

GeoArch

Report 2013/18

Geophysical surveys at Plas Brynkir,
Gwynedd

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31st August 2013

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Abstract

This report details ground resistivity surveys undertaken over areas adjacent to the 'Upper' and 'Lower' houses at Plas Brynkir.

The survey to the north of the Lower House produced anomalies suggestive of features oriented at approximately 40 degrees to the orientation of the north wing. These included a very strong boundary (high resistivity to the northwest, low resistivity to the SE) passing WSW from the NW corner of the N wing. The interpretation of these features is unclear, with services or garden features on an oblique alignment, the location of an earlier building on a different alignment, or a post-demolition hard-standing amongst the possibilities.

The survey close to the Upper House extended from the area in the angle of the two surviving wings, down the slope across the terraced path features, across a revetted ditch and bank and onto the present mini-football field. The principle anomalies are interpreted as:

- *a pipe trench carrying a water pipe to a mid-twentieth century house that stood in the grounds*
- *several orthogonal walls suggesting a substantial range to the SW of the courtyard*
- *less substantial indications of walls to the NW of the courtyard, including a possible square feature, either within the courtyard or forming part of a NW range.*

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Methods

Survey rationale and background

The survey was undertaken on behalf of Mark Baker (Cardiff University) and was undertaken as a part of the 2013 field season.

The surveys were conducted on the 8th and 9th of August 2013 in good, hot, dry conditions.

In all cases where a high degree of certainty on the presence/absence of archaeological features is required, or a high level of interpretation of those features, then additional investigations, usually including intrusive testing through trial excavation, may be required. Geophysical survey results should not be relied on, on their own, to provide unambiguous interpretations.

Survey layout

The surveys were laid-out using a Nikon EDM and tapes, in measured locations with respect to standing buildings. For the Upper House survey a base-line was constructed along the DE side of the lawn area, terminating at a tree at the SW end. The RTK GPS system was unable to collect data of sufficient quality in this area because of the tree cover, so the surveys were not tied in to National Grid directly.

The grid locations are shown in Figure 1.

An attempt to use GPS to locate a base-station on the site was rather unsuccessful, because of the tree coverage. The station (STN1; located on the centre of the 'O' of the small *Osmadrain* hatch cover in the driveway to the SE of the hostel, produced a good XY location (E=252373.105, N=343714.177), but the height value (114.406m) has a large error (0.75m).

Ground resistivity

The ground resistivity survey was undertaken with a Geoscan RM15 resistivity meter, operating a 'parallel twin electrode' configuration, employing three electrodes with 0.5m probe spacing on a PA5 frame, via an MPX15 multiplexer.

In this configuration, the mobile electrode pairs were employed in two configurations:

1. as two pairs of electrodes with a 0.5m spacing (giving the main component of the response from 0.5-0.7m depth), with 0.5m between centres, to give a 0.5m effective traverse interval.
2. as a single pair of electrodes with a 1.0m spacing (using the outer electrodes only)

For the 0.5m-spaced surveys, the configuration meant that data were collected with 0.5m sample interval and 0.5m effective traverse interval (i.e. raw data grid has 0.5 x 0.5m node spacing) on 20m grids, walked in parallel. By using a 0.25m N and 0.25m E initial measuring location, the sampling within these grids is symmetrical. However, because data were simultaneously acquired at a 1.0m spacing, the system had to be configured a 'multiple', rather than 'parallel twin', data from the three probe configurations had to be download individually into *Geoplot*. For the 0.5m spaced probes the 'a' and 'b' sets had to be assembled into composites separately and then merged into a single composite dataset. This meant any rotation and merging of grids on different orientations had to be done in *Surfer* rather than *Geoplot*.

For the 1.0m spaced electrodes collection was at 0.5m sample interval on a 1.0m traverse interval. Data are therefore asymmetrical within each survey area. Data from the separate component sections of the survey were assembled and despiked in *Geoplot*, then exported for merging, interpolation to a 0.125m node spacing and imaging in *Surfer*.

Data processing in *Geoplot* was restricted to removal of any minor data spikes (due to poor electrode) using the 'despike' function'. For the gardens area minor corrections needed to be made to a displaced row of data.

Data from the Upper House (archery range) area (walked NE-SW) and data from the adjacent gardens (walked NW-SE) were assembled separately in *Geoplot*, then exported to *Surfer*, where the datasets were interpolated to a 0.125m node spacing and merged.

For the smaller Lower House survey, data were simply despiked in *Geoplot* and exported to *Surfer* for interpolation to a 0.125m node spacing and imaging.

Results

Lower House Survey: The ground resistivity data are presented in Figure 2 (as a raw and despiked bitmapped images from *Geoplot*), Figure 5 (as the interpolated cleaned data from *Surfer*) and Figure 8 (0.5m-spaced interpolated data from *Surfer* superimposed on a modern basemap).

Upper House Survey: The ground resistivity data are presented in Figures 3-4 (as a raw and despiked bitmapped images from *Geoplot*), Figure 6-7 (as the

interpolated cleaned data from *Surfer*) and Figure 8 (0.5m-spaced interpolated data from *Surfer* superimposed on a modern basemap).

Data quality was generally good in all parts of the component resistivity surveys.

Interpretation

The Lower House Survey: both the 0.5m- and 1.0m-spaced surveys show an area of elevated resistivity towards the NW of the survey, bounded to the S by an abrupt margin (possibly formed by a linear negative anomaly), to the W by a more diffuse margin approximately perpendicular to that to the S and to the east by a parallel sharp margin.

