Accounting for Environmental and Anthropogenic Factors: Approaches to enhancing horizontal resolution and interpretability in geophysical surveys

Ashely Green* and Rachael Holmes

*agreen@bournemouth.ac.uk | Department of Archaeology, Anthropology and Forensic Science | Bournemouth University

**Introduction**

Ground-penetrating radar (GPR) survey, whether small-scale or landscape, can be hindered by environmental and anthropogenic factors which reduce maximum vertical and horizontal resolution, and data interpretability compared with ideal survey conditions.

Pilot surveys aimed to mitigate these factors by increasing horizontal resolution, and so refining published protocols (David et al. 2008) for single channel ground-penetrating radar surveys of areas <1ha.

The pilot dataset suggested that for single channel GPR surveys utilising a 250MHz central frequency antenna:

- In general, a 0.10m traverse interval maximises the potential to delineate targets smaller than 2.5m² where the orientation is unknown and the antenna’s central frequency is ≥500MHz.
- A traverse interval ≤25% the size of the minimum dimensions of a discrete target (where the target is at least 1.5m²) is adequate to delineate significant anomalies but may overlook smaller anomalies.

**Methods**

High resolution GPR survey was accompanied by magnetic, resistance, and/or electromagnetic induction (EMI) survey, and archived data where available.

**The Black Friary - Pilot Study**

- **Site Description**: 13th Century Dominican Friary (O’Carroll 2014)
- **Impeding Factors**: High attenuation soil, Ferrous deposits, and stone tumble which become increasingly difficult to interpret with wider traverse intervals due to their size and orientation
- **Targets**: Inhumations, Cemetery boundary, Historic town-wall

**Tràng An Complex - Mitigating Survey Constraints**

- **Site Description**: 5 caves/rockshelters (Rabett 2013)
- **Impeding Factors**: High attenuation soil, Ground disturbance, Logistical constraints
- **Targets**: Stratigraphic changes, Discrete areas of anthropogenic activity

**Fort Maigh Leana – Data Fusion**

- **Site Description**: Non-Agri’s medieval hillfort (Rabett 2013)
- **Impeding Factors**: High attenuation soil, Ground disturbance, Logistical constraints
- **Targets**: Anthropogenic activity, Structural remains

**Conclusion**

The surveys proved successful within these environments as GPR data showed significant responses in poor site conditions, which were corroborated by ground-truthing and secondary survey. Ultimately, these case studies demonstrate the desirability for focused small area, higher resolution surveys on impacted sites in order to improve data interpretability.

Further analysis of the success rate of these parameters is being conducted in England and Ireland in order to mitigate for the trade-off between ground coverage and data quality.

**References**

3. Rabett, R.J. 2013. The Dominican Friary surveys were undertaken as part of 424 MSc Forensic Archaeology and PhD in Archaeology degrees at Bournemouth University under the supervision of Paul Cheetham and Professor Timothy Corp. (2013). The Early Human Occupation of Tràng An, Vietnam: Archaeological and palaeo-environmental evidence. Journal of Geology, Series B 336:1-7.