

Keighley Shared Church

GPR survey for graves detection – brief report note

On the 22nd of February 2024 a Ground Penetrating Radar (GPR) survey was carried out in the area adjacent to the Keighley Shared Church. The survey was carried out as a part of the learning activities for the students of Forensic Archaeology and Crime Scene Investigation Master's course (School of Archaeological and Forensic Sciences, University of Bradford).

The aim of the survey was to locate potential human burials and assess the subsurface features in the area adjacent to the church. The measurements were collected south of the Church building, in the accessible parts of the lawn and pavement. The area was selected considering the planned development, according to the documentation provided by the Church (Fig. 1).

At the stage of survey preparation, archival plans of the graveyard have been georeferenced and compared with the current field situation (Fig. 2). At the stage of GPR data analysis and interpretation, georeferenced archival plans have been used to correlate geophysical anomalies with some potential historical graves or other features.

This brief survey report note provides basic, general information on the GPR survey, and visualisation printouts with relevant comments and should not be considered as a full survey report.

Survey metadata

Survey date	22.04.2024
Environmental conditions	Saturated, conductive soil (lawn areas) and pavement made of headstones. Trees with no leaves and buildings occasionally slightly obstructed RTK fixed solution. Rainy day.
Survey equipment	Mala Mini MIRA 8-channel 3D GPR; central frequency 400 MHz; sampling resolution c. 0.08 X 0.08 m. Real time positioning using two RTK GNSS Carlson Brx7 receivers in base-rover configuration.
Data processing	GPR data processed in WAVE GPR software using the following procedures: time zero adjustment (Auto offsets), background removal, horizontal high pass, bandpass, migration, spline envelop; 3D data volume created using manual gain control and kriging interpolation; georeferenced time slices exported as geotiffs.



