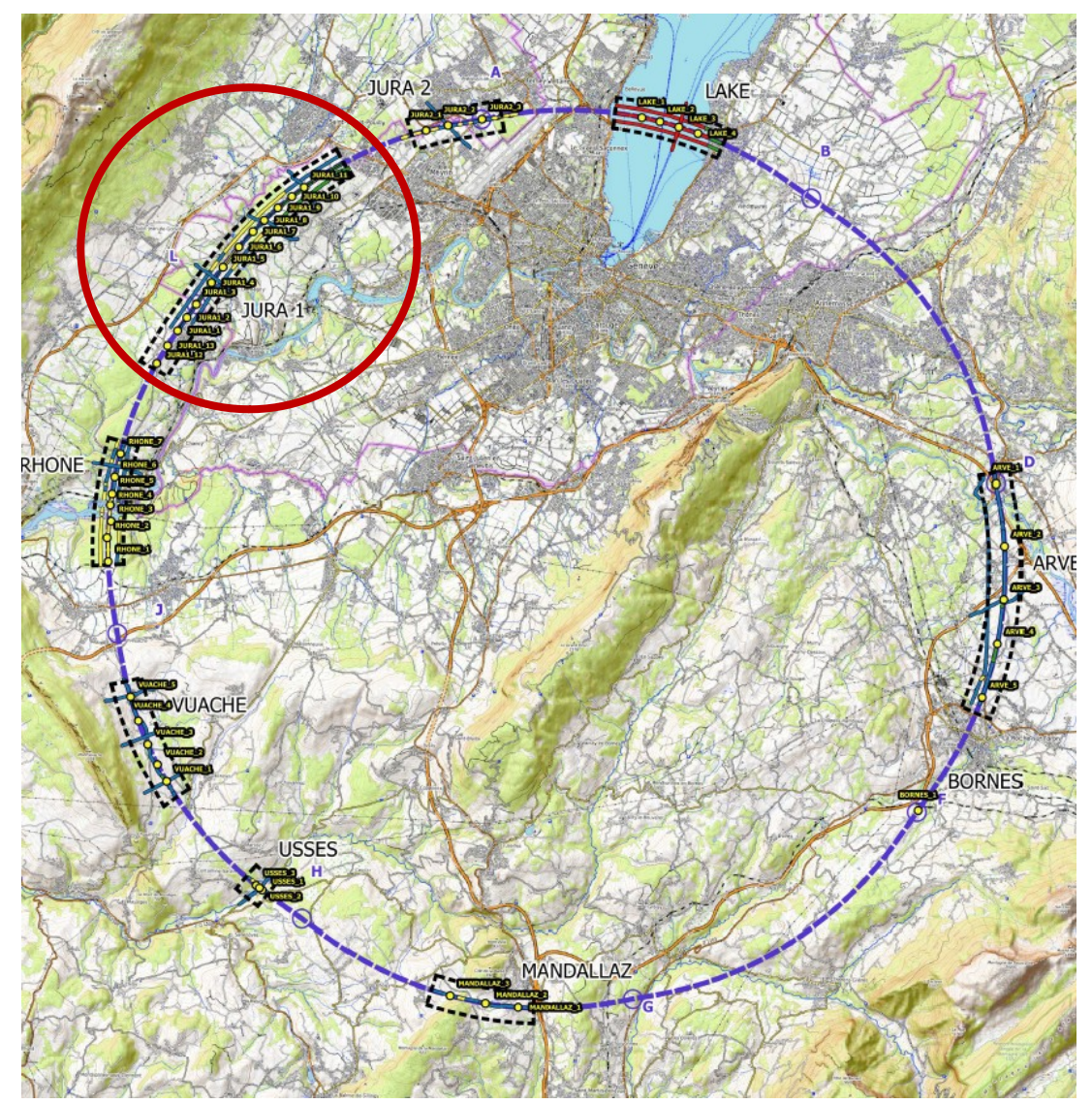
### Vigilance

- Nuisance to neighbourhood

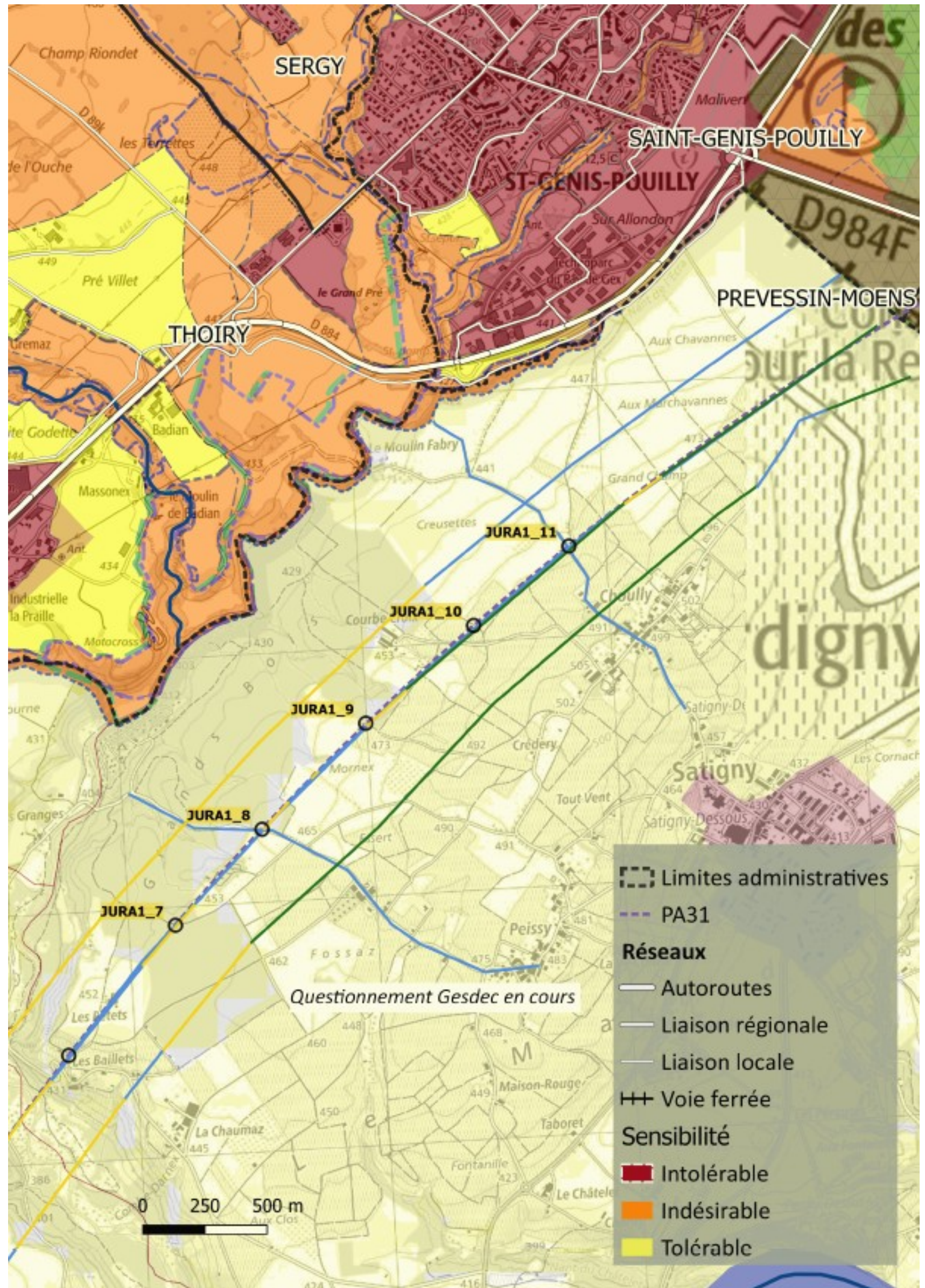




# JURA

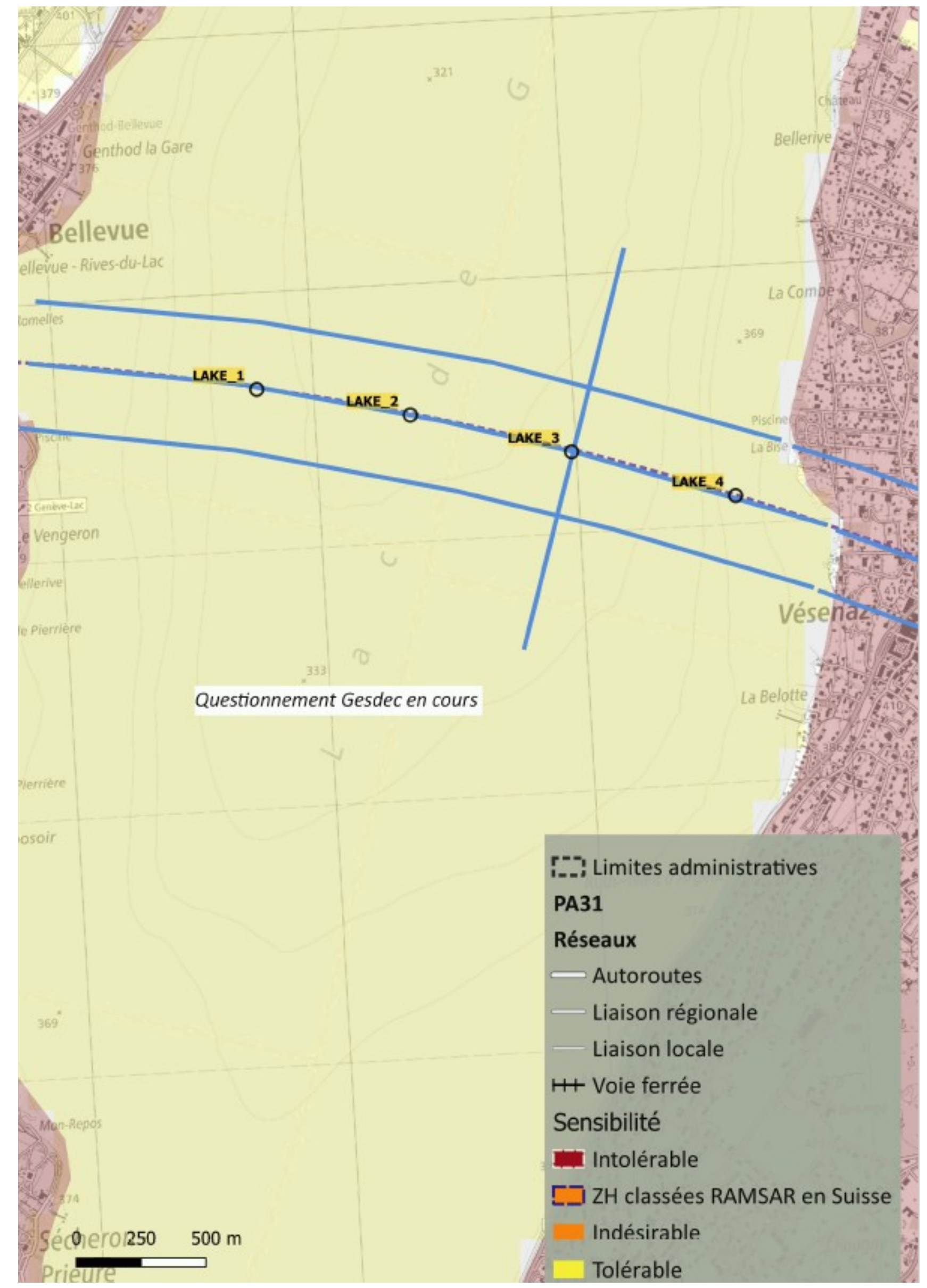
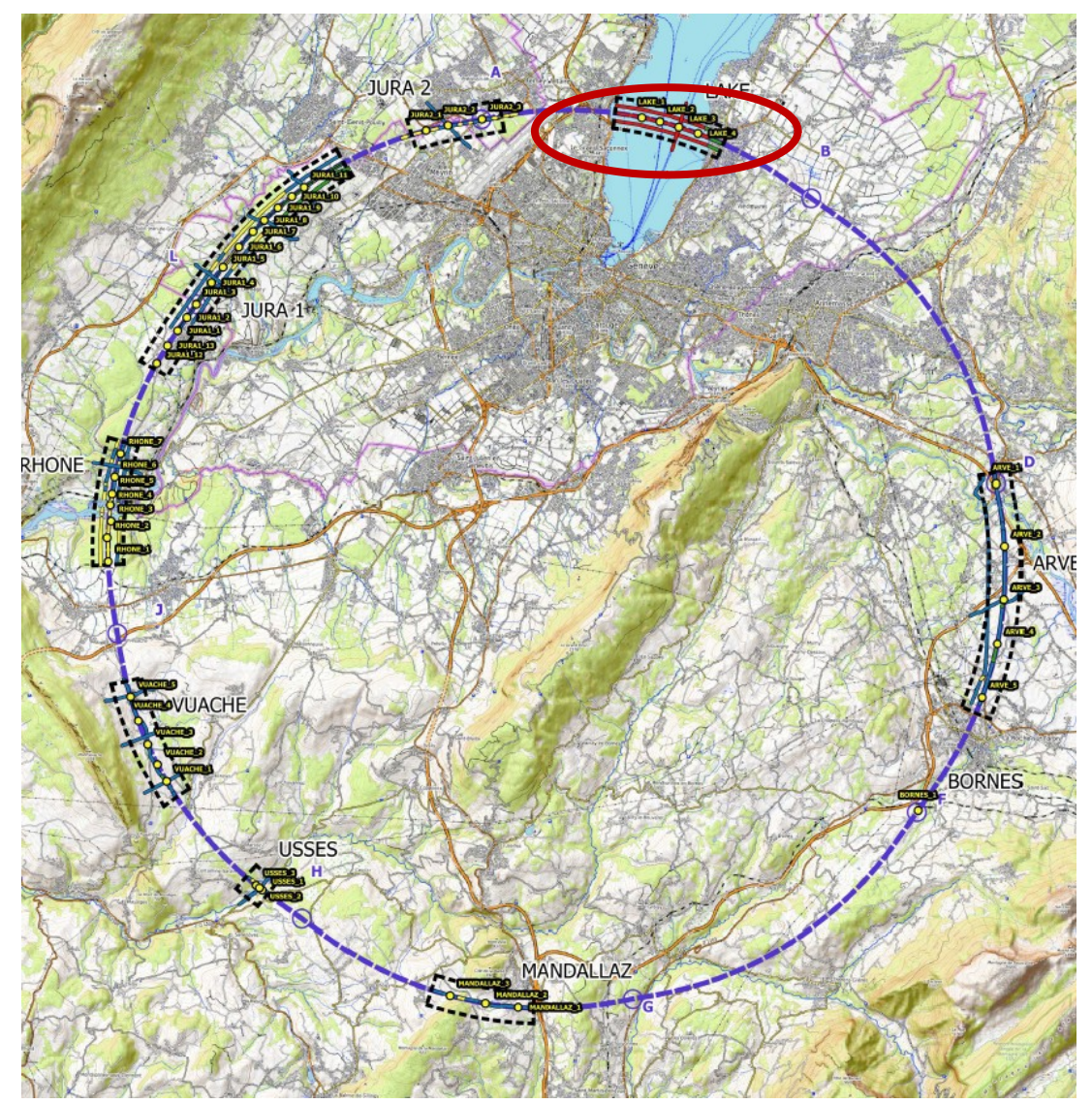