The abrupt S margin to the resistivity high could indicate a service trench passing across the courtyard area and just outside the NW angle of the N wing. In the opposite direction it would pass towards the western part of the southern range.

The nature of the resistivity high is not obvious from the data. The broadly rectilinear form is suggestive of a building footprint, but if the sharp S boundary is a superimposed service feature, then the high might alternatively be a dump of stone rubble, or even associated with garden/path features in the 'courtyard'.

The Upper House Survey: in the area of the Upper House itself, there are several broadly orthogonal positive linear anomalies that can be interpreted as walls. Many show at both 0.5m and 1.0m probe spacings, but some do not appear on the wider spacing – either indicating they are relatively shallow features, or that they are less differentiated at depth (e.g. the wall of a room may be more differentiated from its surroundings above floor level and in the footings, then it is at floor level). It is worth pointing out that positive resistivity anomalies may be generated by, for instance, stone-built drains as well as by walls, so some circumspection is required in assuming all these anomalies indicate walls.

Running across both house area and garden area is a well-marked linear negative resistivity anomaly – likely to be a service trench. It is coincident with the line of a water pipe observed in a previous excavation – and may indicate piped water directed towards the former 'squatter' cottage in the estate to the west.

In the garden area, the wall bounding the wood shows strongly for the negative resistivity anomaly on its upslope side, as well as the positive anomaly associated with the wall itself. This probably emphasises the ha-ha nature of this wall – and suggests it served as a barrier to entry to the gardens, but did not intrude on the view of the ruins of the Upper House from within the garden.

The associated bank and terrace to the NW have little effect on resistivity, suggesting they are relatively insubstantial features.

Interestingly all these features in the upper part of the garden are cut by minor, almost E-W, linear resistivity anomalies, running W from the termination of the former wall along the NW side of the present lawn. Although these initially appeared to be of geological origin, the processed dataset strongly suggests that these are vehicle tracks. Since they cross-cut the

garden features, they may be associated with the mid-20th century logging operations.

In the lower section of the survey across the gardens, the lower track is poorly imaged, but here appears to be a discrete high resistivity anomaly (probably a wall or revetment) between it and the ditch to its NW. The opposite side of the ditch does not appear to show a corresponding wall. There is, however, a slight possible indication of a linear positive anomaly close the crest of the bank between the ditch and the area now a football field.

Discussion

In the area of the Lower House, the survey has provided evidence for features for which there is no simple, obvious, explanation. The existence of a resistivity high, of general rectilinear plan, bounded to the SE by a resistivity low, could be interpreted in a variety of ways. Survey of further areas to the north to determine the full shape of the anomaly, or test excavation, would be required to interpret the anomalies in more detail.

In contrast, in the area of the Upper House, the geophysical survey has provided reasonable grounds for interpreting a number of anomalies as wall defining a SW range to the courtyard, and, with a lower degree of certainty, a range to the NW too. In neither case is there a complete groundplan, with local access issues delimiting the area that could reasonably be surveyed.

In the sloping area below the Upper House, the course of a water pipe has been confirmed. The upper terrace did not image well, suggesting it differs little in the subsurface from the adjacent gardens. The lower track appears slightly better delimited, with a resistivity high, possibly a wall between the track and the adjacent ditch. There is no similar wall to the west of the ditch, but a slight linear positive anomaly might possibly indicate a slight wall on the crest of the bank between the ditch and the present football field.

Figure Captions

Figure 1. Layout of survey grids, with respect to key modern features and National Grid. Basemap © Crown Copyright 2013, Ordnance Survey/EDINA supplied service.

Figure 2. Plas Brynkir, Lower House. Ground resistivity data as a bitmapped images from *Geoplot*:
 a. 0.5m probe spacing, raw data
 b. 0.5m probe spacing, despiked data
 c. 1.0m probe spacing, raw data
 d. 1.0m probe spacing, despiked data

greyscales: 450 ohm measured resistance (black) to 750 ohm (white) for 0.5m probe spacing and 400 ohm measured resistance (black) to 600 ohm (white) for 1.0m probe spacing.

Figure 3. Plas Brynkir, Upper House. Ground resistivity data as a bitmapped images from *Geoplot*:
 a. 0.5m probe spacing, raw data
 b. 0.5m probe spacing, despiked data
 c. 1.0m probe spacing, raw data
 d. 1.0m probe spacing, despiked data

greyscales: 100 ohm measured resistance (black) to 400 ohm (white) for 0.5m probe spacing and 100 ohm measured resistance (black) to 250 ohm (white) for 1.0m probe spacing.

Figure 4. Plas Brynkir, gardens. Ground resistivity data as a bitmapped images from *Geoplot*:
 a. 0.5m probe spacing, raw data
 b. 0.5m probe spacing, despiked and shifted data
 c. 1.0m probe spacing, raw data
 d. 1.0m probe spacing, despiked and shifted data

greyscales: 100 ohm measured resistance (black) to 800 ohm (white) for 0.5m probe spacing and 100 ohm measured resistance (black) to 600 ohm (white) for 1.0m probe spacing.

Figure 5. Plas Brynkir, Lower House. Ground resistivity data as images from *Surfer*:
 a. 0.5m probe spacing
 b. 1.0m probe spacing

greyscales: 500 ohm measured resistance (black) to 750 ohm (white) for 0.5m probe spacing and 450 ohm measured resistance (black) to 600 ohm (white) for 1.0m probe spacing.

