

GEOPHYSICAL SURVEY ON HADRIAN'S WALL AT HEDDON-ON-THE-WALL, NORTHUMBERLAND

1. The aims of the project

The main reason for undertaking this survey was to test whether a magnetometer survey could detect the pits representing obstacles on the level area (the berm) between Hadrian's Wall and the Ditch in front of it. It was also hoped that the results would be clear enough to indicate the arrangement of the pits.

2. The obstacles on the berm of Hadrian's Wall

This vital element in the anatomy of Hadrian's Wall is a recent discovery, emerging during rescue excavations at Shields Road east of central Newcastle in 2000-1 (McKelvey and Bidwell 2005). Similar systems have since been examined at a number of other sites on Tyneside (Frain *et al.* 2005; McKelvey 2010; Platell 2012). Details vary, but essentially the systems of obstacles are represented by three rows of rectangular pits measuring 0.8–1.2m in length and arranged in a quincunx pattern. Each pit held the bases of two obstacles, which probably consisted of forked branches with sharpened ends, described as *cippi* by Caesar and as *cervi* or *cervoli* by other ancient writers. The obstacles formed entanglements c. 2.5m wide, usually set c. 1.3–1.4m in front of the Wall. The berm had an overall width of c. 6m, and the strip in front of the obstacles was occupied by a small bank which heightened the southern lip of the Ditch and sealed off the bases of the obstacles.

The most extensive plans of the pits have been recovered between Wallsend and Newcastle where the Wall is considered by many to have been an addition to the original scheme. In some places the systems of obstacles had been renewed at least once. The pits have also been seen east of Heddon, where the Wall was part of the original scheme.

The large width of the berm, exceptional in terms of military practice in its period, suggests that it was intended to provide obstacles throughout the entire length of the Wall where practicable. Whether this intention was fulfilled remains uncertain: no systems have been seen west of Tyneside, though there have been very few excavations on the berm. Obstacles were clearly seen as effective: they have also been found on the berm of the Antonine Wall.

3. The site (NZ 136 669)

Part of the scheduled site at Heddon-on-the-Wall (Monument no. 1010616) was chosen for the survey because obstacles had been seen during excavations on the berm 300m to the east (Figures 1 and 3). During the consolidation of the Wall in 1936–8 (Leach and Whitworth

2011, 74), rubble had been cleared from in front of the Wall; it is also likely that in places the upper filling of the Ditch was removed to make its line more clearly visible.

The site slopes down to its eastern boundary, just beyond which the ground rises steeply to the summit of Great Hill. Nothing is known of its natural surface deposits, but to the east the bedrock is of sandstone and has only a thin covering of clay. The Wall is displayed throughout the entire length of the site. The berm has been reduced to the level of the footings and is bounded on its north side by the partly filled Ditch.

4. The survey (Appendix Figures 1–14)

Funded by a grant from the Arbeia Society, AD Archaeology carried out the magnetometer survey on 6 July 2018 following the granting of a Section 42 licence to P. Bidwell who organised the project. The area surveyed was 203m in length and generally 5m in width but wider where circumstances allowed. The sample interval was set at 0.25m and the traverse interval at 0.5m. Full technical data (metadata) are provided in the Appendix.

5. The results

The clearest anomalies occurred over a length of c. 115m, extending from the western end of the survey. In this area diagonal patterns were visible which are consistent with the quincunx arrangement of pits, a constant feature of the obstacles on the berm see elsewhere. The anomalies were not confined to the strip along the berm usually occupied by the obstacles. Those to the south might have resulted from disturbance when the Wall was consolidated, though at one point it seemed possible that a fourth row of pits had been inserted next to the Wall. Some of the anomalies on the north side might have been associated with the remains of a small bank known elsewhere on the southern lip of the Wall Ditch.

The detailed description follows the enlarged plans of three areas, starting from the west.

Appendix Figures 11 and 13 (38–65m from the western end of the survey area). There was a very distinct east–west alignment c. 3m north of the Wall, including some rectangular anomalies, in the expected position of the northern row of pits. Some of the anomalies to the south displayed diagonal patterning.

Appendix Figures 10, 12 and 14 (70–90m from the western end of the survey area). This was the most intensive area of anomalies, displaying what are interpreted as three rows of pits, all with their long axes parallel to the Wall. They conformed to the arrangements of the pits elsewhere, with the rows beginning c. 1.3m beyond the Wall and extending northwards from that line for a further 2.5m or so. Some of the clearer outlines were up to 1.2 m in length.

For comparison, Appendix Figure 12 superimposes the plans of pits partly excavated at 24–46 Shields Road at Byker on a section of the survey (McKelvey 2010). Ten of the Byker pits, at the western end of the main trench, were fully excavated. In the surface of the natural clay, the outlines of the rest were visible only where their filling, disturbed by the removal or decay of the posts, was distinct from the original packing of the pits. Similar differences in the fillings might explain some of the irregularities in the outlines of pits detected in the Heddon survey.

On Figure 2 some of the more regular anomalies are outlined. As to the west, there were other anomalies on either side of the three rows. On the south side, beginning 4m from the western edge of the area, were four roughly rectangular outlines which might represent a fourth row of pits adjacent to the Wall, a feature not seen at other sites, though it is possible they are areas of disturbance resulting from the consolidation of the Wall.

Appendix Figure 9 (115-145m from the western end of the survey area). Less showed in this area, but there were some diagonal alignments and, in the western part, indications of the southern row of pits.

The remainder of the whole survey area lies towards the bottom of the slope, beyond which the land rises up to the east towards the summit of Great Hill. Changes in the natural subsoil or differences in the fillings of the pits might explain why far fewer anomalies showed in this area than to the west (Appendix Figures 1 and 2).

6. Conclusions and further research

The project demonstrated that the systems of obstacles are detectable by geophysics, which can also provide indications of their overall arrangements. Whether further refinements of the method are capable of showing finer detail is a question worth pursuing.

It should be possible to establish whether obstacles were provided along the remainder of the Wall, west of Tyneside, except where this was clearly impractical as in much of the central sector. Surveys will necessarily be confined to sites where rubble has been cleared from the berm, which are mainly those where the Wall has been consolidated, or to other lengths where cultivation has removed these deposits.

Bibliography

Bidwell, P., 2005 'The systems of obstacles on Hadrian's Wall: their extent, date and purpose', *Arbeia Journal* 8, 53-75.

Frain, T., McKelvey, J. and Bidwell, P., 2005 'Excavations and watching briefs along the berm of Hadrian's Wall at Throckley, Newcastle upon Tyne, in 2001-2002', *Arbeia Journal* 8, 29-52.

McKelvey, J. 2010 'The excavation of Hadrian's Wall at Nos 24-46 Shields Road, Byker, Newcastle upon Tyne', *Arbeia Journal* 9, 150-7.

McKelvey J. and Bidwell, P. 2005 'The excavation of prehistoric features and Hadrian's Wall at Nos 224-228, Shields Road, Byker, Newcastle upon Tyne', *Arbeia Journal* 8,4-28.

Platell, AC., 2012 'Excavations on Hadrian's Wall at Melbourne Street, Newcastle upon Tyne', *Archaeologia Aeliana, series 5* 41,185-206.

Paul Bidwell, 6.viii.18

FIGURES AND ADDITIONAL MATERIAL

Figure 1. Location plan, scale 1:1250.

Figure 2. Interpretation of anomalies showing on Appendix Figure 10.

Figure 3. The site of the survey looking west.

APPENDIX

Figure 1 Greyscale plot of processed geophysical survey (clipped -5/5nT)

Figure 2 Greyscale plot of processed geophysical survey (clipped -3/3nT)

Figure 3 Detailed greyscale plot of processed geophysical survey (clipped -5/5nT)

Figure 4 Detailed greyscale plot of processed geophysical survey (clipped -3/3nT)

Figure 5 Detailed colour plot of processed geophysical survey (clipped -5/5nT)

Figure 6 Detailed colour plot of processed geophysical survey (clipped -3/3nT)

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Figure 9 Detailed greyscale plot of processed geophysical survey (east) (clipped -3/3nT)

Figure 10 Detailed greyscale plot of processed geophysical survey (central) (clipped -3/3nT)

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Figure 12 Detailed greyscale plot of processed geophysical survey with comparative example of Nos 24-46 Shields Road excavation (central)(clipped -5/5nT)

Figure 13 Detailed greyscale plot of processed geophysical survey (west) (clipped -10/10nT)

Figure 14 Greyscale plot of raw geophysical survey (clipped -6/6nT)

Heddon-on-the-Wall Survey Metadata



Historic England Geophysical Survey Summary Questionnaire

Survey Details

Name of Site: Heddon-on-the-Wall

County: Northumberland

NGR Grid Reference (Centre of survey to nearest 100m): NZ 136 669

Start Date: 6/7/18

End Date: 6/7/18

Geology at site (Drift and Solid): not ascertained, but probably thin deposits of clay over sandstone bedrock, as determined by excavations 300m to the east

Known archaeological Sites/Monuments covered by the survey

(Scheduled Monument No. or National Archaeological Record No. if known)

Monument no: 1010616

Archaeological Sites/Monument types detected by survey

(Type and Period if known. "?" where any doubt).