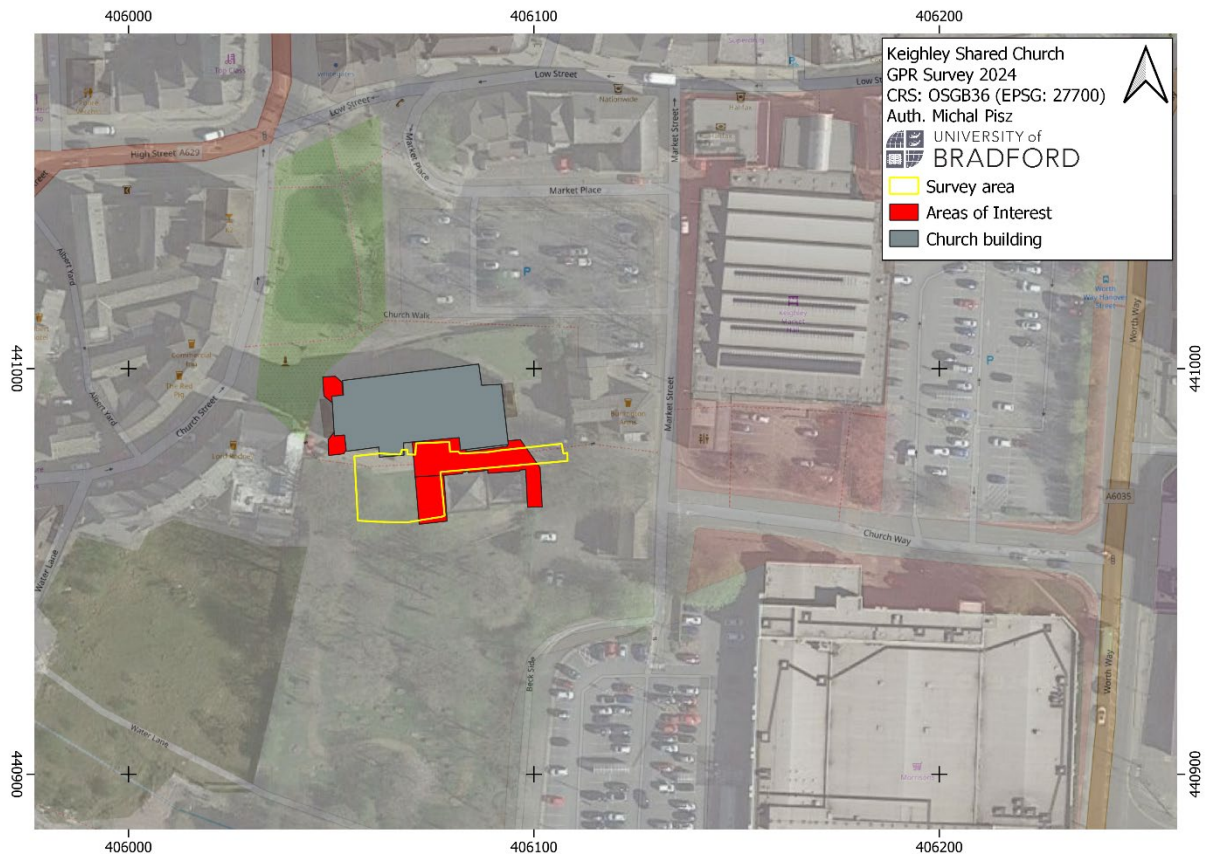


Fig. 1 – Survey area over the proposed area of development

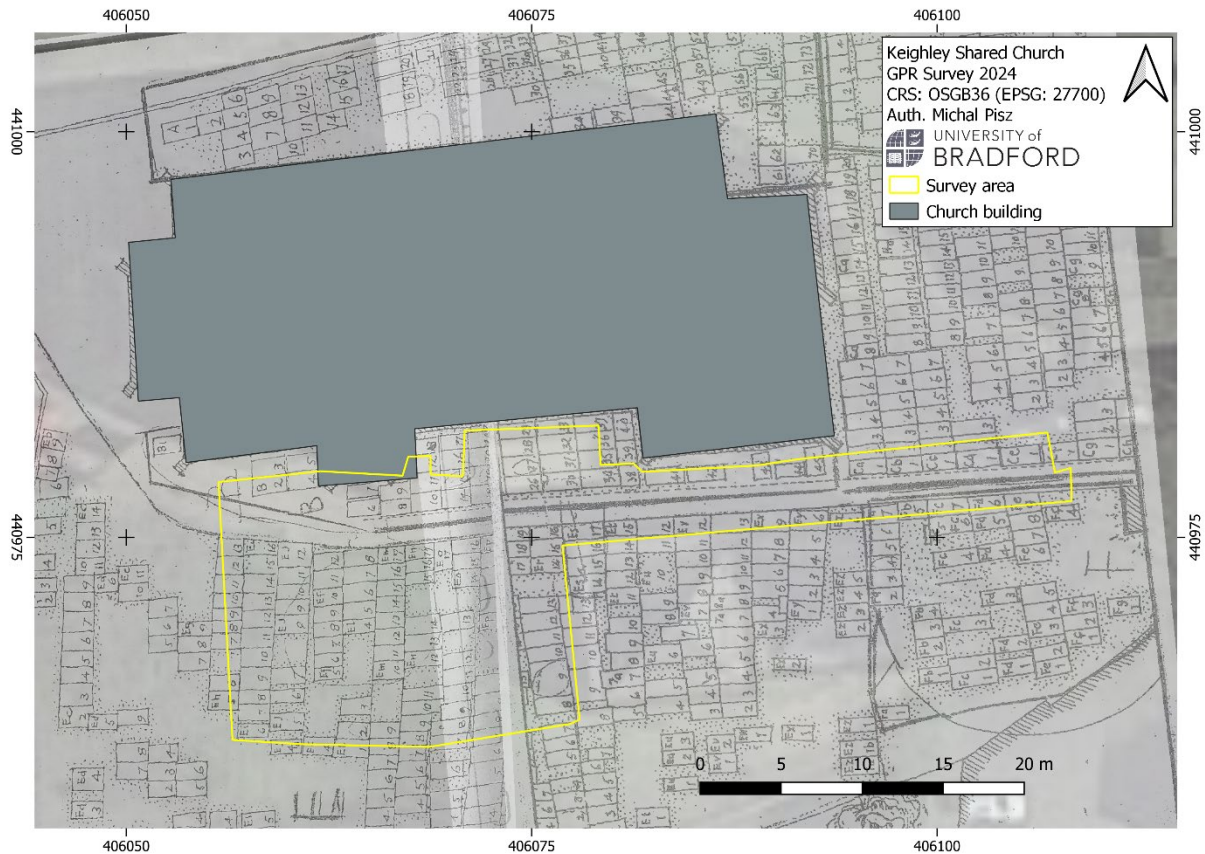


Fig. 2 – Survey area over the georeferenced archival graves plan



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General observations

The conditions for the GPR survey were not ideal and could have limited the prospection depth and clarity. Saturated, i.e., highly conductive soil attenuates the electromagnetic wave.