Figure 6. Plas Brynkir, Upper House & Garden. Ground resistivity data as images from *Surfer*:
 0.5m probe spacing
 a. greyscale: 100 ohm measured resistance (black) to 750 ohm (white)
 b. greyscales: 160 ohm measured resistance (black) to 320 ohm (white)
 c. greyscales: 160 ohm measured resistance (black) to 320 ohm (white) with possible walls shown in brown.

Figure 7. Plas Brynkir, Upper House & Garden. Ground resistivity data as images from *Surfer*:
 1.0m probe spacing
 a. greyscale: 100 ohm measured resistance (black) to 500 ohm (white)
 b. greyscales: 120 ohm measured resistance (black) to 220 ohm (white)
 c. greyscales: 120 ohm measured resistance (black) to 220 ohm (white) with possible walls shown in brown.

Figure 8. Plas Brynkir. Ground resistivity data as images from *Surfer*, 0.5m probe spacing, located on modern basemap.

Lower House data shown with greyscale 500 ohm measured resistance (black) to 750 ohm (white)
 Upper House data shown with greyscale 180 ohm measured resistance (black) to 320 ohm (white)

Basemap © Crown Copyright 2013, Ordnance Survey/EDINA supplied service.

Figure 1

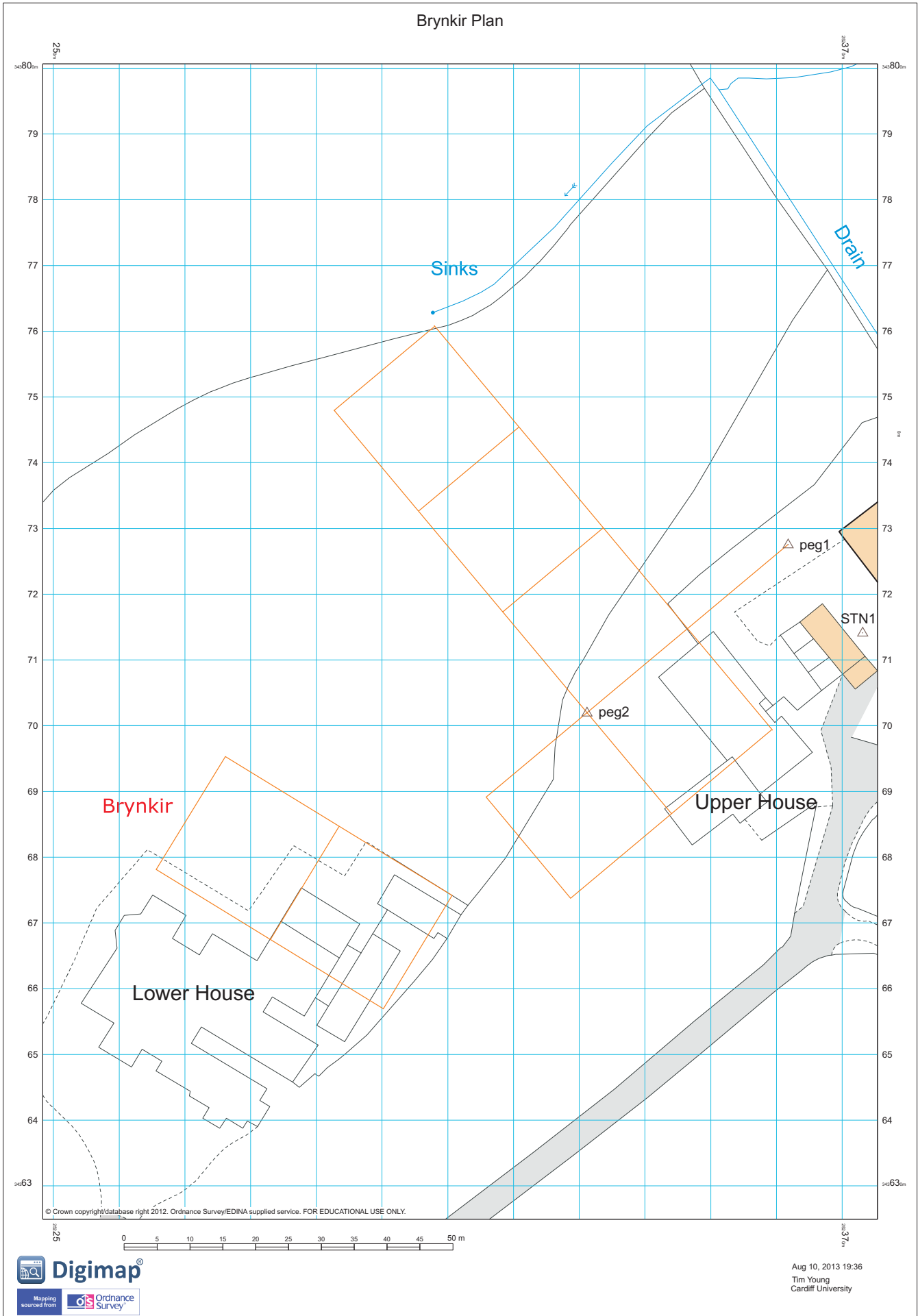


Figure 2



20m



Figure 3

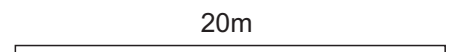
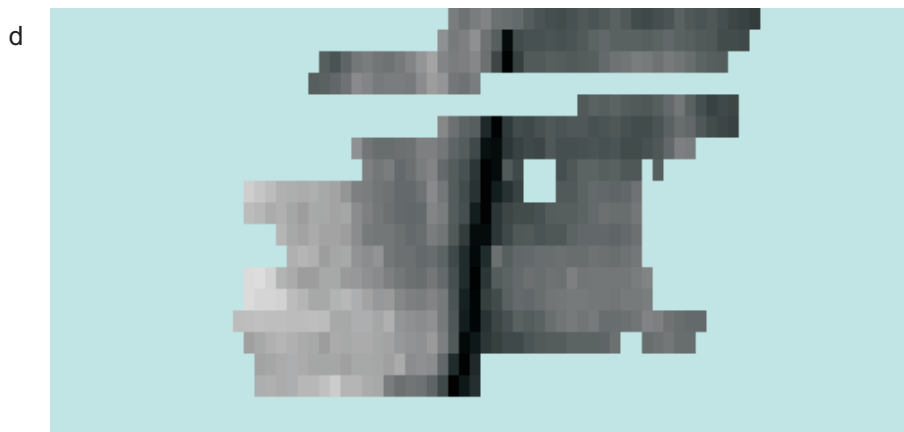
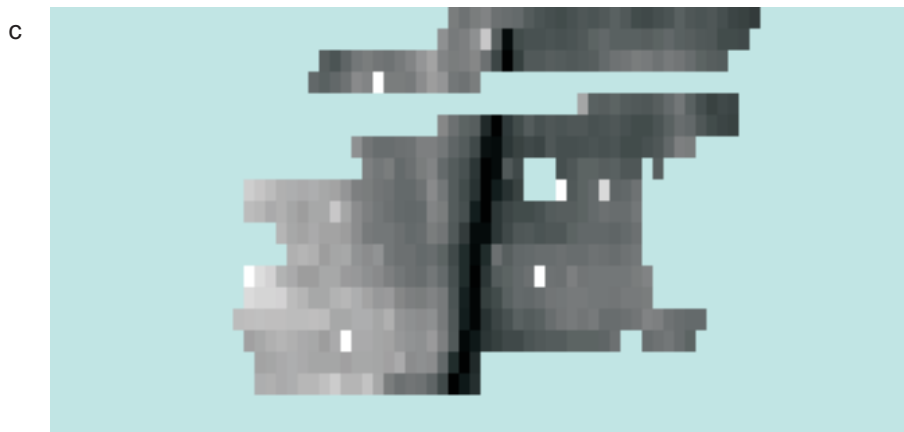
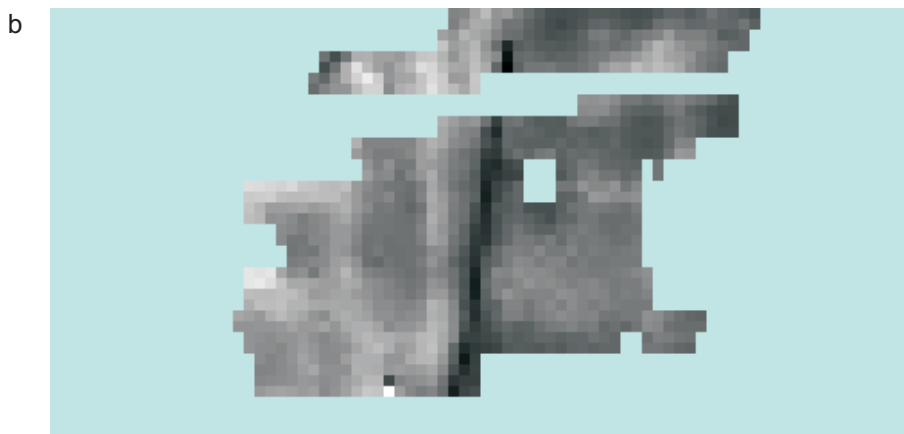
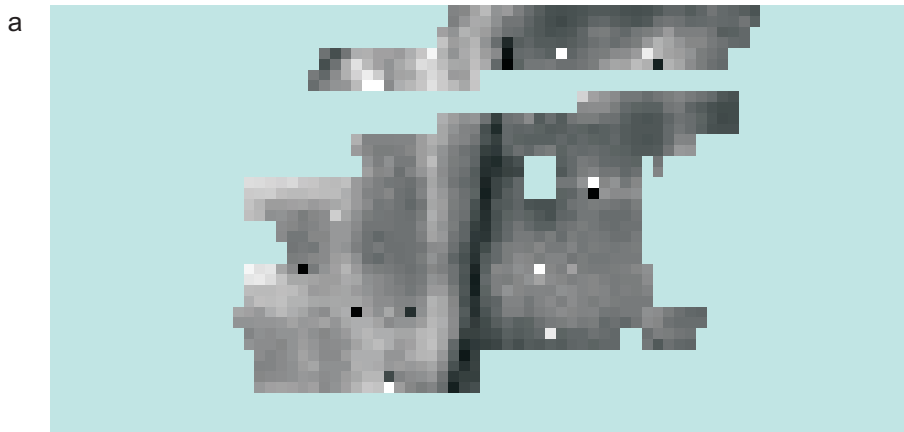


