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Antique houses and yards in Mediterranean and Atlantic climates: impact on field characteristics and on chemical field tests (North and South France)

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The studied examples point to a correlation between the success of phosphorus and chemical mapping of houses, annexes and surroundings, on one side, and the study of type and preservation of natural soils, on the other. The latter are mostly determined in the field, which makes a pedological field intervention essential. They are also in relation with soil climate as shown by some general trends in the presented Late La Tène and antique case studies.

The main objective is the definition of functional differentiations in (parts of) these **buildings and annexes**. On a broader scale, specialists of house and settlement archaeology have been longing for some time for a systematisation of the research on functionalities. It is hoped that the proposed step by step method will allow the selection, in the field, of the cases and places that are adapted, as well as to the more systematic but well targetted sampling, budgeting and analyses that respond to such a demand.

Concerning the field approaches, we follow a step by step method that comprises :

- i- the intervention of a soil scientist in the field, including finding and describing reference profiles in the natural soil and avoiding variability between the samples,
- ii- sampling only if convenient,
- iii- followed by P-tests and sample description,
- iv- classification of the relative (less to more) P-enrichments,
- v- putting this and the useful other descriptions on the archaeological plan, so as to check possible correlations with the house or other past limits.

The field approaches lead, if successful, to :

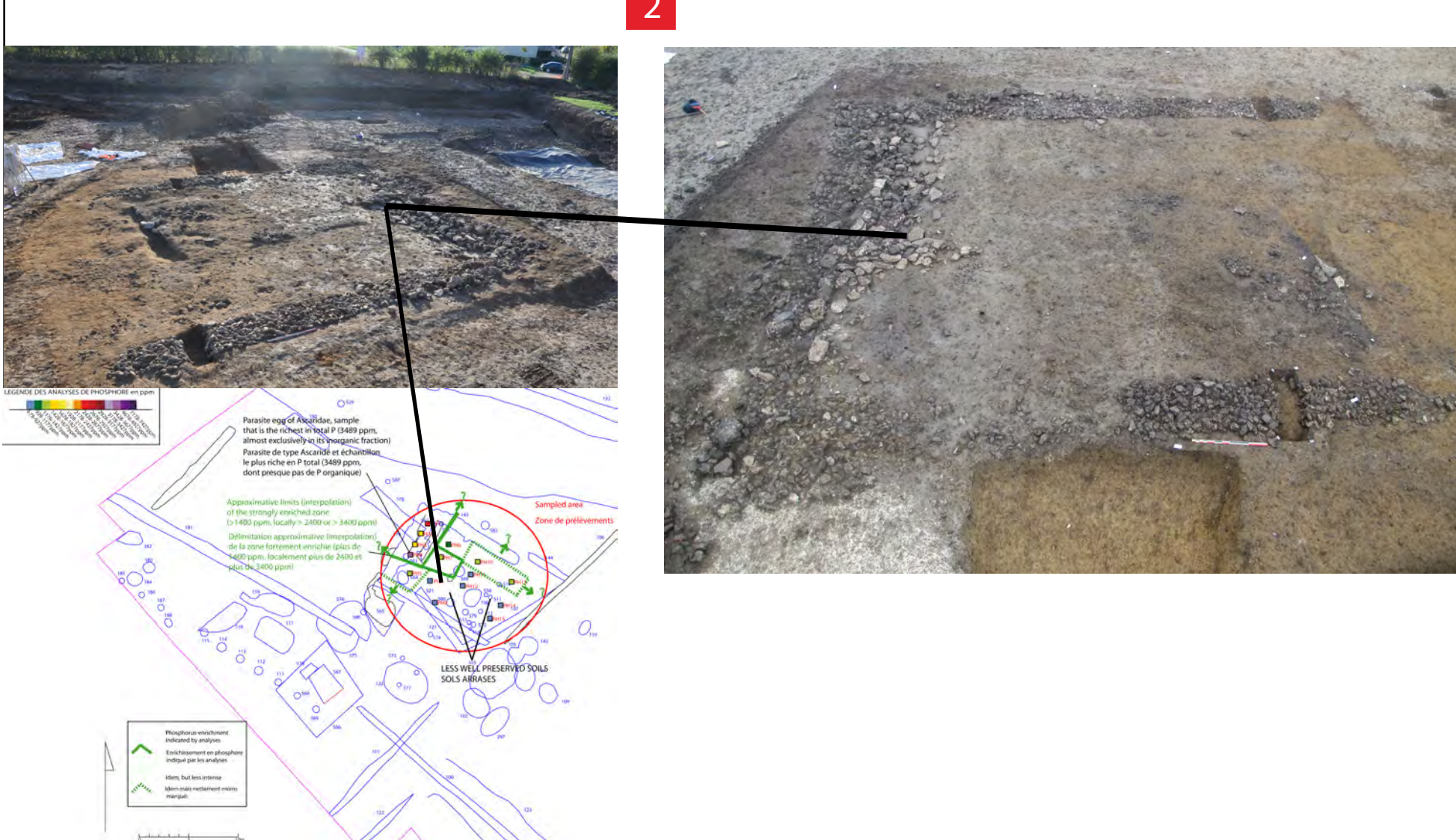
- vi- laboratory analyses including total phosphates and cations on a selection of samples (and if adapted also iron, organic carbon, chlorine, sulfur, ...)
- vii- a larger span of analyses is using rapid methods as portable X-ray fluorescence (for some of these elements).
- viii- if successful, hypotheses based on these analyses can be confortred and precised by phytolith analyses and palaeo-parasitology (on more or less organic layers) and fecal biochemistry (on a well chosen sub-sample).