Roman, Hadrian's Wall, obstacles on the berm

Surveyor (Organisation, if applicable, otherwise individual responsible for the survey):

AD Archaeology for P. Bidwell

Name of Client, if any:

P. Bidwell on behalf of the Arbeia Society (bidwepa@aol.com)



Historic England

Purpose of Survey: to determine whether pits associated with systems of obstacles on the berm of Hadrian's Wall were detectable by geophysics, and to record their arrangement

Location of:

a) Primary archive, i.e. raw data, electronic archive etc: copies to be deposited with English Heritage and Northumberland HER

b) Full Report: as above



Technical Details

(Please fill out a separate sheet for each survey technique used)

Type of Survey (Use term from attached list or specify other): magnetometer

Area Surveyed, if applicable (In hectares to one decimal place): 0.1ha

Traverse Separation, if regular: 0.5m

Reading/Sample Interval: 0.25m

Type, Make and model of Instrumentation: *Bartington Grad 601-2* fluxgate gradiometer

For Resistivity Survey:

Probe configuration:

Probe Spacing:

Land use at the time of the survey (Use term/terms from the attached list or specify other):

Grassland- undifferentiated (part of a displayed Scheduled Ancient Monument)



Additional Remarks (Please mention any other technical aspects of the survey that have not been covered by the above questions such as sampling strategy, non standard technique, problems with equipment etc.): none

List of terms for Survey Type

Magnetometer (includes gradiometer)

Resistivity

Resistivity Profile

Magnetic Susceptibility

Electro-Magnetic Survey

Ground Penetrating Radar

Other (please specify)



List of terms for Land Use:

Arable
Grassland - Pasture
Grassland - Undifferentiated
Heathland
Moorland
Coastland - Inter-Tidal
Coastland - Above High Water
Allotment
Archaeological Excavation
Garden
Lawn
Orchard
Park
Playing Field
Built-Over
Churchyard
Waste Ground
Woodland
Other (please specify)

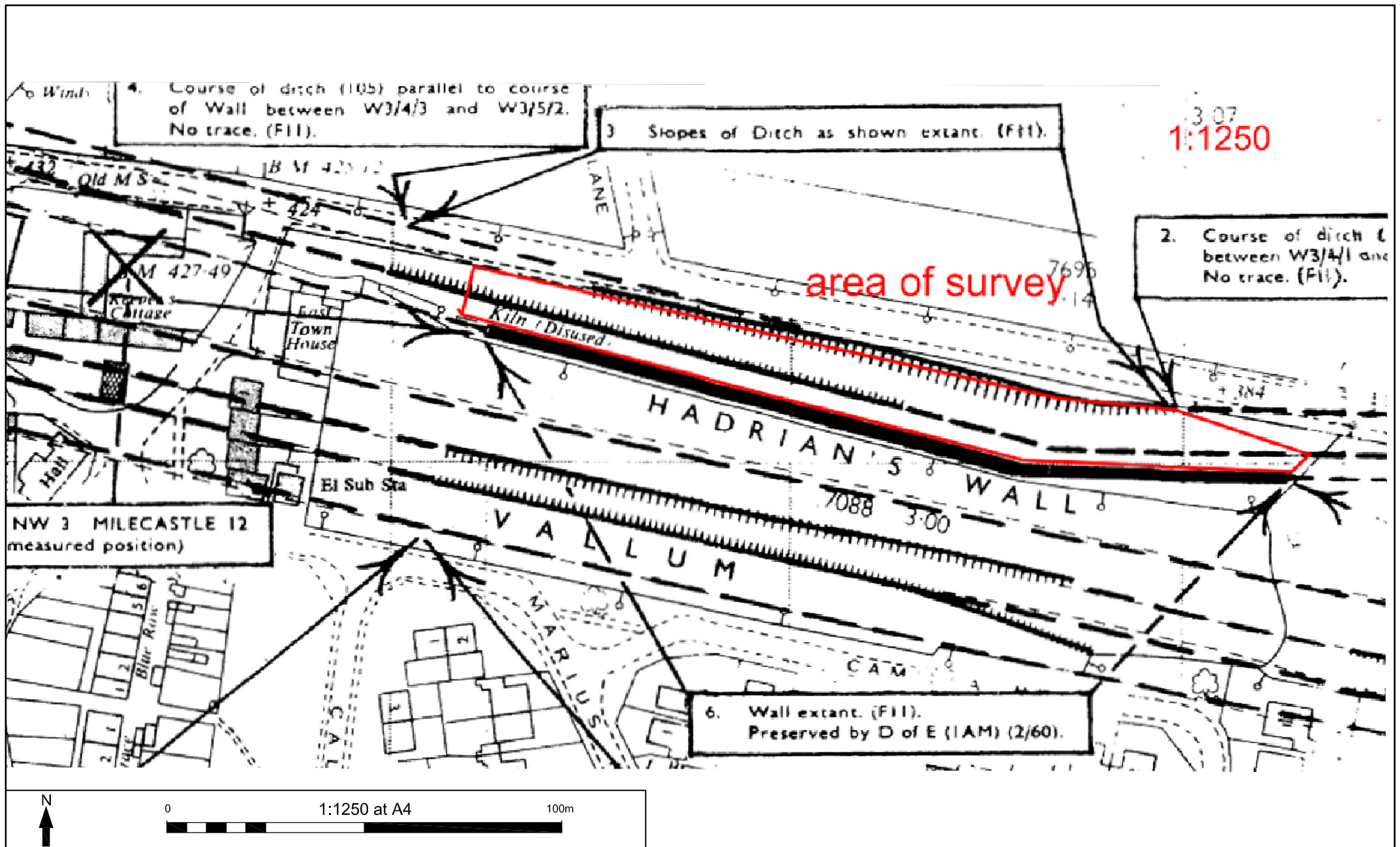


Figure 1: Location plan, scale 1:1250

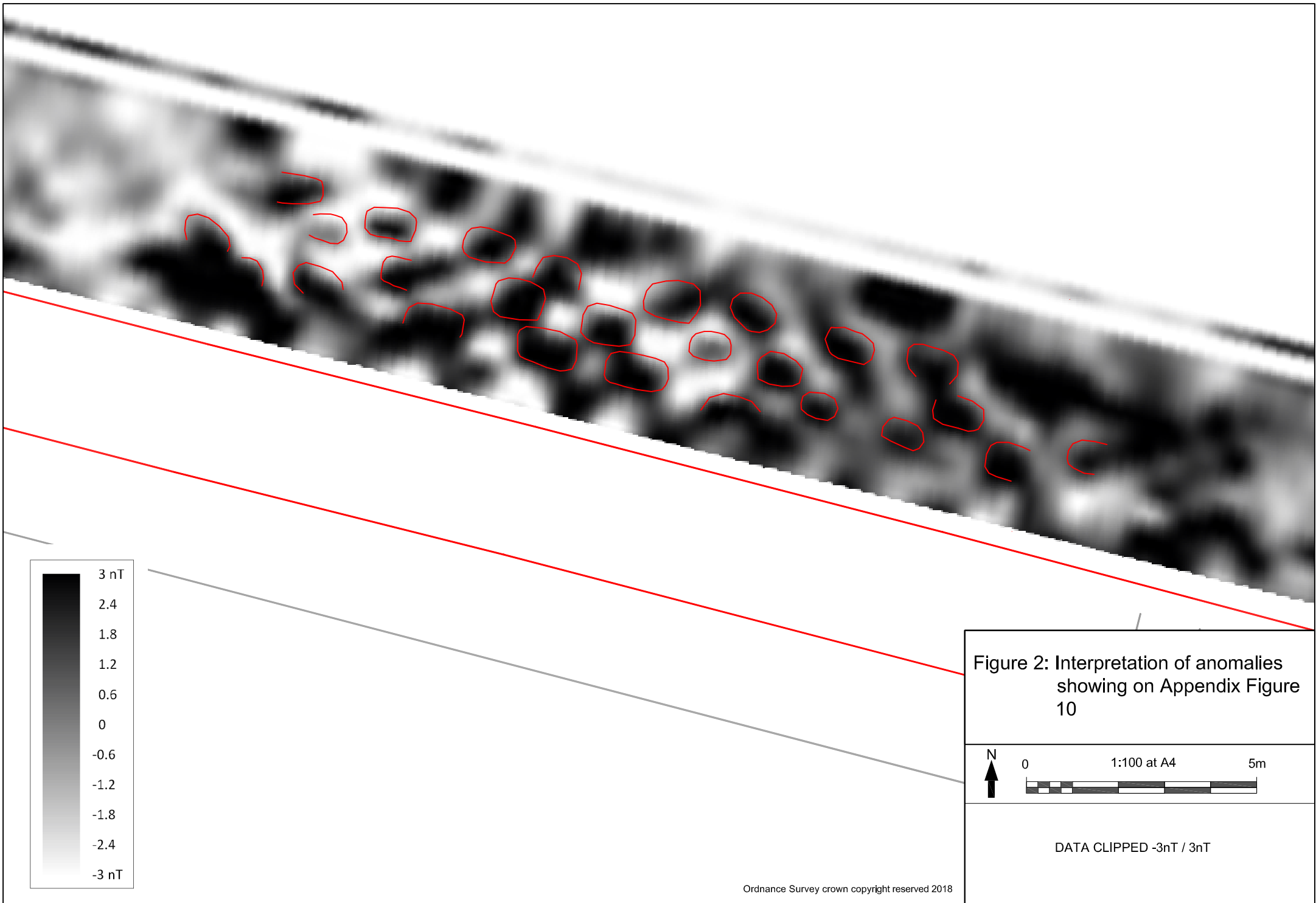
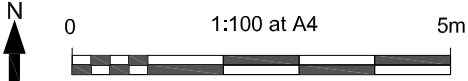


Figure 2: Interpretation of anomalies showing on Appendix Figure 10



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Figure 3: The site of the survey looking west.