See Gesdec analyse





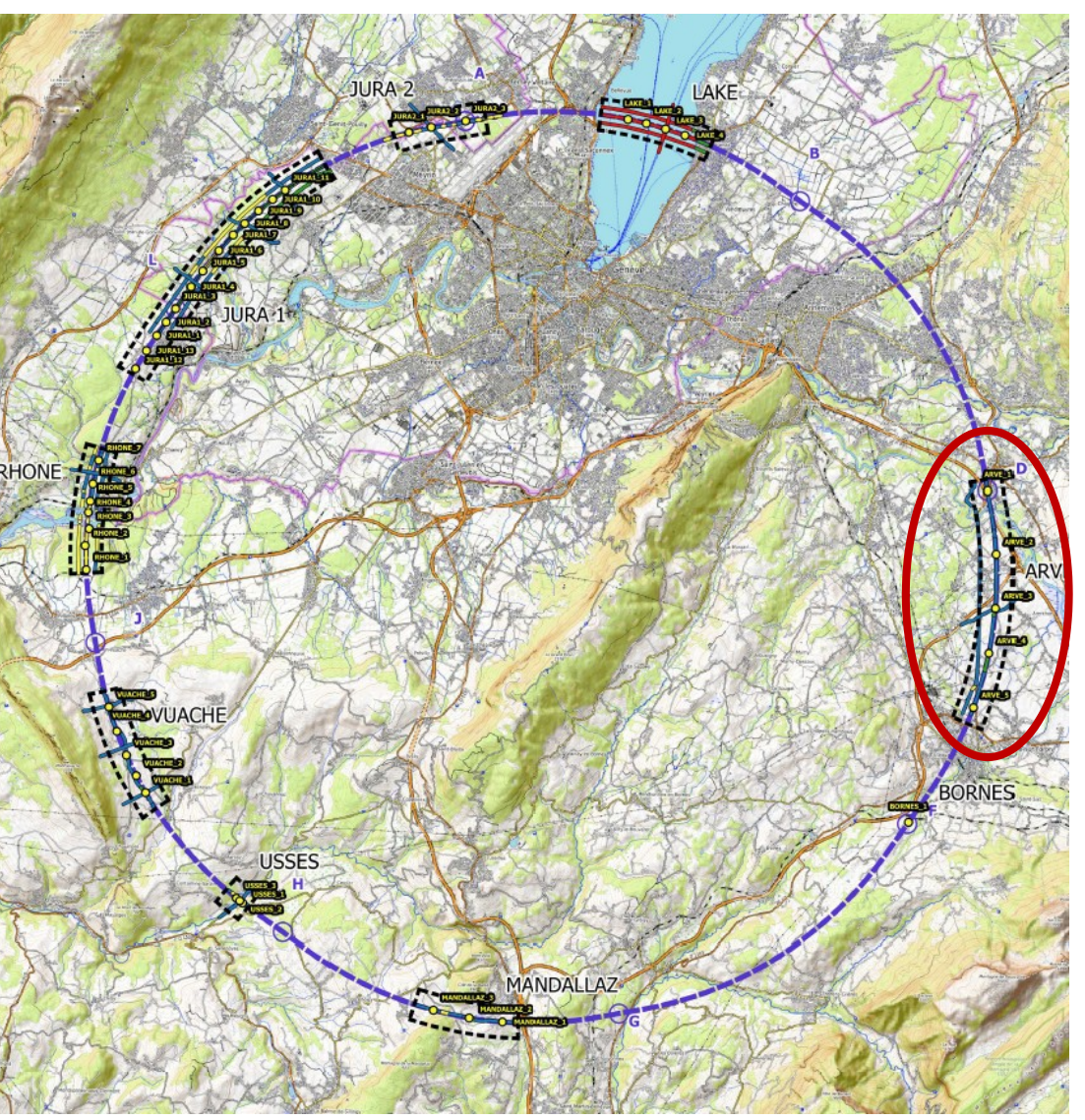
# LAKE



See Gesdec analyse



# ARVE



## Borings

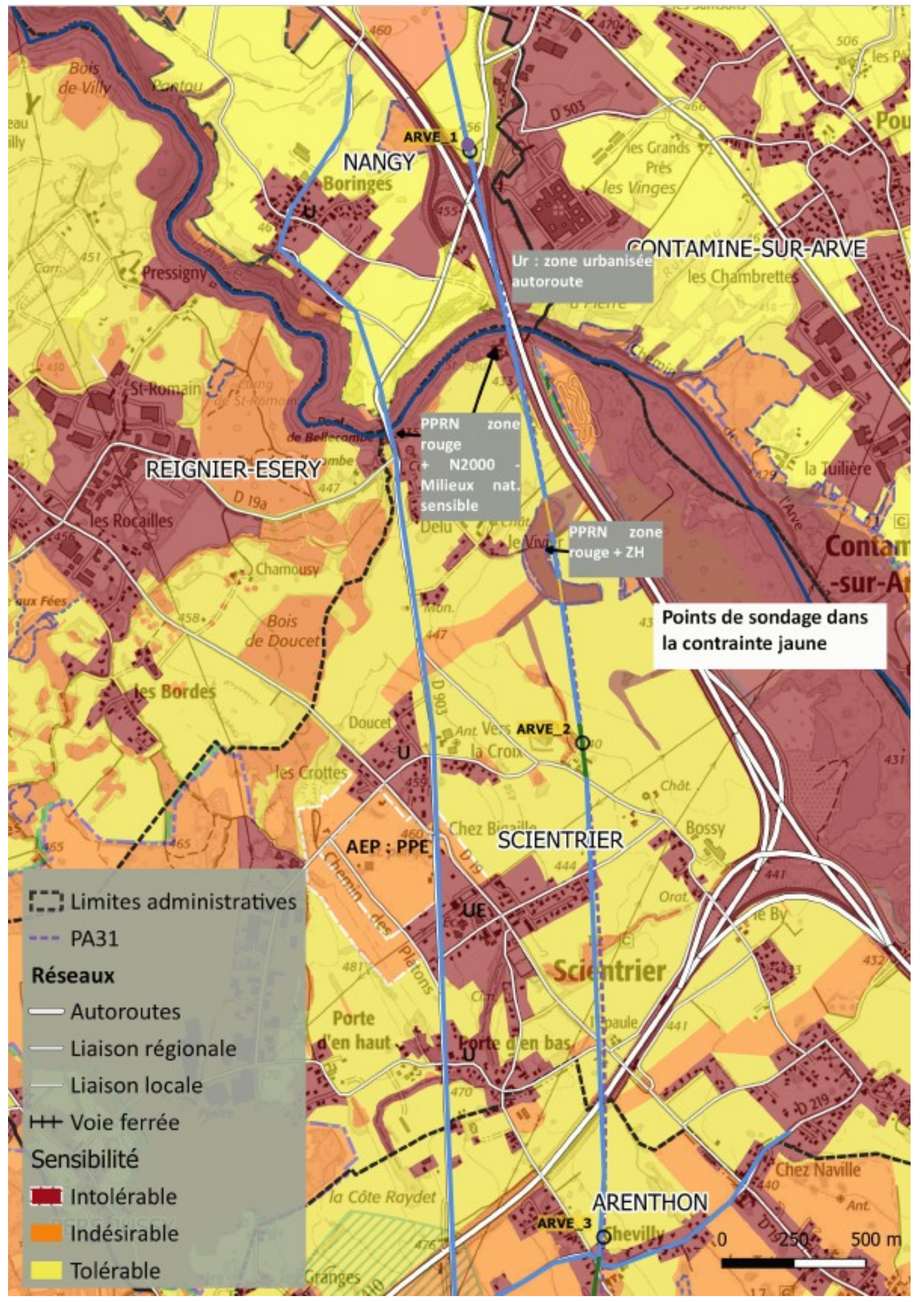
- Yellow constraint : OK

## Geophysical investigation

- Western alignment : mainly on a road
- East alignment : various constraints
  - \* Urbanized area/highway : seems overcomeable
  - \* Natural risk prevention plan (flooding)
  - \* Wetlands
  - \* Natura 2000 zone (sensitive natural environment)