Figure 4

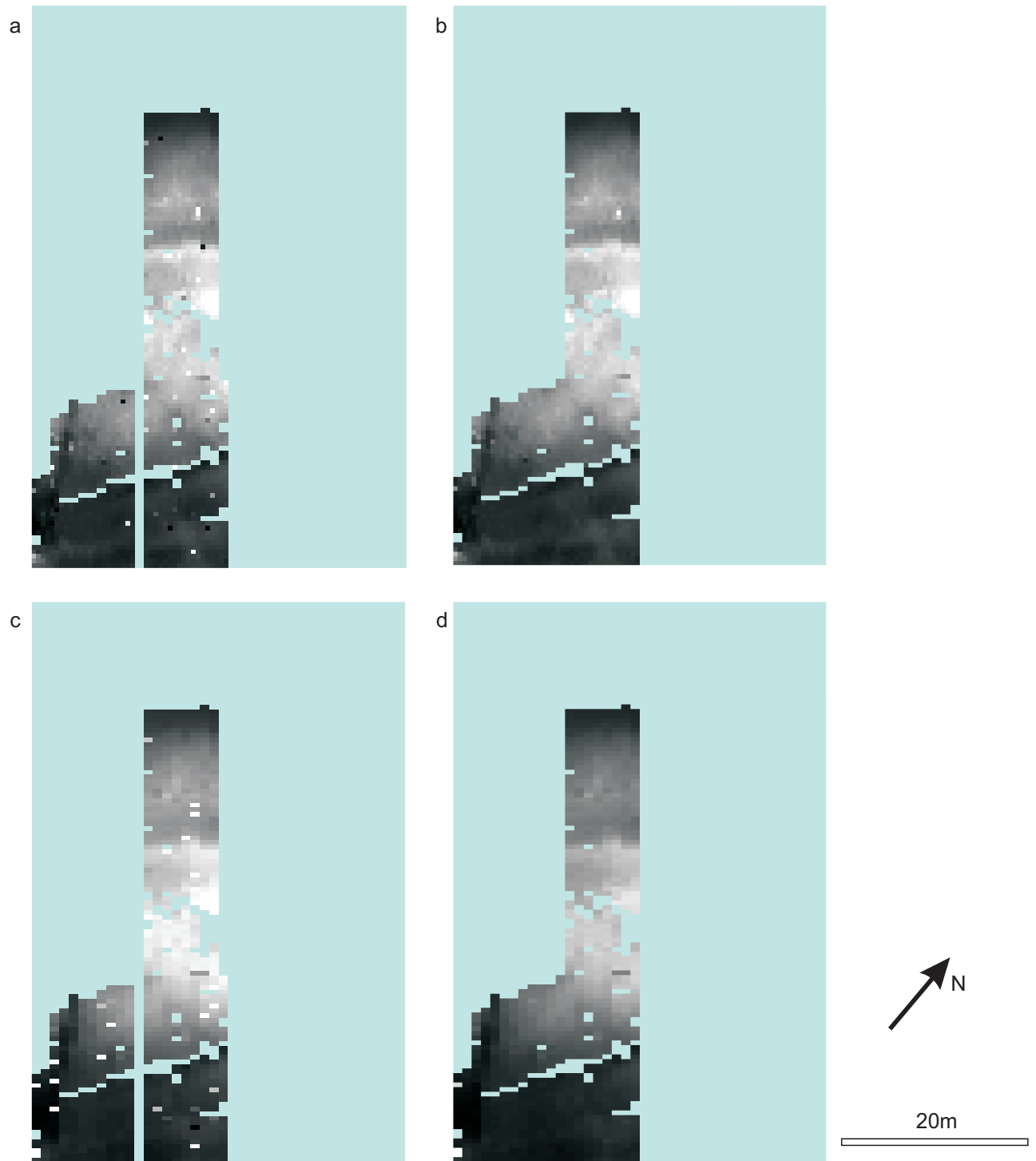




Figure 5