APPENDIX

AD293

**Wall Mile 11
Heddon-on-the-Wall,
Northumberland**

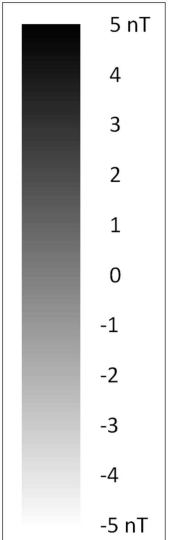
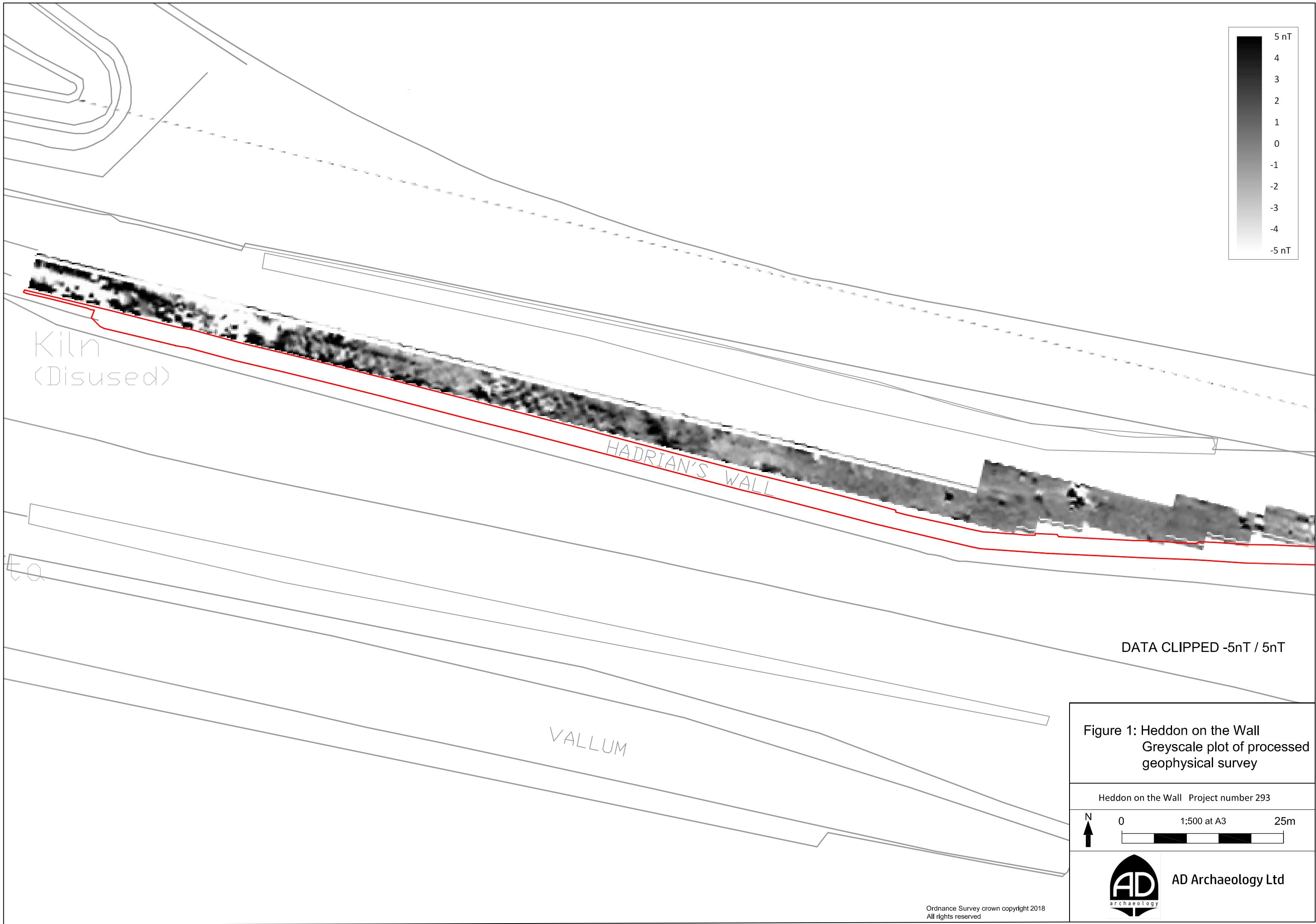
Geophysical Survey



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- Figure 14 Greyscale plot of raw geophysical survey (clipped -6/6nT)

HEDDON-on-the-WALL Survey Metadata



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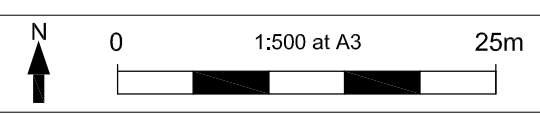
HADRIAN'S WALL

VALLUM

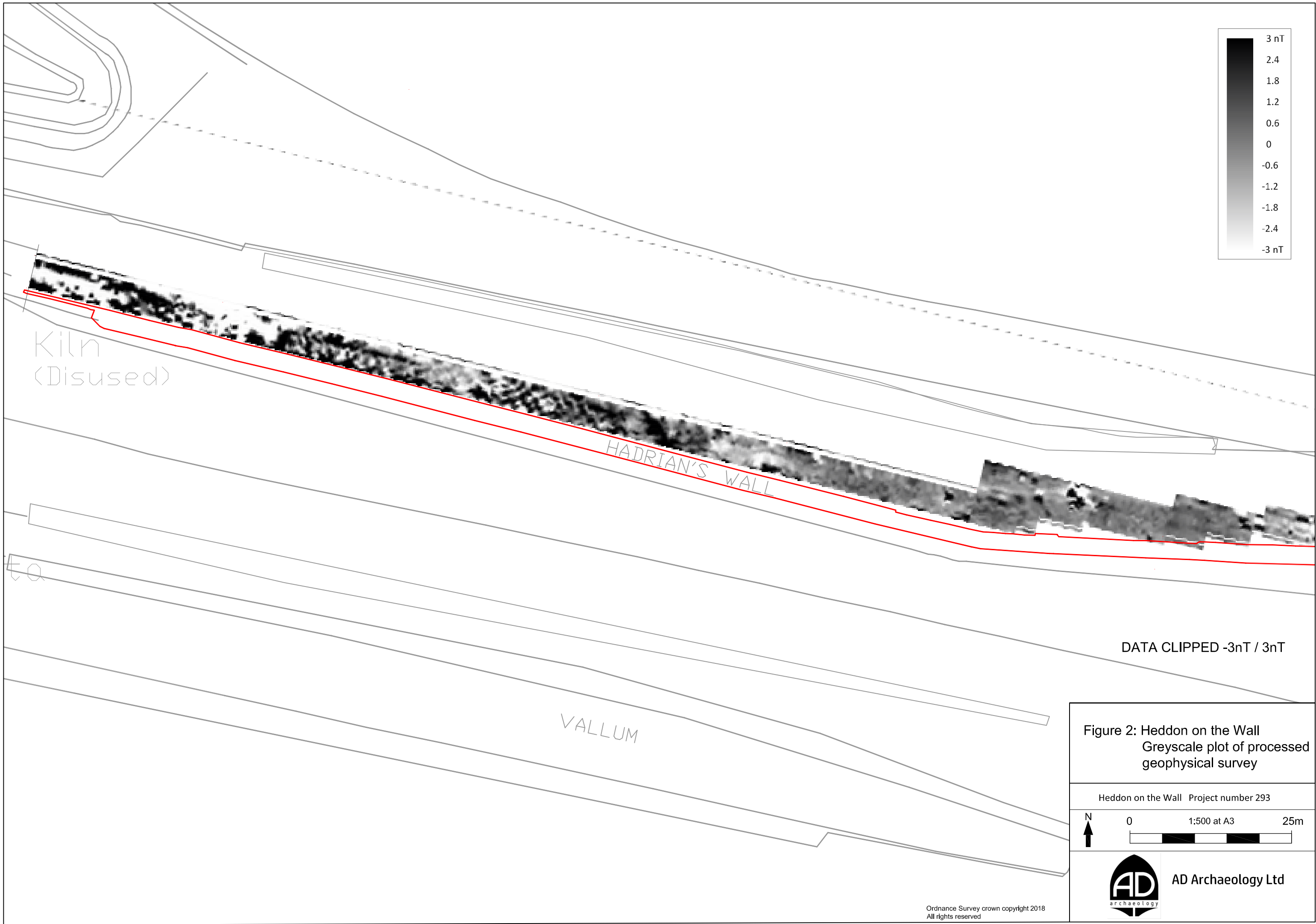
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Figure 1: Heddon on the Wall
Greyscale plot of processed
geophysical survey

Heddon on the Wall Project number 293



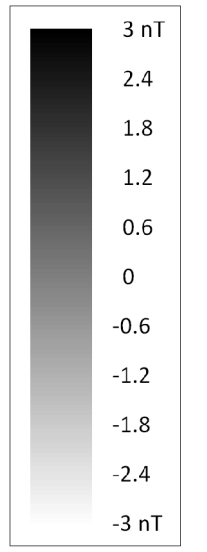
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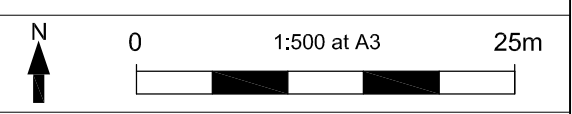
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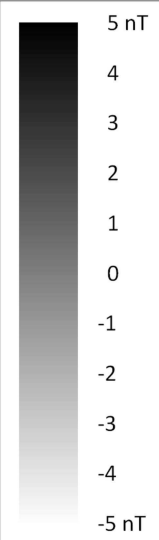
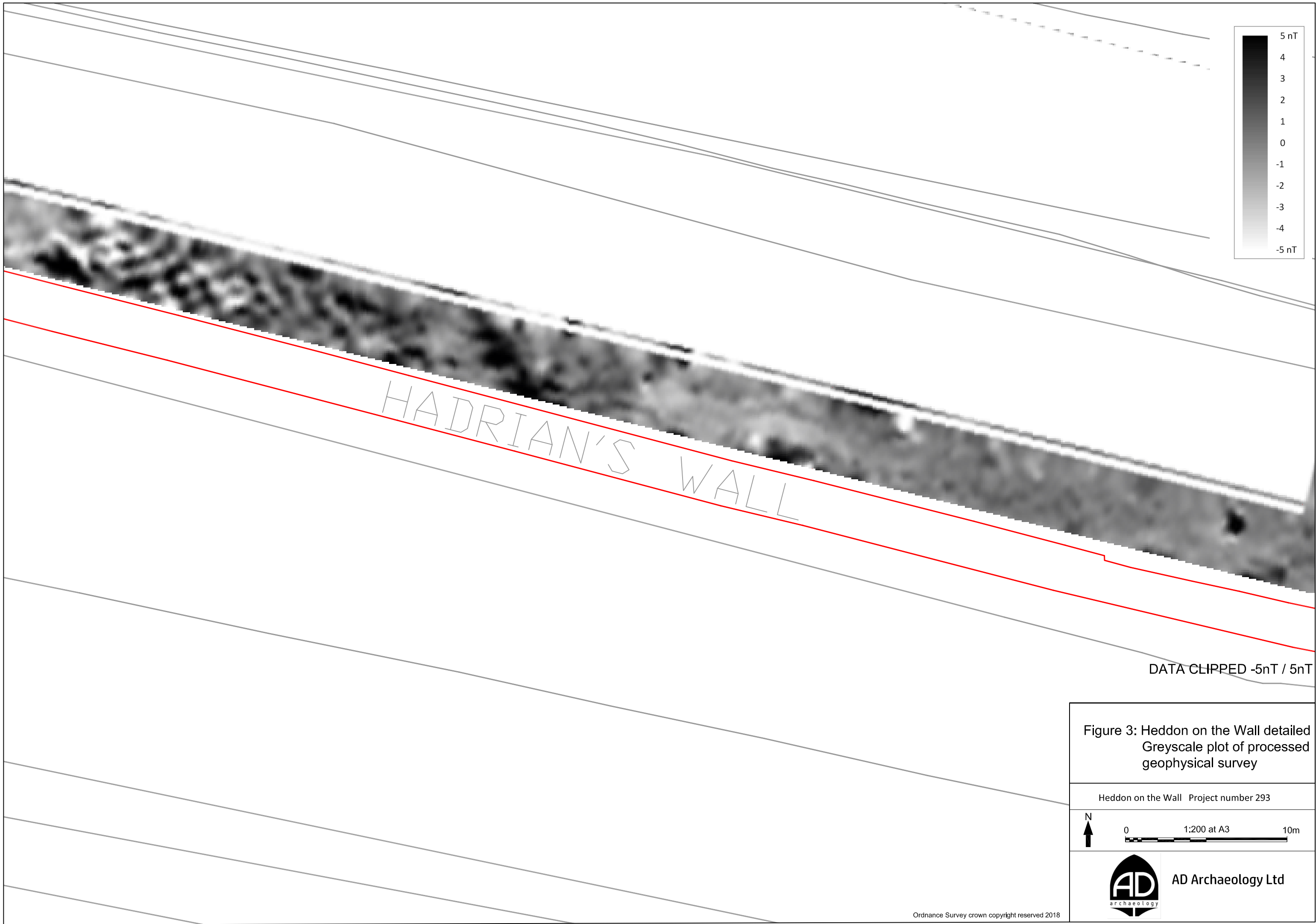
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Figure 2: Heddon on the Wall
Greyscale plot of processed
geophysical survey

