

D. I2.4.2. AS-BUILT DOCUMENT ON POMPEY SITE (FR)

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3 INTRODUCTION

Pompey is one of the three pilot sites of the NWE-REGENERATIS project. It is a former tailing pond owned by the EPFGE (Etablissement Public Foncier de Grand Est, Public Real-Estate Company of Grand Est region). The site has been chosen for two main reasons: (1) it hosted various activities for iron based alloys production; (2) it was rehabilitated on the surface, and historic documentation and investigations are done with respect of the French legislation and threshold values. One of the interests of this site is that it allows testing the NWE-REGENERATIS methodologies developed within WPT1 and WPT2 on a site that has already been remediated.

Site works provided access to material to perform lab trials and also allowed on-site geophysical measurements.

This report contains a general description on how the operations on site have been performed and a description of the final conditions on site. It does not include the extraction campaign description and production of ecocatalysts since these activities have not been developed on site.

4 PRESENTATION OF THE POMPEY SITE

The Pompey site is a former tailing pond from the iron and steel complex of Pompey-Frouard-Custines, located 10 km North from Nancy. The steel complex was active from 1870 to 1986. It is renowned for producing cast iron and special steels, such as ferromanganese (ferro-alloy rich in manganese). 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.

The geological substratum of the former tailing pond 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 10 m. The surface of the former pond is estimated to 26 000 m², for a total estimated volume of wastes equal to 260 000 m³.

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 NGF downstream (East of the island). The basin surface varies between 199 and 194.5 m NGF, with a mean altitude at 195 m (ANTEA, 2002).

On-site work included a two-stages geophysical campaign and sampling campaign.

The geophysical measurements allowed mapping the variations of geophysical properties laterally and horizontally, over the entire surface of the deposit, by moving geophysical tools at the surface of the site. These techniques are non-destructive and no restauration operation is needed.

In addition, a two-stages sampling campaign was also conducted: (1) traditional sampling prior to the geophysical investigations within an already-existing pit (see Figure 1); (2) targeted sampling based on the geophysical results within 4 selected boreholes, from 0 to 9 m deep (see Figure 1).



Figure 1: Map of the different sampling locations on the Pompey site.

5 SAMPLING CAMPAIGNS ON SITE

5.1 TRADITIONAL SAMPLING CAMPAIGN

Traditional sampling investigation, prior to the geophysical investigations, took place from the 23rd to the 25th of November 2020. A pit is already dug since 2010 on site to investigate the first 2 meters of soils (see “fosse” in Figure 1). The first samples of soils to analyze were thus taken within the pit, in the first two meters (see Figure 2). Two types of samples were extracted:

- 17 soil samples were taken every 20 cm from 0.2 m to 1.8 m depth. Two different sides of the pit were investigated (noted P2 and P4) for portable X-ray fluorescence spectroscopy analysis at BRGM: 9 samples for P2 and 8 samples for P4. Each soil sample weights in average 330 g.
- 2 soil samples were taken in the pit at 2 depths: [1.0 - 1.1] m and [1.65 - 1.80] m for deeper laboratory analysis at CTP's center in Tournay. The choice of these two depths were dictated by preliminary soil analysis from Huot (2013) that detected higher content of Pb and Mn at 1 m; and of Zn at 1.8 m (see deliverable DI2.1.1)