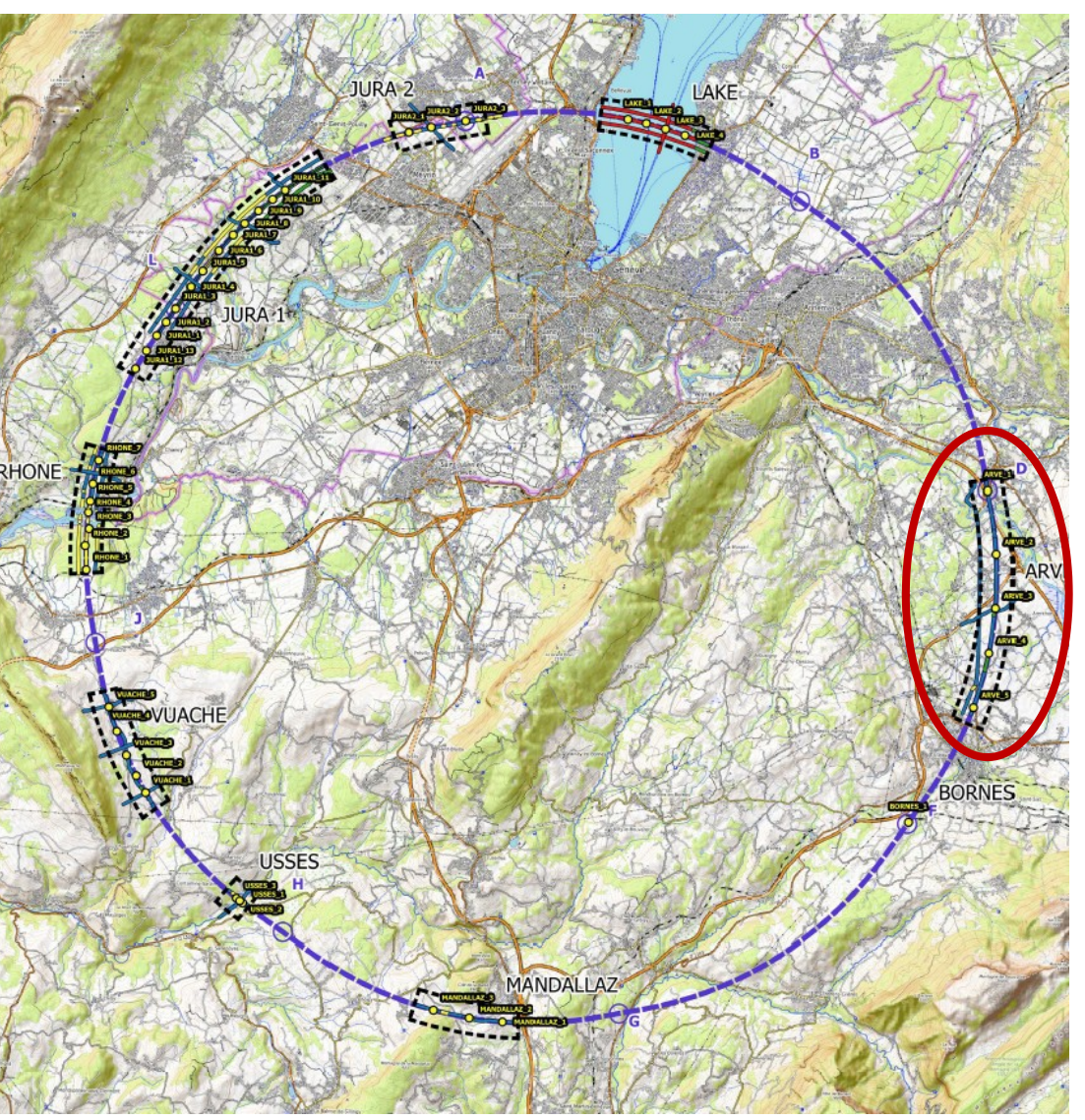
## Vigilance

- Crossing the Arve





# ARVE



## Borings

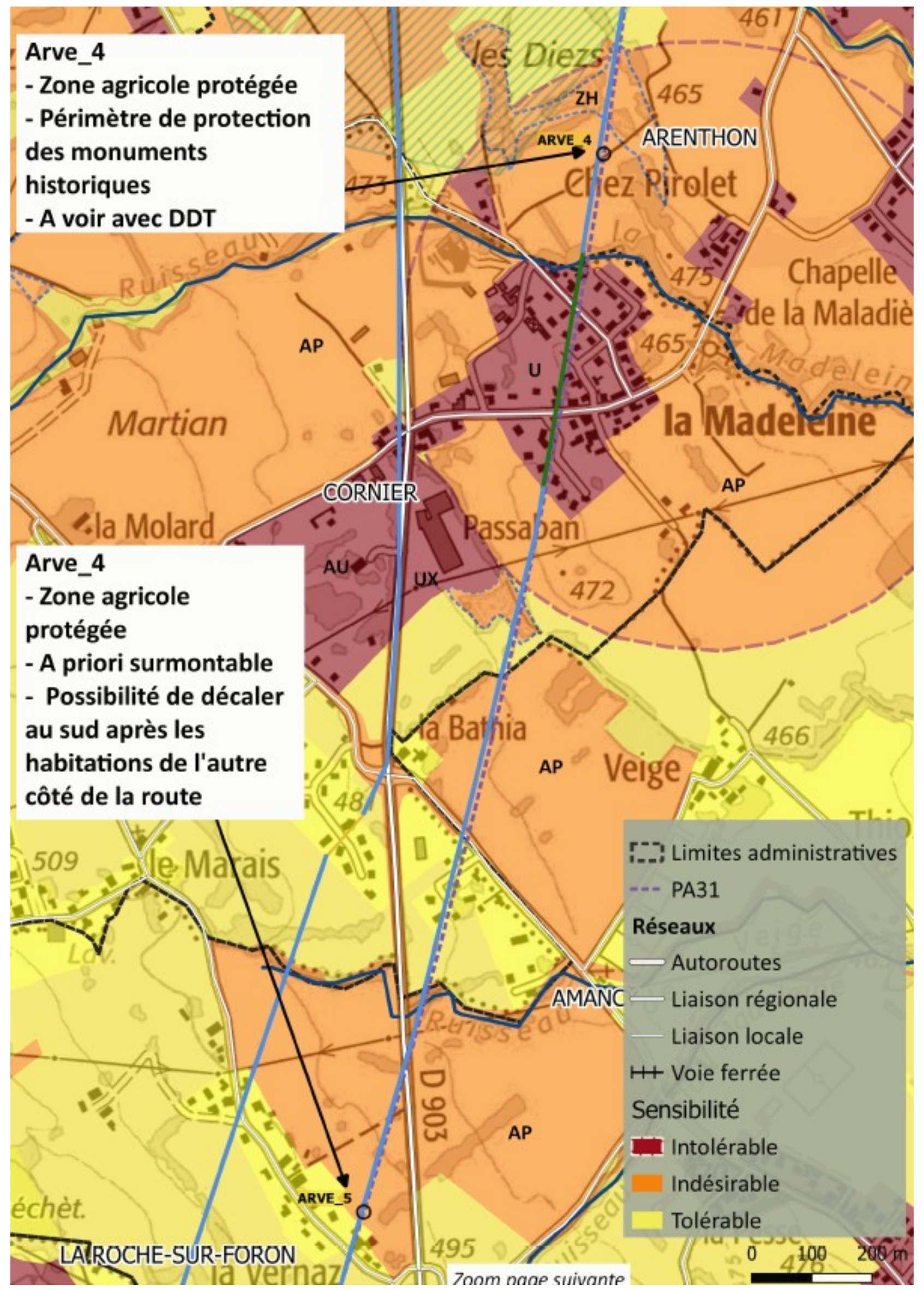
- Protected natural area : seems overcomeable
- Perimeter of protection of historical monuments : to be checked with DDT

## Geophysical investigation

- Western alignment : mainly on a road, or in yellow constraint
- East alignment : various constraints,
  - \* Urbanized area : OK,
  - \* Protected agricultural area : OK