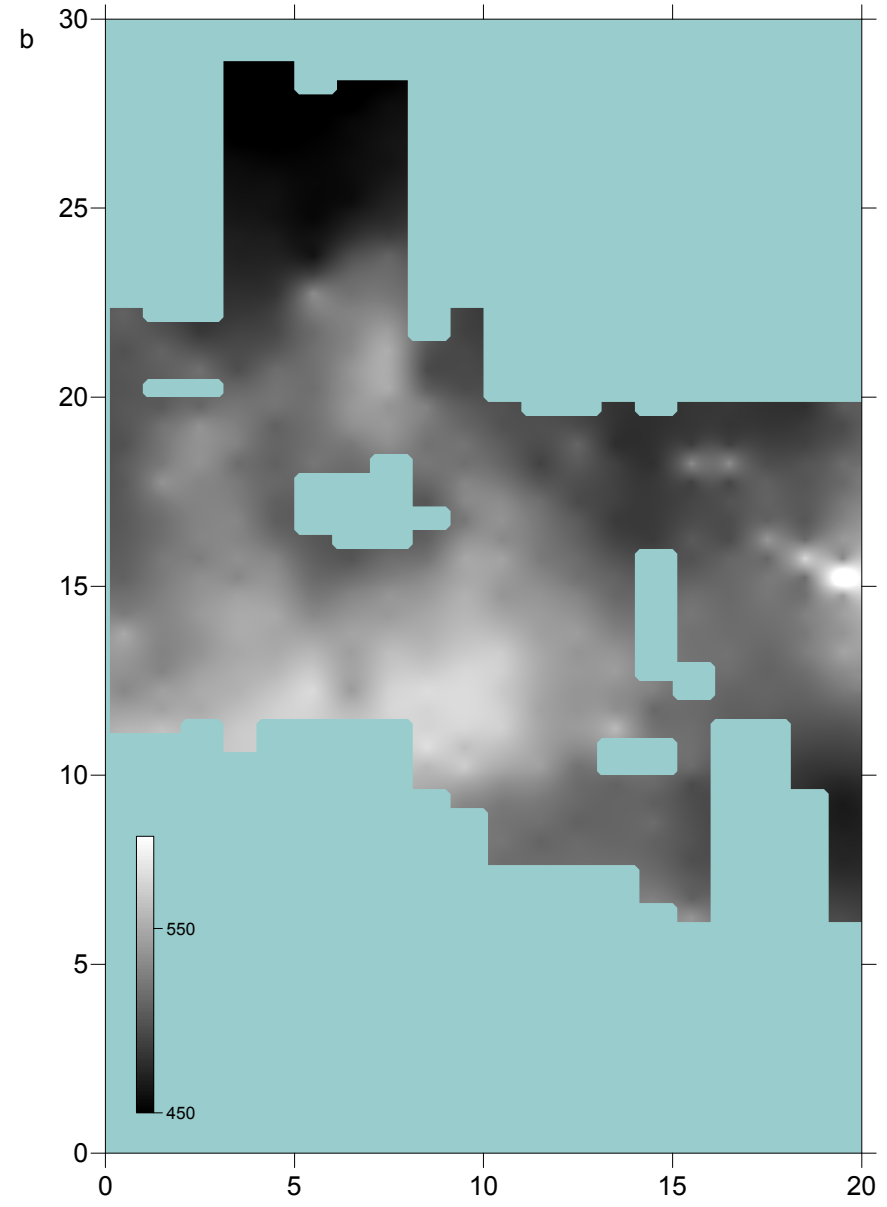
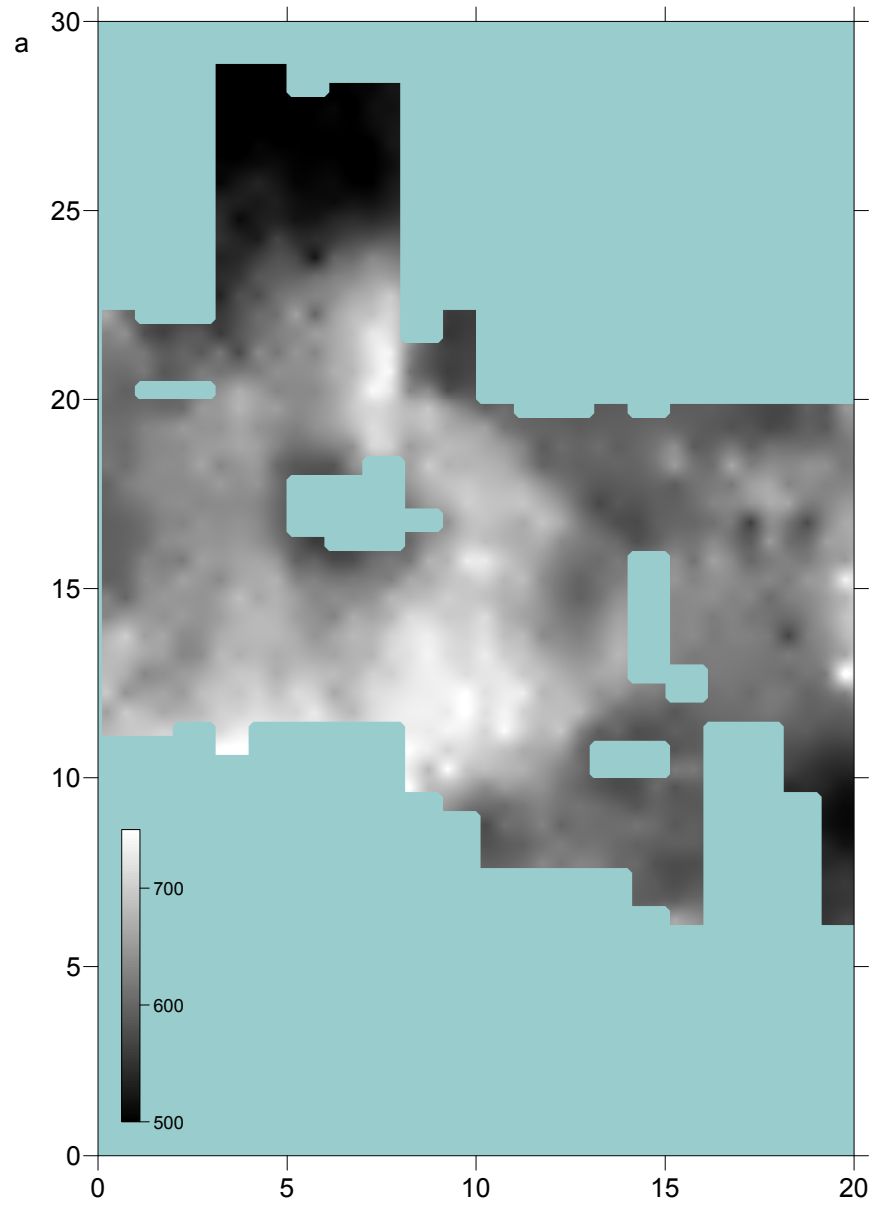