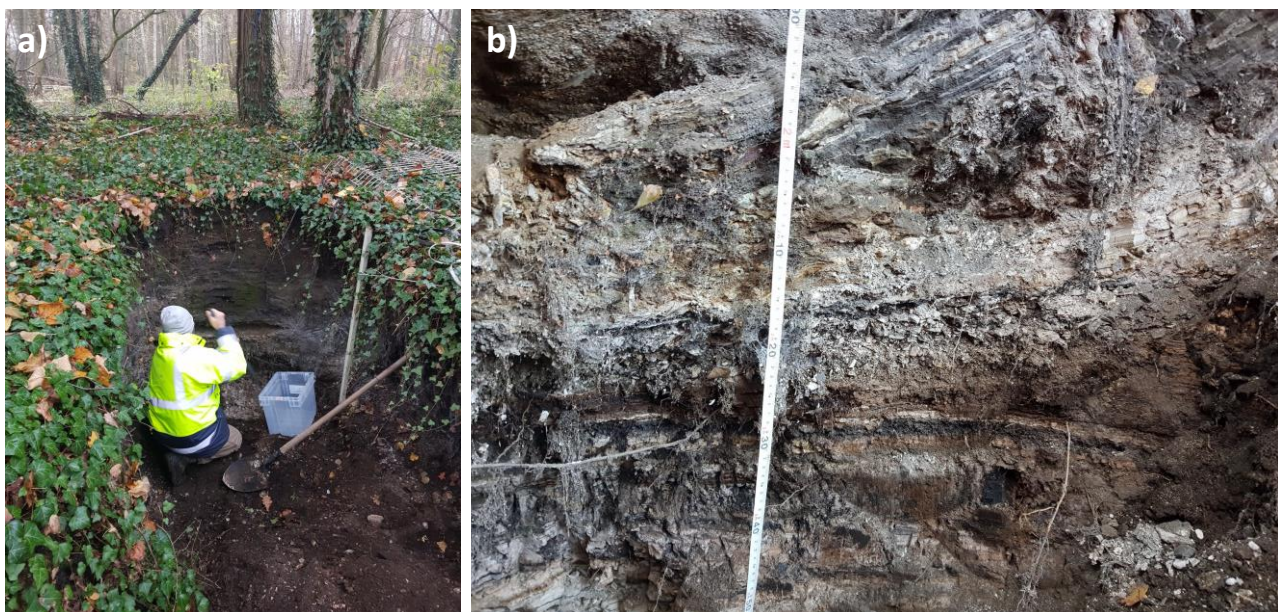


Figure 2 : a) Extraction of soil samples from the trench pit; b) zoom on the variation of techno-soil layers observed within the trench pit

5.2 TARGETED SAMPLING CAMPAIGN

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 (see deliverable DI2.2.1). 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. Several sampling locations have been decided based on these geophysical observations (see DI2.2.1 and Figure 1).

No heavy machinery is allowed to enter the site because of the poor bearing capacity of the soils (see deliverable DI2.3.1 and ANTEA, 2001a, 2001b). Indeed, the soils are delicate to excavate and sensitive to water, which require the use of suitable drilling equipment. We therefore considered the option of a lightweight auger and a light core drill to perform the sampling campaign.

- 4 samples were taken by IXANE at two different locations I1 and I2 (see Figure 1), IXSANE extracted the samples using a lightweight auger that can cross up to 5 m of land depending on the soil conditions. The samples were taken at two different depth intervals: [0-0.5] m and [3-4] m
- 45 samples were taken by BRGM using a light core drill for depths ranging between 0 and 9.2 m at 4 different locations (see Figure 3): 11 samples for FP1 from 0 to 9.2 m, 10 samples for FP2 from 0 to 8.2 m, 12 samples for FP3 from 0 to 9.2 m, and 12 samples for FP4 from 0 to 9.2 m



Figure 3 : a) Picture of the core drill in action in Pompey (08/2021); b) Zoom on the drilling rod with two different layers of soil.

6 FINAL STATE OF THE SITE

Regarding the traditional sampling campaign, the open pit from which the samples were extracted is in the same state than before the operation. No particular restoration is needed. A white protecting grating is covering the deepest part of the pit to ease its location and protect visitors from falling (see Figure 8).

Regarding the targeted sampling campaign,

- **2 sampling location** (I1 and I2, see Figure 1) were investigated by IXANE using a lightweight auger on 4 m depth. The dug holes were refilled with local material extracted that are not part of the analyzed samples over the entire depth. No marks were left to identify the location of these boreholes in the future.
- **4 boreholes** were drilled by BRGM using a light core drill on 9.5 m. The boreholes were backfilled with local material extracted during the sampling that were not part of the analyzed samples over the entire borehole except the last 50 cm. This space was left in order to install a 1.5 m pvc blue pipe above the borehole. The name of the borehole was written on the pipe in order to re-identify it in the future if necessary.

Pictures for each of the boreholes were taken (see Figure 4 to Figure 7) and GPS coordinates are presented in Table 1.

Table 1: GPS coordinates of all the sampling points investigated during the NWE-REGENERATIS project at the Pompey pilote site

sampling campaign	Name	L93_northing [m]	L93_easting [m]	std_L93_northing [m]	std_L93_easting [m]
1. traditional	fosse	6856619.35	930368.62	1.48	0.52
	fosse_bis	6856614.6	930364.04	0.64	0.44
2. targeted	I1	6856620.08	930378.38	/	/
	I2	6856530.48	930417.1	/	/
	FP1	6856524.47	930383.21	0.05	0.06
	FP2	6856590.03	930380.14	0.76	1.05
	FP3	6856649.43	930351.62	1.02	0.25
	FP4	6856543.27	930444.27	0.46	0.4

