

D. I2.1.2 SITE SPECIFIC INVESTIGATION PLAN AND SCHEDULE ON POMPEY SITE (FR)

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BRGM

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1 INTRODUCTION

This document summarizes the description of the studied pilot site including maps and pictures as well as limits of the area of investigation. A sampling plan for geophysical survey and conventional methods is also discussed.

2 POMPEY PILOT SITE

2.1 DESCRIPTION OF POMPEY SITE

Pompey has been chosen as one of the three test sites for REGENERATIS methodology (see Figure 2). It is a former tailing pond. The pilot site will allow testing the methodologies developed within WPT1 and WPT2 on a site that was already remediated. EPFGE (Etablissement Public Foncier de Grand Est, Public land-management corporation of the Grand Est region) is the owner and will retain ownership of POMPEY site after the project end.

The site is chosen for two main reasons: (1) it hosted various activities for iron based alloys production; (2) it was just rehabilitated on surface, and historic documentation and investigations are done with respect of the French legislation and threshold values. The planned sampling work (both for conventional and geophysical methods), represents a good opportunity to build the REGENERATIS methodology and compare with classical remediation methods. Site works will provide access to material to perform lab trials and allow in situ measurements, including innovative techniques such as geophysical methods.

The last blast furnace of the Pompey-Frouard-Custines iron and steel complex was stopped in 1986. Over time, a forest ecosystem developed on the former tailing pond. The dike delimiting the site was planted with a curtain of black locust trees in 1997. The rest of the pond gradually got covered with diversified deciduous vegetation, more or less dense depending on the area (see Figure 1).

The geological substratum consists of the Lias marl formations (at 181 m NGF), which are covered by alluvium from the two rivers, composed of coarse siliceous materials (sands, gravel and pebbles) at the base over 3 to 6 m surmounted by finer materials (sands, silts and clays) on 1 to 3 m. These alluvial formations were locally exploited and backfilled with waste rock and iron and steel by-products. The depth of the deposits in the basin is estimated at around ten meters.

The waters of the alluvial table would circulate from the channeled Moselle towards the Meurthe, whose level is lower. The piezometric levels measured in 2002 are 187.5 m NGF upstream (South-West of the island) and 184 m downstream (East of the island), the basin surface being at 195 m NGF (ANTEA, 2002).

Two informational visits were carried out on the 7th of September 2020 and on the 23rd of November 2020. Pictures were taken (see Figure 1) as well as surface samples for soil analysis in the lab.