Figure 6

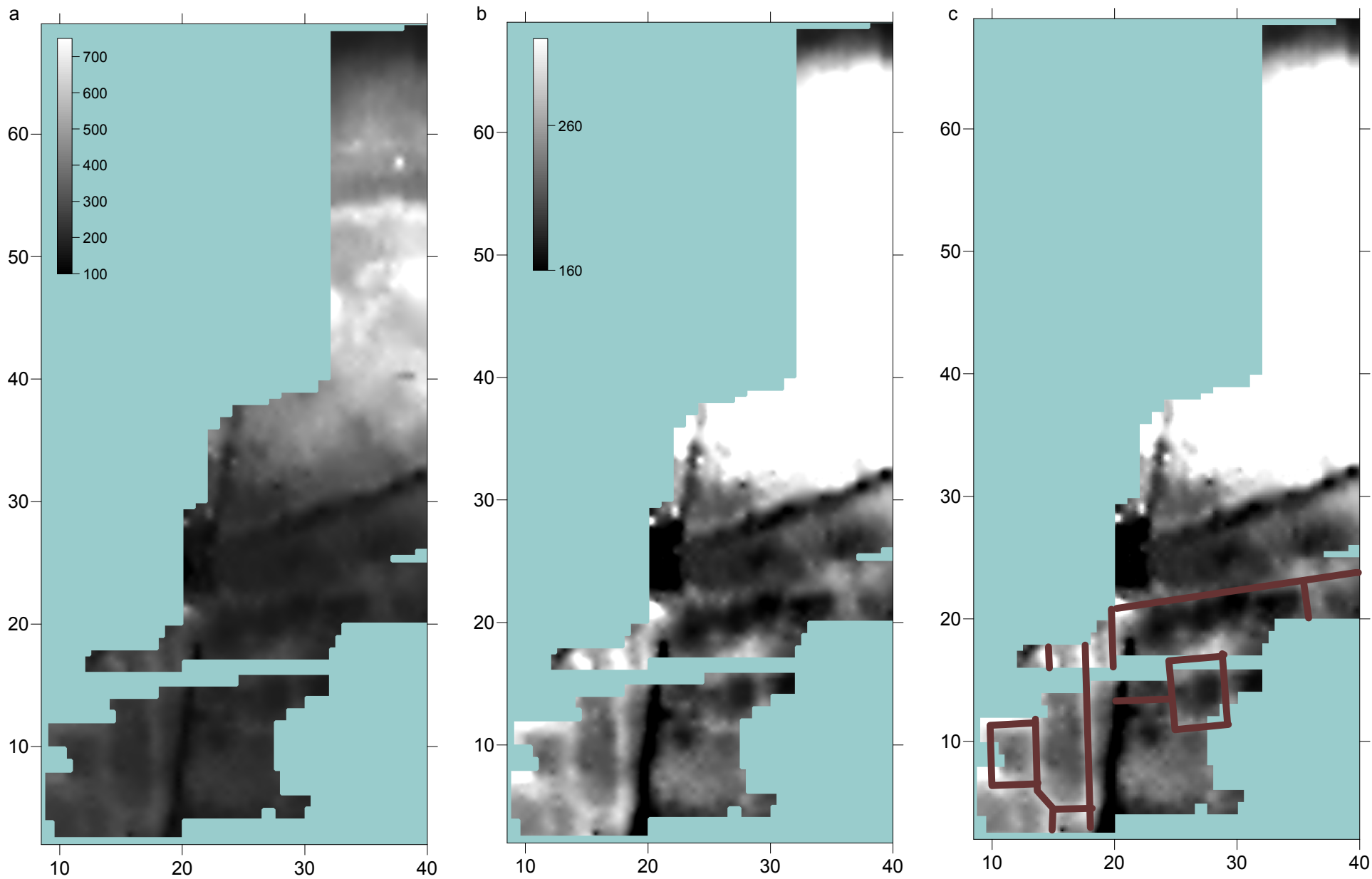


Figure 7

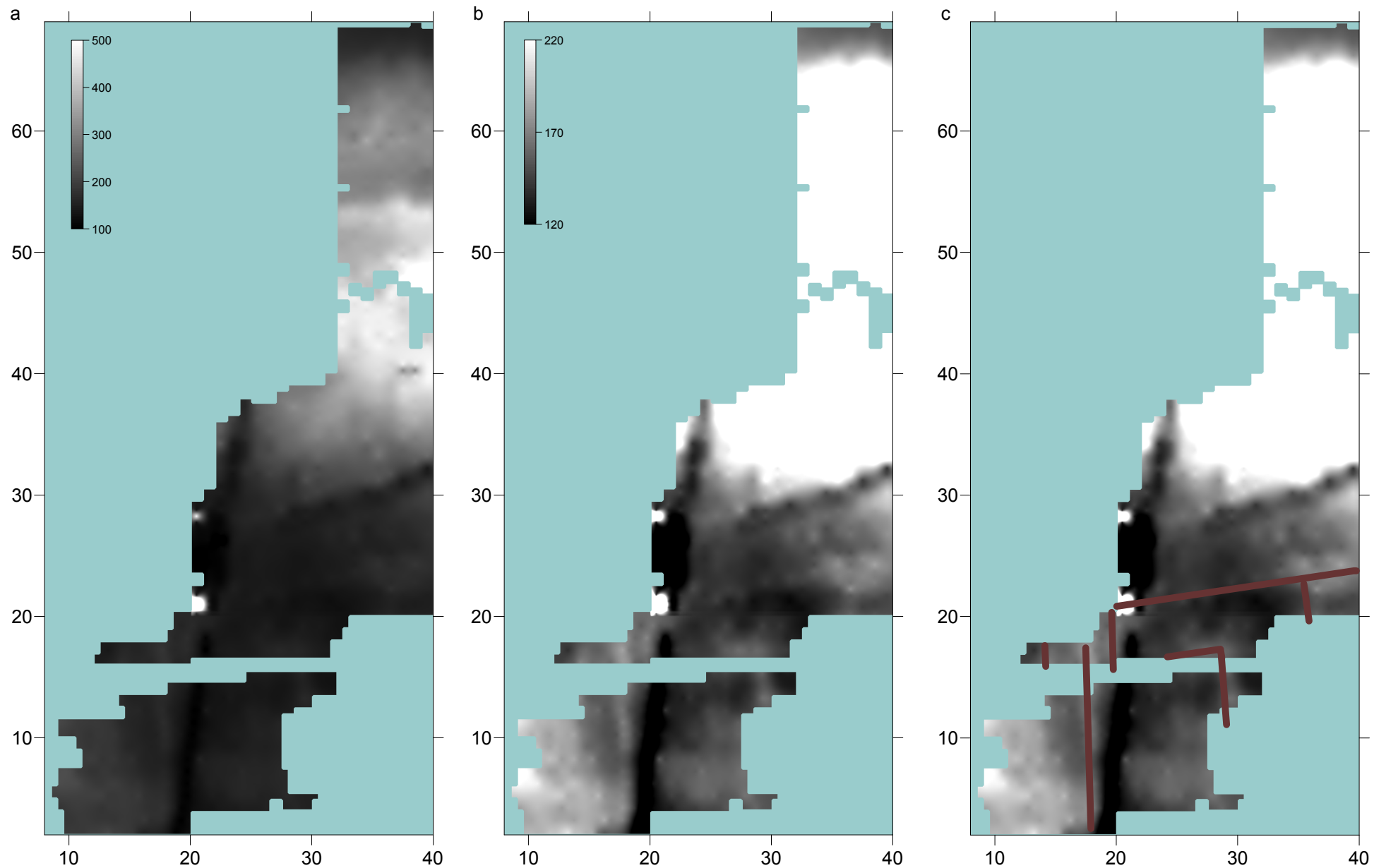