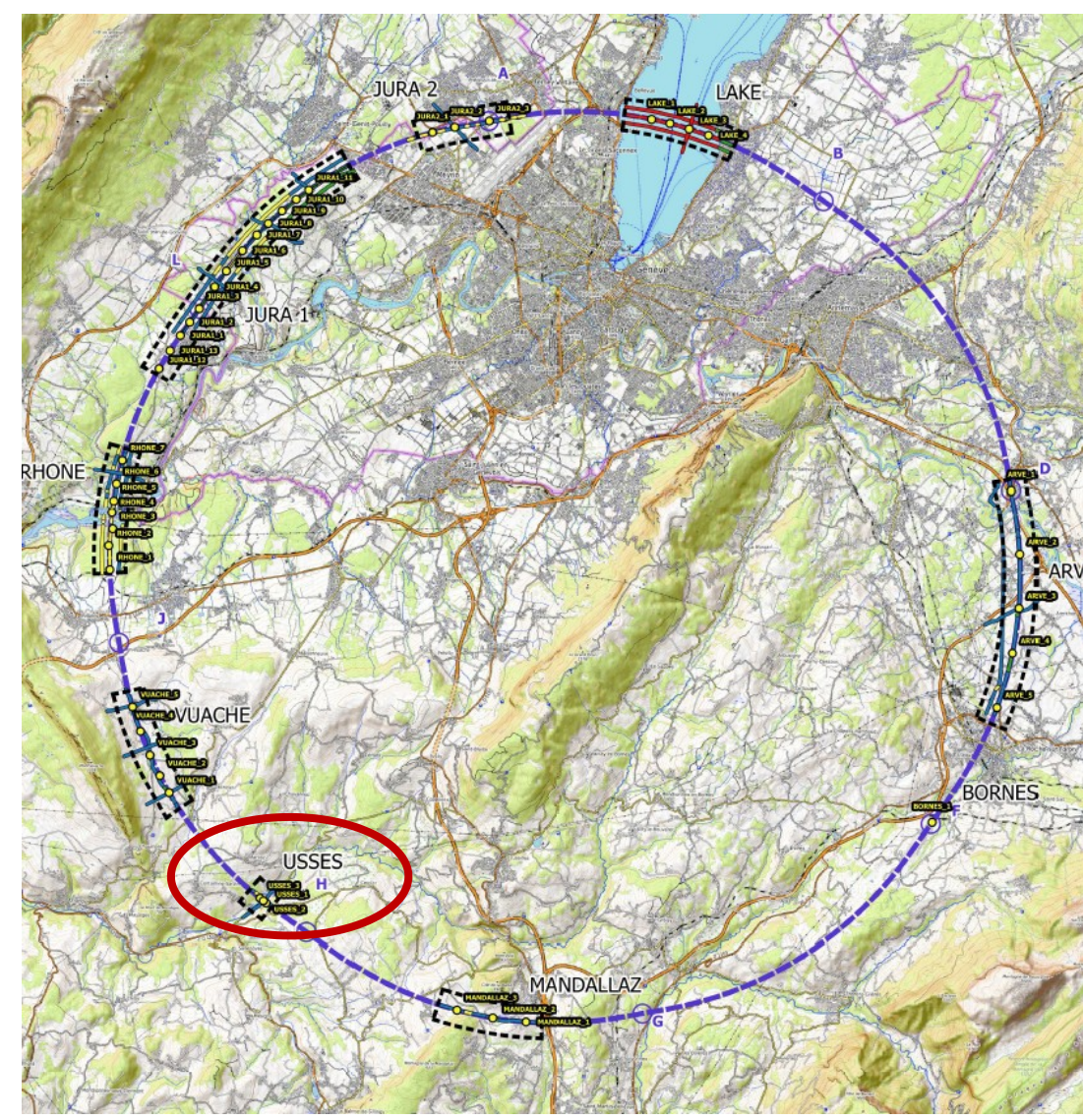
## Vigilance

- Crossing the Arve



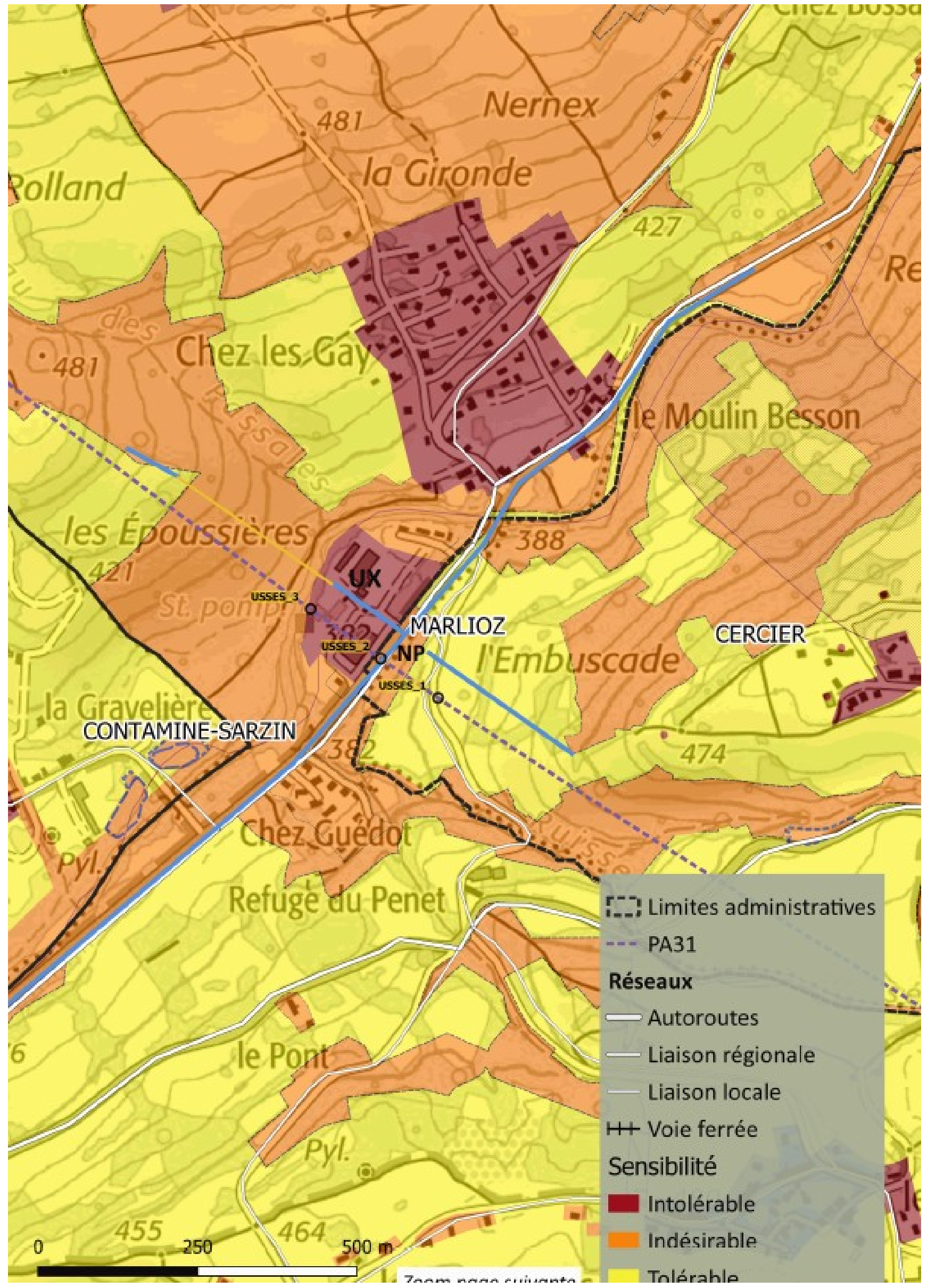


# USSES



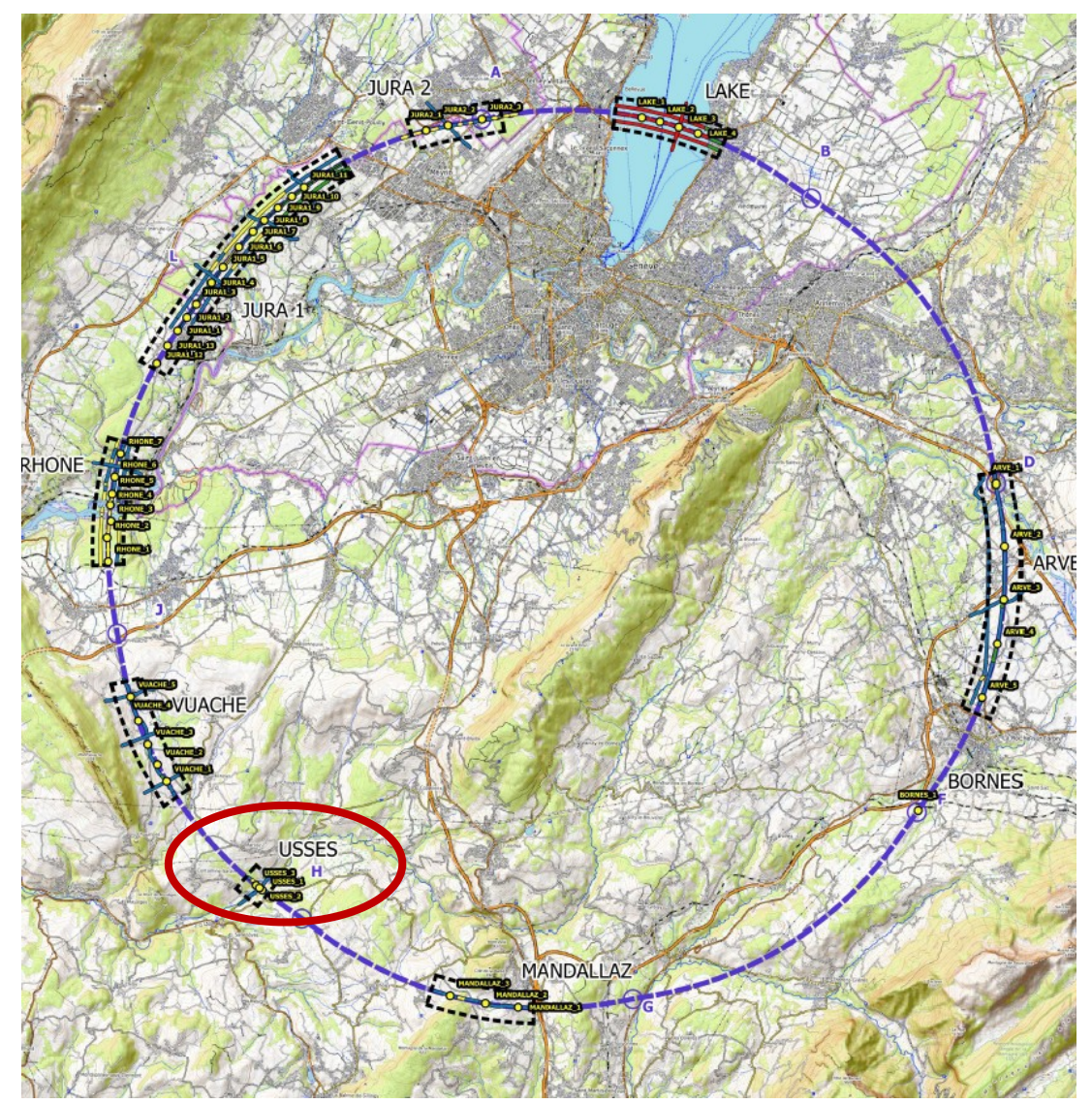
## Geophysical investigation

- Northern alignment : classified wooded area and biodiversity reservoir, seems overcomeable