3D GPR survey recorded several geophysical anomalies, mostly related to subsurface features. There is a significant difference in the geophysical response over the lawn and the pavement, with the latter containing much less of reflective bodies. A large amount of highly reflective objects beneath the ground on most of the survey area (grassy parts) suggests landscaping in the past. The land might have been backfilled with rubble to level the ground, resulting in the contemporary ground level in the lawn area, and the reflective backfill underneath. This could be mostly observed in time slices from the first meter below ground level (b.g.l.), the deepest reflective responses from the supposed backfill to be found about 1.5m b.g.l.

The overlaying reflective layers hinder the interpretation of the underlying features, but it could be assumed that the ground levelling occurred after the time of burials, so the graves could be either exhumed or currently being buried under the supposed backfill layer. In course of comprehensive data analysis, a number of anomalies matching the response type for burials, were outlined and are presented below.

Conclusions

The GPR survey* revealed numerous anomalies which could be interpreted both as reflective horizons and layers, i.e., land backfill, as well as some distinctive anomalies. A few of the latter resemble typical responses from burials and were outlined in the final interpretation (Fig. 3). Compared to the georeferenced graves plan, the anomalies reflect the general alignment of graves, however, there are way fewer GPR responses from potential burials than the plan would suggest (Fig. 4).

Considering the development, there is a high possibility that archaeological features would be found in the area, with the remark that there are only a few potential graves in the shallowest (up to 1-1.5m b.g.l.) layers.

* - Rendered GPR time slices are attached to this brief report note, along with the printouts with survey extent and interpretations, presented in the text.