Heddon on the Wall Project number 293



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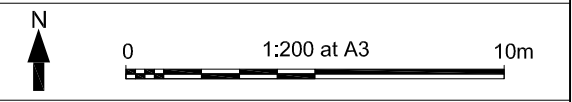


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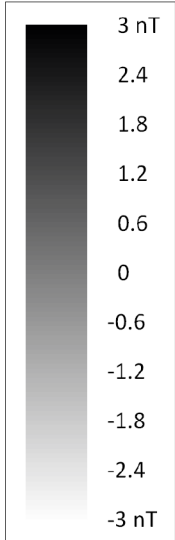
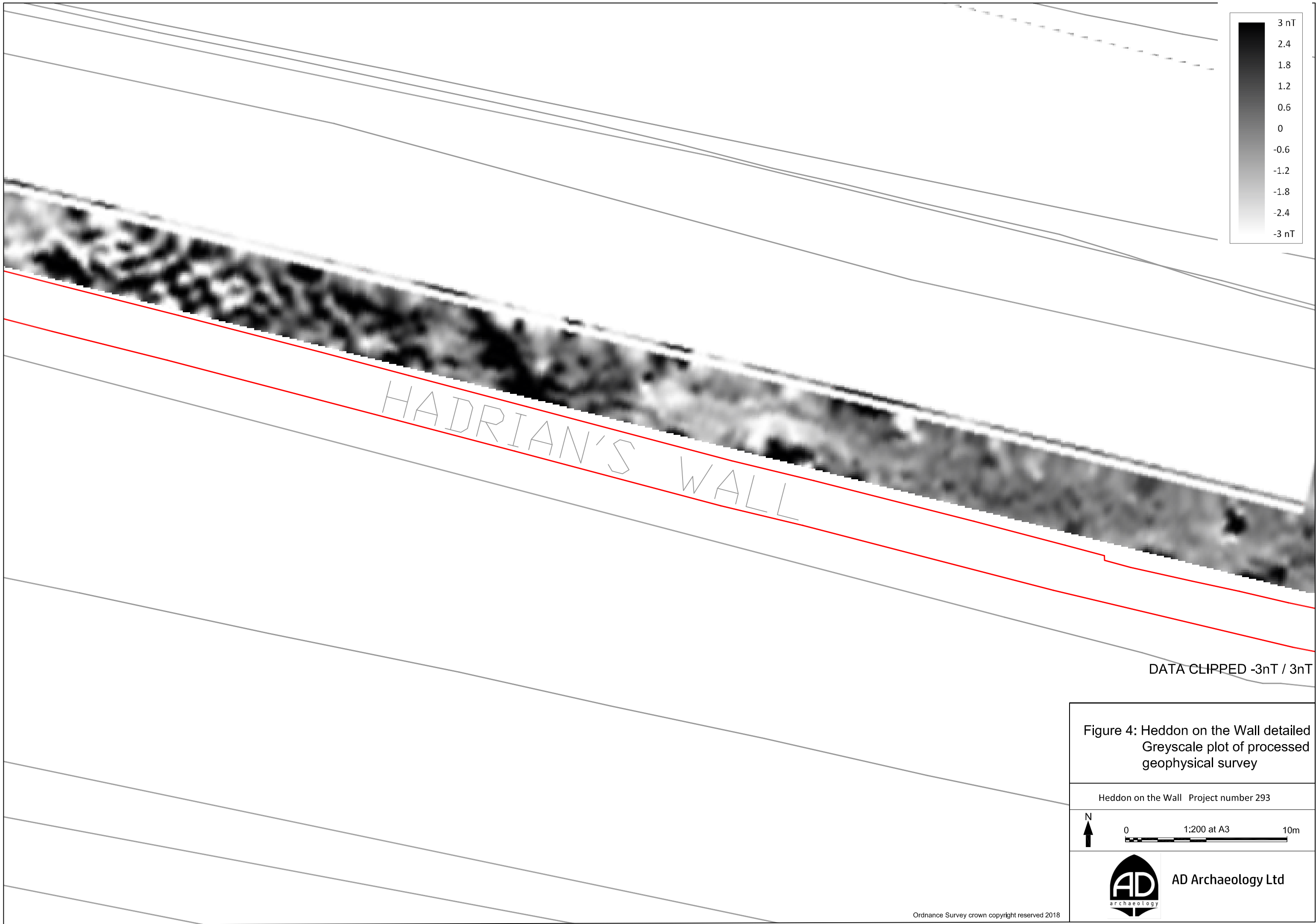
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Figure 3: Heddon on the Wall detailed Greyscale plot of processed geophysical survey

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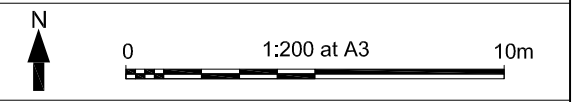


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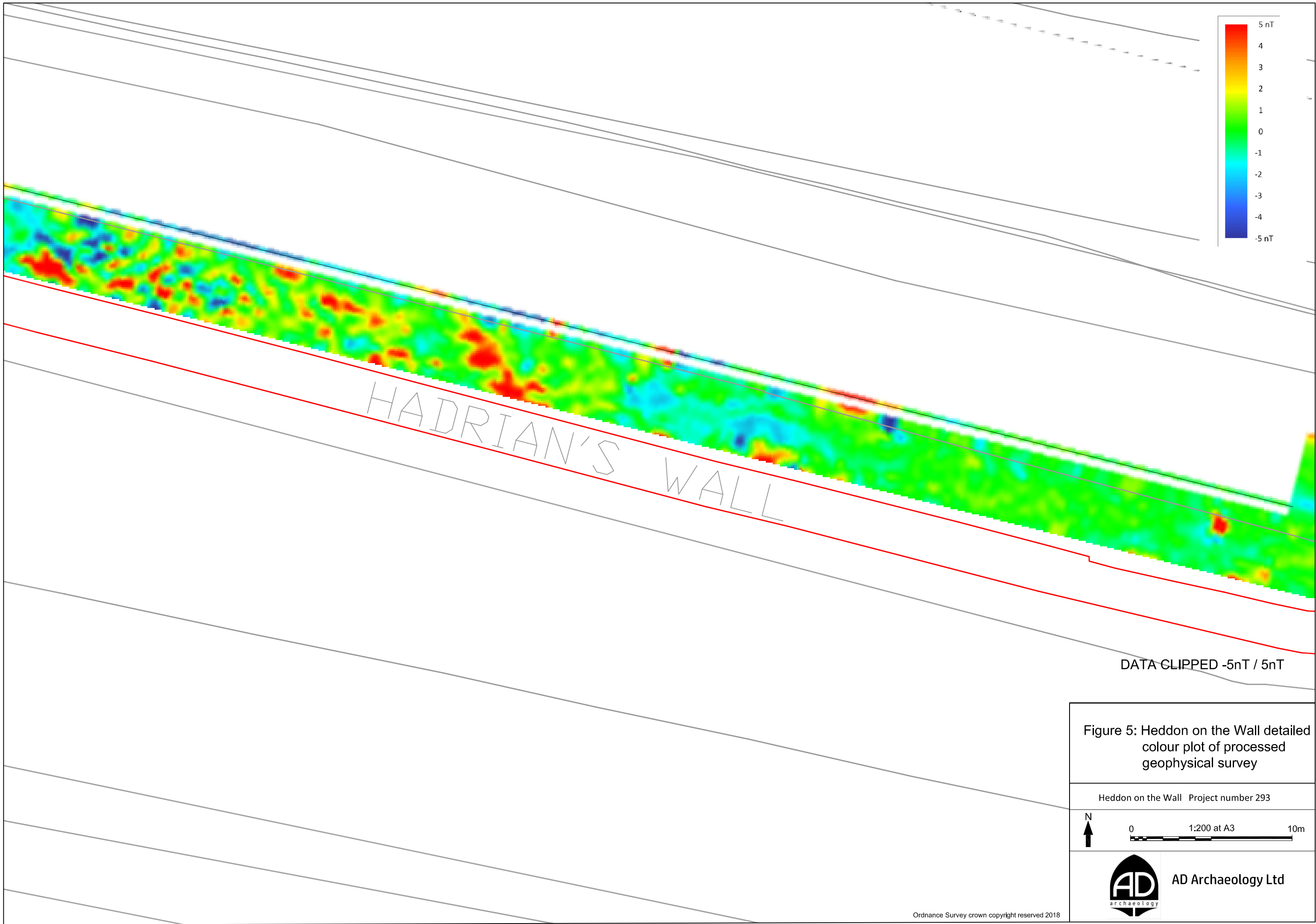
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Figure 4: Heddon on the Wall detailed Greyscale plot of processed geophysical survey