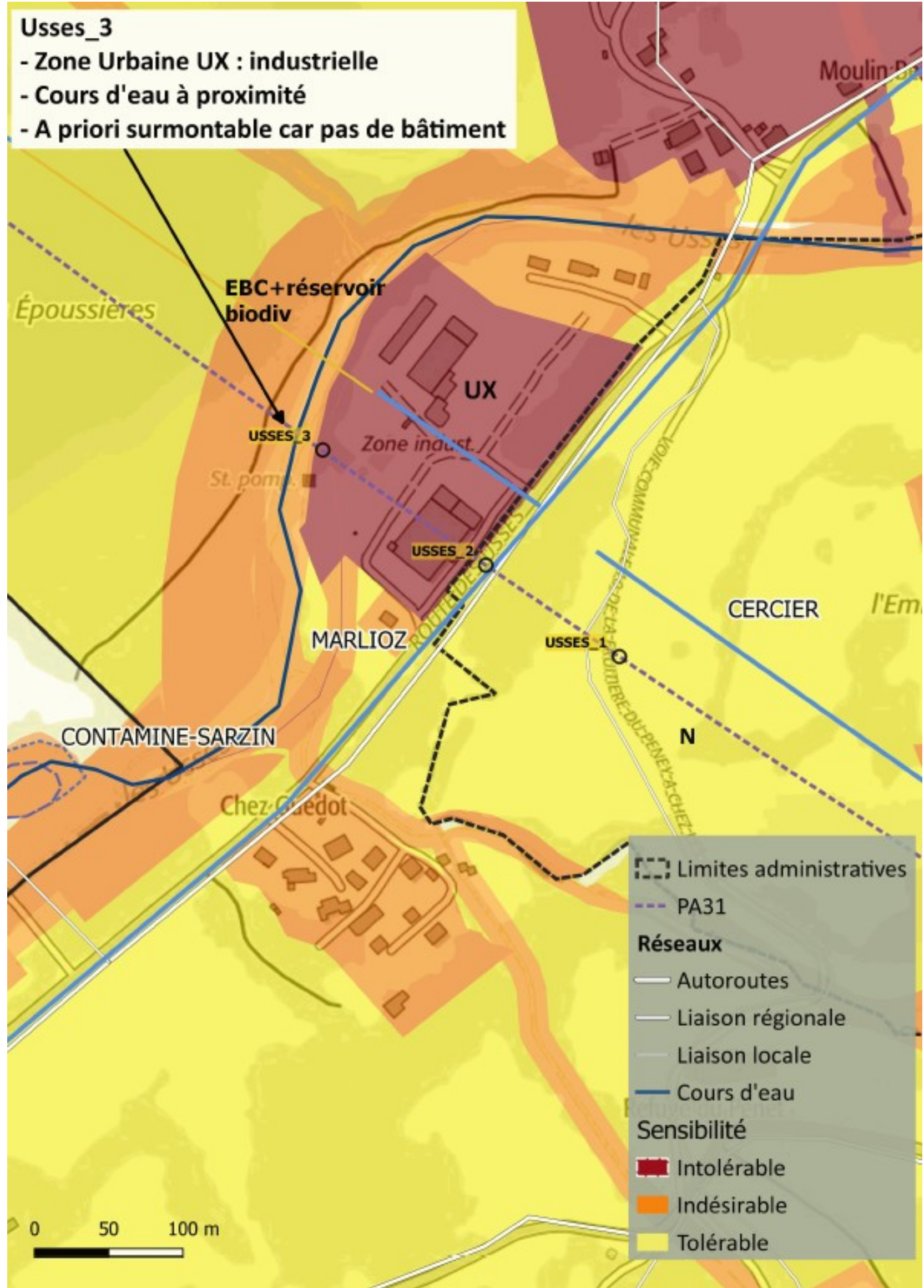


# USSES



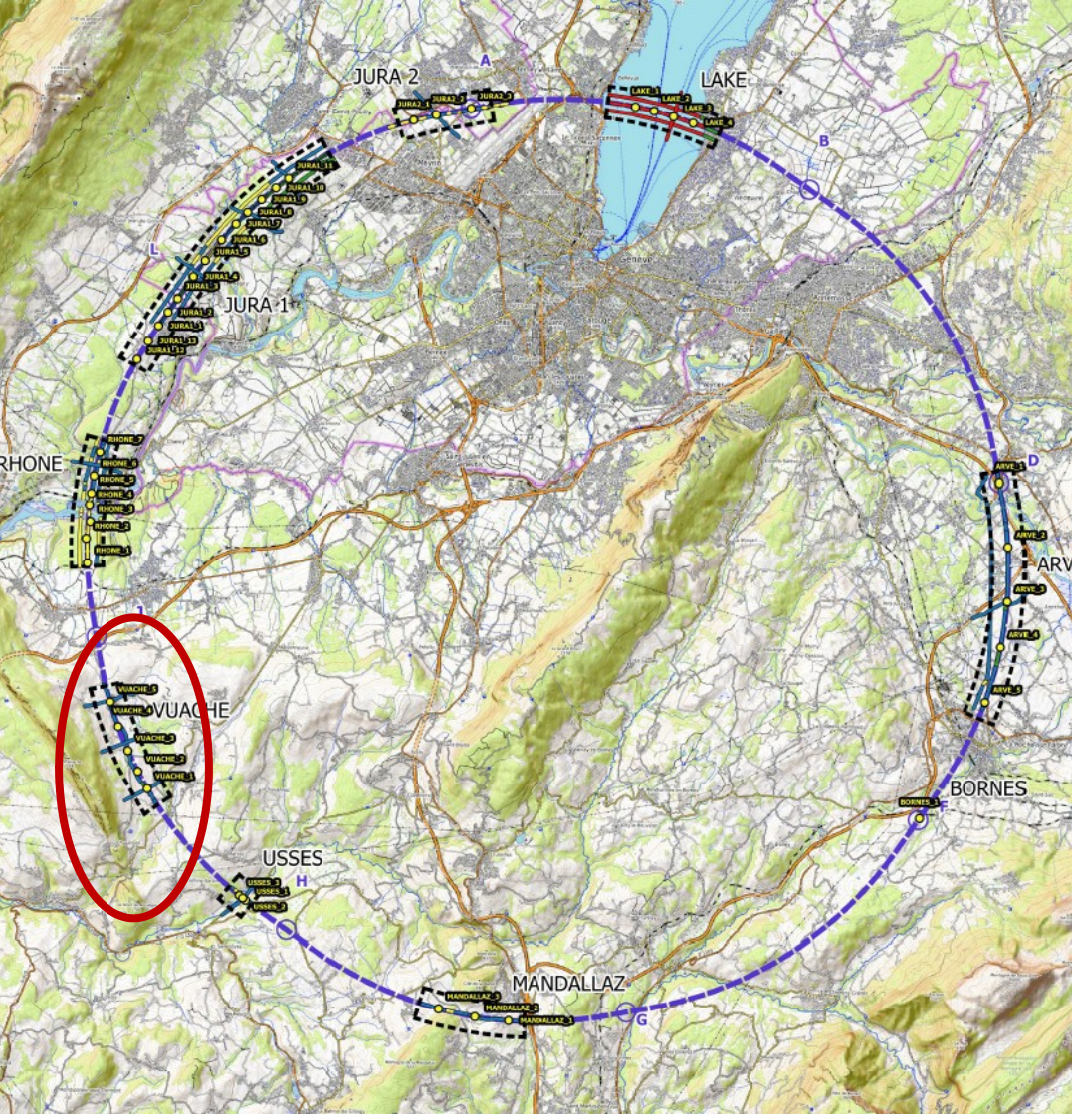
## Borings

- Industrial zone : OK





# VUACHE



## Borings

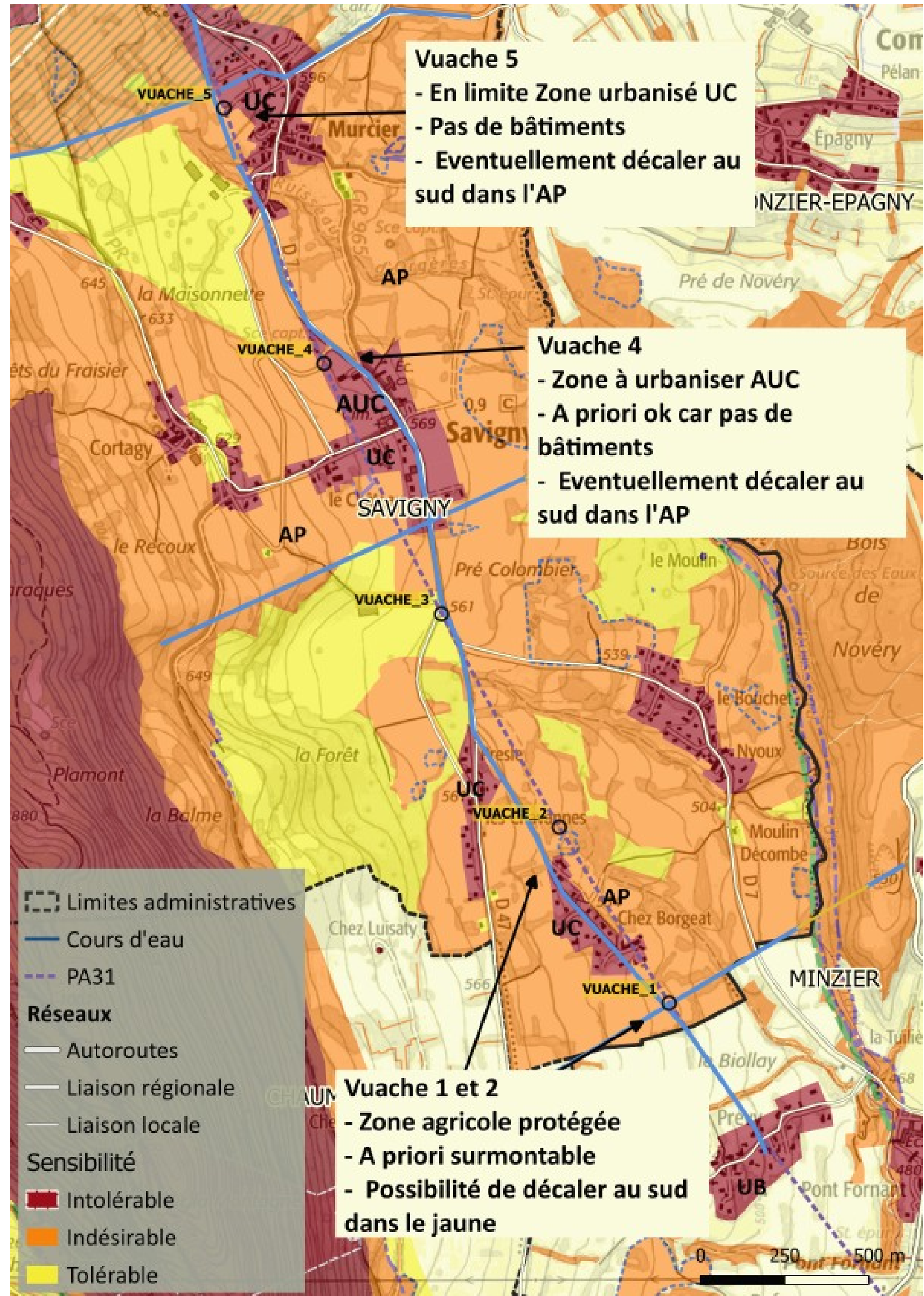
- Urbanized zone : OK
- To be urbanized zone : OK (no building)
- Protected agricultural area : seems overcomeable

## Geophysical investigation

- On the roads : OK
- On protected agricultural zones : seems overcomeable

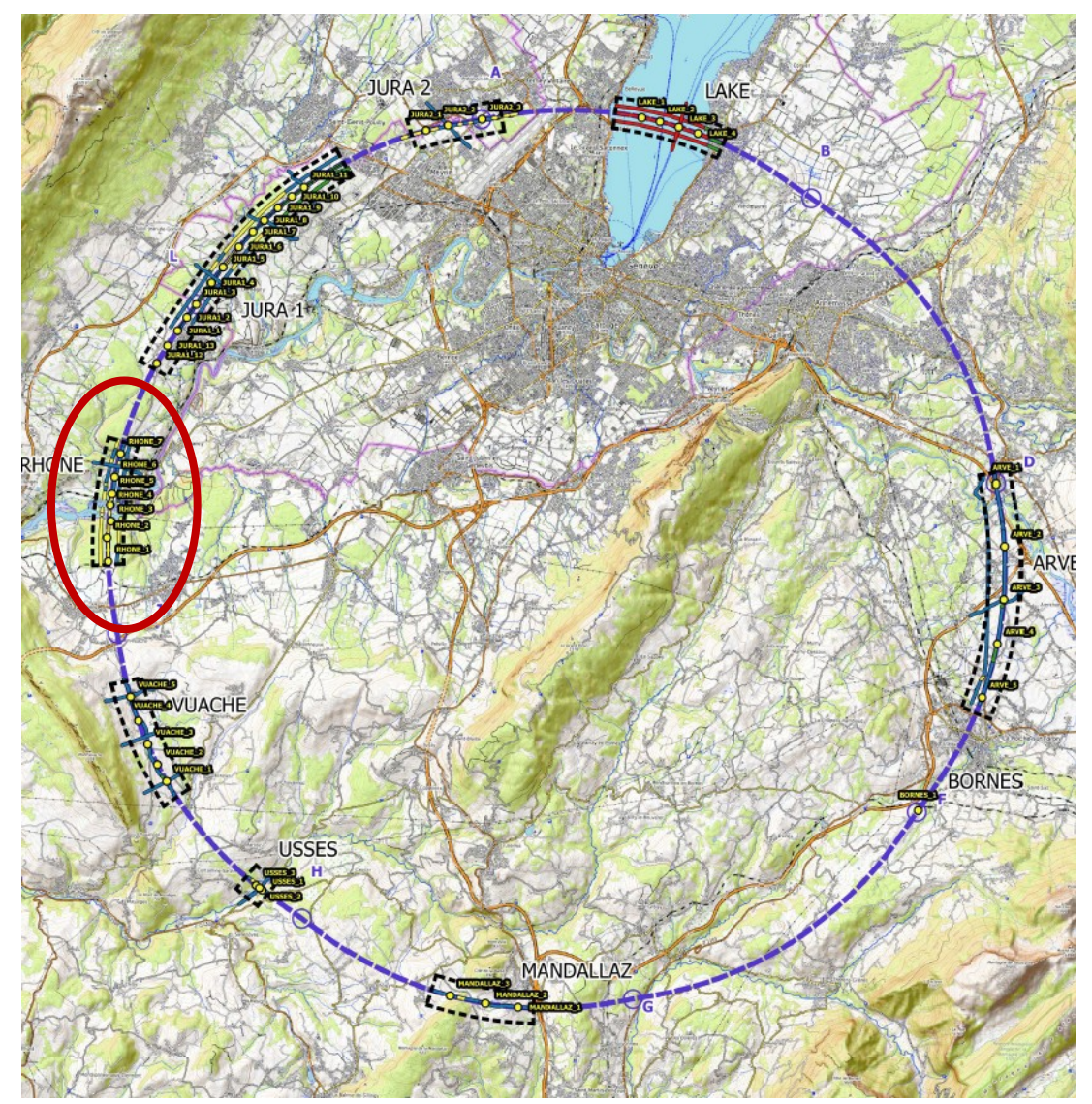
## Vigilance

- Nuisance to neighbourhood





# RHONE

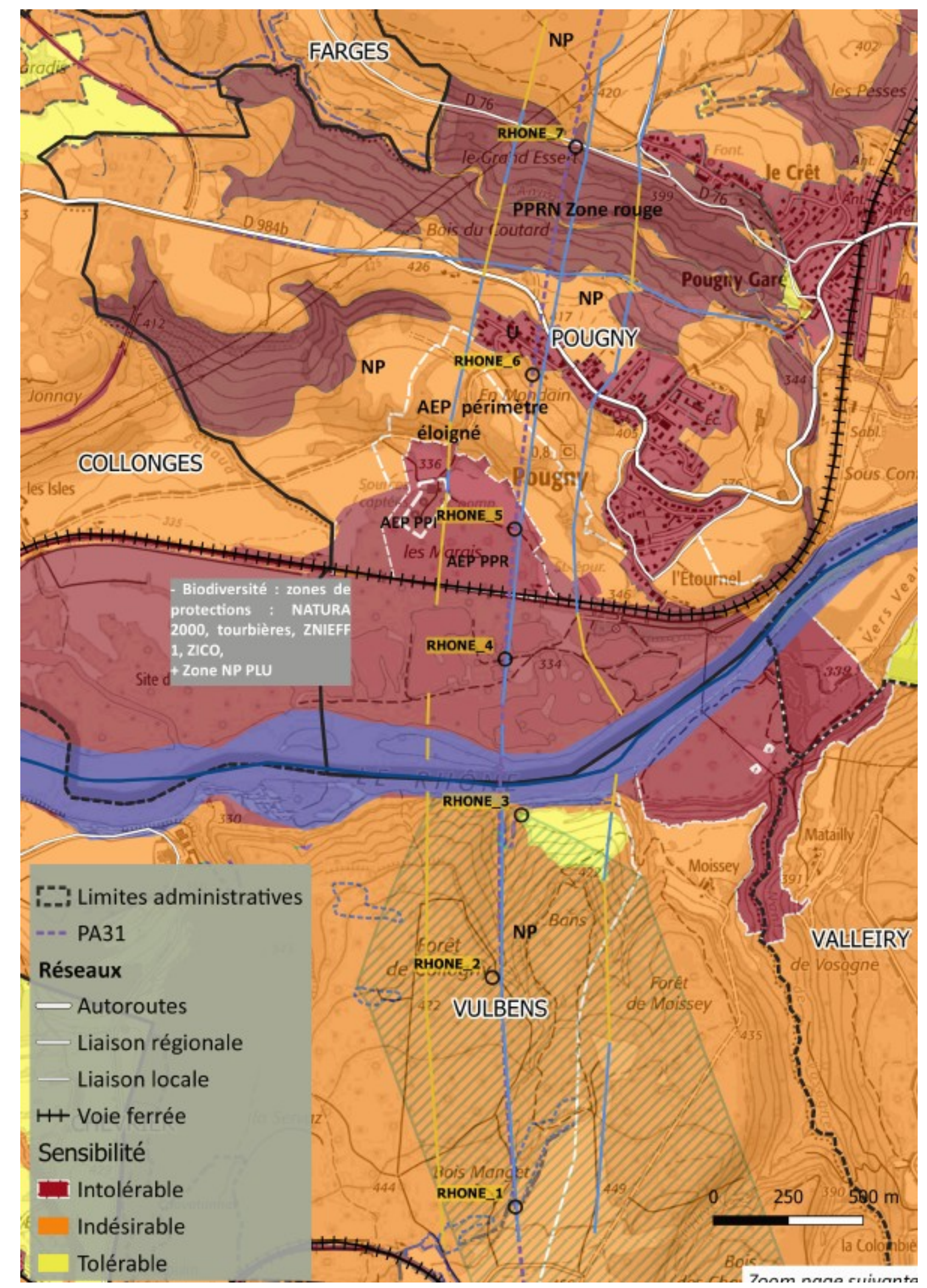


## Geophysical investigation

- Natural risk prevention plan
- Urbanized zone : OK
- Protected natural area : seems overcomeable
- Drinking water supply, remote perimeter
- Natura 2000 area
- Peatlands
- ZNIEFF 1 area
- ZICO area
- Protected natural area in PLU

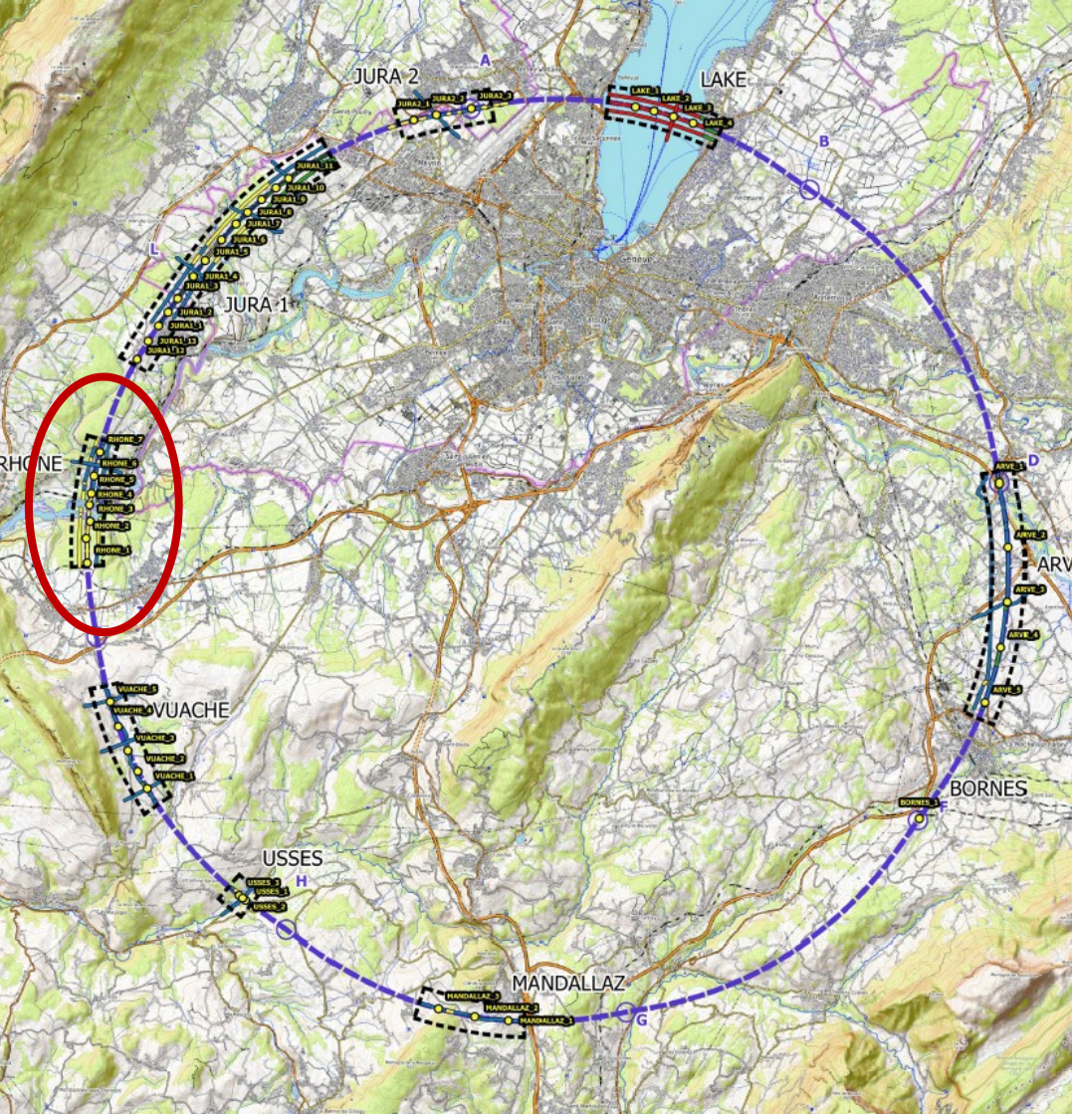
## Vigilance

- Very heavy constraints
- Some zones are likely to be impossible to investigate, especially next to the river