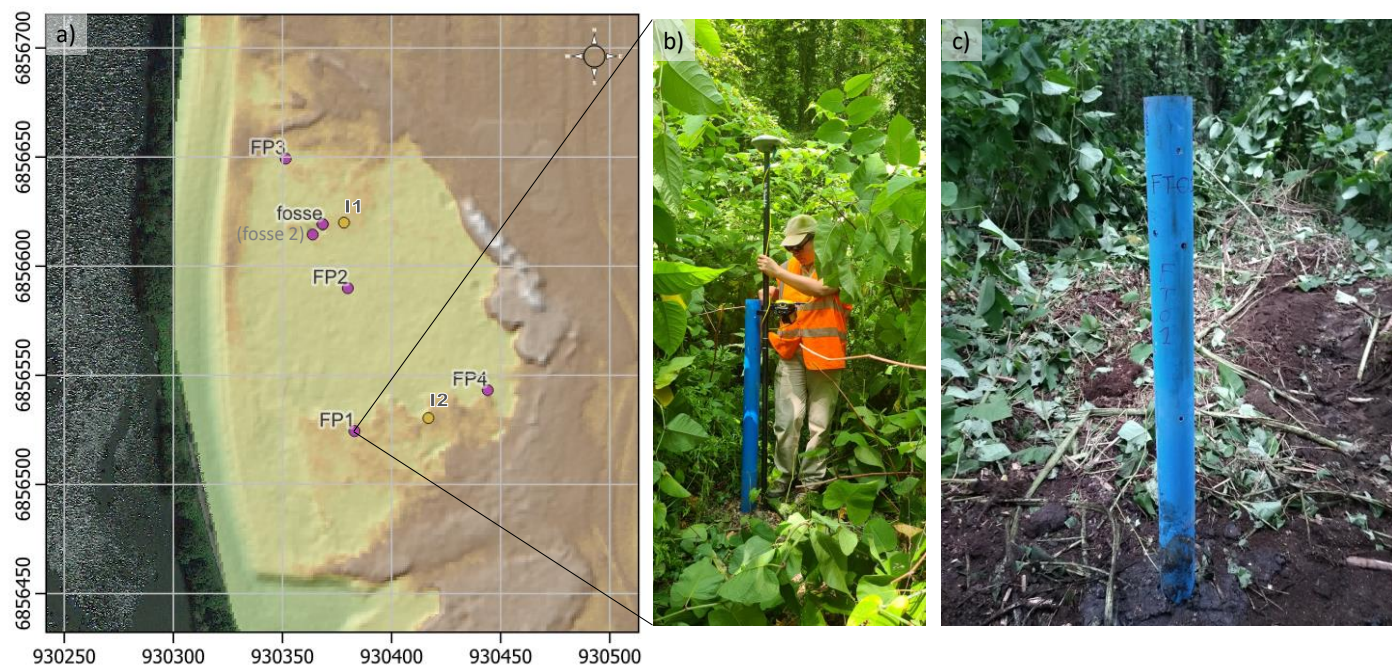


Figure 4: a) map of the Pompey field site with localization of the 6 sampling points (FP1-4 and I1-2) and the 2 pits (fosse and fosse 2); b) picture of the sampling point **FP1** post-sampling campaign (16/06/2023); c) picture of the sampling point **FP1** during sampling campaign (26/08/2021)

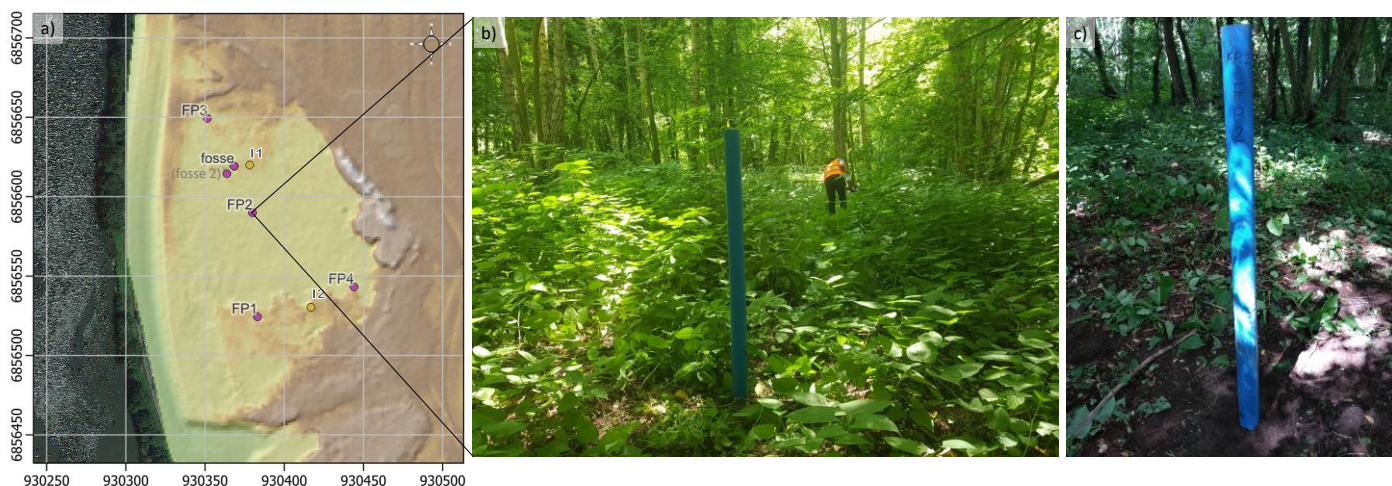


Figure 5: a) map of the Pompey field site with localization of the 6 sampling points (FP1-4 and I1-2) and the 2 pits (fosse and fosse 2); b) picture of the sampling point **FP2** post-sampling campaign (16/06/2023); c) picture of the sampling point **FP2** during sampling campaign (26/08/2021)