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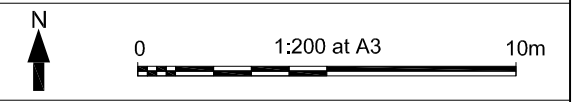


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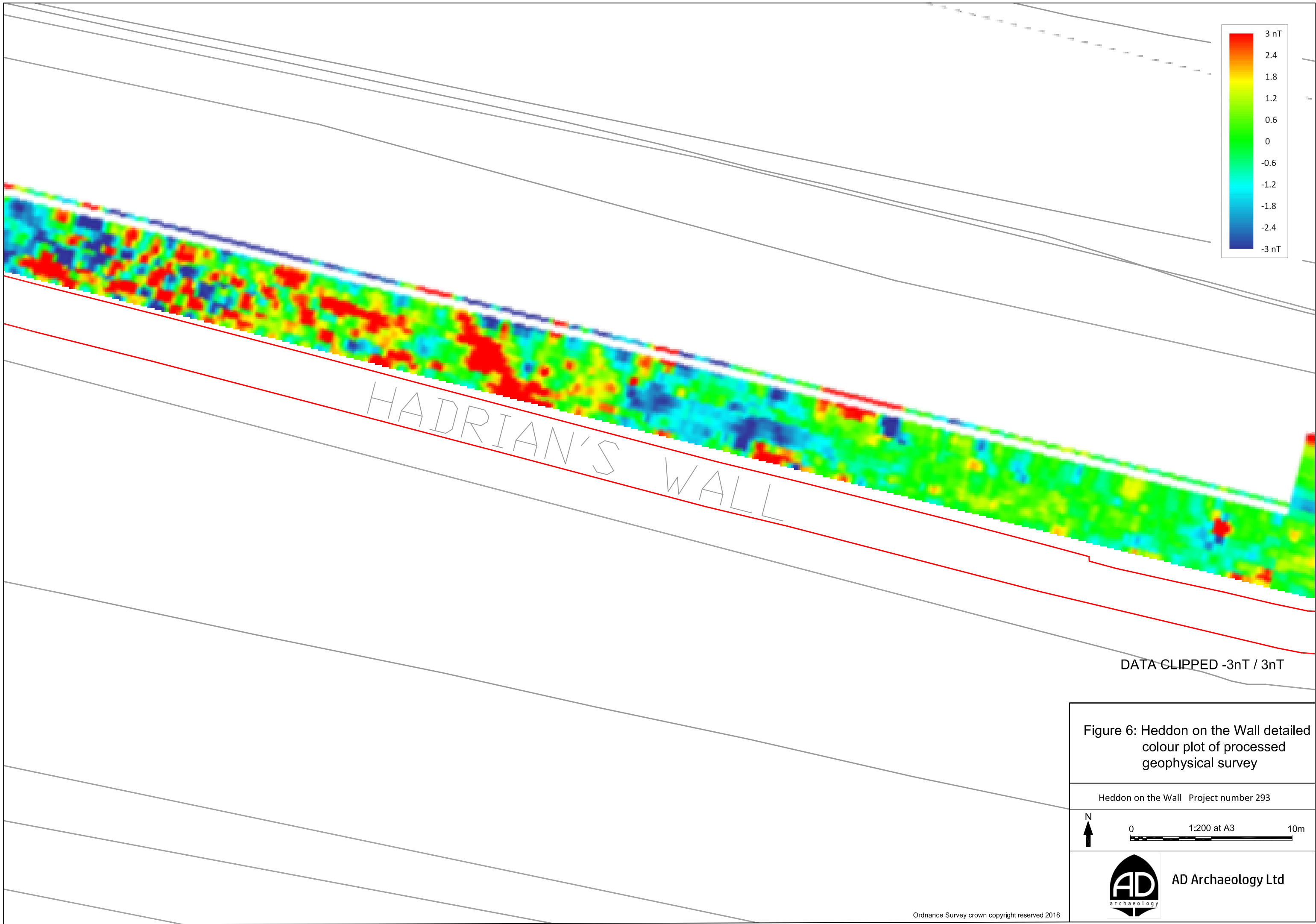
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Figure 5: Heddon on the Wall detailed colour plot of processed geophysical survey

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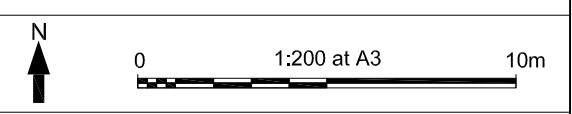


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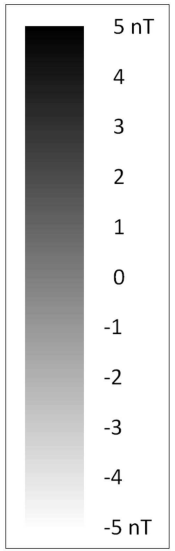
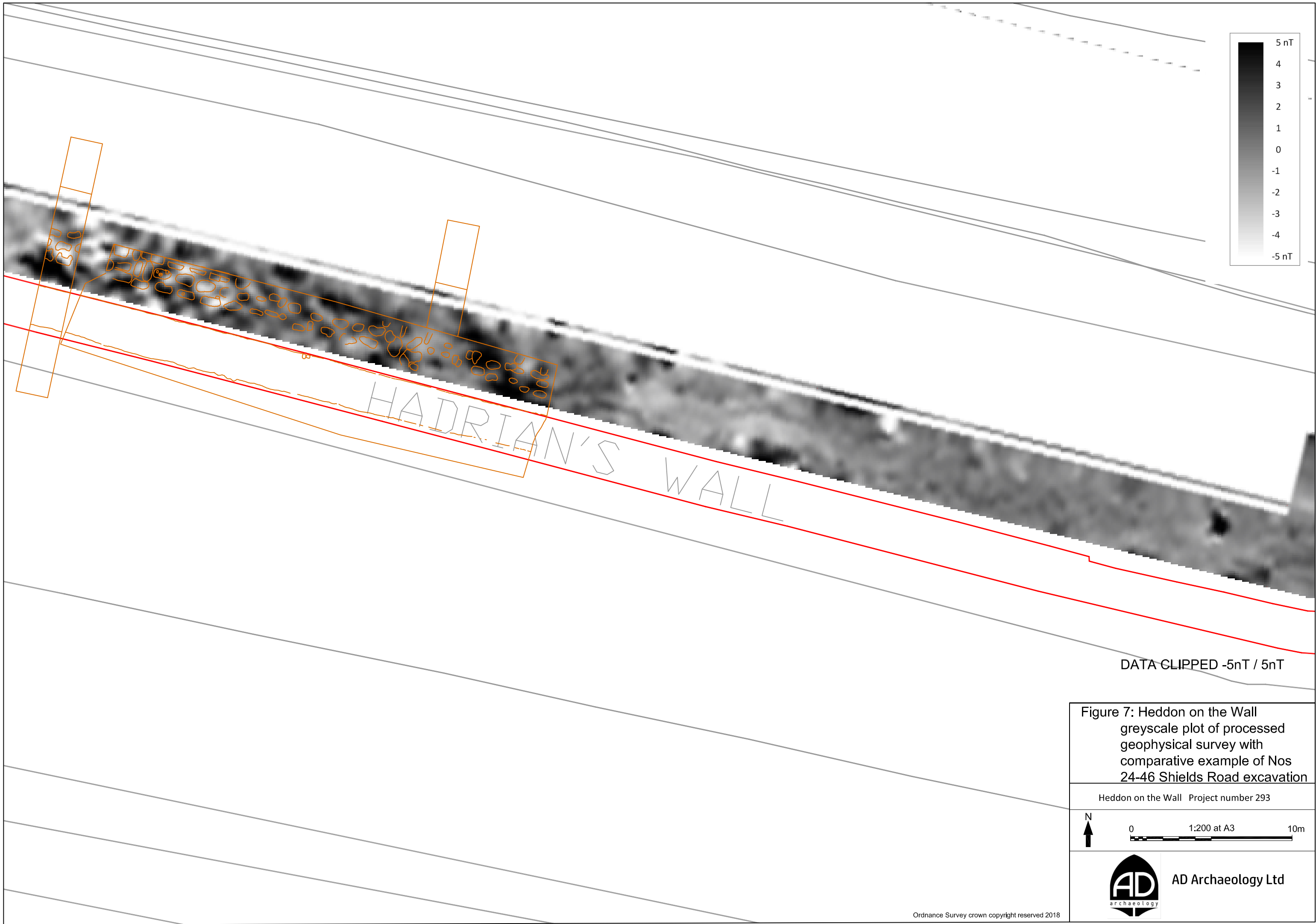
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Figure 6: Heddon on the Wall detailed colour plot of processed geophysical survey