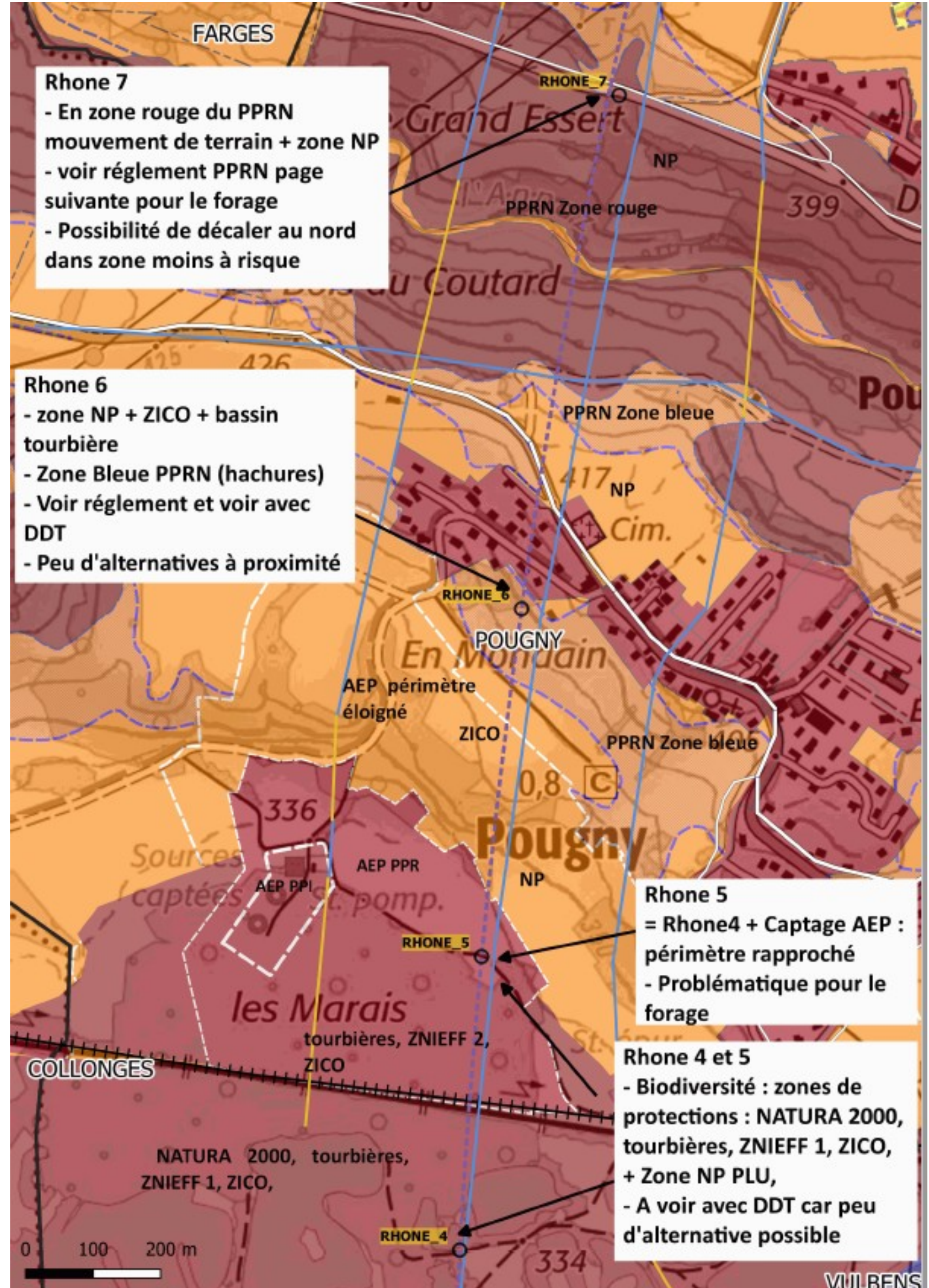


# RHONE



## Borings

- Rhone 7 : displacement to North seems possible (protected natural area)
- Rhone 6 : seems overcomeable (and possibly in the urbanized area)
- Rhone 5 : seems impossible : displacement to the North to consider (but still various orange protections)
- Rhone 4 : seems very difficult (and no alternative)



### Extrait PPRN Pougny - Zone Rouge

A l'intérieur de la zone rouge **sont interdits tous travaux, constructions, installations et activités diverses**, à l'exception de ceux visés ci-après.

- Sont admis:
- les travaux d'entretien et de gestion normaux des biens et activités implantés antérieurement à la publication du présent plan, qui n'aggravent pas les risques et/ou leurs effets,
  - les travaux et installations destinés à réduire les conséquences des risques, après avis d'un expert,
  - les travaux d'infrastructure qui n'aggravent pas les risques et/ou leurs effets,
  - les réparations effectuées sur un bâtiment sinistré dans le cas où la cause des dommages n'a pas de lien avec le risque qui a entraîné le classement en zone rouge.

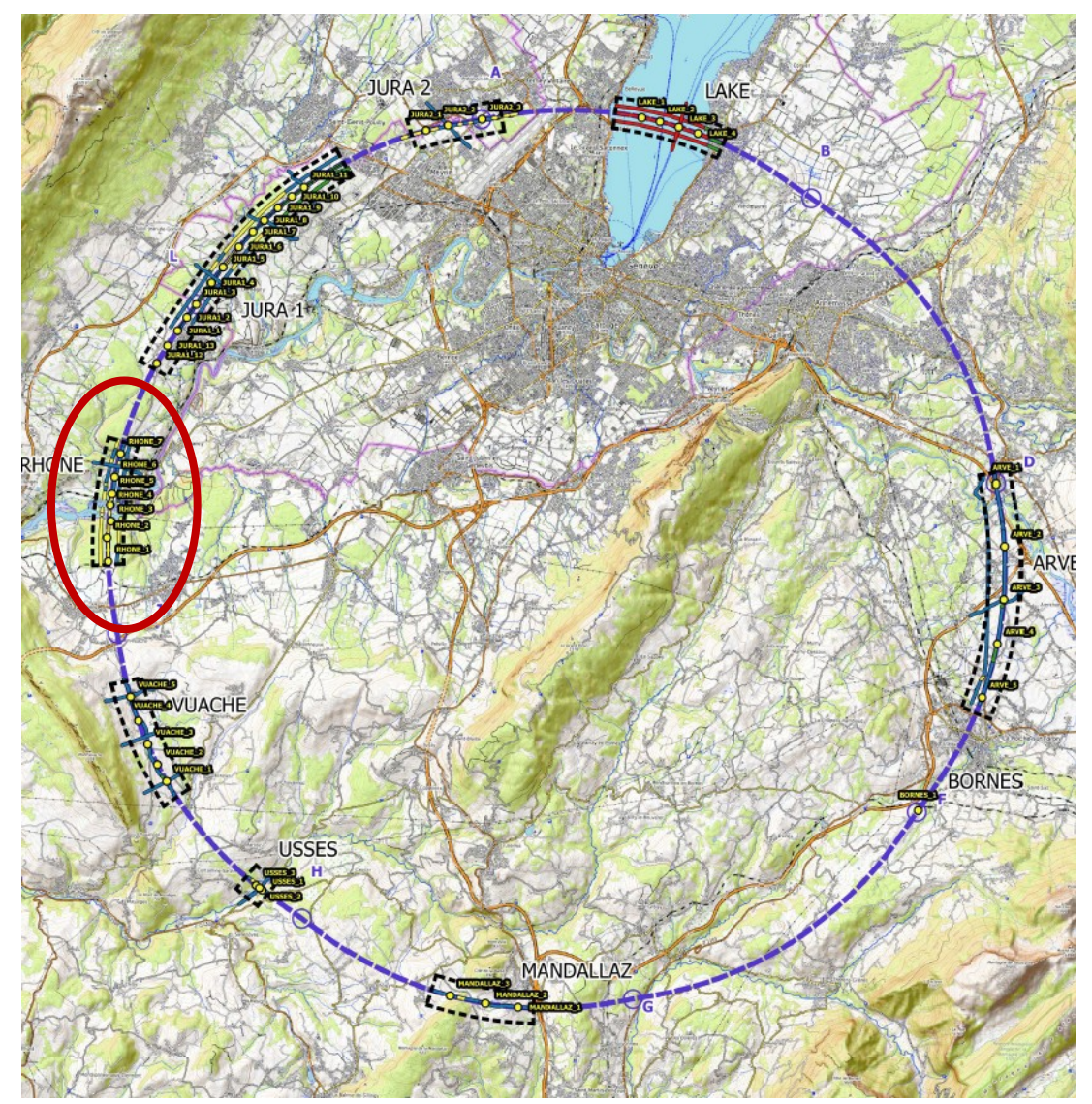
### Extrait PPRN Pougny Zone bleue

A l'intérieur de la zone bleue **sont autorisés tous travaux, installations et activités diverses. Un géo-technicien ou un bureau d'études agréé définira les conditions de réalisation de ces aménagements.** Il précisera:

- tes conditions d'équilibre avant travaux,
- l'incidence de l'aménagement projeté sur la stabilité d'ensemble du terrain et sur les constructions voisines,
- les conditions d'assise des ouvrages,
- les conditions d'équilibre locales des aménagements périphériques (remblai/déblai).