07/09/2020



07/09/2020



07/09/2020



23/11/2020



23/11/2020



23/11/2020



Figure 1: Pictures of Pompey pilot site in September and November 2020

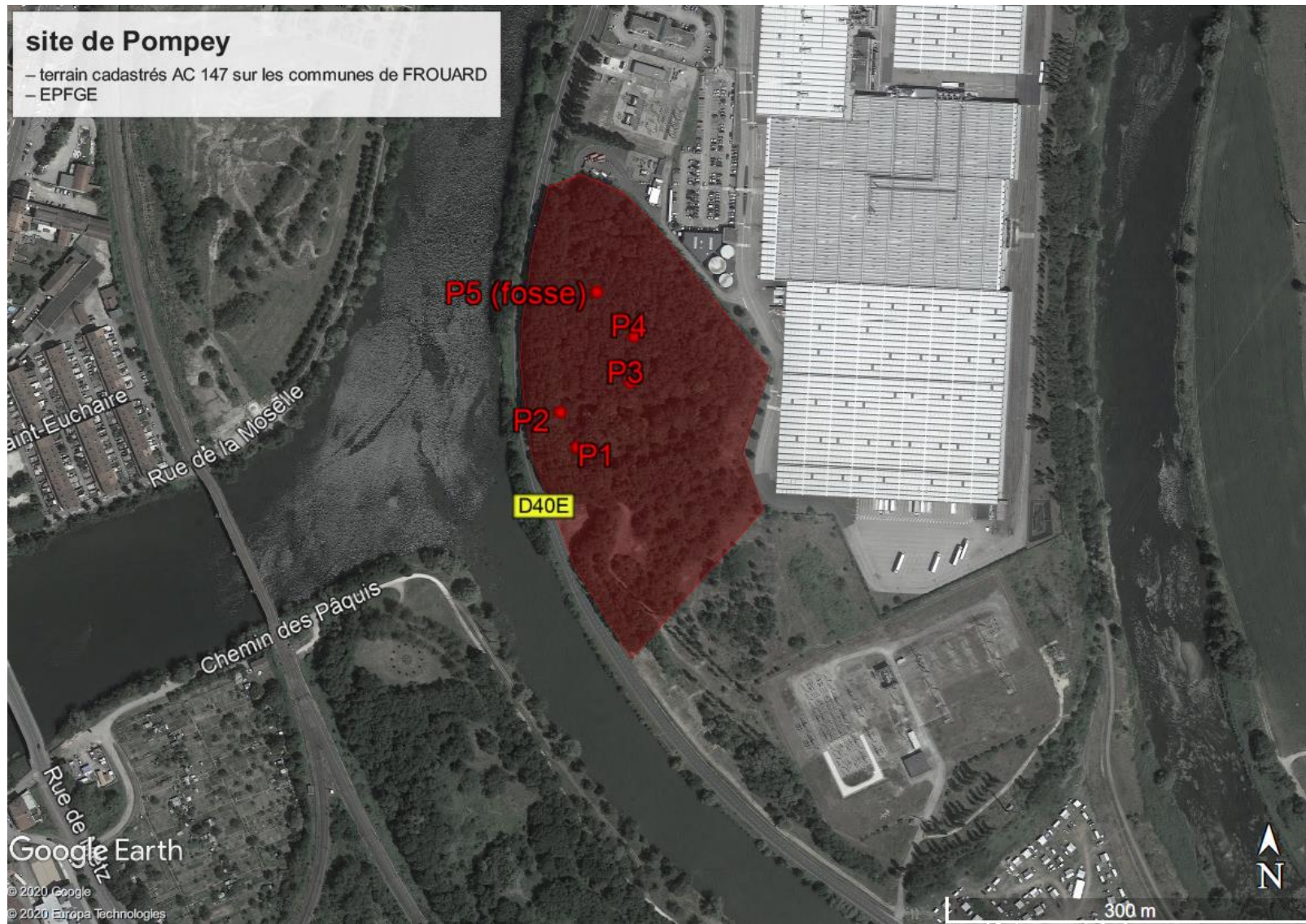


Figure 2: Localization of Pompey pilot site (red area). P1 to P5 are sampling points where surface samples were taken in sept. 2020.

2.2 FIRST VISIT ON SITE WITH GEOPHYSICAL MEASUREMENTS

On the 23-24th of November 2020, a visit was organized at the pilot site to test the planned geophysical methodology with a first resistivity and chargeability profile. This visit also aimed at collecting soil samples in the existing ditch and screen the first 2 m of soil for magnetic susceptibility variations.

2.2.1 Measurements taken on 11/24/2020

Several preliminary measurements were undertaken during the November site visit:

- 2 soil samples were taken in the pit at 2 depths: [1.0-1.1] m and [1.65-1.80] m for measurements at CTP's center in Tourney. The choice of these two depths were dictated by preliminary soil analyzes from Huot (2013) that detected higher content of Pb and Mn at 1 m; and of Zn at 1.8 m
- Magnetic susceptibility measurements were taken with a kappa-meter on 4 different profiles within the soil pit: every 10cms starting at 0.2 m depth above ground surface (above this, only vegetated soil / humus were observed) down to 1.8 m (see Figure 3)
- Soil samples taken every 10 cms for X-ray fluorescence spectroscopy analysis (Niton technology) at BRGM
- A geophysical profile was installed following an oriented NNW-SSE to measure the electrical resistivity and chargeability of the soil layers (see Figures 4 and 5).

2.2.2 Observations:

Following the measurements taken in November, several observations can be noted:

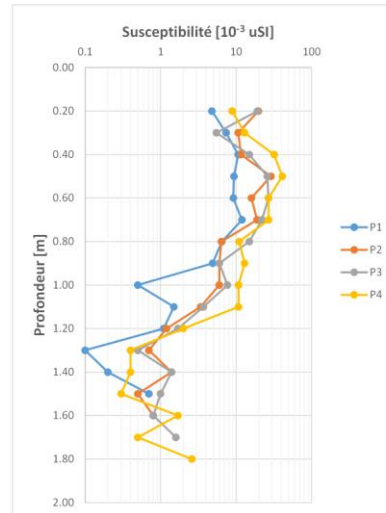
- Magnetic susceptibility drops around 1m depth: $10 \cdot 10^{-3}$ SI to $1 \cdot 10^{-3}$ SI linked to a change in the concentration of magnetic (metallic?) elements (see Figure 3)
- 3 pseudo-horizontal layers observed in terms of electrical resistivity: (1) one very resistant at the surface (between 2 and 3 m thick); (2) one very conductive in the center (about 6 m thick): (3) one with a medium resistance at the base (between 8 and 9 m deep), representing the natural terrain (quaternary alluvium) (see Figure 5)
- For the conductive layer, a distinction can be made between the SSE and NNW parts. These variations could correspond to the presence of 2 different settling pounds, with two different variations in the composition of the deposited material (observed on historical aerial photos). Their positioning in relation to the ERT profile needs to be specified.
- Chargeability anomalies, especially localized in the first resistant layer, potentially linked to all-round material, including large metallic pieces. The chargeability of the intermediate layer could be mitigated by the high conductivity of this layer.
- The profile interpreted in terms of metallic factor reveals pronounced anomalies in this conductive intermediate layer. It would be interesting to take samples of the soil in line with these anomalies.

2.2.3 Results

Visit to the field site – 24/11/2020

Magnetic Susceptibility measurements
on 4 profiles within the left pit

Figure 3: Magnetic susceptibility measurements on 4 profiles in the pit - P5 location on Figure 2



P1 to P4 from
left to right in
the pit



Visit to the field site – 24/11/2020

ERT profil

23/11:

- Measure with syscal terra: Clean96; DD96_rho
- Measure with syscal 404: DD96_tdp2ms

24/11:

- Measure with syscal 404: DD96_light_tdp2ms

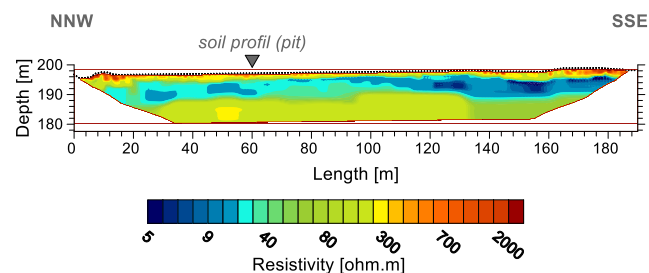
Figure 4: Location of the geophysical profile on the field site map



Visit to the field site – 24/11/2020

ERT profil

Figure 5: Results of the geophysical profile in terms of electrical resistivity tomography



3 SAMPLING PLAN

3.1 GEOPHYSICAL SURVEY

Several measures, in collaboration with the university of Liège, are planned to complete the first results obtained:

- 4 NNW-SSE ERT + TDIP profiles to observe the lateral variation of the results obtained on the first profile
- 2 perpendicular WSW-ENE profiles to obtain a more 3D view of variations in chargeability and resistivity
- 5 NNW-SSE seismic profiles to specify the limits of the observed layers
- A magnetic map with a cesium magnetometer over the entire area to complete the kappa-meter measurements made in the pit
- An optional EM map (with a DualEMtool or similar) to allow imaging of the electrical conductivity up to the more conductive layer (around 5 m deep)

The figure 6 bellow presents the planned locations of the geophysical profiles and maps.