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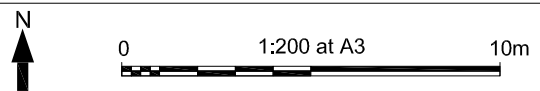
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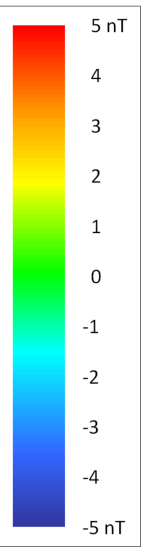
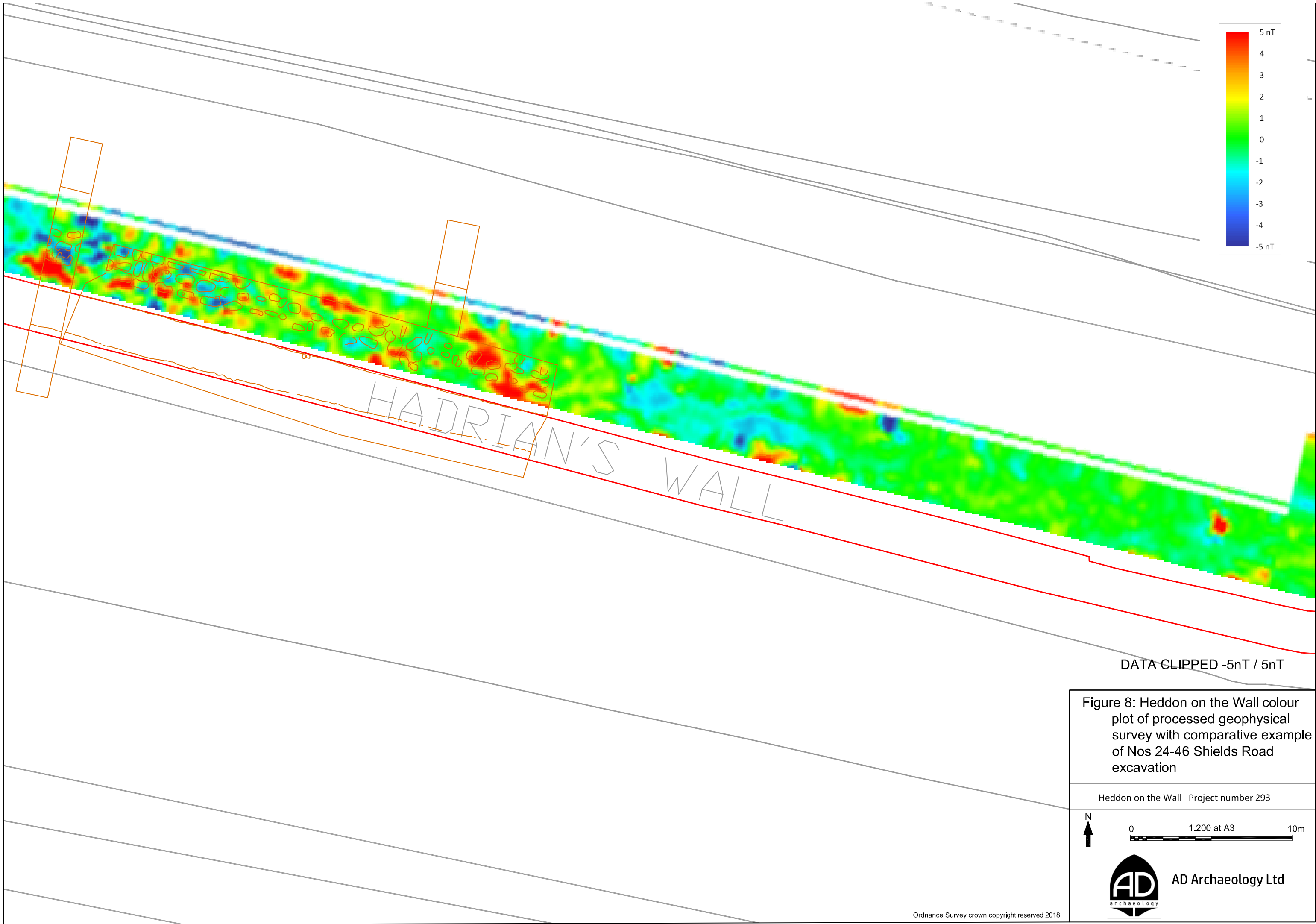
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Figure 7: Heddon on the Wall greyscale plot of processed geophysical survey with comparative example of Nos 24-46 Shields Road excavation

Heddon on the Wall Project number 293



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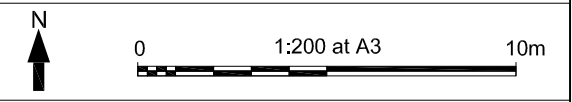


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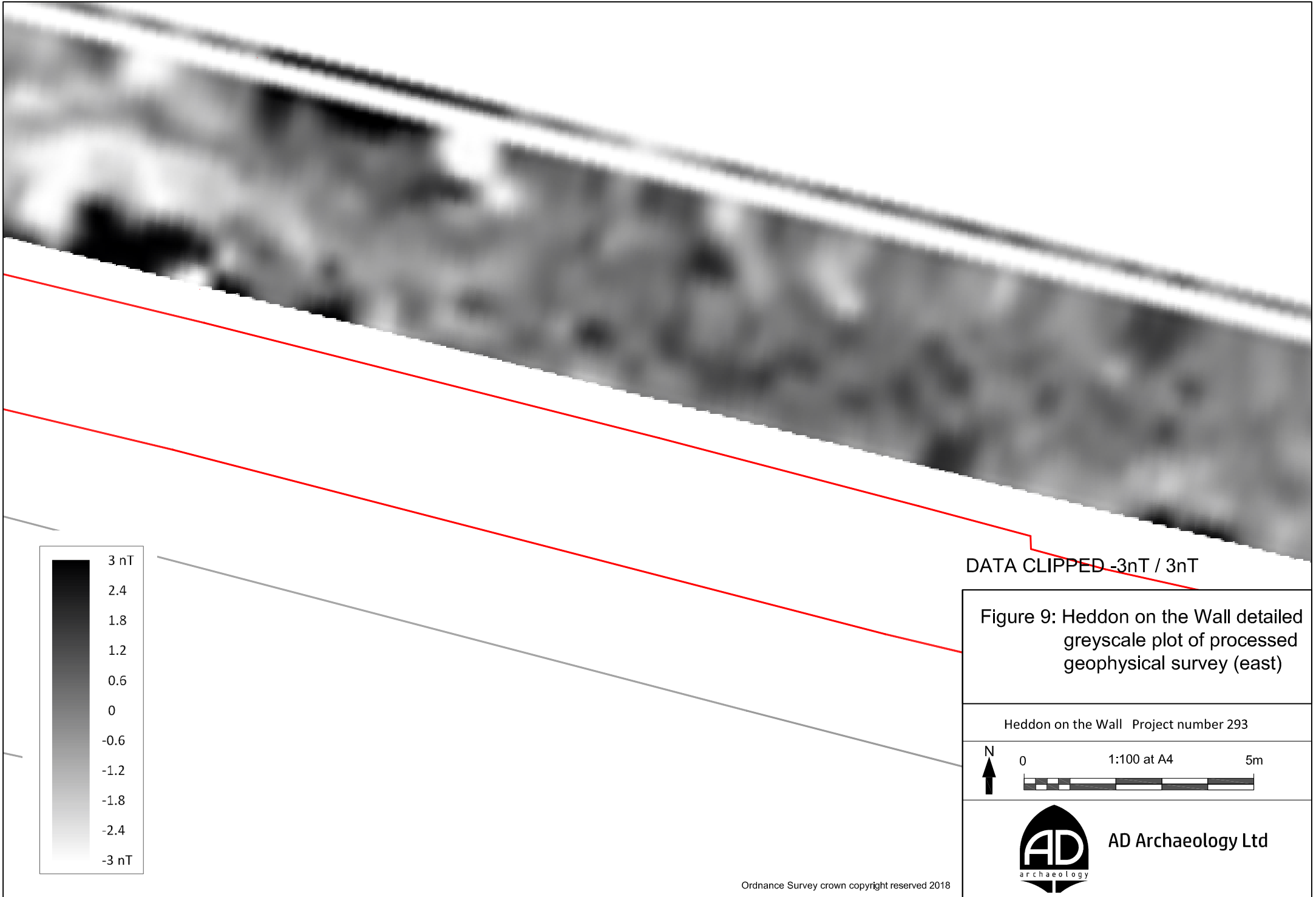
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Figure 8: Heddon on the Wall colour plot of processed geophysical survey with comparative example of Nos 24-46 Shields Road excavation

Heddon on the Wall Project number 293



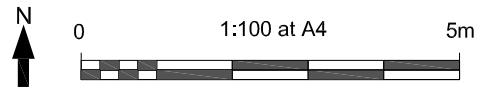
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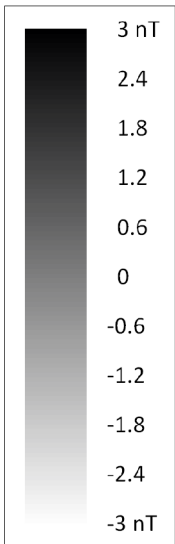
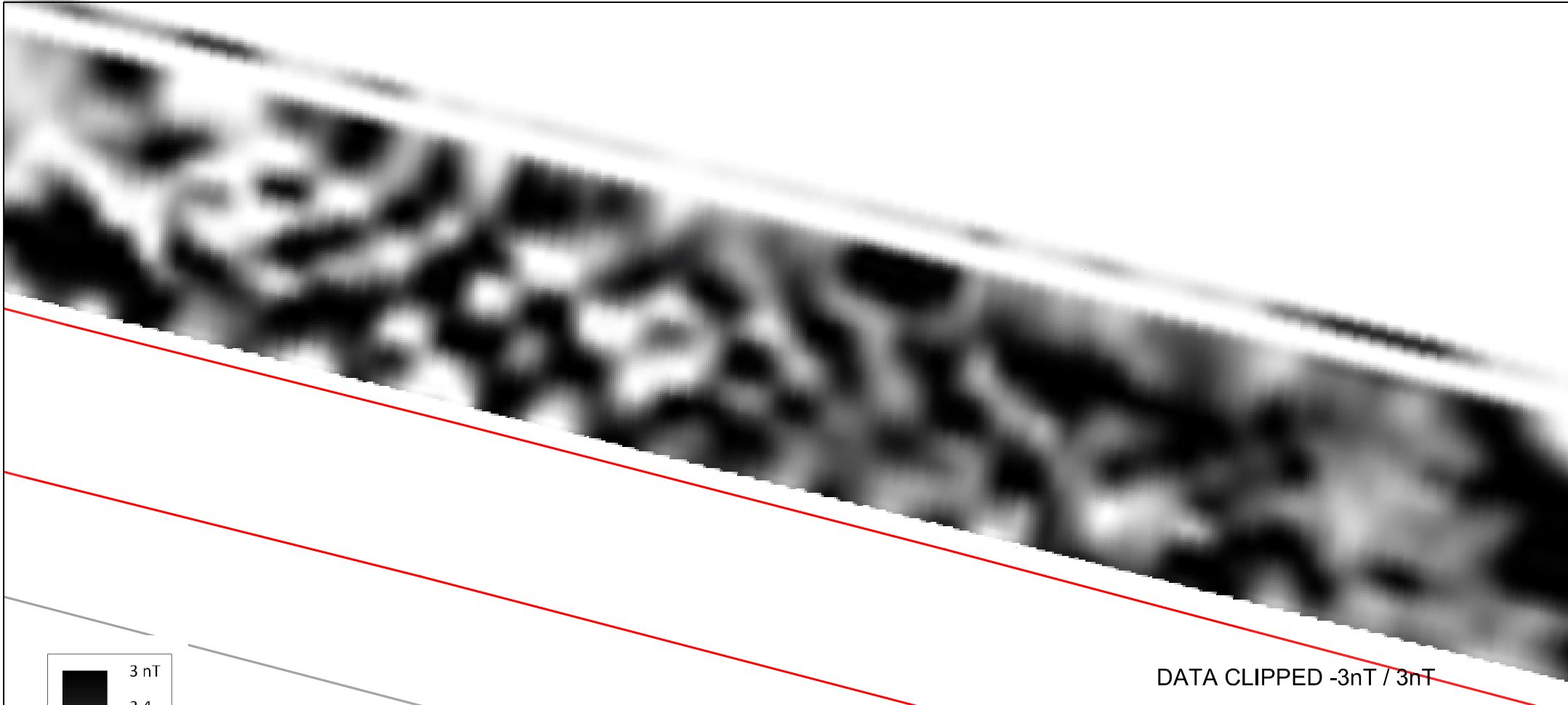
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Figure 9: Heddon on the Wall detailed greyscale plot of processed geophysical survey (east)