In the decarbonated silts and sands, buildings are sampled and analysed successfully even when they are slightly eroded or scraped. In the rare cases where a surface horizon is preserved, this is considered as a «not to be missed» occasion for a variety of soil- and other analyses. By contrast, on very calcareous soils and in zones with a mediterranean climate, only very completely preserved surface horizons bear the traces of the chemical enrichments and also are «unmissable» for other approaches.

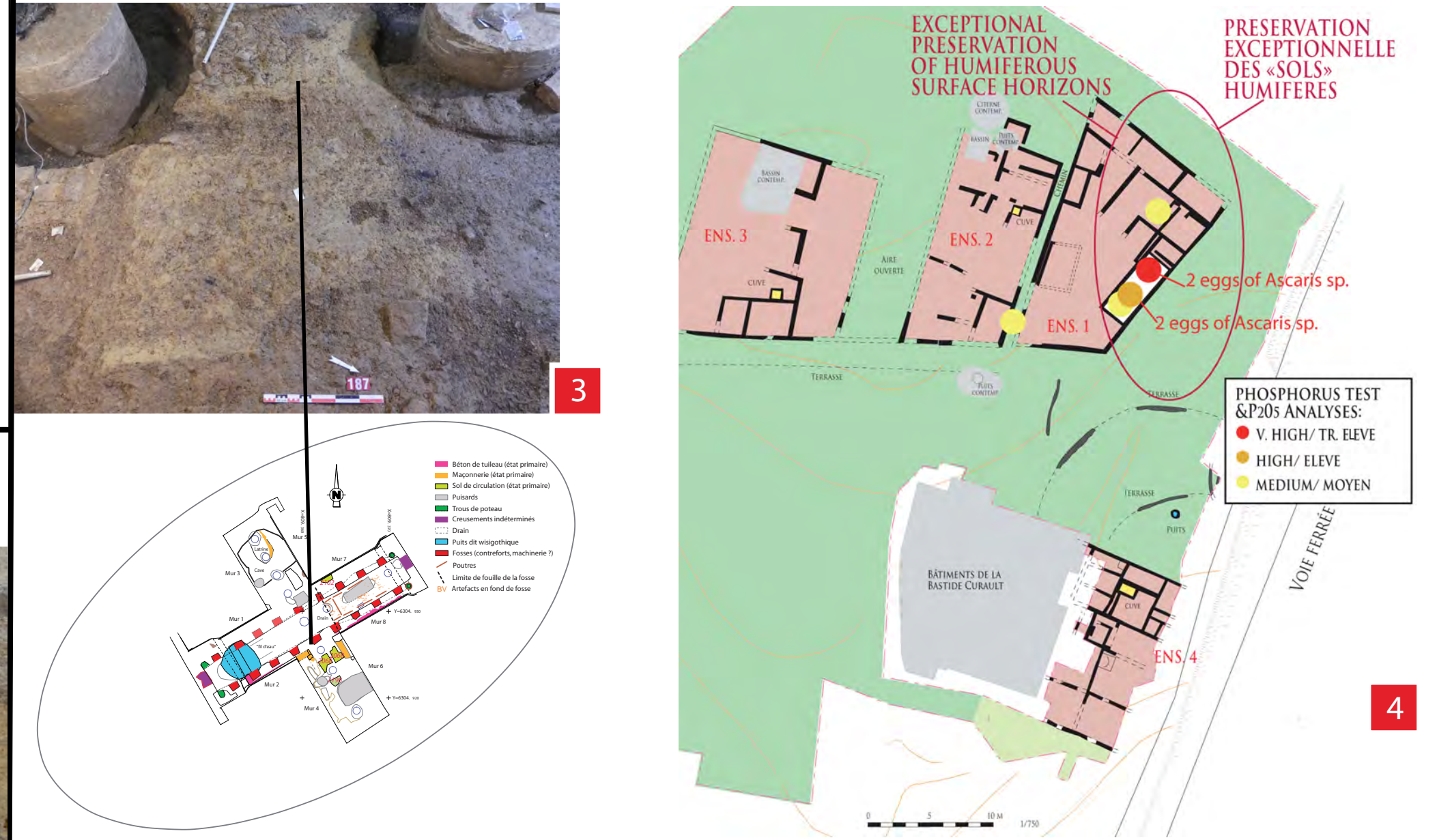
Problematic sites in the south



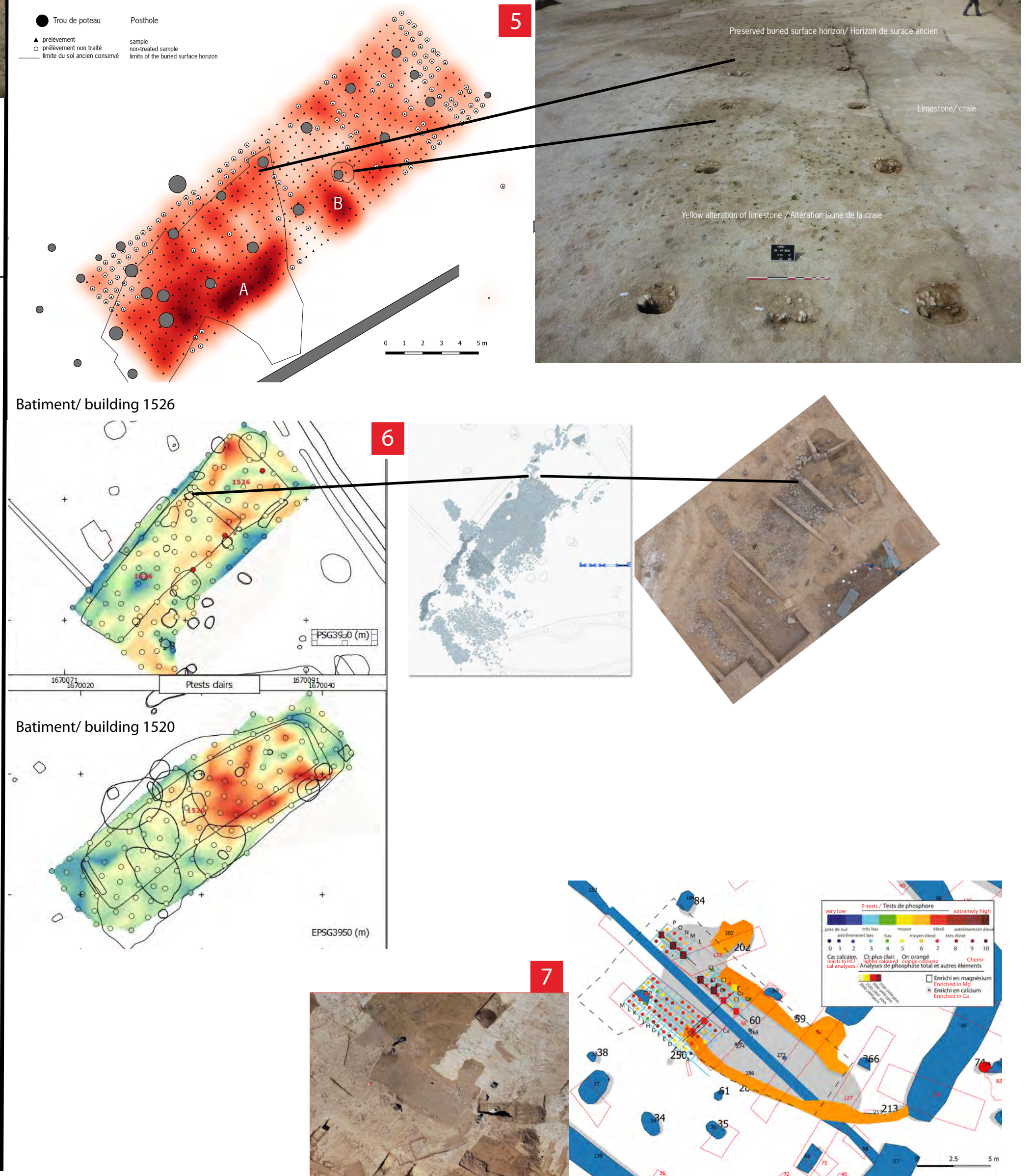
Problematic sites in the north



Successful sites in the south



Successful sites in the north



1: In the south of France, an antique housing area in Veloux (Bouches du-Rhône, F.) bears only the lower parts of the original surface horizon («Bbi» or bioturbation horizon) and lacks any phosphorus enrichments because of this very slight erosion. The same problems arise on very calcareous soils both in north and southern France, where infiltration of phosphorus is inhibited by the high calcium content, forming stable Ca+P molecules, limited to the very surface of the occupation horizon.