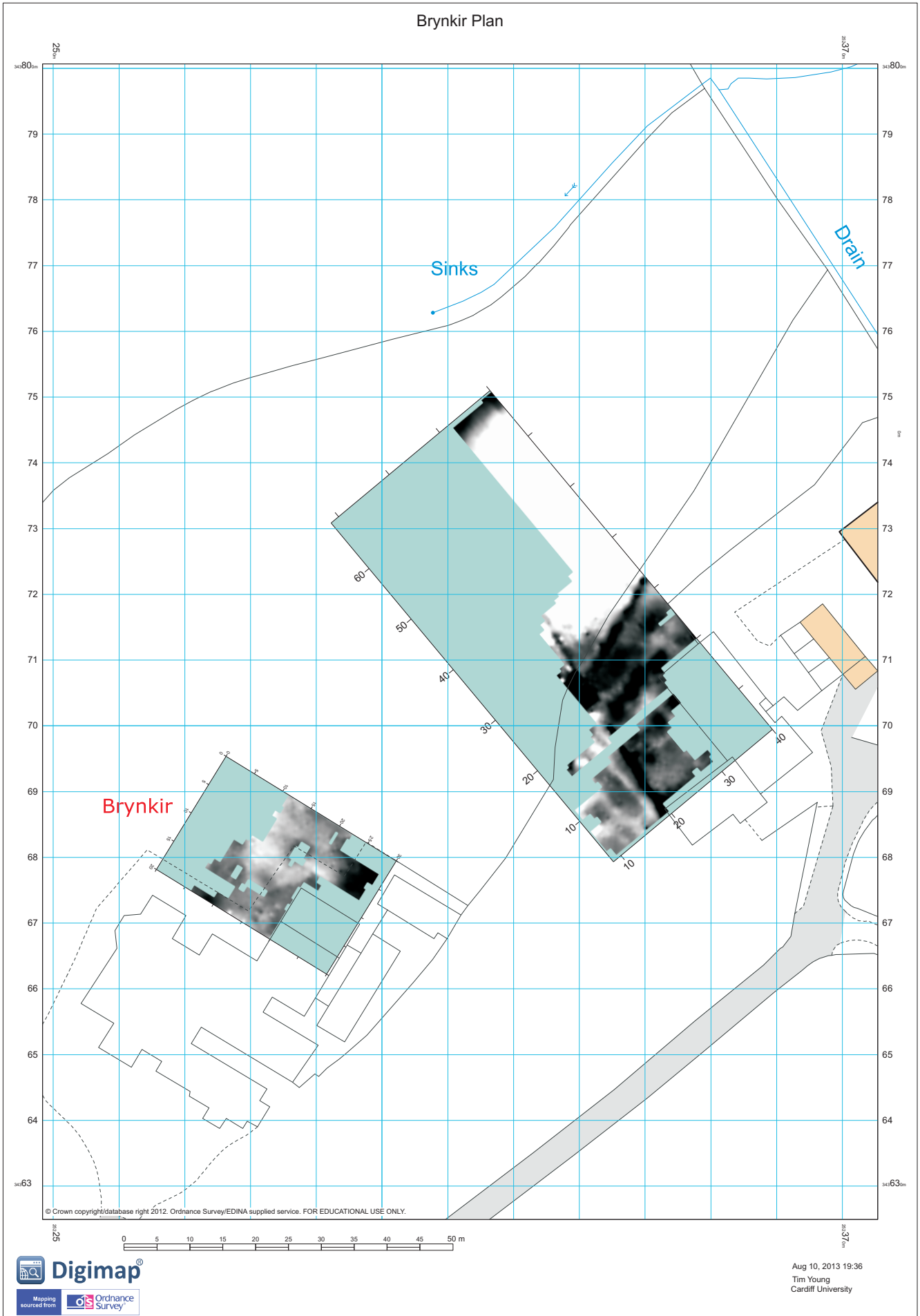


Figure 8



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