# RHONE

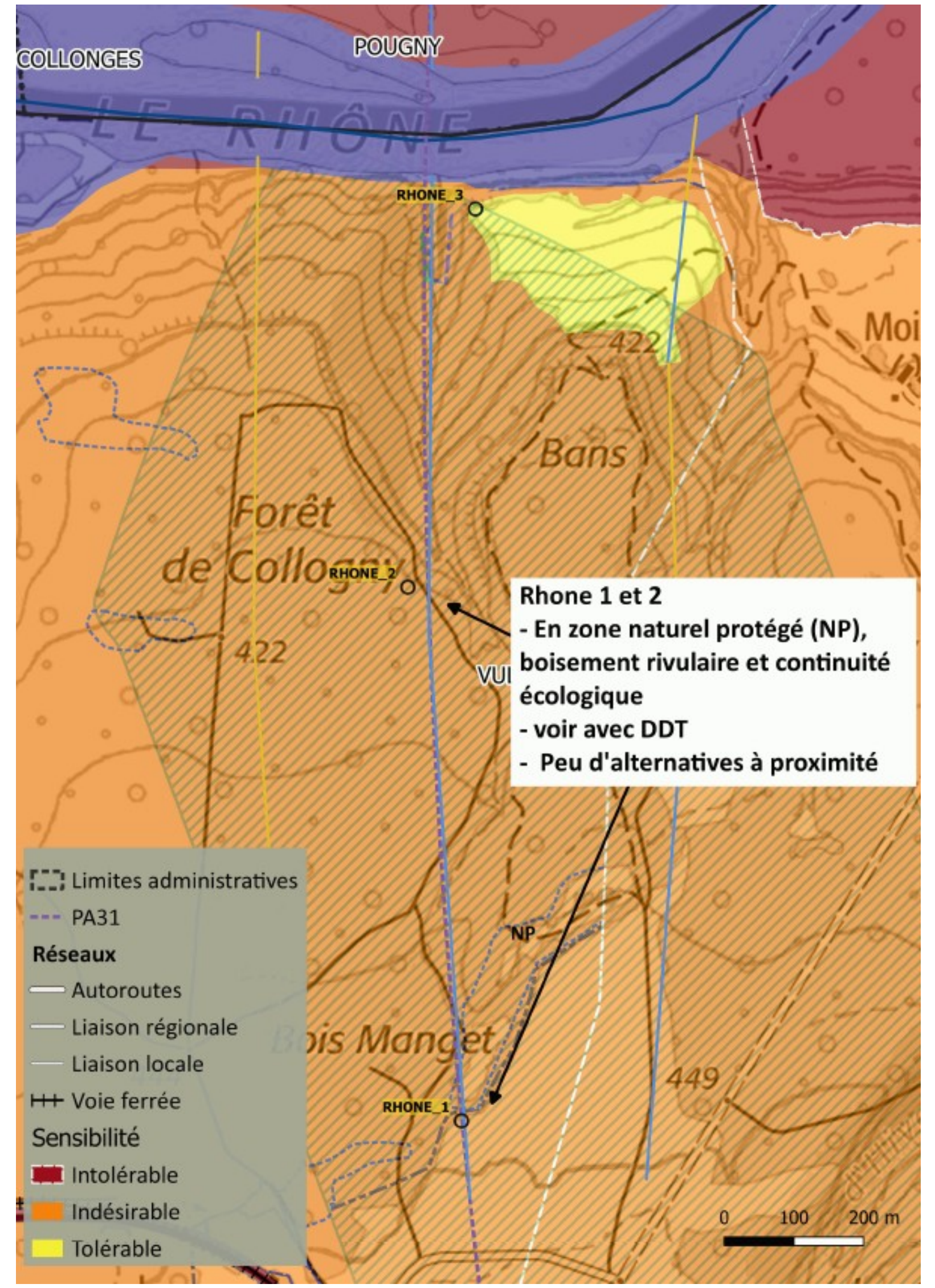


## Borings

- Protected natural zone
- Riverine woodland and ecological continuity

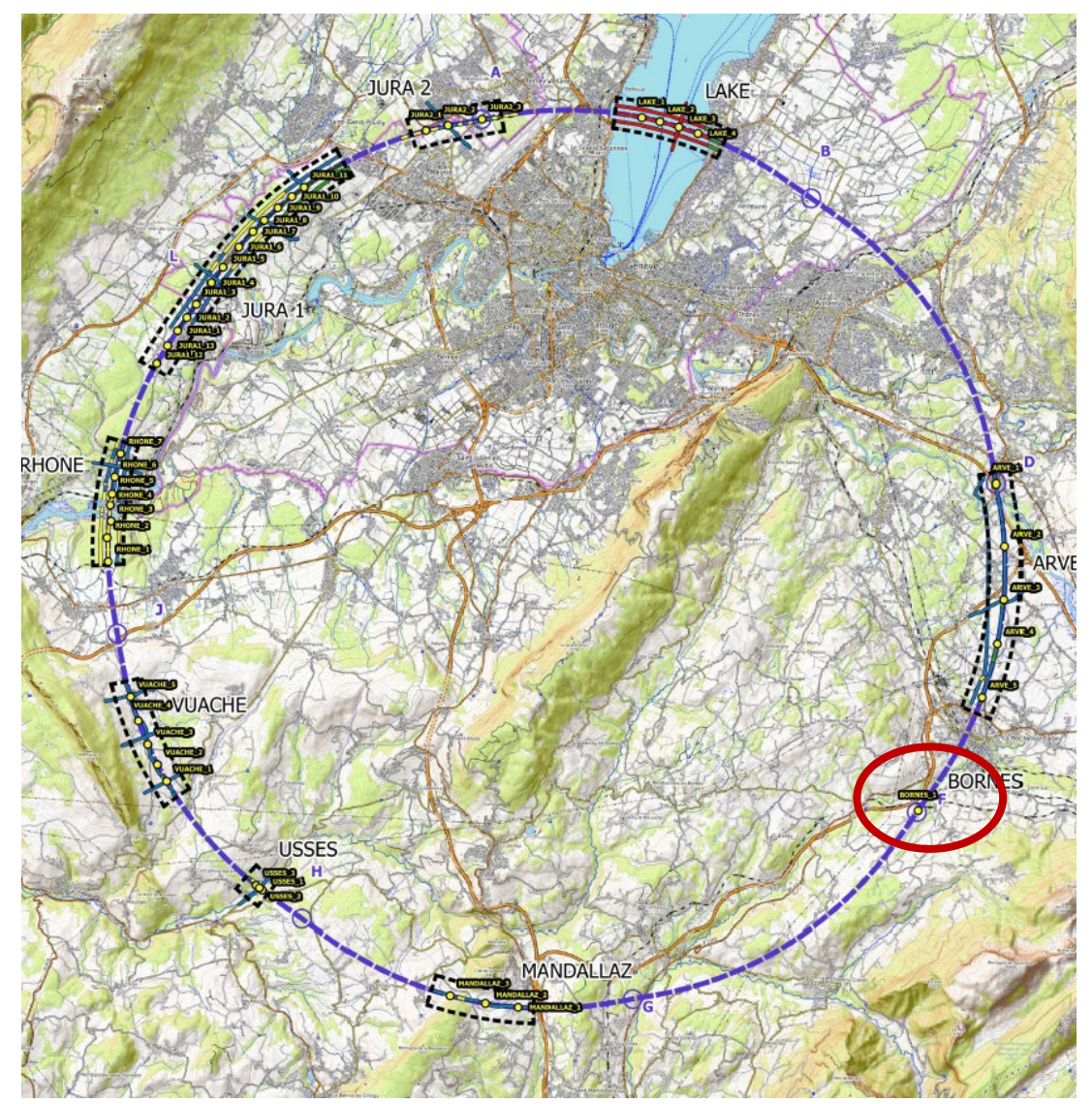
## Vigilance

- Access issues



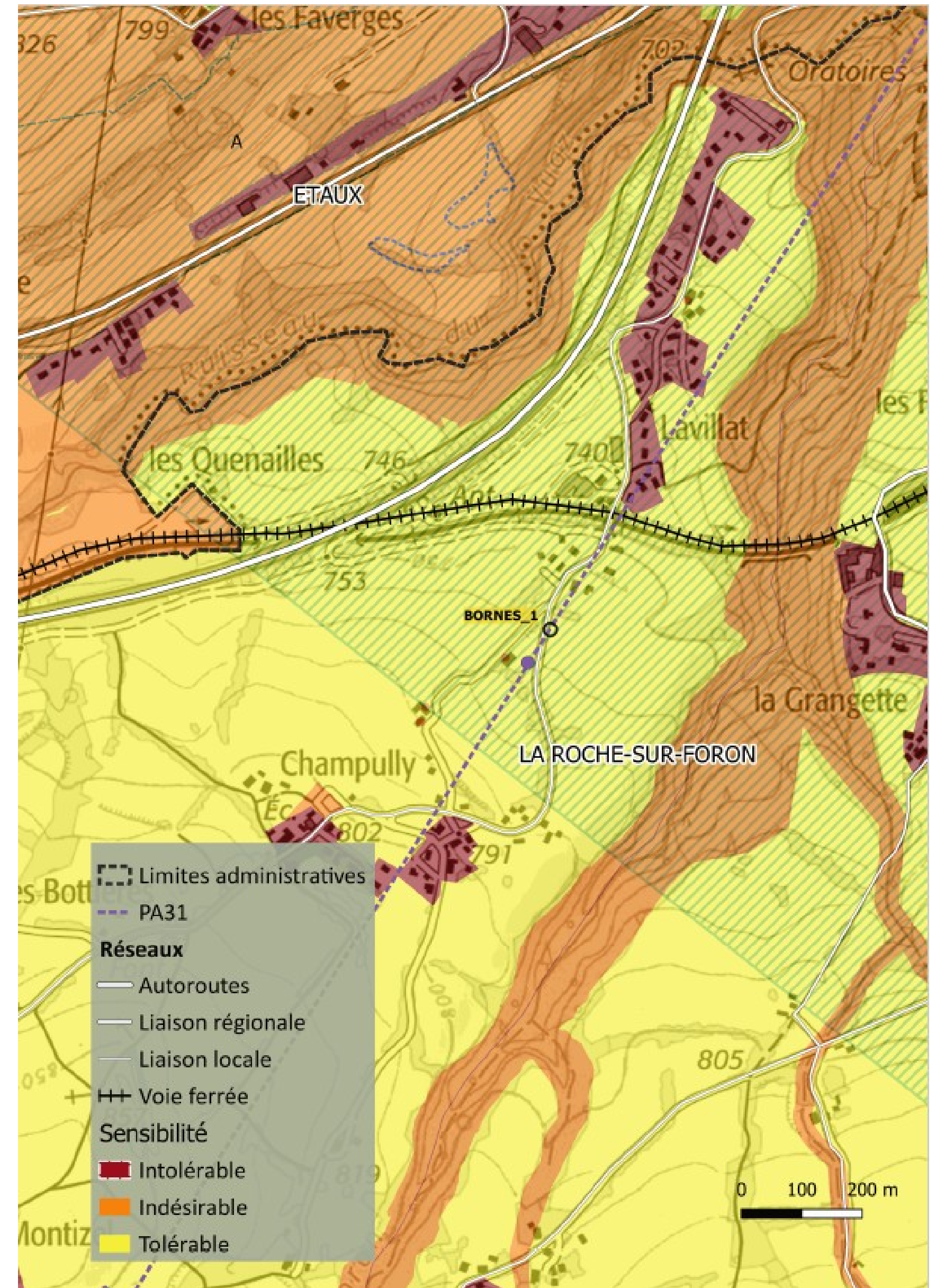


# BORNE



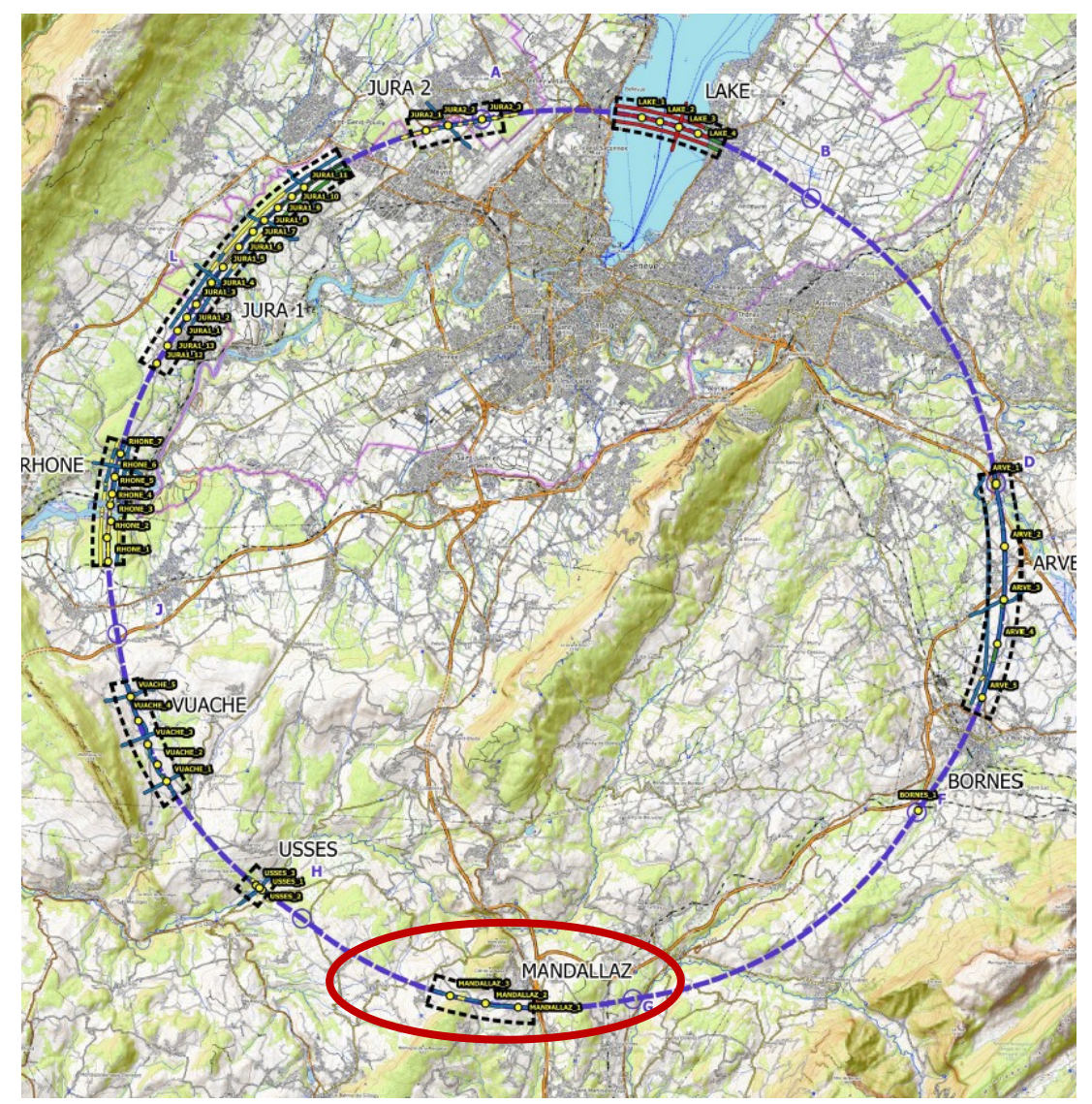
## Borings

- Yellow constraint : OK





# MANDALLAZ

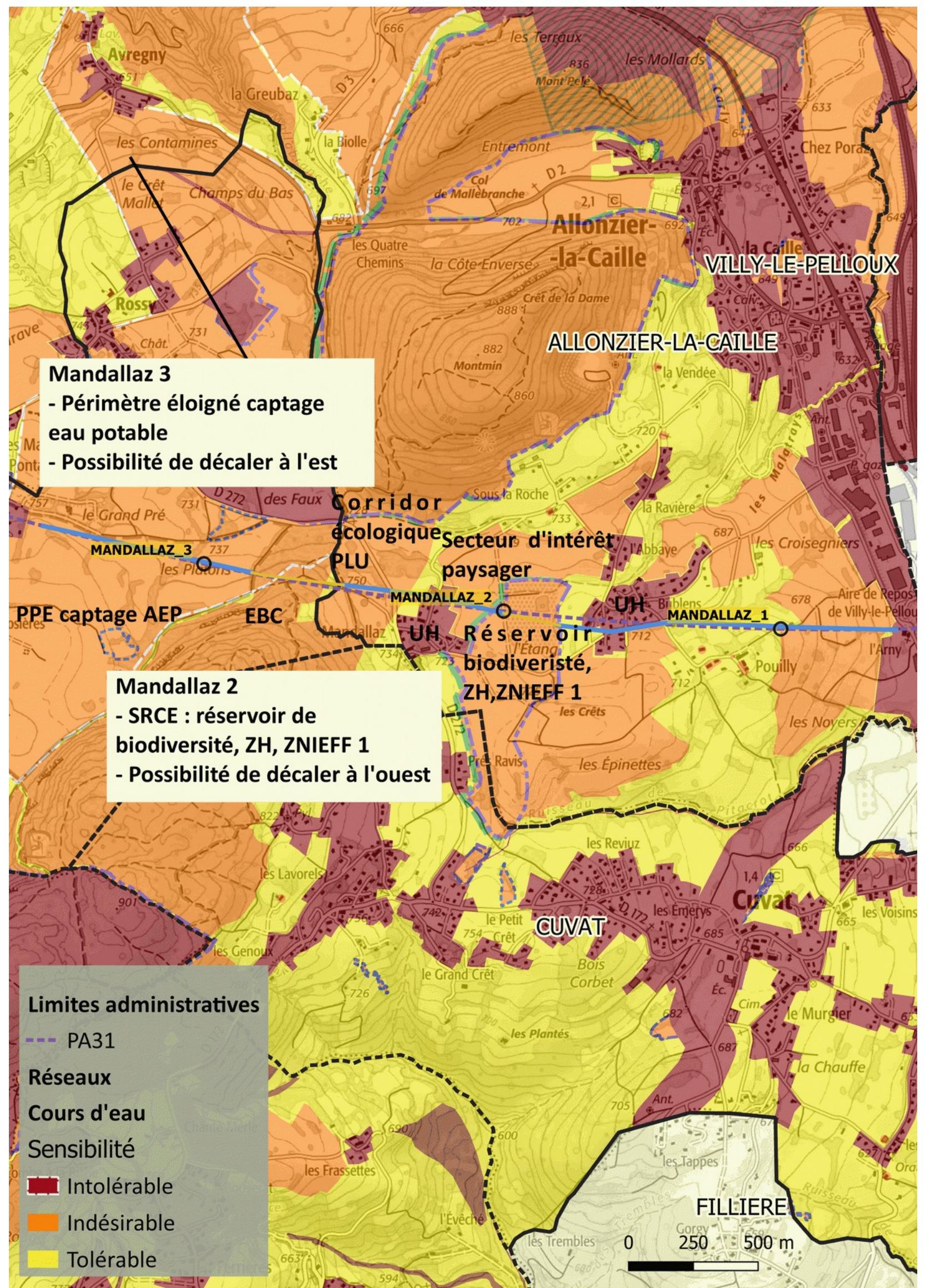


## Borings

- Urbanized zone : OK
- Drinking water supply, remote perimeter
- Biodiversity reservoir
- Wetlands
- ZNIEFF 1 area
- ZICO area
- Yellow or orange constraint : seems feasible

## Geophysical investigations

- Vigilance on red crossings



**Mandallaz 3**  
 - Périmètre éloigné captage eau potable  
 - Possibilité de décaler à l'est

**Mandallaz 2**  
 - SRCE : réservoir de biodiversité, ZH, ZNIEFF 1  
 - Possibilité de décaler à l'ouest

**Limites administratives**  
 - - - PA31  
**Réseaux**  
**Cours d'eau**  
**Sensibilité**  
 ■ Intolérable  
 ■ Indésirable  
 ■ Tolérable



# Feedback from geologists

## HRA globally relevant

### Plateau de Borne seems to be too little taken into account

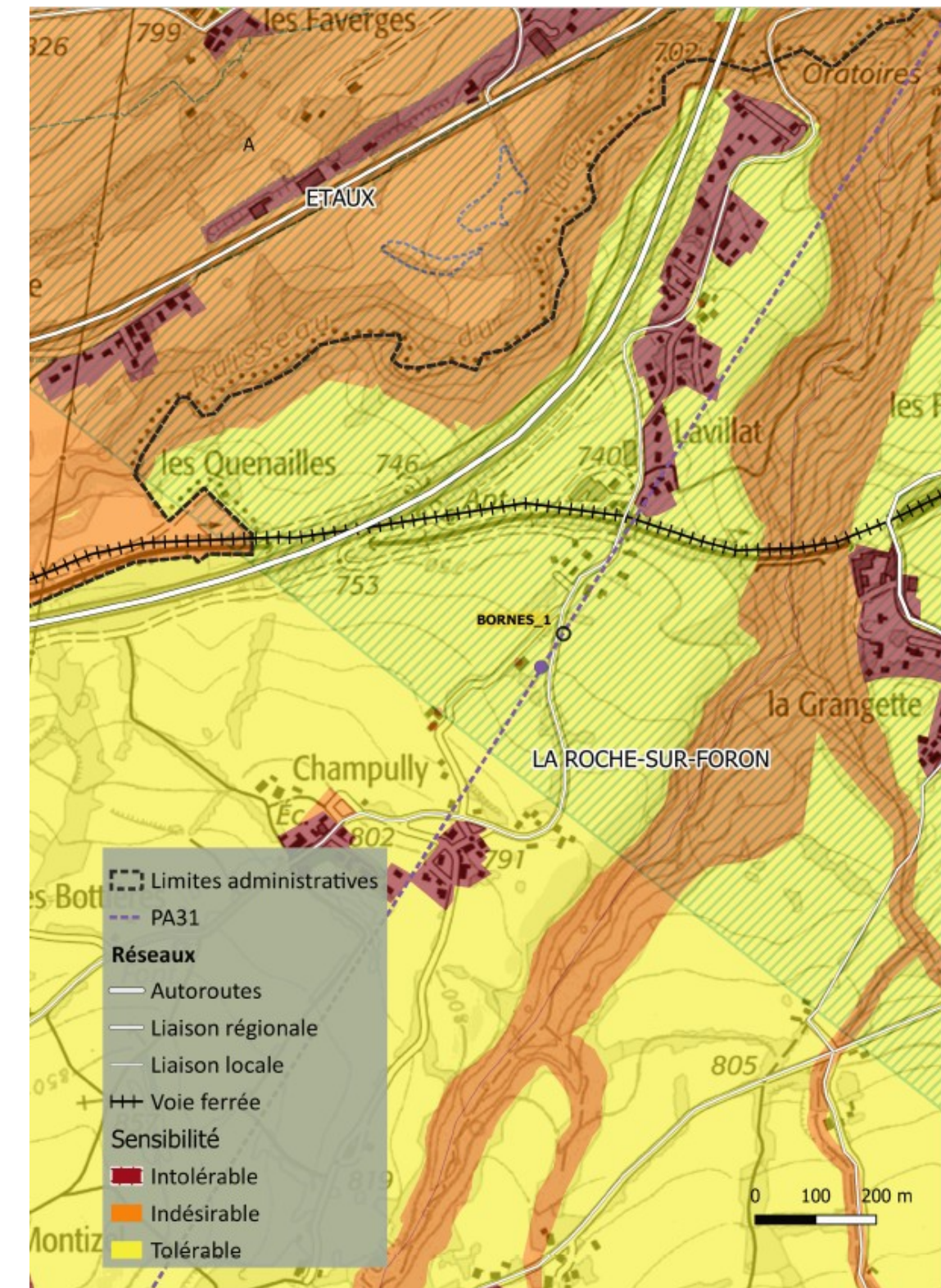
- One boring not enough

### Very highly recommended, even in the HRA phase, to have a borehole for each shaft

- Shafts are critical elements
- Provide information on the experimental caves
- Shafts may increase the vulnerability of strategic groundwater bodies

### More technical elements (see specific note) :

- Geophysics: complements on vertical seismic profiles and cross-borehole (material characterisation)