2: In Houdan (Seine-et-Marne, F.), on a decarbonated silty soil, only part of the house has preserved the humus-rich surface and the whitish discoloration associated with it. Elsewhere, in the orange subsoil, tests and analyses show a clear drop in values. At other sites on decarbonated soils, there can even be a total loss of information when the top of the soil is more heavily abraded (sloping sites, over-stripping, etc.). Observations in the field enable certain (parts of) sites to be avoided in favour of others.

3: Well protected below the amphitheater of Nimes (Gard, F.), the local strong enrichment in phosphate of a sandy surface horizon might coincide with archaeological arguments for the detention of animals (carceres ?, 3 m large free space for a storage, cages, others ?). The association with a stronger presence of calcium is also noted here (porcine rather than bovine excrements according to litterature ?).

4: Part of the excavation plan of the Late Roman phases of the villa of Mougins (Alpes-Maritimes, France), a humus horizon on marls, showing a strong enrichment in phosphorus and some parasite eggs (plan: Elsa Frangin, completed by Kai Fechner) : possible stabling area ?

5: In Champaign, on limestones and calcareous silts, an antique elongated building with a preserved humus-horizon, in Lavau (Aube, F), provides more phosphorus on and outside its walls than in its inner surface. This is the case both where the buried surface horizon is preserved (A) and outside of this zone (B). Hence, here, taphonomy cannot explain this lack of enrichment of the inside of the building, allowing to exclude stabling or other very P-polluting activities (drawing: M. Kasprzyk).

6: The two Roman buildings of Bruay-la Bussière (Pas-de-Calais, F), with a buried humus horizon on decarbonated loess, both have extreme P amounts in a slightly deeper rear part (in red; drawing: F. Broes).

7: The late La Tène stone-surrounded «basin» or annex of Maltot (Calvados, F), a humus horizon on decarbonated silts, has revealed a strong correlation between phosphates and calcium, sometimes also magnesium, and a lack of potassium and sodium (porcine rather than bovine excrements according to litterature) (drawing: K. Fechner). This encourages further research as e.g. parasitology.