Figure 6: a) map of the Pompey field site with localization of the 6 sampling points (FP1-4 and I1-2) and the 2 pits (fosse and fosse 2); b) picture of the sampling point **FP3** post-sampling campaign (16/06/2023); c) picture of the sampling point **FP3** during sampling campaign (26/08/2021)

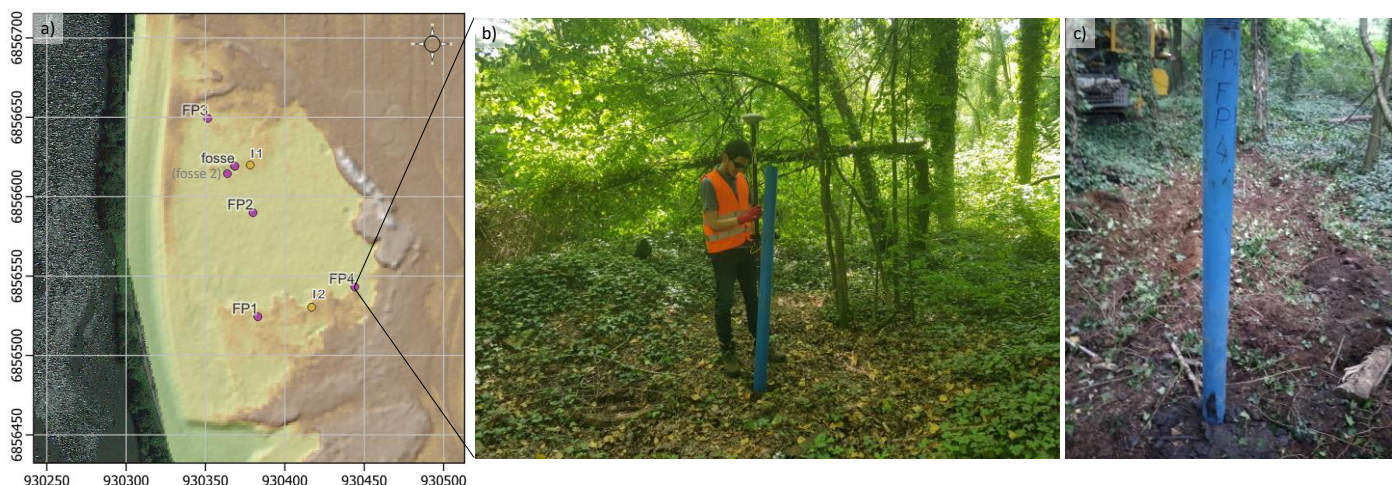


Figure 7: a) map of the Pompey field site with localization of the 6 sampling points (FP1-4 and I1-2) and the 2 pits (fosse and fosse 2); b) picture of the sampling point **FP4** post-sampling campaign (16/06/2023); c) picture of the sampling point **FP4** during sampling campaign (26/08/2021)



Figure 8: a) map of the Pompey field site with localization of the 6 sampling points (FP1-4 and I1-2) and the 2 pits (fosse and fosse 2); b) picture of the 2 pits (fosse and fosse 2) post-sampling campaign (16/06/2023).

7 CONCLUSIONS

During the NWE-REGENERATIS project, several operations have been led on the Pompey site:

- **a two-stages geophysical campaign:** Maps and profiles of the variations of geophysical properties were extracted from the data. The geophysical tools used on site are only surface tools and non-destructive. No restauration operation is thus needed

- **two sampling campaign:**
 - samples were extracted from the pit already available on site for X-ray analysis in the lab. After the sampling campaign, the pit was set back to its orginial state: we covered the deepest part of the pit with a white protecting grating to ease its location and protect futur visitors from falling
 - samples were extracted from 2 locations by IXANE using a lightweight auger on 4 m depth. The dug holes were entirely refilled. No marks were left to identify the location of these boreholes in the future.
 - samples were extracted from 4 locations by BRGM using a light core drill on 9.5 m. The boreholes were backfilled with local material and a pvc blue pipe was installed above the borehole. The name of the borehole was written on the pipe in order to re-identify it in the future if necessary.

8 REFERENCES

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