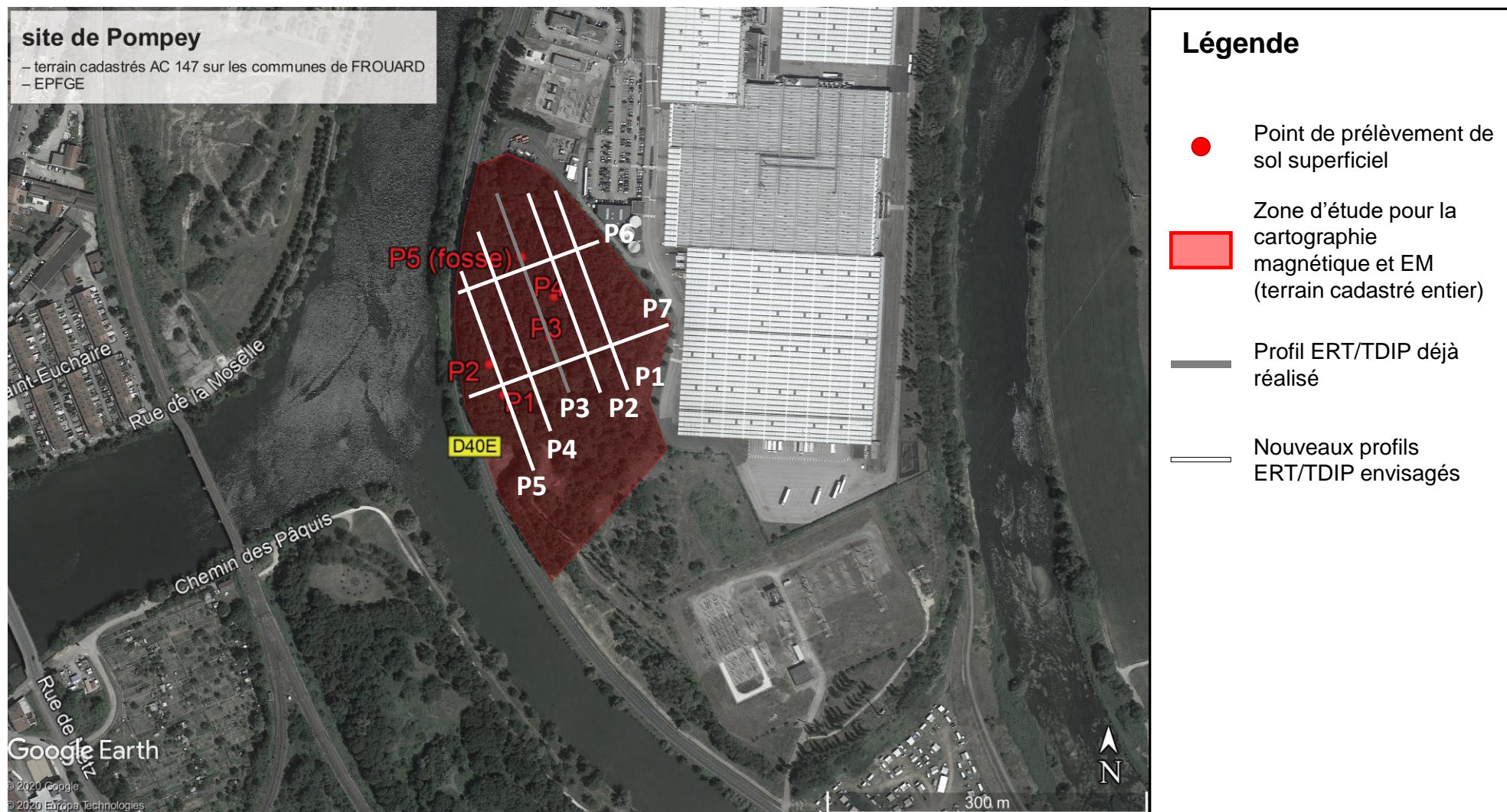


Figure 6: Localization of Pompey pilot site (red area). The entire area is planned for magnetic and electromagnetic surveys. White Lines are representing geophysical profiles for electrical resistivity and chargeability measurements. P1 to P5 red points are sampling points from sept. 2020.

3.2 CONVENTIONAL METHODS

Two conventional sampling campaigns are planned for the Pompey pilote site.

The first one, prior to the geophysical investigations, took place. A pit is already digged since 2010 on site for the first 2 meters of soils (see P5 in figure 2). Without other complementary information, the tailing pond is supposed to contain horizontal layers of soils with composition variations being only vertical and not lateral. The first samples of soils to analyze were thus taken within the pit, in the first two meters. The results are expected soon.

No heavy machinery is allowed to enter the site. We must therefore consider the option of a lightweight auger. IXSANE proposes to study the idea of carrying out a few sampling points with an auger that can cross up to 5 m of land depending on the soil conditions.

The localization of the sampling points will be decided with regards to the results of the geophysical campaign and the first soil analysis results.

Following the first geophysical results, it appears that the potentially most interesting soil layer starts at 2-3 m deep and up to 8-9 m deep. It would therefore be interesting to take samples from this layer in the second sampling campaign, both on the NNW and SSE sides of the former tailing pond.

4 SCHEDULE - GANTT CHART

A planned Gantt chart for the geophysical and conventional sampling activities is proposed bellow. This chart can be modified depending on results and sanitary conditions.

Tableau 1 : Gantt Chart representing the planned activities and the time schedule on Pompey pilot site.

	2020				2021									
	September	October	November	December	January	February	March	April	May	June	July	August	September	October
Deliverable I2.2.1 Site specific report on geophysical survey														
Deliverable I2.2.2 Site specific report on traditional sampling investigations														
Traditional soil sampling	BRGM		BRGM			IXANE			BRGM + CTP					
Geophysical investigations			BRGM				BRGM +U. Liège							

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