Heddon on the Wall Project number 293



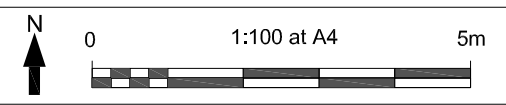
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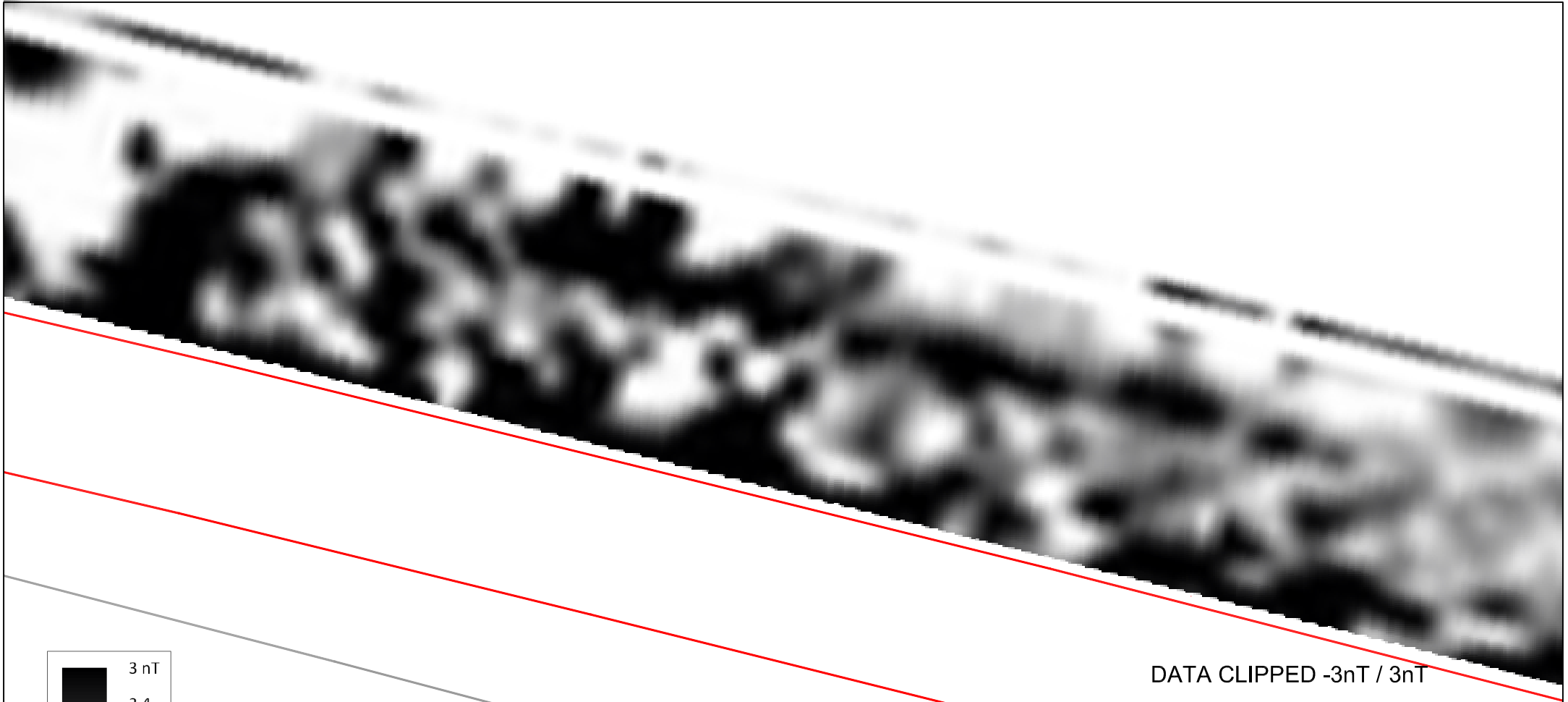
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Figure 10: Heddon on the Wall
detailed greyscale plot of
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survey (central)

Heddon on the Wall Project number 293



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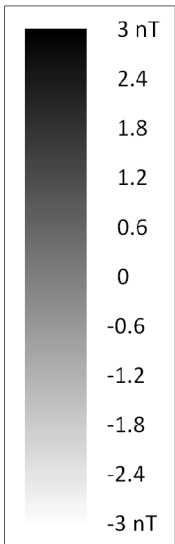
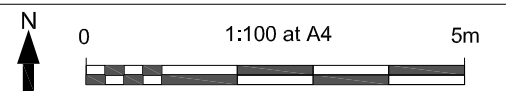
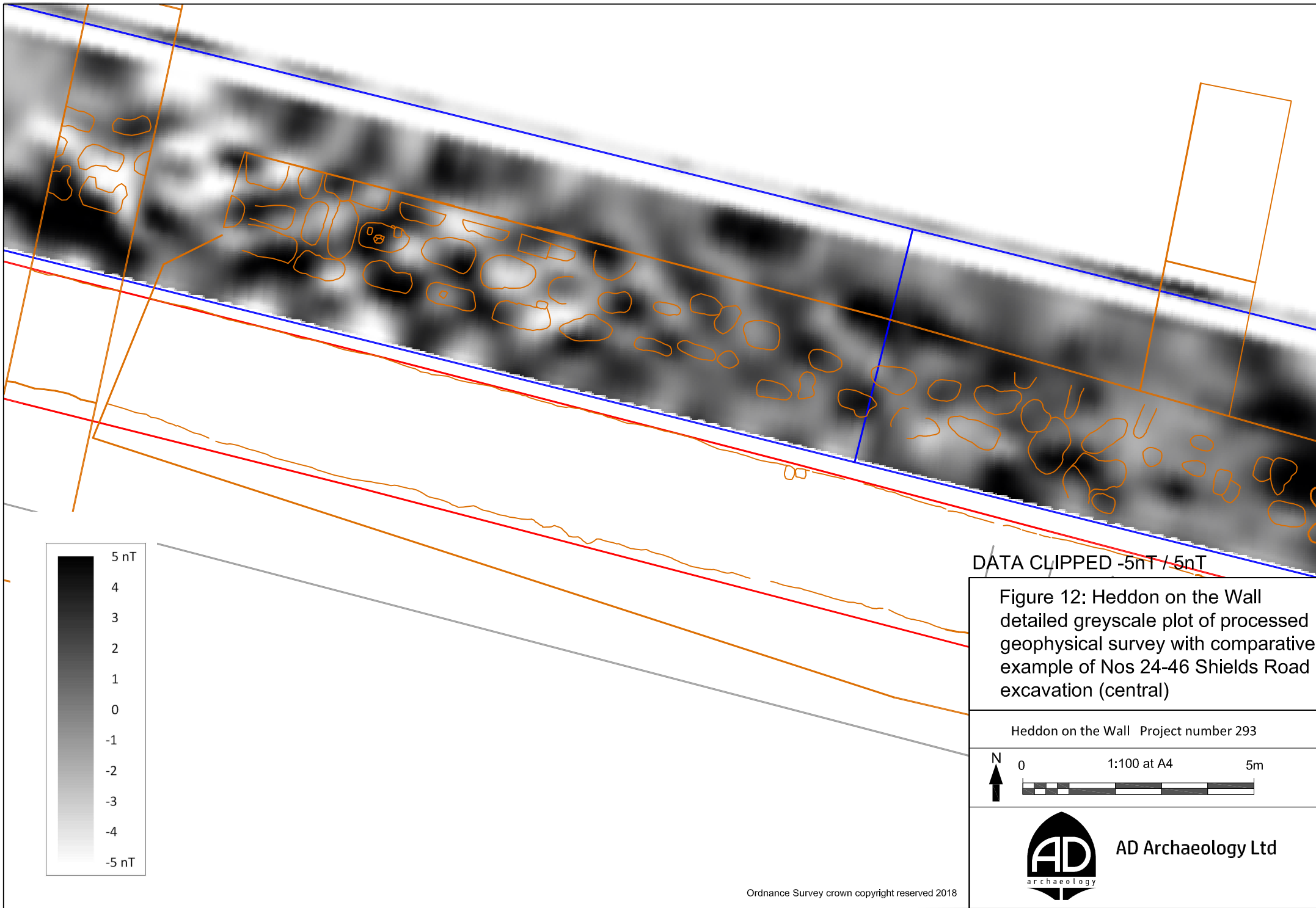


Figure 11: Heddon on the Wall
detailed greyscale plot of
processed geophysical
survey (west)