- Borehole logging: deviation measurement, Gamma Ray measurements (identify clay layers), stereo analysis of discontinuities by imaging (orientations), microseismic logs (quality of formations crossed)
- For low permeability ground, use pore pressure logs rather than piezometers





# Feedback from hydrogeologists

## Detailed hydrogeological study to come

- to understand the behaviour of water bodies and the impact of the project

## Today, opportunity to acquire initial information on the water bodies crossed by the boreholes

- will facilitate the drafting of the future specifications

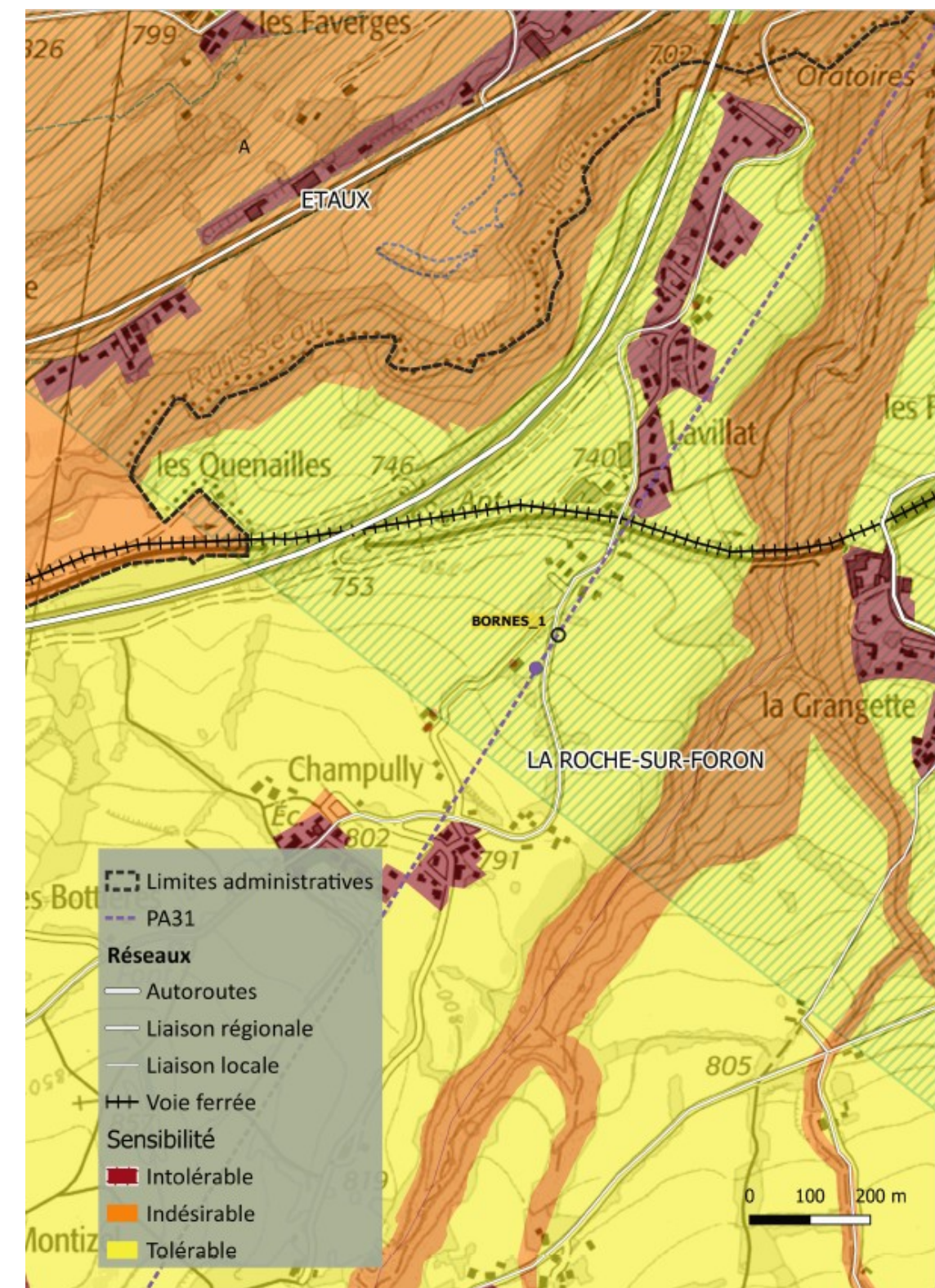
## In particular, measurements and analyses could be carried out in the boreholes:

- **To characterise the various fasciae of the groundwater bodies intersected:** water sampling for hydro-chemical analysis and dating, logging with at least water temperature, dissolved oxygen concentration and electrical conductivity,

- **To determine the direction of groundwater flow and the hydrodynamic parameters of the groundwater bodies:** velocity measurements in the water columns, in situ permeability testing between packers, cracking surveys, tracer tests,

- If the structure allows it, it would be useful to set up **continuous monitoring of water levels in the boreholes.**

**These elements should be adapted to the type of borehole, the nature of the ground, the level of water status**







THANK YOU