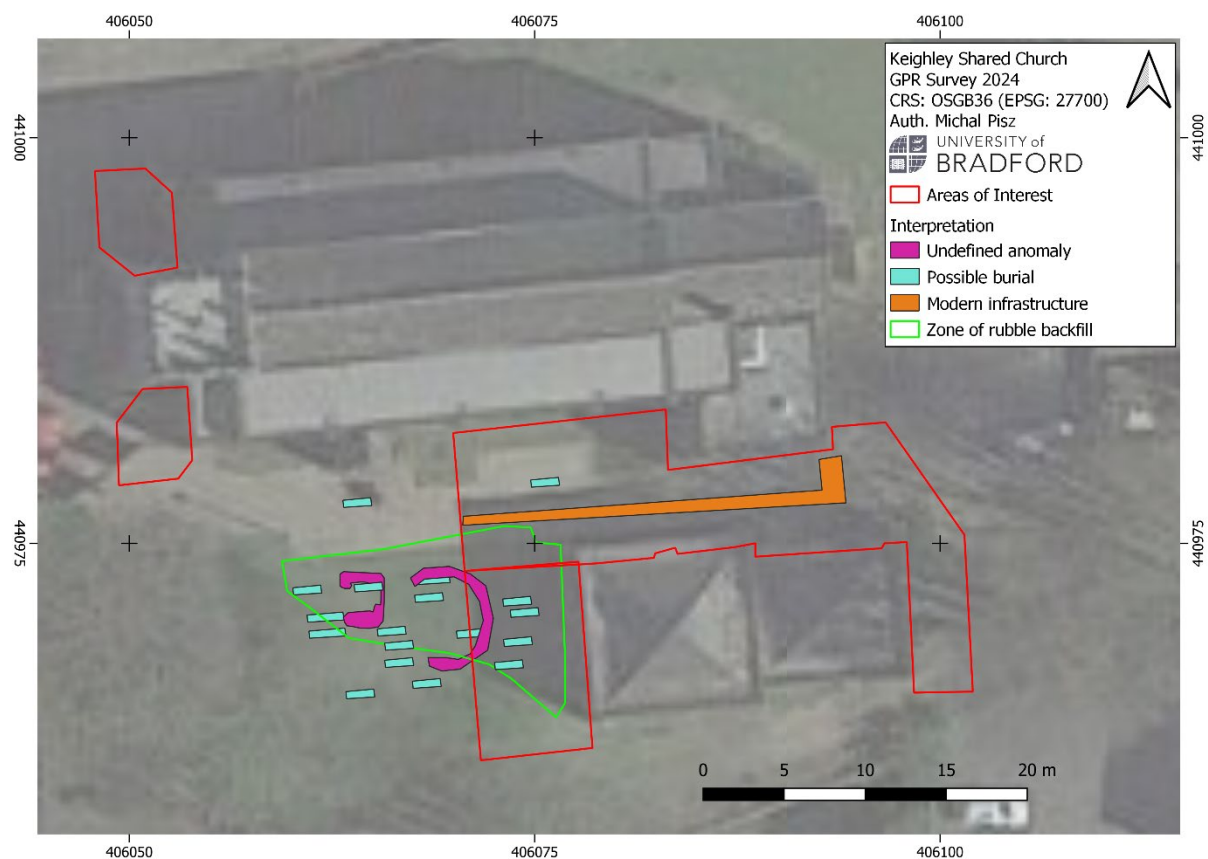


Fig. 3 – 3D GPR data combined interpretation overlaid on satellite imagery

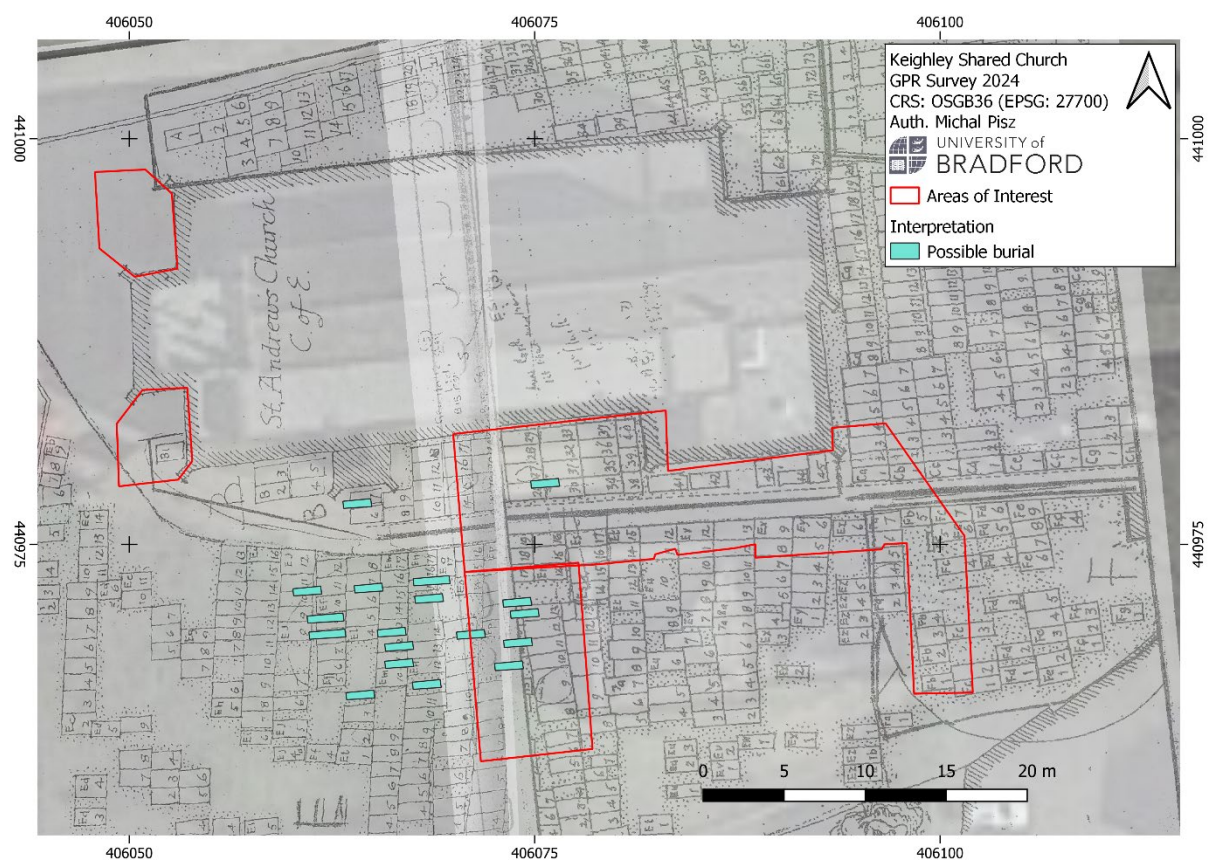


Fig. 4 – Outlined potential burials overlaid on the area of interest and georeferenced graves plan.



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