Heddon on the Wall Project number 293



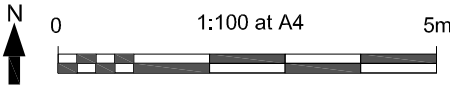
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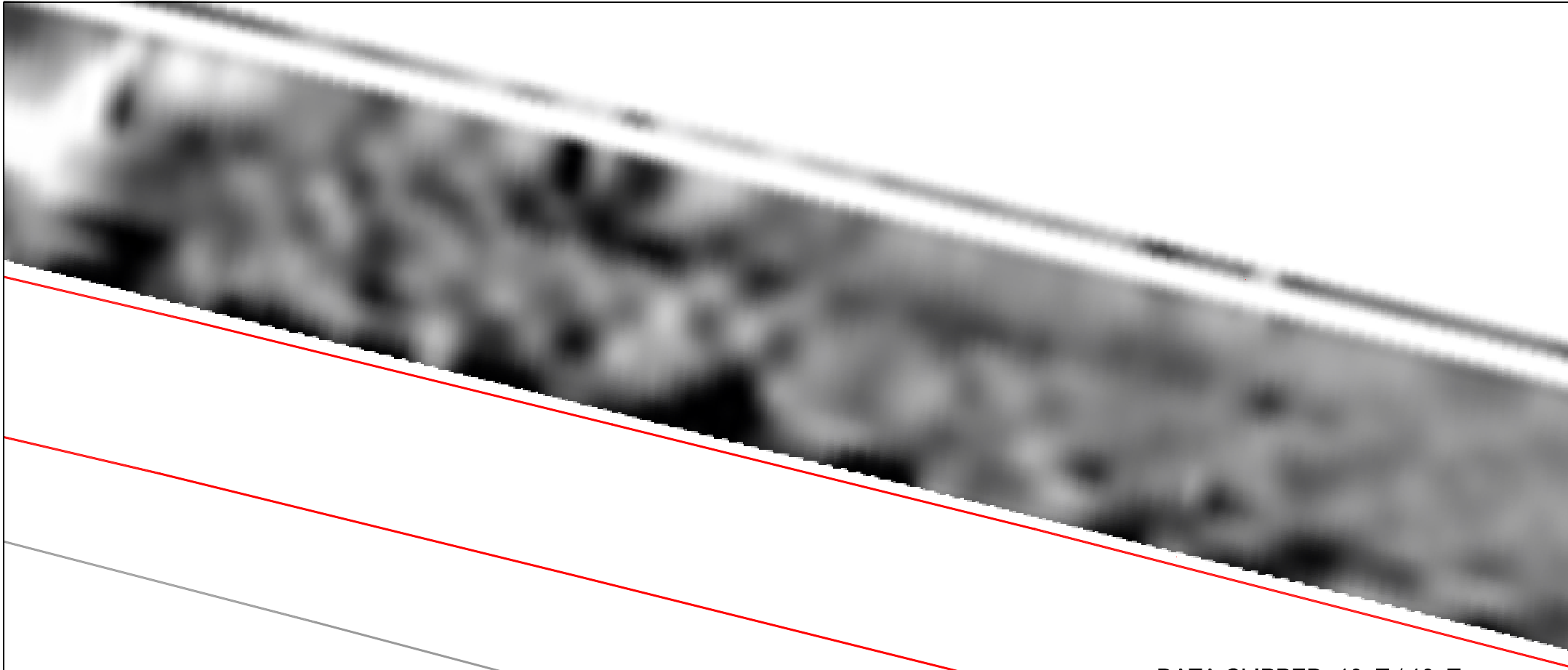
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Figure 12: Heddon on the Wall detailed greyscale plot of processed geophysical survey with comparative example of Nos 24-46 Shields Road excavation (central)

Heddon on the Wall Project number 293



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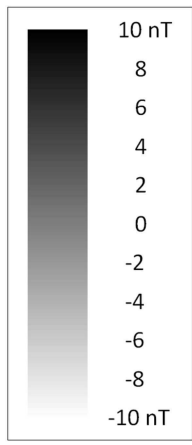
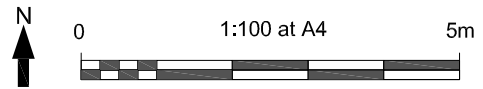
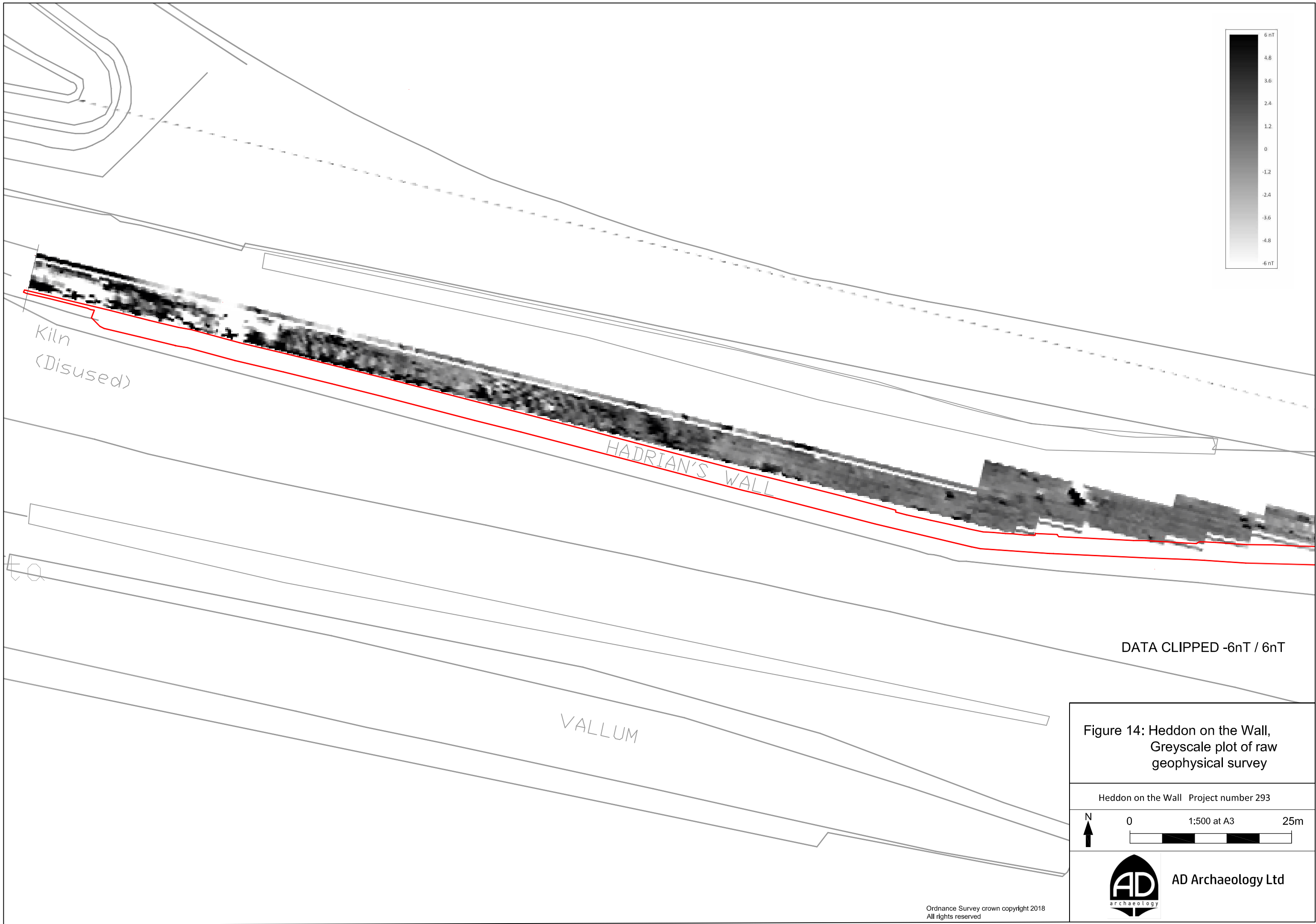


Figure 13: Heddon on the Wall
detailed greyscale plot of
processed geophysical
survey (west)

Heddon on the Wall Project number 293



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HADRIAN'S WALL

VALLUM

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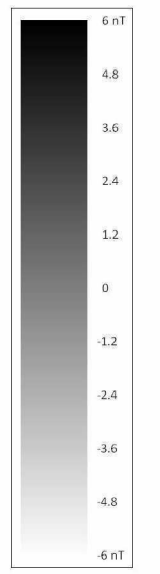
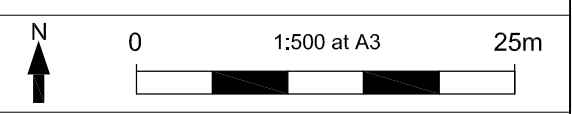


Figure 14: Heddon on the Wall,
Greyscale plot of raw
geophysical survey

Heddon on the Wall Project number 293



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HEDDON ON THE WALL SURVEY METADATA

SITE

Name: Heddon Cippi Pits
Location: Heddon-on-the-wall
MapRef:

COMPOSITE

Path: C:\Users\DELL User\Documents\TerraSurveyor
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Filename: heddonwall_workingtest.xcp
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Instrument Type: Grad 601 (Magnetometer)
Units: nT
Direction of 1st Traverse: 270 deg
Collection Method: ZigZag
Sensors: 2 @ 1.00 m spacing.
Dummy Value: 2047.5

Dimensions

Composite Size (readings): 840 x 75
Survey Size (meters): 210 m x 30 m
Grid Size: 30 m x 30 m
X Interval: 0.25 m
Y Interval: 0.4 m (surveyed @ 0.5 m)

Stats

Max: 10.00
Min: -10.00
Std Dev: 3.81
Mean: -0.09
Median: 0.00
Composite Area: 0.63 ha
Surveyed Area: 0.11631 ha

PROGRAM

Name: TerraSurveyor
Version: 3.0.28.1

-10/10nT clipped

Processes: 5
1 Base Layer
2 DeStripe Median Sensors: All
3 Interpolate: Y x 1.25
4 Clip at 1.00 SD
5 Clip from -10.00 to 10.00 nT

-5/5nT clipped

Processes: 6
1 Base Layer
2 DeStripe Median Sensors: All
3 Interpolate: Y x 1.25
4 Clip at 1.00 SD
5 Clip at 1.00 SD
6 Clip from -5.00 to 5.00 nT

-3/3nT clipped

Processes: 6
1 Base Layer
2 DeStripe Median Sensors: All
3 Interpolate: Y x 1.25
4 Clip at 1.00 SD
5 Clip at 1.00 SD
6 Clip from -3.00 to 3.00 nT